



**SILIGURI INSTITUTE OF TECHNOLOGY  
INFORMATION TECHNOLOGY  
ENGINEERING**



# **COURSE FILE**

**2<sup>ND</sup> SEM, 1<sup>ST</sup> YEAR, 2019**

**SEC – IT**

**PAPER DESCRIPTION : ENGLISH**

**PAPER CODE :HM HU 201**

# Course File

**Course Title: English**

**Code: HM HU201**

**Semester: 2<sup>nd</sup> Year: 1<sup>st</sup>**

**Name of the Faculty: MS Rimni Chakravarty**

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Class Schedule			
Lecture		Tutorial	Practical
Tuesday	10-11.40am		

Hours for meeting students:	
Wednesday	After 4.40 pm
Friday	After 4.40pm

## i) Course Objective

The students will be able to comprehend the utility of English language and their aspects in professional life.

## ii) Course Outcomes

Course Outcome		Target (marks %)
HU201.1	Write grammatically correct English to express in a lucid manner (BT1)	50%
HU201.2	Summarize technical and non technical passages written in English (BT2)	50%
HU201.3	Understand and develop the skill to write different instruments of organizational communication (PS3)	50%
HU201.4	Explain the various concepts of technical communication and its utility in profession (BT2)	50%

- i. After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes:

Sl. No.	Knowledge and Skills
1	Understand and know grammatical nuances like subject verb agreement, use of prepositions, idioms and phrases etc.
2	Organization of writing, comprehend and write a precise on technical and non technical passages and write an essay on technical and general topics
3	Identify the different characteristics of good business letters, reports and job application letters.
4	Distinguish and practice the form, structure, tone and style of organizational communication like memo, circular, notice, agenda and minutes.

- ii. Once the student has successfully complete this course, he/she must be able to answer the following questions or perform/demonstrate the following:

Sl	Question	BT Level
1.	How to describe the difference between “practice” and “practise”?	1
2.	Write the synonym and antonym of words like global, optimistic etc.	1
3.	How to write a notice as the game secretary of the institute urging the other students to participate in a friendly football match to be held with the male faculties on the ground.	BT PS3
4.	What are the barriers of effective communication skills? Explain the methods to overcome the barrier?	1
5.	What are the “Seven C” of effective communication? How would these be helpful in solving issues in professional life?	1
6.	Justify the title “The Open Window” by Saki.	2
7.	Explain the short story “The Thief “by Ruskin Bond?	2
8.	Identify the difference between a CV and a Resume.	1
9.	Write a resume along with a cover letter evaluating the key skills to justify the position applied for.	1
10.	What are the basic principles of a Group Discussion?	1
11.	How to weigh the dos and don’ts in a Group Discussion?	1
12.	What are the parameters justified in a group discussion?	2
13.	How to plan effectively in a group Discussion?	3
14.	How to build rapport with the audience in presentation?	3
15.	What are the methods needed to be devised while making a presentation?	2
16.	What are the methods that need to be adapted to remain assertive and not aggressive in a group discussion as well as in a presentation?	BT PS6
17.	How the team leader should operate in a presentation?	BT PS5
18.	How the group should co ordinate among themselves in a group Discussion?	BT PS5
19.	How one should develop the quality of delivery in a presentation and a group discussion?	BT PS5
20.	Why is it necessary to maintain eye contact in a presentation?	BT PS5

### iii) Topic Layout

Topic		Lecture Hours
<b>1.English language and grammar</b>	Correction of errors in sentences/Building vocabulary/word formation/Single word for a group of word. Fill in the blanks with correct words. English Language and Grammar/Sentence structure and Transformation/Active and Passive Voice/Direct and Indirect Sentences.	5
<b>2. Reading Comprehension</b>	Strategies for reading a comprehension passage, Practicing Technical and non technical passages	4
<b>3. Technical Communication</b>	The Theory of Technical Communication -Nature and Scope/Barriers of Communication/ Different Communication Models/ Effective Communication (Verbal and Non Verbal)/ Presentation /Public Speaking Skills	9
<b>4. Mastering Technical Communication</b>	Writing skills: Technical report/ Business letters/ Job Application letters/ Organizational Communication/ Group Discussion	12

### iv) Text books

1. Technical Communication (Principles and practice) by Meenakshi Raman and Sangeeta Sharma, Oxford University Press, 2011.
2. Effective Technical communication by M.Ashraf. Rizvi, Tata McGraw-Hill
3. Communication Techniques and Skills by R.K.Chadha, Dhanpat Rai Publications, 2011

### Reference books:

1. Dr. D. Sudharani: Manual for English Language Laboratory Pearson Education (WB edition), 2010
2. Board of Editors: Contemporary Communicative English For Technical Communication, Pearson Longman, 2010

### (v) Evaluation Scheme

#### 1) Theory

Evaluation Criteria	Marks
Internal Exam*	15
Quiz / assignment	10
Attendance	5
University Exam/External Exam	70
Total	100

\* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

## Course target attainment levels:

Attainment Level	Inference
Attainment Level 1	40% of the students have attained more than the target level of that CO
Attainment Level 2	50% of the students have attained more than the target level of that CO
Attainment Level 3	60% of the students have attained more than the target level of that CO

Overall Course Attainment Target = 70% of the students will get “A” Grade

Target has been set on the basis of last year’s performance / result by the students, student quality this year and difficulty level of the course.

## University Grading System:

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

## (vi) Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes												PSOs	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	1.	2.
HU201.1	-	-	-	-	-	-	-	-	1	2	-	1	-	-
HU201.2	-	-	-	-	-	-	-	-	1	2	-	1	-	-
HU201.3	-	-	-	-	-	-	-	-	1	2	-	1	-	-
HU201.4	-	-	-	-	-	-	-	-	1	2	-	1	-	-
Average CO	-	-	-	-	-	-	-	-	1	2	-	1	-	-

1 = courses in which the student will be exposed to a topic (BT level 1& 2)

2 = courses in which students will gain competency in that area (BT level 3-4)

3= courses in which students will master that skill (BT level 5-6)

### Justification:

CO1 to CO4 minimally satisfies functioning effectively as an individual, and as a member or leader in diverse teams (PO9)

CO1 to CO4 partially satisfies in communicating effectively with engineering community and with society at large by being able to comprehend and write effective reports, make effective presentations and give and receive clear instructions (PO10)

CO3 and CO4 minimally satisfy to recognize the need for and make preparation and ability to engage in independent and lifelong learning in the broadest contexts of technological change (PO12)

**(vii) Assessment Methodology**

Outcome	Assessment Tool
HU201.1	Quiz, IE 1 and IE2
HU201.2	Assignments/ Internal exam 1
HU201.3	Internal exam 1 and 2
HU201.4	Internal exam 1 and 2
HU201.1, HU201.2, HU201.3, HU201.4	End of Semester University exam

**(viii) A. Weekly Lesson Plan**

Week	Lectures	Assignment
1 <sup>st</sup> and 2 <sup>nd</sup> week	Introduction to Cos, syllabus and assessment. English Language and grammar/Correction of errors in sentences/Building vocabulary/word formation/Single word for a group of word./Fill in the blanks with correct words. English Language and Grammar/Sentence structure and Transformation/Active and Passive Voice/Direct and Indirect Sentences.	
3 <sup>rd</sup> and 4 <sup>th</sup> week	Technical Communication - Nature and Scope, Barriers, Communication Models, Effective communication Verbal and non Verbal communication	
	Presentation and public speaking	
5 <sup>th</sup> and 6 <sup>th</sup> week	<p>Reading Comprehension: Strategies for reading a comprehension passage, Practicing Technical and non technical passages</p> <p><b><u>Précis writing exercise 1: (CO2)</u></b></p> <p>The universal tendency of the human mind is to shrink from the trouble of thinking out any of its so-called opinions. People become mentally indolent, too indolent to judge for themselves. On any conceivable subject, they take their opinions ready-made. The memory thus becomes a store house of conventional readymade opinions, and these eventually harden into irrational convictions. (57 words)</p> <p>Qs.1 Make a précis of the above passage and give a</p>	

	<p>suitable title. (BT 2)</p> <p>Answer: <u>How irrational convictions are formed</u></p> <p>People generally are too lazy to think for themselves and accept ready-made opinions that finally become foolish convictions with them. (20 words)</p>	
5 <sup>th</sup> and 6 <sup>th</sup> week	<p>Strategies for Reading Comprehension: Précis writing</p> <p><b><u>Précis writing exercise 2(CO2)</u></b></p> <p>It is undesirable that some useful analogies can be drawn between relation systems of computer mechanism and relation system of brain mechanism. The comparison does not depend upon any close resemblance between the actual mechanical links which occur in brains and computers; it depends on what the machines do. Furthermore, brains and computers can both be originalised so as to solve problems. The mode of communication is very similar in both cases, so much so that computers can now be designed to generate artificial human speech and even, by accident, to produce sequences of words which human beings recognize as poetry. The implication is not that machines are gradually human forms, but that there is no sharp break of continuity between what is human and what is mechanical.</p> <p><u>Questions:</u></p> <ol style="list-style-type: none"> <li>1) The similarity between human brain and the computer could be categorized as _____. (BT1)</li> <li>2) Why are computers able to many functions similar to those performed by the human brain? (BT1)</li> <li>3) What is the prime object of the author of this passage/ what is the central theme of this passage? (BT2)</li> </ol> <p>Give a suitable title to the passage? (BT2)</p>	
7 <sup>th</sup> week	<p>Job Application letter</p>	<p><b><u>Write a letter for applying for the post of management trainee in response to the following advertisement in ‘The Times of India’: (CO3, BT2)</u></b></p> <p>Zeomega is a leading provider of software for integrated care management. Our</p>

		<p>solution does more than help care managers track individuals and their treatment.</p> <p>Education: B.Sc (CS), BCA, BE, B.Tech, M.Sc, M.Tech, MCA, MBA</p> <p>Do you like challenges and being on the forefront of innovation or being around really smart people? If yes, we invite you to explore an exciting career with us.</p> <p>Technical skills: Responsible for design, development, coding, testing, debugging and documentation of applications to satisfy requirements of one or more user areas.</p>
<p>8<sup>th</sup> week and 9<sup>th</sup> week</p>	<p>Business Letters – Inquiry letters and replies to inquiry letters</p> <p><b>Activity:</b> Read the following letter and make necessary changes in the language, style, tone and attitude of the letter (CO3, BT2)</p> <p>Dear Mr. Chopra,</p> <p>I have gone through the letter sent by your office last week. Please be advised that our company can accept the offer to which the letter refers because it would be beneficial for our company in several ways. In fact, we have been looking for such innovative programmes for our junior executives for a long time but no training and consultancy company came forward with such a proposal. You are the first company to send us this interesting proposal.</p> <p>I have gone through the structure of the workshop and find it exhaustive and appropriate. However, the workshop may not be effective unless it includes some project work relating to some important areas of artificial intelligence. Moreover, our company may not be able to upgrade the knowledge level in this regard on a continuous basis unless project work is included.</p> <p>There is no doubt that you have worked hard to design the structure of the programme so that it is suited to our needs. Nevertheless, we would not be able to take any action unless we receive your final proposal. Send this positively by the end of</p>	



	<p>May, 2009.</p> <p>Yours sincerely,</p> <p>(Signature) RS Prasad</p>	
8 <sup>th</sup> week and 9 <sup>th</sup> week	Business Letters – Letters placing orders, complaint and adjustment letters	<p><b><u>Writing a complaint letter (CO3)</u></b></p> <p>Write a complaint letter to the General Manager, BSNL (Dhanbad) pointing out billing error in your May and July' 2004 telephone bills. (BT2)</p>
10 <sup>th</sup> and 11 <sup>th</sup> week	Report writing – types and report writing practice	<p><b><u>Writing an investigative report (CO3)</u></b></p> <p>You have been asked to investigate a serious fire accident. Write a report describing the cause or causes, losses and suggesting ways to prevent such accidents in future. This report has been asked from you by DM (District Magistrate) of Siliguri. Write a report in a memo format. (BT2)</p>
12 <sup>th</sup> week	Organizational Communication/Notice, memos, agenda, minutes	<p><b>1. <u>Writing a notice (CO3)</u></b></p> <p>Your institution is organizing annual sports week to be held in the last week of January. As the convenor or secretary of the sports union of your institution, write a notice asking students to participate in as many events and make it a success. (BT2)</p> <p><b>2. <u>Writing a minutes (CO3)</u></b></p> <p>Prepare a minutes of the board of directors of Himalaya Food products limited arranging the following items of discussion in proper order: housing loan to employees, complaints regarding the quality of the products, appointment of employees and present financial status of the company. (BT2)</p>

## (VIII) B. COMBINED DAILY LESSON PLAN & EXECUTION REPORT

NAME OF FACULTY : MS Rimni Chakravarty	DEPARTMENT :DESH	SUBJECT: English CODE : HM HU - 201	SEMESTER :2 <sup>nd</sup>
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Unit / Module	Comp. Index	Topic Description ( to be quoted from syllabus )	No. of Lecture (s)	Plan Date(s)	Executi on Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
1	1.1	Introduction to Cos, syllabus and assessment	1	801-2019 Tuesday	1501-2019 Tuesday		Importance of Communication in industry	
	1.2	Single word for a group of words	1	801-2019 Tuesday	21-01-2019 Tuesday	<b>MCQs and exercises:</b> a. Name a single word for a group of words, e.g., that which cannot be corrected? Answer incorrigible BT1 b. Write the verbs in the appropriate form e.g. The poultry ...belongs.....( belong) to him		
	1.3	Sentence structures and Transformation	1	151-2019 Tuesday	2201-2019 Tuesday	1.Describe the principles that govern the different types of sentences simple, compound, complex BT1 2 Convert a compound sentence into a complex one e.g. John shouted and everybody waved which will be transformed as Everybody waved when John shouted BT level 1 3.Name the different types of sentences, simple, compound and complex.BT level 1		
	1.4 & 1.5	Active and Passive Voice/ Direct and Indirect Narration/ Strategies of essay writing and Quiz on English Language and Grammar	2	2201-2019 Tuesday	2901-2019 Tuesday	Quiz – 15 questions on antonyms and synonyms (vocabulary), prepositions and choose the correct word. <u>Section I</u> (CO1) (BT1) Choose the word which is similar in meaning (synonyms) to the given word: Astute - a) judicious b) Abstentious c) Abhorrent d) Agitated Pagan - a) Believer b) Pageant c) Atheist d) Pacifist Euphemistic – a) Effective b) Pretentious c) Preventive d) Impending Recapitulate – a) Receive b) Recent c) Reiterate d) Rebuke Fervid – a) Intended b) Flexible c) Futile d) Intense		

						<p><u>Section II</u> (CO1) (BT1)</p> <p>Fill in the blanks with appropriate words given below the passage:</p> <p>Twenty20 cricket __ (6) __ the young than the old; it is a young man's game because of the __ (7) __ required in the field and the speed needed __ (8) __ the wickets. Runs __ (9) __ are runs __ (10) __ and these days __ (11) __ tend to __ (12) __ younger legs to older brains. But no coach in the world would turn down the __ (13) __ of some of the cooler heads. Watch the cup __ (14) __, not just for runs and wickets, but for __ (15) __ of truth.</p> <p>a) praises b) condemn c) celebration d) celebrates  a) athleticism b) reflexes c) acrobatics d) aerobics  a) into b) between c) across d) through  a) lost b) restored c) saved d) stored  a) given away b) snatched c) taken d) earned  a) coaches b) teachers c) trainers d) instructors  a) disinterested b) interested c) prefer d) appreciate  a) indifference b) foolishness c) sense d) wisdom  a) keenly b) carelessly c) closely d) distantly  a) instances b) minutes c) seconds d) moments</p>		
4	4.1	The Theory of Communication: Definition and scope	1	291-2019 Tuesday	0502-2019 Tuesday	<p>1.Explain the term communication BT2  2,Name the Latin root of communicationBT1  3.Discuss the nature of communication and its scope BT2</p>		
	4.2 & 4.3	Barriers of Communication/ Models of communication	1	2901-2019 Tuesday	0502-2019 Tuesday	<p>Name and describe the barriers of communication BT1  2,Explain the difference between the physical, psychological barrier of communication BT2  3.Discuss how to solve the different barriers of communication BT2</p>		
	4.4 & 4.5	Effective Communication: Verbal and Non verbal/ Presentation and Public Speaking Skills.	2	0502-2019 Tuesday	1902-2019 Tuesday			
2	2.1 & 2.2	Strategies for reading comprehension – I/ Strategies for reading comprehension – II	2	1902-2019 Tuesday	2602-2019 Tuesday	<p>Précis writing exercise 1: (CO2)</p> <p>The universal tendency of the human mind is to shrink from the trouble of thinking out any of its so-called opinions. People become mentally indolent, too indolent to judge for themselves. On any conceivable subject, they take their opinions ready-made. The memory thus becomes a store house of conventional readymade opinions, and these</p>		

						<p>eventually harden into irrational convictions. (57 words)</p> <p>Qs.1 Make a précis of the above passage and give a suitable title. (BT 2)</p> <p>Answer: <u>How irrational convictions are formed</u></p> <p>People generally are too lazy to think for themselves and accept ready-made opinions that finally become foolish convictions with them.</p> <p>(20 words)</p>		
2.3 & 2.4	Strategies for reading comprehension – III/ Strategies for reading comprehension – IV	2	2602-2019 Tuesday	0503-2019 Tuesday	<p>Précis writing exercise 2: (CO2)</p> <p>It is undesirable that some useful analogies can be drawn between relation systems of computer mechanism and relation system of brain mechanism. The comparison does not depend upon any close resemblance between the actual mechanical links which occur in brains and computers; it depends on what the machines do. Furthermore, brains and computers can both be originalised so as to solve problems. The mode of communication is very similar in both cases, so much so that computers can now be designed to generate artificial human speech and even, by accident, to produce sequences of words which human beings recognize as poetry. The implication is not that machines are gradually human forms, but that there is no sharp break of continuity between what is human and what is mechanical.</p> <p><u>Questions:</u></p> <p>The similarity between human brain and the computer could be categorized as _____.(BT1)</p> <p>Why are computers able to many functions similar to those performed by the human brain? (BT 1)</p> <p>What is the prime object of the author of this passage/ what is the central theme of this passage? (BT 2)</p> <p>Give a suitable title to the passage? (BT 2)</p>			
3	3.1 Drafting Job Application letter and Resume	2	0503-2019 Tuesday	12,319 Tuesday	<p>Write a job application letter to the following advertisement on Telegraph 20<sup>th</sup> August 2015</p> <p>An MNC has a vacancy for the post of a Junior Manager, where the company would be recruiting an engineer with three years of experience .Apply with 21 days along with the resume to Ms. Rita Ghosh , HR Manager ,Corporate Computer Communications ,EN Block salt lake ,Kolkata : 700091</p>			

3.2	Drafting Job Application letter ,CV	1	12.3-2019 tuesday	1903-2019 Tuesday	<p><u>Drafting a job application letter</u> (CO3, BT 2)</p> <p>Write a letter for applying for the post of management trainee in response to the following advertisement in ‘The Times of India’:</p> <p>Zeomega is a leading provider of software for integrated care management. Our solution does more than help care managers track individuals and their treatment.</p> <p>Education: B.Sc (CS), BCA, BE, B.Tech, M.Sc, M.Tech, MCA, MBA</p> <p>Do you like challenges and being on the forefront of innovation or being around really smart people? If yes, we invite you to explore an exciting career with us.</p> <p>Technical skills: Responsible for design, development, coding, testing, debugging and documentation of applications to satisfy requirements of one or more user areas.</p>		
3.3	Business Letters - Difference between a good letter and a bad letter Enquiry Letter Placement of order letter	1	1203-2019 Tuesday	1903-2019 Tuesday	<p>Write an enquiry letter to OUP YMCA library building ,Jai Singh road ,New Delhi 110001enquiring about the availability of the following books</p> <p>Technical Communication : Principles and Practice second edition by Meenakshi Raman and Sangeeta Sharma BT level 1</p> <p>Write a letter to The Marketing Manager, OUP YMCA library Building ,Jai Singh Road ,New Delhi 110001 placing order for the following book:Technical Communication: Principles and Practice second edition by Meenakshi Raman and Sangeeta Sharma BT level 1</p>		
3.4	1.Discussion on the method to write a complaint letter 2. Discussion on the method to write adjustments to complaint letter. 3 Writing a complaint and adjustment letter?	1	1903-2019 Tuesday	26.3.019 Tuesday	<p>1. Write a complaint letter to the Marketing Manager, XYZ Publisher, Dariyaganj, New Delhi 110001 to have sent you a book entitled ‘Communication Skills for Engineers ‘2<sup>nd</sup> Edition 2015 in a mutilated condition by speed post on 20<sup>th</sup> September 2015 which you received at this moment claiming for your amount for the book or sending you a good one.BT level 1</p> <p>2..Write an adjustment letter as the Marketing Manager of XYZ publisher ,Daryiganj ,New Delhi 110001 to your customer who has complaint for sending a mutilated book entitled “communication skill for the Engineers “ BT level 1</p>		
3.5	1. Discussion on the method to write a Request	1	1903-2019	2603-2019	1.Explain the method of drafting request letter and replies to request letter		

	letter, complaint and adjustment letters 2. Drafting Request letter, complaint and adjustment letters		Tuesday	Tuesday	<p>2. <u>Activity</u>: Read the following letter and make necessary changes in the language, style, tone and attitude of the letter BT 2</p> <p>Dear Mr. Chopra, I have gone through the letter sent by your office last week. Please be advised that our company can accept the offer to which the letter refers because it would be beneficial for our company in several ways. In fact, we have been looking for such innovative programmes for our junior executives for a long time but no training and consultancy company came forward with such a proposal. You are the first company to send us this interesting proposal.</p> <p>I have gone through the structure of the workshop and find it exhaustive and appropriate. However, the workshop may not be effective unless it includes some project work relating to some important areas of artificial intelligence. Moreover, our company may not be able to upgrade the knowledge level in this regard on a continuous basis unless project work is included.</p> <p>There is no doubt that you have worked hard to design the structure of the programme so that it is suited to our needs. Nevertheless, we would not be able to take any action unless we receive your final proposal. Send this positively by the end of May, 2009.</p> <p>Yours sincerely, (Signature) RS Prasad</p>		
3.6	1. Discussion on the method to write a complaint and adjustment letters 2. Drafting Request letter, complaint and adjustment letters	1	26.02019 Tuesday	02042019 Tuesday	<p><u>Drafting complaint letter</u> (CO3)</p> <p>Write a complaint letter pointing out billing error in your May and July' 2004 telephone bills to the General Manager, BSNL (Dhanbad). (BT 2)</p>		
3.7	Report Writing I : 1. What is a report? Discuss 2. Discuss the different types of reports. BT level 1	1	2603-2019 Tuesday	0204-2019 Tuesday		Discussion of the importance of reports in professional life and its different	

		3.Describe what to write in an FIR BT level 1 4.Discuss the points to be mentioned in a sales report, investigative report newspaper report BT level 1					types	
	3.8	Report writing II - 1.Discuss the method to follow in preparing newspaper report 2.Write a newspaper report	2	0204-2019 Tuesday	0904-2019 Tuesday	Write a report for a local newspaper on the two day seminar held on “ Technology and the common Man hosted by your college giving details of the presentations made by the eminent speakers on the subject.BT level 1		
	3.9	Report Writing III - 1.Discuss the method to follow in preparing an investigative report 2.Write an investigative report	1	0904-2019 Tuesday	2304-2019 Tuesday	<u>Writing an investigative report:</u> (CO3) You have been asked to investigate a serious fire accident. Write a report describing the cause or causes, losses and suggesting ways to prevent such accidents in future. This report has been asked from you by DM (District Magistrate) of Siliguri. Write a report in a memo format. (BT 2)		
	3.10	Organizational Communications - 1. Discussion on the importance of drafting Notice, Memorandum, Circular 2 Drafting Notice, Memorandum, Circular	1	0904-2019 Tuesday	2304-2019 Tuesday	<u>Writing a notice:</u> (CO3) Your institution is organizing annual sports week to be held in the last week of January. As the convener or secretary of the sports union of your institution, write a notice asking students to participate in as many events and make it a success. (BT 2)		
	3.11	Organizational Communications - 1. Discussion on the importance of Agenda, Proposal, Minutes 2 Drafting Agenda, Proposal, Minutes.	2	2304-2019 Tuesday	304-2019 Tuesday	<u>Writing minutes:</u> (CO3) Prepare a minutes of the board of directors of Himalaya Food products limited arranging the following items of discussion in proper order: housing loan to employees, complaints regarding the quality of the products, appointment of employees and present financial status of the company.(BT2		
2	2.5	Topic 5 / Unit 2 Reading Comprehension	1	304-2019 Tuesday	0705-2019 Tuesday	Reading and discussing different technical and general passages (BT1 & BT 2)		
	2.6	Reading Comprehension	1	304-2019 Tuesday	0705-2019 Tuesday			

## **(ix) Teaching Strategy / Method**

1. Classroom discussions
2. Revision of the previous lesson
3. Previous year Question-Answer discussions
4. Home assignments.
5. Identify slow learners in a class and arrange confusion clearing session separately for them.
6. Identify the bright students
7. Learning by question and answering
8. Learning by practice
9. Always encouraging the students to ask questions

### **(ixa) Strategy to support weak students**

1. Couple weak students with bright ones.
2. Encourage them to respond in the class.
3. Make them solve previous year university questions.

### **(ixb) Strategy to encourage bright students**

1. Engage them to help the weak learners in solving assignments.
2. The bright students are encouraged to guide the weak students as group leaders to lead the weak ones face challenges of academics with confidence.
3. Try to encourage them to study beyond the syllabus
4. Ask them to develop the habit of reading anything good and rich in content

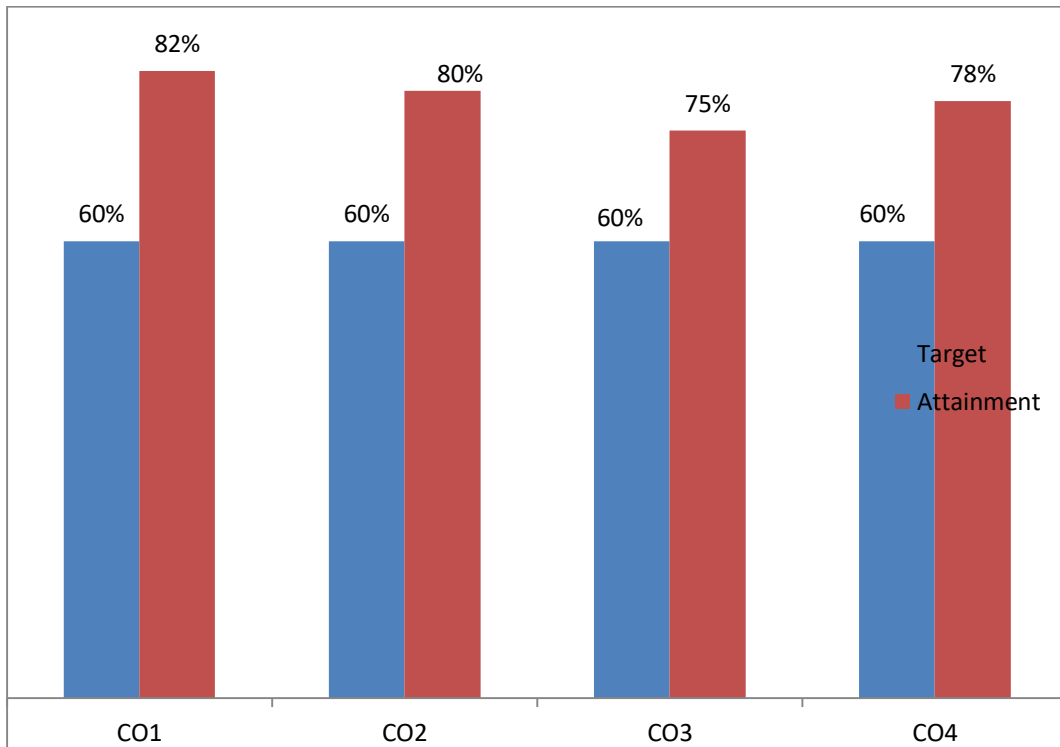
### **(ixc) Efforts to keep students engaged**

1. Engage them in group activities and instruct them to narrate a story to inspect the element of Grammar and its usage.
2. Asking random questions to the students from the topic
3. Take a surprise test and applaud when they perform well.
4. Regular assignment and homework
5. Internal examinations
6. Quiz in class

## **(x) Analysis of Students performance in the course**

### **INTERNAL ASSESSMENT**



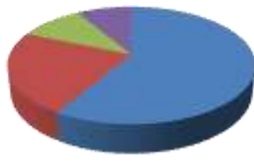


As per the chart above, it can be seen that target has been achieved for all COs. However more emphasis is to be given in précis writing and more practice sessions to be taken on resume writing and business letters.

## **UNIVERSITY EXAMINATION**

University Gradation			University results	
Letter Grade	Point	% Marks	Grade	Number of students who scored
O	10	90% & above	O	0
E	9	80%-89%	E	4
A	8	70%-79%	A	9
B	7	60%-69%	B	3
C	6	50%-59%	C	4
D	5	40%-49%	D	0
F	Less Than 5	Less than 40%	F	0

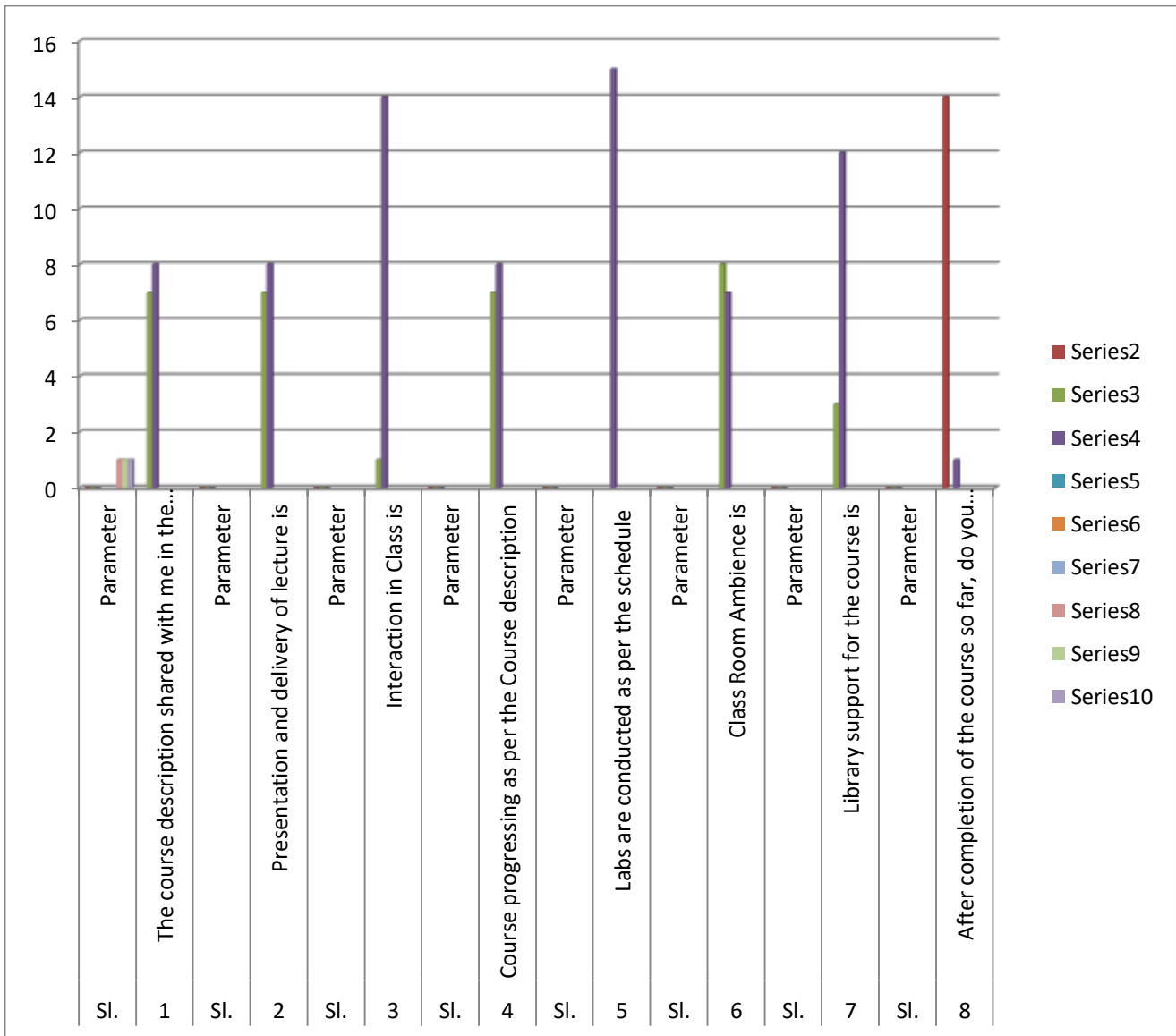
## university result



- 1st Qtr
- 2nd Qtr
- 3rd Qtr
- 4th Qtr

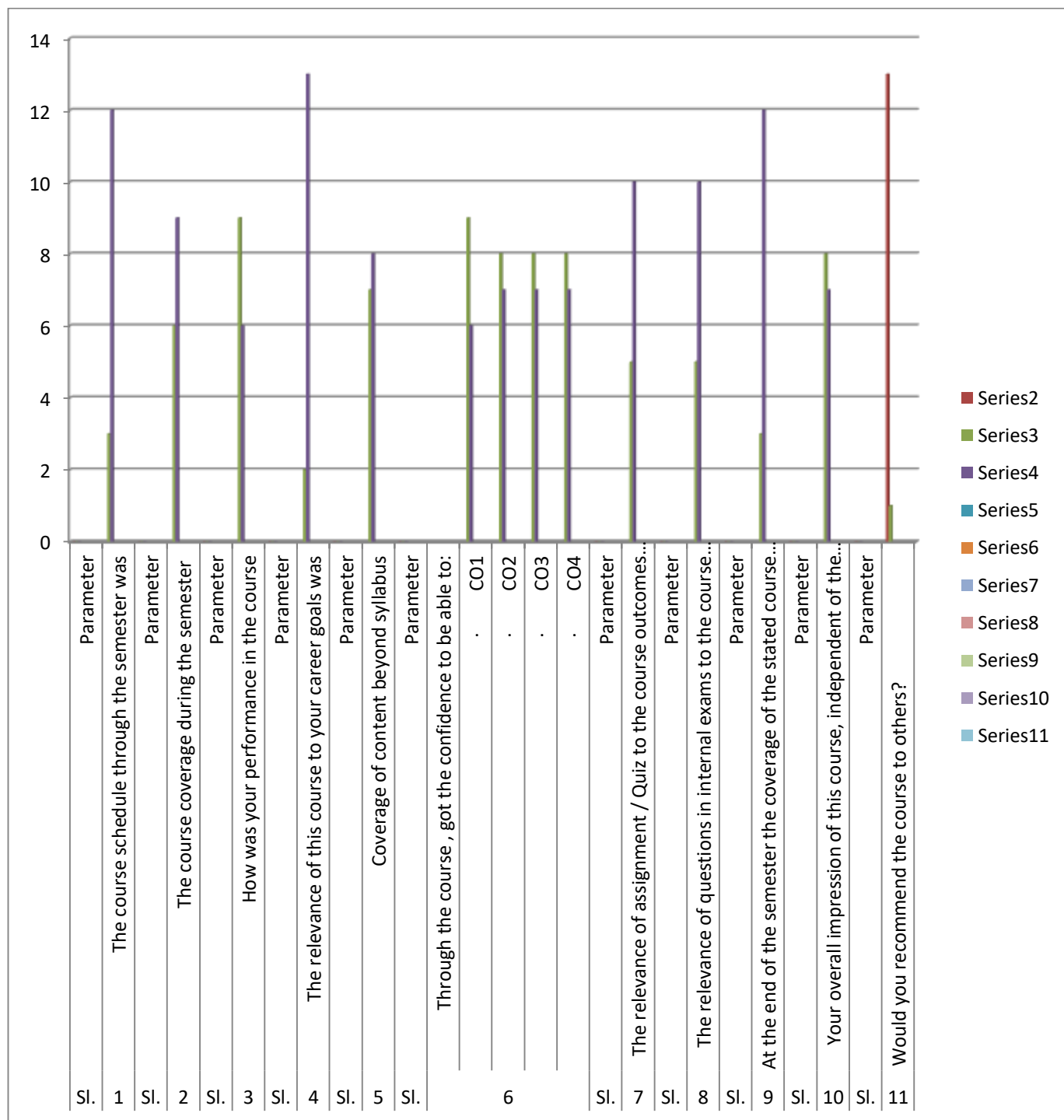
## (xi) Analysis of Student Feed Back

### Formative feedback analysis taken before 1<sup>st</sup> internal:



<b>Major comments by students on the subject taught:</b>
1. This course is improving our communication, presentation skills and boosting our confidence
2. This course helps us to communicate with people very confidently and smartly
3. This course is overcoming my stage fear and improving my communication skills

**Summative feedback analysis taken at the end of 2<sup>nd</sup> internal:**



### Major comments by students on the subject taught:

1. The things we could do beyond syllabus like visiting an orphanage was excellent. That became possible only because of the class and our respected teacher
2. Classes were interesting enough
3. The class is very innovative and interesting. Best experience of learning effortlessly.
4. Sometimes writing in theory classes turns bit boring.
5. The classes were energetic. Teaching method was very good.

### The corrective measures which are taken as follows:

1. The students were allotted time to make them understand the points which they were unable to grasp.
2. The weak students were paired with the bright students in a vigorous manner for the sake of motivation.
3. Initiatives were vigorously taken to raise queries among the students.
4. The students were given assignment to speak up from the podium in the next class.

#### **(xii) Teacher Self-Assessment (at the completion of course)**

- The teacher aims to develop hand outs and assignments on precise writing.
- The teacher aims to adopt group work as a method to improve their understanding the concepts of technical communication.

#### **(xiii) Recommendations/ Suggestions for improvement by faculty**

- The faculty aims to go slow for the weak students.
- The faculty aims to keep more touch with the students and adopt methods to ensure that the weak students complete their assignments in proper time.

# INTERNAL ASSESMENT RECORD

Subject with code: English (HU201)

Section: Information Technology

Semester :2<sup>nd</sup>

Discipline: IT

Sl	Roll No.	Name	Attendance		Internal Examination			Assign ment / Quiz (10)	Total (30)
			Total	Marks (5)	1 <sup>st</sup> 50	2 <sup>nd</sup> (50)	Avg. (15)		
1	11900218001	Ujjwal Jha	30	5	35	35	11	10	26
2	11900218002	Tejoshmoy Dutta	24	4	37	18	8	10	22
3	11900218003	Sudeshna Pan	30	5	33	34	10	10	25
4	11900218004	Subrata Roy	24	5	6	23	4	10	20
5	11900218005	Subhankar Maji	24	5	34	18	8	10	23
6	11900218006	Subhajit Mandal	24	4	28	AB	7	10	21
7	11900218007	Sourik Basu	24	4	37	32	10	10	24
8	11900218008	Sonu Kumar	28	5	9	17	4	10	19
9	11900218009	Snehadeep Bhowmik	24	4	27	19	7	10	21
10	11900218010	Shubham Kumar	25	4	23	20	6	10	20
11	11900218011	Shivam Raj	30	5	27	24	8	10	24
12	11900218012	Shivam Kumar Mishra	30	5	20	14	5	10	20
13	11900218013	Saumya Sagar	30	5	29	19	7	10	22
14	11900218014	Sahil Pal	30	5	31	36	10	10	25
15	11900218015	Sagar Prasad	30	5	29	22	8	10	23
16	11900218016	Sagar Lama Tamang	30	5	34	28	9	10	24
17	11900218017	Sagar Dutta	30	5	18	11	4	10	19
18	11900218018	Roshan Darnal	26	4	26	34	9	10	24
19	11900218019	Ratnadeep Shome	24	5	22	15	6	10	21
20	11900218020	Raktimabho Ghosh	28	5	25	20	7	10	22
21	11900218021	Rakesh Ghosh	24	4	17	12	4	10	18
22	11900218022	Rajoshree Saha	26	4	31	31	9	10	23
23	11900218023	Raja Sah	30	5	15	8	3	10	18
24	11900218024	Rahul Raj	30	5	21	20	6	10	21
25	11900218025	Rahul Deb Barman	24	4	31	23	8	10	22
26	11900218026	Rahul Biswas	24	4	28	21	7	10	21
27	11900218027	Pritish Jha	24	4	27	29	8	10	22
28	11900218028	Prithvi Raj	24	4	38	39	12	10	16
29	11900218029	Pritam Sharma	30	5	27	34	9	10	24
30	11900218030	Pragya Jaiswal	30	5	30	29	9	10	25
31	11900218031	Nipu Chandra Das	24	4	25	32	9	10	24
32	11900218032	Muskan Bansal	30	5	22	32	8	10	23
33	11900218033	Kush Ojha	30	5	31	25	8	10	23
34	11900218034	Jaydeep Das	30	5	29	30	9	10	24
36	11900218036	Harshita Richa	30	5	37	34	11	10	26
37	11900218037	Esha Das	30	5	36	43	12	10	27
38	11900218038	Diptiman Majumdar	30	5	36	44	12	10	27
39	11900218039	Deepraj Pradhan	30	5	22	23	7	10	22
40	11900218040	Deepjoy Sarkar	30	5	35	38	11	10	26
41	11900218041	Debashis Mishra	30	5	33	11	7	10	26

42	11900218042	Buddhadeb Jena	30	5	ab	27	3	10	18
43	11900218043	Brijesh Kumar Choudhury	30	5	27	AB	3	10	18
44	11900218044	Avrojyoti Dhar	30	5	22	23	7	10	22
45	11900218045	Ashutosh Kumar	30	5	30	34	10	10	25
46	11900218046	Arnab Roy	30	5	25	31	8	10	25
47	11900218047	Arghadip Bagchi	30	5	29	37	10	10	25
48	11900218048	Apu Sarkar	30	5	25	29	8	10	24
49	11900218049	Anjay Kant Jha	30	5	33	38	11	10	26
50	11900218050	Anindita Saha Pramanik	30	5	35	27	9	10	25
51	11900218051	Amelia Dutta	30	5	33	38	10	10	25
52	11900218052	Abhishikta Biswas	30	5	35	27	8	10	24







## Records of Assignment

**Subject with code: English Language and Technical Communication (HU201)**

**Section: Information Technology Engineering      Semester :1<sup>st</sup>**

**Discipline: information Technology Engineering**

Sl	Roll No	Name																
1	11900218 001	Ujjwal Jha	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y			
2	11900218 002	Tejoshmoy Dutta	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y	Y	
3	11900218 003	Sudeshna Pan	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y	Y	
4	11900218 004	Subrata Roy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		
5	11900218 005	Subhankar Maji	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y	Y	
6	11900218 006	Subhajit Mandal	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
7	11900218 007	Sourik Basu	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y			
8	11900218 008	Sonu Kumar	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y	Y	
9	11900218 009	Snehadeep Bhowmik	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10	11900218 010	Shubham Kumar	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y	Y	
11	11900218 011	Shivam Raj	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
12	11900218 012	Shivam Kumar Mishra	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	
13	11900218 013	Saumya Sagar	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
14	11900218 014	Sahil Pal	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y			
15	11900218 015	Sagar Prasad	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y	Y	
16	11900218 016	Sagar Lama Tamang	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
17	11900218 017	Sagar Dutta	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y	Y	

18	11900218 018	Roshan Darnal	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
19	11900218 019	Ratnadeep Shome	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y	Y	
20	11900218 020	Raktimabho Ghosh	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
21	11900218 021	Rakesh Ghosh	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
22	11900218 022	Rajoshree Saha	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
23	11900218 023	Raja Sah	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
24	11900218 024	Rahul Raj	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
25	11900218 025	Rahul Deb Barman	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
26	11900218 026	Rahul Biswas	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
27	11900218 027	Pritish Jha	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
28	11900218 028	Prithvi Raj	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
29	11900218 029	Pritam Sharma	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
30	11900218 030	Pragya Jaiswal	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
31	11900218 031	Nipu Chandra Das	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
32	11900218 032	Muskan Bansal	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
33	11900218 033	Kush Ojha	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
34	11900218 034	Jaydeep Das	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
36	11900218 036	Harshita Richa	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
37	11900218 037	Esha Das	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
38	11900218 038	Diptiman Majumdar	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
39	11900218 039	Deepraj Pradhan	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
40	11900218 040	Deepjoy Sarkar	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
41	11900218 041	Debashis Mishra	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
42	11900218 042	Buddhadeb Jena	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
43	11900218 043	Brijesh Kumar Choudhury	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y
44	11900218 044	Avrojyoti Dhar	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
45	11900218 045	Ashutosh Kumar	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
46	11900218 046	Arnab Roy	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
47	11900218 047	Arghadip Bagchi	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
48	11900218 048	Apu Sarkar	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
49	11900218 049	Anjay Kant Jha	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		

50	11900218 050	Anindita Saha Pramanik	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
51	11900218 051	Amelia Dutta	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		
52	11900218 052	Abhishikta Biswas	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		



Director  
Siliguri Institute of Technology

## NAME WITH ROLL NO.s OF STUDENT WHOSE ACADEMIC PERFORMANCE IS NOT SATISFACTORY

Sl.	Roll No.	Name of Student	Remedial measures taken by teacher
1.	11900218028	Prithvi Raj	Counselled, More classroom attention, Additional home assignments
2.	11900218042	Buddhadeb Jena	Counselled, More classroom attention, Additional home assignments
3.	11900218043	Brijesh Kumar Choudhury	Counselled, More classroom attention, Additional home assignments
4.	11900218044	Avrojyoti Dhar	Counselled, More classroom attention, Additional home assignments
5.	11900218023	Raja Sah	Counselled, More classroom attention, Additional home assignments
6.	11900218017	Sagar Dutta	Counselled, More classroom attention, Additional home assignments



Director  
Siliguri Institute of Technology

# CERTIFICATE

I, the undersigned, have completed the course allotted to me as shown below

Sl. No.	Semester	Subject with Code	Total Units/ Chapters	Remarks
1.	2 <sup>nd</sup>	English (HM HU201)	4/25	

Date :	<b>Signature of Faculty</b>
--------	-----------------------------

## Submitted to HOD

Certificate by HOD

I, the undersigned, certify that Prof. Rimni Chakravarty has completed the course work allotted to him/ her satisfactorily/ not satisfactorily.

Date :	<b>Signature of HOD</b>
--------	-------------------------

## Submitted to Principal/Director

Date :	<b>Signature of Principal/Director</b>
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Director  
Siliguri Institute of Technology



**SILIGURI INSTITUTE OF TECHNOLOGY**  
**ELECTRICAL ENGINEERING**



# **COURSE FILE**

**2ND SEM, 1ST YEAR, 2019**

**PAPER DESCRIPTION : PHYSICS - 1**

**PAPER CODE : BS PH201**

# Course File

Course Title: *Physics I*

Code: BS-PH 201/PH291

Semester: 2<sup>nd</sup> Year: 1<sup>st</sup>, 2019

Name of the Faculty:

Internet Homepage:

E-mail :

Class Schedule					
Lecture			Bridge course	Tutorial	Practical
Day	No. Of periods	Time	1 class	1 class	3 class(=1 lab)
Monday	1	3.00pm-3.50pm	11.40am-12.30pm	---	-----
Wednesday	1	2.10pm-3.00pm		3.00pm-3.50pm	---
Thursday	1	10.00am-10.50am	----	----	---
Friday	---	----	----	----	2.10-4.40pm

Hours for meeting students:		
Tuesday	11am - 12pm	Or by appointment
Wednesday	11am - 12pm	

## i) Course Objective

A foundation course on Physics from which the students will be able to apply their knowledge in their respective engineering disciplines

## ii) Course Outcomes

- i. After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The student will be able to:

COs	Statement	Target
C102.1	Have basic concepts of mechanics, optics and its applications, electricity, magnetism and qualitative understanding of concepts of quantum physics and statistical mechanics.	50%
C102.2	Explain different physical phenomenon by mathematical formulations.	50%
C102.3	Implement different theoretical formulation for quantitative solutions of problems.	50%



<b>C102.4</b>	Employ data analysis techniques, including errors and representing data graphically by different experimental methods.	60%
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- ii. Once the student has successfully completed this course, he/she must be able to answer the following questions or perform/demonstrate the following:

Sl.	Question	BT Level
1.	Define damped vibration. Write down the differential equation for damped vibratory motion explaining the physical significance of each term in the equation	BT Level 1
2.	How is it proved that an electromagnetic wave consists of particles? Explain the two effects	BT Level 1
3.	Derive Schrodinger's time dependent wave equation for one dimensional motion of a free particle. Hence, write the three dimensional time dependent wave equation	BT Level 2
4.	What is hysteresis loss? How should the hysteresis curve look for permanent magnets and electromagnets?	BT Level 1
5.	Give the physical interpretation of wave function	BT Level 1
6.	State the basic postulates of M-B, B-E and F-D statistics	BT Level 1
7.	Compare Interference and Diffraction of light. Distinguish between Fresnel and Fraunhofer class of Diffraction. Prove that the tangent of the polarization angle is equal to the refractive index of the medium. Define what is population inversion?	BT Level 1
8.	Give the physical significance of Maxwell's equations	BT Level 1
9.	Plot electron distribution function governed by F-D statistics in metals at (i) $T = 0K$ and (ii) $T > 0K$	BT Level 2
10.	Explain the behaviour of a dielectric material placed in an electrostatic field.	BT Level 2

### iii) Topic/Unit/Chapter Layout

Topic/Unit/Chapter	Laboratory topics	Lecture Hours	Laboratory hours
Module-1: Quantum Mechanics: a. Advanced Classical Mechanics	Determination of Stefan's radiation constant	6	3
	Determination of Planck's constant using photocell.		3
b. Quantum Mechanics		10	
Module-2: Statistical Mechanics	-----	4	0

Module-3: a) Dielectric properties	Determination of dielectric constant of a given dielectric material	3	3
	Determination of Lande's factor using Electron spin resonance spectrometer.	4	3
b) Magnetic properties			
Module-4 : Crystal structure	Determination of band gap of semiconductors	14	3
	Determination of Hall co-efficient of semiconductors.		3
	To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells.		3
	Determination of the thermo-electric power at a certain temperature of the given thermocouple.		3
	Determination of specific charge (e/m) of electron by J.J. Thomson's method.		3
	Verification of Bohr's atomic orbital theory through Frank-Hertz experiment		3
	Determination of Rydberg constant by studying Hydrogen/ Helium spectrum		3

#### iv) Textbooks

1. R. K. Kar (Engineering physics), NCBA, 2e
2. Amal Chakraborty (Engineering Physics I), Chhaya Prakashani, 1e
3. S. P. Kulia (Engineering Physics I), NCBA, 2e
4. Sanjib Bhattacharya (Engineering Physics I), Book and Allied (P) Ltd., 1e
5. Sujoy kr. Bhattacharya and Saumen Paul (Engineering Physics I), Mc Graw Hill, 3e
6. A.K.Vasudeva (Modern Engineering Physics) S.Chand, 3e
7. Amal Chakraborty (Engineering Physics II), Chhaya Prakashani, 1e
8. Sujoy kr. Bhattacharya and Saumen Paul (Engineering Physics II), Mc Graw Hill, 3e

#### Reference books :

1. Bhattacharyya (Engineering Physics) , OUP, 1e
2. A. B. Gupta (College Physics Vol II), NCB, 4e
3. A. K. Ghatak (Optics), Tata McGraw Hill Publishing Company Limited, 3e
4. S. N. Ghoshal (Introduction to Quantum Mechanics), S.Chand, 3e
5. S. O. Pillai (Crystallography), New Age Science, 3e

## (v) Evaluation Scheme

### 1) Theory

Evaluation Criteria	Marks
Internal Exam*	15
Quiz / assignment	10
Attendance	5
University Exam/External Exam	70
Total	100

\* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

### 2) Laboratory

Expt. No.	Experiment Name	Schedule	Marks
<b>BS PH 291-1</b>	Determination Of Dispersive Power Of The Material Of Given Prism.	hours	<b>40</b>
<b>BS PH 291-2</b>	Determination Of Wavelength Of Light By Newton's Ring Method..	FRIDAY 2.10- 4.40PM	
<b>BS PH 291-3</b>	Determination Of Wavelength Of Light By Laser Diffraction Method.		
<b>BS PH 291-4</b>	Determination Of specific charge (e/m) of electron by J.J. Thomson's method		
<b>BSPH 291-5</b>	Determination Of Hall coefficient of a semiconductor by four probe method		
<b>BSPH 291-6</b>	Use Of Carry Foster's Bridge To Determine Unknown Resistance.		
<b>BSPH 291-7</b>	Determination Of Steafan-Boltzmann constant		
<b>BSPH 291-8</b>	Determination Of Planck's constant using photocell		
<b>BSPH 291-9</b>	Determination Of Lande-g factor using Electron Spin Resonance Spectrometer		
<b>BSPH 291-10</b>	Determination Of Wavelength Of Light By Fresnel's Bi-Prism Method.		
<b>BSPH 291-11</b>	Determination Of Band gap of semiconductor.		
<b>BSPH 291-12</b>	Determination Of Young's Modulus of elasticity of the material of a bar by the method of flexure.		
<b>BSPH 291-13</b>	Determination Of Modulus Of Rigidity By Static Method		
<b>BSPH 291-14</b>	Determination Of Modulus Of Rigidity By Dynamic Method.		
University Exam			

## Course target attainment levels:

Attainment Level	Inference
Attainment Level 1	40% or less of the students have attained more than the target level of that CO
Attainment Level 2	41-50% of the students have attained more than the target level of that CO
Attainment Level 3	51-60% of the students have attained more than the target level of that CO

Overall Course Attainment Target = 70% of the students will get "A" Grade

Target has been set on the basis of last year's performance / result by the students, student quality this year and difficulty level of the course.

## University Grading System:

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

## (vi) Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
BSPH 201.1	2	2	0	0	0	0	0	0	1	0	0	2	1	0
BSPH 201.2	2	2	0	0	0	0	0	0	1	0	0	2	1	0
BSPH 201.3	2	2	0	0	0	0	0	1	2	0	0	2	1	0
BSPH 291	2	1	0	0	2	0	0	2	2	2	0	2	1	0
BSPH 201	2	2	0	0	1	0	0	2	2	2	0	2	1	0

**1** = courses in which the student will be exposed to a topic (BT level 1& 2)

**2** = courses in which students will gain competency in that area (BT level 3-4)

**3**= courses in which students will master that skill (BT level 5-6)

CO1 to CO4 partially satisfies application of knowledge of mathematics and science in solving engineering problems. (PO1, PO2).

## (vii) Assessment Methodology

Outcome	Assessment Tool	Specific Question/activity aligned to the Outcome
BSPH 201.1	Assignment Internal Test Quiz End semester test	<ol style="list-style-type: none"> <li>1. Write down the differential equation for a damped vibratory motion, explaining the physical significance of each term in the equation. What is meant by critical damping?</li> <li>2. State Stokes theorem. If <math>\vec{A} = x^2 y\hat{i} - 2xz\hat{j} + 2yz\hat{k}</math>, find curl of <math>\vec{A}</math>. Find the equation of motion of a floating cylinder in a liquid and hence find the frequency of oscillation.</li> <li>3. What is Rayleigh criterion of resolution? (b) What do you mean by resolving power of an optical instrument? (c) Obtain an expression for the resolving power of a plane diffraction grating.</li> </ol>
BSPH 201.2	Assignment Internal Test Quiz End semester test	<ol style="list-style-type: none"> <li>1. State Gauss's theorem in electrostatics. With the help of this theorem find the values of field for uniformly charged infinite cylinder</li> <li>2. Explain the difference between (i) diamagnetism and paramagnetism, (ii) paramagnetism and ferromagnetism (iii) ferromagnetism and antiferromagnetism, and (iv) antiferromagnetism and ferrimagnetism.</li> <li>3. State De Broglie's hypothesis.</li> </ol>
BSPH 201.3	Assignment Internal Test Quiz End semester test	<ol style="list-style-type: none"> <li>1. Derive Schrodinger's time dependent wave equation for one dimensional motion of a free particle. Hence, write the three dimensional time dependent wave equation.</li> <li>2. Show that for a particle in a rigid box spanning from <math>x = 0</math> to <math>x = a</math>, the eigen function is given by <math>y(x) = \sqrt{2/a} \sin n\pi x/a</math>. Also find the average eigen values.</li> </ol>
BS PH 201.4	Assignment Internal Test Quiz End semester test	<ol style="list-style-type: none"> <li>1. Calculate the number of ways of arranging 10 Fermions in 15 phase space cells.</li> <li>2. Find the number of energy states in the energy range <math>E</math> and <math>E+dE</math>.</li> <li>3. What will happen to the distribution function following F-D statistics at <math>T = 0K</math> when (i) <math>E_i = E_f</math>, (ii) <math>E_i &gt; E_f</math> and (iii) <math>E_i &lt; E_f</math>?</li> </ol>
BS PH 201	Mini Project Term Paper Power point Presentation	Applications of Different Topics related to the Syllabus of B. Tech students
BS PH 291	Assignment	Laboratory Assignment 1 and 2

## (VIII) A. Weekly Lesson Plan

Week	Lectures	Tutorial	PRACTICAL	Assignment
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<p>1 (3L &amp; 1T)</p>	<p>Discussion of COs, Syllabus and Assessment Methodology. Problems including constraints &amp; friction. Basic ideas of vector calculus and partial differential equations. Potential energy function <math>F = -\text{grad } V</math>, equi-potential surfaces and meaning of gradient. Conservative and non-conservative forces.</p>	<p>Problems on Vectors</p>	<p>Introductory class and manual distribution</p>	<p><u>Assignment 1</u>  Vectors, Oscillators, Rigid body dynamics, Diffraction, Polarisation, Laser, Maxwell's equations.</p>
<p>2 (3L &amp; 1T)</p>	<p>Conservation laws of energy &amp; momentum. Non-inertial frames of reference. Harmonic oscillator; Damped harmonic motion forced oscillations and resonance.</p>	<p>Problems on Damped harmonic motion forced oscillations and resonance</p>	<p><b>BSPH 291-12</b> <b>BSPH 291-4</b> <b>BSPH 291-5</b> <b>BSPH 291-6</b> <b>BSPH 291-7</b></p>	
<p>3 (3L &amp; 1T)</p>	<p>Motion of a rigid body in a plane and in 3D. Angular velocity vector. Moment of inertia.  Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits ( only the expressions for max;min, &amp; intensity and qualitative discussion of fringes); diffraction grating(resolution formula only), characteristics of diffraction grating and its applications.</p>	<p>Problems on Motion of a rigid body in a plane and in 3D, diffraction at single slit, double slit, and multiple slits ( only the expressions for max;min, &amp; intensity.</p>	<p><b>BSPH 291-5</b> <b>BSPH 291-4</b> <b>BSPH 291-6</b> <b>BSPH 291-7</b> <b>BSPH 291-9</b> <b>BSPH 291-2</b></p>	
<p>4 (3L &amp; 1T)</p>	<p>Polarisation : Introduction, polarisation by reflection, polarisation by double reflection, scattering of light, circular and elliptical polarisation, optical activity.  Lasers : Principles and working of laser : population inversion, pumping, various modes, threshold population inversion with examples .</p>	<p>Problems on Polarisation &amp; Lasers</p>	<p><b>BSPH 291-2</b> <b>BSPH 291-11</b> <b>BSPH 291-3</b> <b>BSPH 291-5</b> <b>BSPH 291-9</b> <b>BSPH 291-6</b></p>	
<p>5</p>	<p>Maxwell's equations. Polarisation, permeability and dielectric constant, polar and non-polar dielectrics,</p>	<p>Problems on Maxwell's</p>	<p><b>BSPH 291-9</b> <b>BSPH 291-11</b> <b>BSPH 291-5</b></p>	

(3L & 1T)	internal fields in a solid,	equations. Polarisation	<b>BSPH 291-2</b> <b>BSPH 291-4</b> <b>BSPH 291-12</b>	
<b>6</b> (3L & 1T)	Clausius-Mossotti equation (expression only), applications of dielectrics. Magnetisation, permeability and susceptibility,	Problems on Clausius-Mossotti equation Magnetisation, permeability and susceptibility,	<b>BSPH 291-11</b> <b>BSPH 291-5</b> <b>BSPH 291-2</b> <b>BSPH 291-12</b> <b>BSPH 291-9</b> <b>BSPH 291-3</b>	<u>Assignment 2</u>  On Electromagnetism and Basic Quantum mechanics
<b>7</b> (3L & 1T)	Classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.  Introduction to quantum physics, Black body radiation, explanation using the photon concept,	Problems on Quantum physics	<b>BSPH 291-11</b> <b>BSPH 291-5</b> <b>BSPH 291-2</b> <b>BSPH 291-12</b> <b>BSPH 291-9</b> <b>BSPH 291-3</b> <b>BSPH 291-4</b>	
<b>8</b> (3L & 1T)	Compton effect, de Broglie hypothesis, wave-particle duality, verification of matter waves,	Problems on Compton effect, de Broglie hypothesis	Revision class/Extra class	
<b>9</b> (3L & 1T)	Uncertainty principle, Schrodinger wave equation, particle in box,	Problems on Uncertainty principle, Schrodinger wave equation, particle in box	Revision class/Extra class	<u>Assignment 3</u>  Applications of Quantum mechanics
<b>10</b> (3L & 1T)	Quantum harmonic oscillator, Hydrogen atom. Macrostate, Microstate, Density of states,	Problems on Quantum harmonic oscillator, hydrogen atom, Density of states	Revision class/Extra class	

<p>11 (3L &amp; 1T)</p>	<p>Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac statistics.</p>	<p>Problems on Maxwell Boltzmann, Fermi-Dirac statistics</p>	<p>Mock test 1</p>	<p><u>Assignment 4</u></p> <p>Statistical Mechanics</p> <p><u>AND</u></p> <p>Laboratory Assignment</p>
<p>12 (2L &amp; 1T)</p>	<p>Bose-Einstein statistics.</p>	<p>Problems on Bose-Einstein statistics.</p>	<p>Mock test 2</p>	
<p>13 (2L &amp; 1T)</p>	<p>Revision and Previous years questions discussions.</p>	<p>University question answer discussion</p>	<p>Mock test 3</p>	



## (VIII) B. COMBINED DAILY LESSON PLAN & EXECUTION REPORT

<b>NAME OF FACULTY :</b>	<b>DEPARTMENT: EE</b>	<b>SUBJECT: Physics CODE : BS PH201</b>
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Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus)	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/ mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)
<b>x1</b>	<b>Introduction and Mechanics</b>		<b>05</b>			
	1.1	Introduction about CO, PO. Syllabus and Assessment Methodology.	01	16.01.2019	16.01.2019	
	1.2	Basic ideas of vector calculus and partial differential equations. Potential energy function $F = -\text{grad } V$ .	01	21.01.2019	21.01.2019	
	1.3	Equi-potential surfaces and meaning of gradient. Conservative and non-conservative forces. Conservation laws of energy & momentum.	01	24.01.19	24.01.2019	Assignment 1
	1.4	Non-inertial frames of reference. Harmonic oscillator; Damped harmonic motion forced oscillations and resonance. Motion of a rigid body in a plane and in 3D. Angular velocity vector. Moment of inertia.	01	28.01.19	28.01.2019	Assignment 1 + MCQ test
	1.5	Tutorial (Solution of Problems + Doubts clearance)	01	16.01.19	16.01.2019	
<b>2</b>	<b>Introduction to Optics</b>		<b>06</b>			
	2.1	Basic Idea about Interference and Diffraction.	01	30.01.19	30.01.2019	Assignment 2

Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus)	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/ mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)
		Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction.				
	2.2	Fraunhofer diffraction at single slit, double slit, and multiple slits. Resolution formula of diffraction grating, characteristics of diffraction grating and its applications.	01	31.01.19	31.01.2019 06.02.2019	Assignment 2
	2.3	Polarisation : Introduction, Basic concept of Polarisation. Polarisation by reflection, polarisation by double reflection, scattering of light, circular and elliptical polarisation, optical activity.	01	06.02.19	06.02.2019 07.02.2019	Assignment 2
	2.4	Lasers: Principles and working of laser : population inversion, pumping, various modes, threshold population inversion with examples.	01	07.02.19	07.02.2019 11.02.2019	Assignment 2 + MCQ test
	2.5	Tutorial (Solution of Problems + Doubts clearance)	02	6.02.19 13.02.19	13.02.2019	
3	<b>Electromagnetism and Dielectric Properties of Materials</b>		<b>07</b>			
	3.1	Polarisation, permeability and dielectric constant, polar and non-polar dielectrics, internal fields in a solid. Expression of Clausius - Mossotti equation, applications of dielectrics.	02	11.02.19 13.02.19	13.02.2019	Assignment 3
	3.2	Magnetisation, permeability and susceptibility,	01	14.02.19	14.02.2019	Assignment 3

Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus)	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/ mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)
		Classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.				
	3.3	Maxwell's equations. Significance and Derivation.	02	18.02.19 27.02.19	27.02.2019	Assignment 3 + MCQ
	3.4	Tutorial (Solution of Problems + Doubts clearance)	02	13.02.19 27.02.19	13.02.2019 27.02.2019	
<b>4</b>		<b>Quantum Mechanics</b>	<b>06</b>			
	4.1	Introduction to quantum physics, Black body radiation, explanation using the photon concept	01	08.03.19	11.03.2019	Assignment 4
	4.2	Compton effect, de Broglie hypothesis, wave-particle duality, verification of matter waves.	01	11.03.19	13.03.2019	Assignment 4
	4.3	Uncertainty principle, Schrodinger wave equation, particle in box	01	28.03.19	28.03.2019 01.04.2019	Assignment 4
	4.4	Quantum harmonic oscillator and Hydrogen atom.	02	01.04.19 10.04.19	10.04.2019	Assignment 4 + MCQ test
	4.5	Tutorial (Solution of Problems + Doubts clearance)	01	10.04.19	10.04.2019	
			<b>Statistical Mechanics</b>	<b>07</b>		
<b>5</b>	5.1	Macrostate, Microstate, Density of states	02	11.04.19 22.04.19	11.04.2019 22.04.2019	Assignment 5
	5.2	Qualitative treatment of Maxwell Boltzmann, Bose-Einstein statistics.	02	23.04.19 24.04.19	23.04.2019 24.04.2019	Assignment 5
	5.3	Fermi-Dirac statistics and Plot of F-D Distribution curve at different conditions.	02	25.04.19 29.04.19	25.04.2019 02.05.2019	Assignment 5 + MCQ test
	5.4	Tutorial (Solution of Problems + Doubts clearance)	01	24.04.19	06.05.2019	

## **(IX) Teaching Strategy / Method**

1. Detailed use of blackboard
2. Good oratory skill with clearly audible volume of lecture
3. Interactive classroom
4. Always encouraging the students to ask questions
5. Use of practical examples or similar models to illustrate the topics.

### **(IXA) Strategy to support weak students**

1. Paying attention to their problems in understanding the subject
2. Encouraging them to express their point of trouble
3. Allotting extra time beyond schedules class hours to help them understand the topics
4. Suggesting them different ways (as found suitable depending upon the case) to overcome their problem.

### **(IXB) Strategy to encourage bright students**

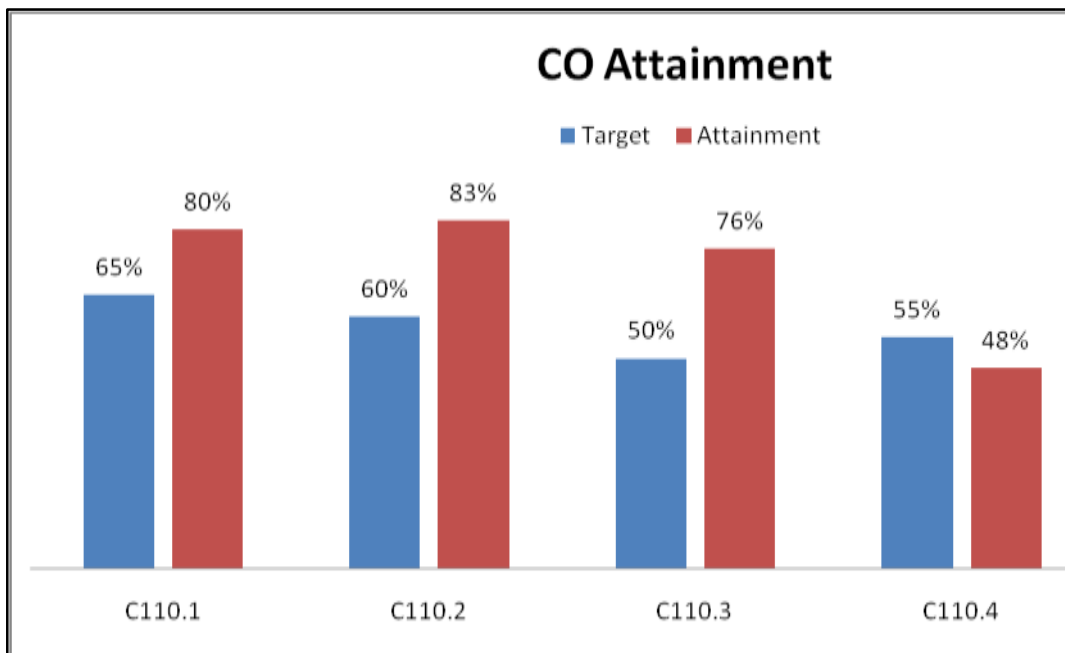
1. Try to encourage them to study beyond the syllabus
2. Ask them to develop the habit of reading anything good and rich in content
3. Advise them to try and solve higher level engineering numerical problems.

### **(IXC) Efforts to keep students engaged**

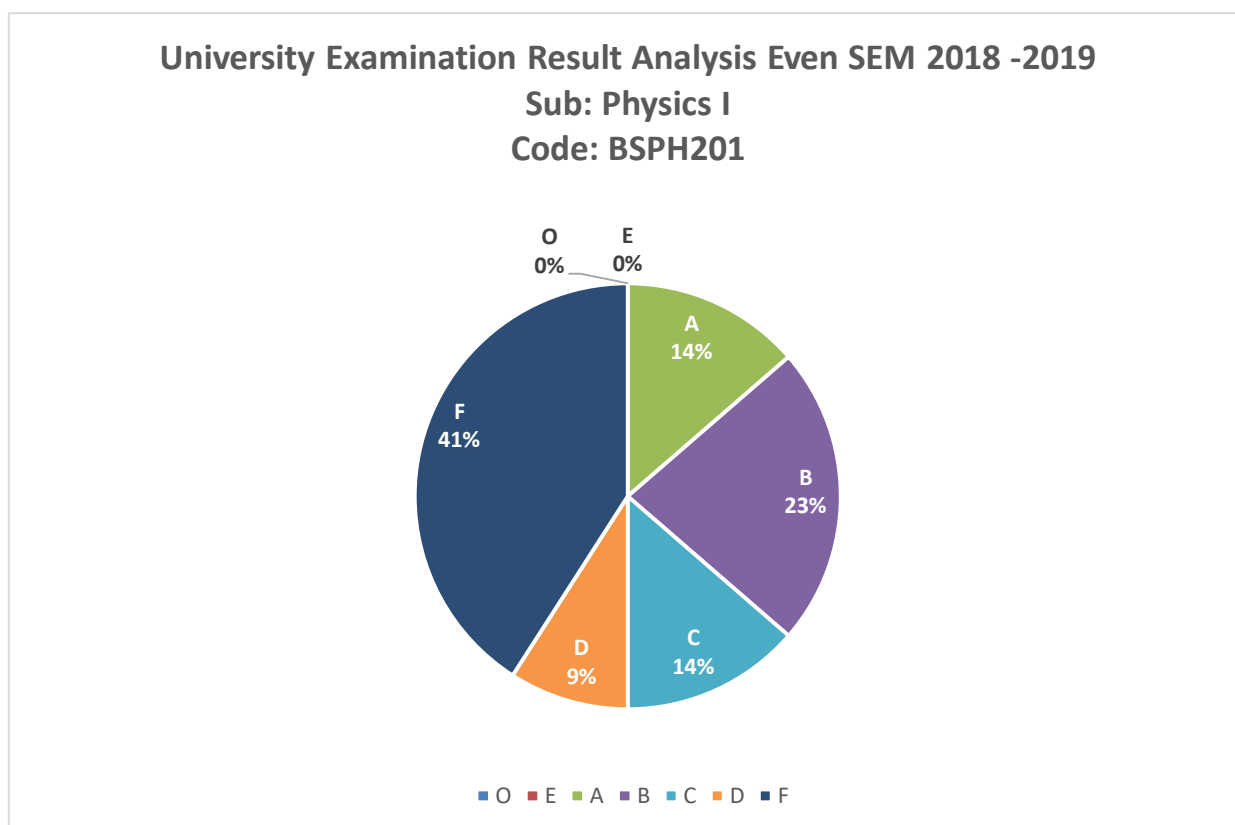
1. During class to avoid monotony, some aptitude problems are given to solve.
2. Asking random questions to the students from the topic
3. Sometimes different tricks or techniques are shown to them to make the lecture interesting.
4. Informal technical quiz is also held.

## **(X) Analysis of Students performance in the course**

### **INTERNAL ASSESSMENT**



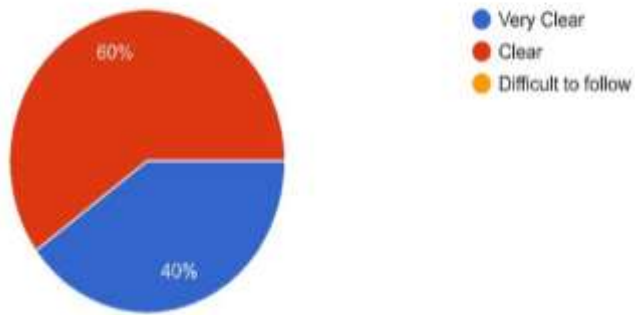
## UNIVERSITY EXAMINATION



## (XI) Analysis of Student Feed Back

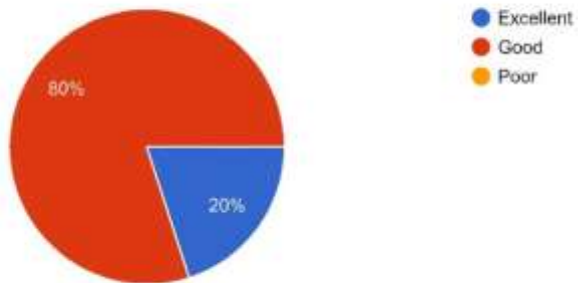
## The course coverage during the semester

10 responses



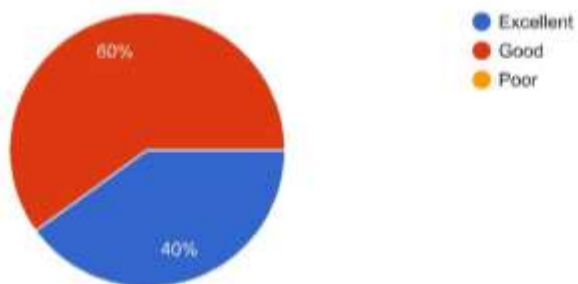
## How was your performance in the course

10 responses



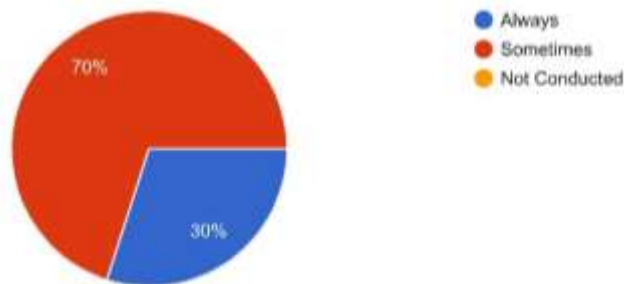
## The relevance of this course to your career goals was

10 responses



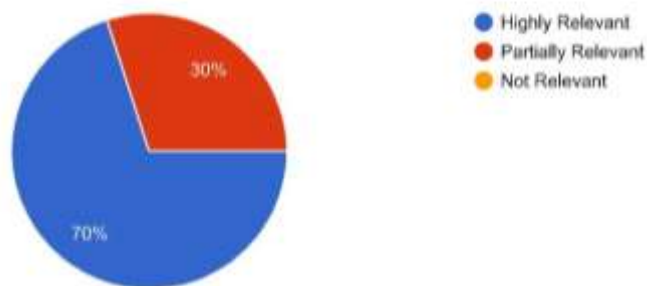
### Coverage of content beyond syllabus

10 responses



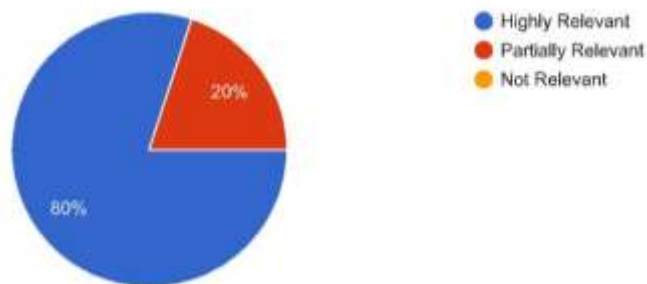
### The relevance of laboratory experiment to the course outcomes was

10 responses



### The relevance of assignment / Quiz to the course outcomes was

10 responses



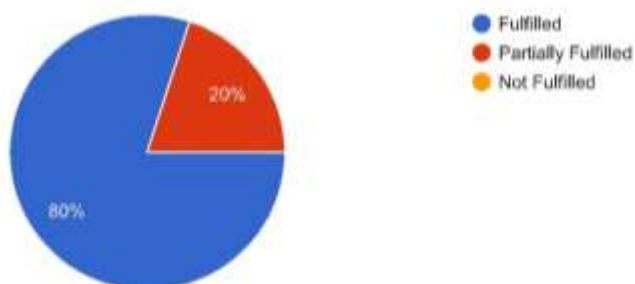
The relevance of questions in internal exams to the course outcomes was

10 responses



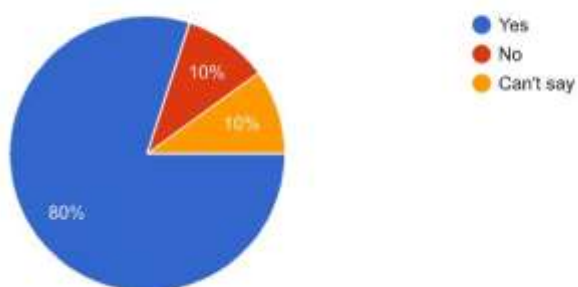
At the end of the semester the coverage of the stated course objectives and course outcomes by teacher was

10 responses



Would you recommend the course to others?

10 responses



## (XII) Teacher Self-Assessment (at the completion of course)

1. Syllabus coverage was 100%
2. More effort will be given to improve the performance level of CO2 and CO3.

## (XIV) Recommendations/Suggestions for improvement by faculty



1. Syllabus of Physics-I should be oriented towards more applications in engineering aspects.
2. There are no theoretical discussions for most of the lab classes in the lecture part. So there is a gap between theory and lab classes, which needs to be addressed by the University.
3. Some popular lectures on a topic of beyond syllabus should be arranged to explore student's knowledge (satisfying PO1).
4. Students are advised for regular visit to library for accessing reference books, e-books and journals.
5. Additional and revision classes for slow learners.
6. Organizing Popular talks and seminars

## INTERNAL ASSESMENT RECORD

**Subject with code: BS PH 201**

**Section: \_\_EE\_\_**

**Semester : \_\_\_\_\_2nd\_\_\_\_\_**

**Discipline: \_\_\_\_Physics\_\_\_\_\_**

Sl.	Roll No.	Name	Attendance		Internal Examination			Assignment / Quiz	Total
			Total	Marks	1 <sup>st</sup>	2nd	Avg.		
1.	119016180 11	Vivek Roy Kayet	5	5	36	6	37	8	45
2.	119016180 12	Swapnanil Dutta	5	5	40	29	40.5	10	50.5
3.	119016180 13	Susmita Dutta	5	5	24	33	42.5	9	51.5
4.	119016180 14	Suman Bera	5	5	42	39	46	10	56
5.	119016180 15	Sujan Barman	5	4	27	4	36.5	8	44.5
6.	119016180 16	Subhankar Das	5	4	03	5	34	8	42
7.	119016180 17	Shaswata Sengupta	5	4	33	AB	34	8	42
8.	119016180 18	Sayan Basak	5	5	13	22	37.5	9	46.5
9.	119016180 19	Sanyik Nath	5	5	11	19	35.5	9	44.5

10.	119016180 20	Rajiv Chettri	5	5	15	AB	38.5	10	48.5
11.	119016180 21	Rajdeep Chakraborty	5	4	5	3	35.5	8	43.5
12	119016180 22	Payel Majumdar	5	5	31	40	47	10	57
13	119016180 23	Nischal Rai	5	5	23	29	38	9	47
14	119016180 24	Komal Kumari	5	5	27	34	44.5	9	43.5
15	119016180 25	Gourav Roy	5	5	32	28	40.5	9	49.5
16	119016180 26	Debabrata Mukherjee	5	4	6	AB	34	8	42
17	119016180 27	Darshan Nath	5	5	49	45	49.5	10	59.5
18	119016180 28	Briti Das	5	5	13	11	35.5	9	44.5
19	119016180 29	Bipin Kumar	5	5	07	AB	34	8	42
20	119016180 30	Bedabrata Dutta	5	5	19	20	33.5	9	42.5
21	119016180 31	Barnali Biswas	5	5	16	33	40.5	10	50.5
22	119016180 32	Aryan Chettri	5	4	17	13	37	8	45
23	119016180 33	Abhishek Chaurasia	5	4	13	6	36.5	8	44.5















# Records of Assignment

Subject with code: Physics 1 BS PH 201

Section: EE 1<sup>st</sup> Year

Semester : 2nd

Discipline: EE

Sl.	Roll No.	Name	Assignment	Term Paper	Mini Project	Power Point Presentation
1.	11901618011	Vivek Roy Kayet	-	-	-	-
2.	11901618012	Swapnanil Dutta	√	√	√	√
3.	11901618013	Susmita Dutta	√	√	√	√
4.	11901618014	Suman Bera	√	√	√	√
5.	11901618015	Sujan Barman	√	√	-	-
6.	11901618016	Subhankar Das	-	-	-	-
7.	11901618017	Shaswata Sengupta	-	-	-	-
8.	11901618018	Sayan Basak	√	√	-	-
9.	11901618019	Sanyik Nath	-	√	-	-
10.	11901618020	Rajiv Chettri	√	√	√	√
11.	11901618021	Rajdeep Chakraborty	√	√	-	-
12	11901618022	Payel Majumdar	√	√	√	√
13	11901618023	Nischal Rai	√	√	√	√
14	11901618024	Komal Kumari	√	√	√	√
15	11901618025	Gourav Roy	√	√	√	√
16	11901618026	Debabrata Mukherjee	-	-	-	-
17	11901618027	Darshan Nath	√	√	√	√
18	11901618028	Briti Das	√	√	√	√

19	11901618029	Bipin Kumar	√	√	√	-
20	11901618030	Bedabrata Dutta	√	√	√	-
21	11901618031	Barnali Biswas	√	√	√	√
22	11901618032	Aryan Chettri	-	-	-	-
23	11901618033	Abhishek Chaurasia	√	√	√	√

## LIST OF PRACTICALS

**Subject with code: Physics 1 BS PH 201**

**Section: EE 1<sup>st</sup> Year**

**Semester : 2nd**

**Discipline: EE**

<b>Sl.</b>	<b>Details of Experiment(s)</b>	<b>Hours allotted</b>
<b>BS PH 291-1</b>	Determination Of Dispersive Power Of The Material Of Given Prism.	2.30 hours
<b>BS PH 291-2</b>	Determination Of Wavelength Of Light By Newton's Ring Method.	2.30 hours
<b>BS PH 291-3</b>	Determination Of Wavelength Of Light By Laser Diffraction Method.	2.30 hours
<b>BS PH 291-4</b>	Determination Of specific charge (e/m) of electron by J.J. Thomson's method	2.30 hours
<b>BSPH 291-5</b>	Determination Of Hall coefficient of a semiconductor by four probe method	2.30 hours
<b>BSPH 291-6</b>	Use Of Carry Foster's Bridge To Determine Unknown Resistance.	2.30 hours
<b>BSPH 291-7</b>	Determination Of Steafan-Boltzmann constant	2.30 hours
<b>BSPH 291-8</b>	Determination Of Planck's constant using photocell	2.30 hours
<b>BSPH 291-9</b>	Determination Of Lande-g factor using Electron Spin Resonance Spectrometer	2.30 hours
<b>BSPH 291-10</b>	Determination Of Wavelength Of Light By Fresnel's Bi-Prism Method.	2.30 hours
<b>BSPH 291-11</b>	Determination of Band gap of semiconductor.	2.30 hours
<b>BSPH 291-12</b>	Determination Of Young's Modulus of elasticity of the material of a bar by the method of flexure.	2.30 hours
<b>BSPH 291-13</b>	Determination Of Modulus Of Rigidity By Static Method	2.30 hours

<b>BSPH 291-14</b>	Determination Of Modulus Of Rigidity By Dynamic Method.	2.30 hours
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**NAME WITH ROLL NO.s OF STUDENT WHOSE ACADEMIC PERFORMACE IS NOT SATISFACTORY**

Sl .	Roll No.	Name of Student	Remedial measures taken by teacher
1.	1190161801 1	Vivek Roy Kayet	1. Extra doubt clearing classes were taken. 2. Individually approached and inspired to attend the regular classes.
2.	1190161801 6	Subhankar Das	
3.	1190161801 7	Shaswata Sengupta	
4	1190161802 6	Debabrata Mukherje e	
5	1190161803 2	Aryan Chettri	

# CERTIFICATE

I, the undersigned, have completed the course allotted to me as shown below

Sl. No.	Semester	Subject with Code	Total Units/ Chapters	Remarks

Date :

**Signature of Faculty**

## Submitted to HOD

### Certificate by HOD

I, the undersigned, certify that.....has completed the course work allotted to him/ her satisfactorily/ notsatisfactorily.

Date :

**Signature of HOD**

## Submitted to Principal/Director

Date :

**Signature of Principal/Director**



Director  
Siliguri Institute of Technology



**SILIGURI INSTITUTE OF TECHNOLOGY  
CIVIL ENGINEERING**



# **COURSE FILE**

**2ND SEM, 1ST YEAR, 2019**

**SEC – A/B**

**PAPER DESCRIPTION : CHEMISTRY-I**

**PAPER CODE : BS-CH201**

# Course File

Course Title: Chemistry

Code: BS-CH201

Semester 2nd Year 2019

Name of the Faculty: Dr. Debabrata Moitra

E-mail: moitradebabrata85@gmail.com

## Class Schedule

Lecture		Tutorial	Practical
Wednesday (10:00A.M. to11:40 A.M).	Thursday (10:50A.M to 11:40A.M)	Thursday (14:10 P.M to 16:40 P.M)	Wednesday (14:10 P.M to 16:40 P.M)

Hours for meeting students:

Recess time or by appointment

### i) Course Objective :

To impart knowledge on basic chemistry which will help students to establish their career in multidisciplinary area.

### ii) Course Outcomes:

- After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The student will be able to:

		Target
CO1	List major chemical reactions that are used in the synthesis of molecules. (Bloom's taxonomy level:1)	60%
CO2	Rationalise bulk properties and processes using thermodynamic considerations and periodic properties such as ionization potential, oxidation states and electronegativity. (Bloom's taxonomy level:2)	60%
CO3	Classify the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques. (Bloom's taxonomy level:3)	60%
CO4	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces. (Bloom's taxonomy level:4)	60%
CO5	Explain the data of quantitative chemical analysis and make use of simple model, equations to solve problems related to basic chemistry (Bloom's taxonomy level:4)	60%



- ii. Once the student has successfully complete this course, he/she must be able to answer the following questions or perform/demonstrate the following:

Sl.	Question	BT Level
1.	<p>1. Explain the following reactions with a suitable example. (i) Wolff-Kishner reduction, (ii) Cannizzaro reaction, (iii) Friedel Crafts' reaction, (iv) Tollens' test and Fehlings' test, (v) SN<sub>1</sub> and SN<sub>2</sub> reaction mechanism, (vi) Nucleophilic addition. (a) Phenol on treatment with Br<sub>2</sub> in CS<sub>2</sub> at low temperature gives two isomeric mono bromophenols 'X' and 'Y'. But phenol on treatment with bromine water gives a white precipitate 'Z'. Identify the products 'X', 'Y' and 'Z' with chemical reactions. (b) What do you mean by enantiomer and diastereomer? Differentiate them with examples. (c) Give one example of each of Friedel Crafts' alkylation and acylation reaction. (d) Predict the major product(s) of the following reactions and explain their formation:</p> <p>i) <math>\text{H}_3\text{C} - \text{CH} = \text{CH}_2 \xrightarrow[\text{HBr}]{(\text{Ph}-\text{CO}-\text{O})_2}</math></p> <p>ii) <math>\text{H}_3\text{C} - \text{CH} = \text{CH}_2 \xrightarrow{\text{HBr}}</math></p> <p>(e) Write down the criteria for aromaticity.</p>	1
2.	<p>2. (a) For a reaction both <math>\Delta H</math> and <math>\Delta S</math> are positive. Under what conditions will the reaction be spontaneous? (b) What will be the conjugate acids for the following Bronsted bases? NH<sub>3</sub>, HCO<sub>3</sub><sup>-</sup>, CH<sub>3</sub>COO<sup>-</sup>, H<sub>2</sub>PO<sub>2</sub><sup>-</sup>.</p> <p>3. (a) Assign oxidation no. of the followings : 'P' in H<sub>3</sub>PO<sub>2</sub>, 'Cr' in K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, 'S' in H<sub>2</sub>SO<sub>5</sub>, 'C' in HCOOH. (b) How crystal field theory explains the colours of transition metal complexes?</p> <p>4. (a) pH of a solution of a strong acid is 5. What will be the pH of the solution obtained after diluting the given solution 100 times? (b) Write the Nernst equation for the cell reaction in the Daniel cell. How will the E<sub>cell</sub> effected when the concentration of Zn<sup>2+</sup> is increased? (c) Draw and explain the energy level diagrams for conductor, semiconductor and insulator. (d) Explain enantiomers and dia-stereoisomers with examples.</p> <p>5. Derive the Nernst equation. What is EMF of a cell? How EMF of a cell is related to free energy (mathematical relation)?</p> <p>6. State and explain the first law of thermodynamics. What is entropy? What is the physical significance of it? Derive the entropy change during reversible expansion of an ideal gas</p> <p>7. (a) What is Lewis acid? Give example (b) What is solubility product? What will be the solubility product of the salt A<sub>x</sub>B<sub>y</sub>? (c) Explain principle and applications of Florescence spectroscopy. (d) Draw figure to show the splitting of d orbitals in an octahedral crystal field. [Fe(H<sub>2</sub>O)<sub>6</sub>]<sup>3+</sup> is strongly paramagnetic whereas [Fe(CN)<sub>6</sub>]<sup>3-</sup> is weakly paramagnetic. Explain</p>	2
3.	<p>8. What is spectrochemical series of crystal field theory? Explain the difference between a weak field ligand and strong field ligand.</p> <p>9. (a) What is the wavelength range of Ultra-violet radiation. (b) Write short note on i) Chromophore ii) Auxochrome.</p> <p>10. Define and derive Lambert-Beer's law. What is "Finger print region in IR spectra? What are the applications of IRspectroscopy? What is NMR spectroscopy? What is MRI? What is chemical shift in NMR spectroscopy?</p>	3

4.	<p><b>11.</b> What is molecular orbital? Calculate the bond order of the following species and indicate their magnetic properties - <math>O_2</math>, <math>O_2^+</math>, <math>O_2^-</math>, <math>O_2^{2-}</math></p> <p><b>12.</b> Teacher asked two students to write the electronic configuration of <math>d^4</math> system using CFT in octahedral crystal field. Student I: <math>t_{2g}^3 e_g^1</math>, Student II: <math>t_{2g}^4 e_g^0</math>.          (a) Suggest which student gives correct configuration. Justify your answer.          (b) Draw figure to show splitting of degenerate 'd' orbitals in an octahedral crystal field.</p> <p><b>13.</b> (a) Give molecular orbital energy level diagram of CO. Write its electronic configuration, magnetic behaviour and bond order. (b) Discuss different types of hydrogen bonding with example.</p> <p><b>14.</b> What is a semiconductor? Classify the semiconductors and give examples.</p> <p><b>15.</b> (a) Explain the terms band gap, valence band and conduction band with diagram. Classify the semiconductors with examples. (b) Estimate the critical constants of a gas (<math>T_c</math>, <math>P_c</math> and <math>V_c</math>) whose van der Waals constants are, <math>a = 0.751</math></p>	4
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### iii) Topic/Unit/Chapter Layout

Topic/Unit/Chapter	Lecture Hours
Module-1: Atomic and molecular structure.	10
Module-2: Spectroscopic techniques and applications.	8
Module-3: Intermolecular forces and potential energy surfaces.	4
Module-4: Use of free energy in chemical equilibria.	8
Module-5: Periodic properties.	4
Module-6: Stereochemistry.	4
Module-7: Organic reactions and synthesis of a drug molecule.	4

### iv) Textbooks

**1. Text Book:** Chemistry by Gourkrishna Dasmohapatra.

**2. Reference books**

1. Physical Chemistry by P.C. Rakshit
2. Inorganic Chemistry by J. D. Lee
3. Organic Chemistry by Morrison & Boyd

## (v) Evaluation Scheme

### 1) Theory

Evaluation Criteria	Marks
Internal Exam*	15
Quiz / assignment	10
Attendance	5
University Exam/External Exam	70
Total	100

\* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

### 2) Laboratory (If applicable)

Expt. No.	Experiment Name	Schedule	Marks
1.	Determination of absorption isotherm of acetic acid by activated charcoal.	3 hours	40
2.	Determination of surface tension of the given liquid at room temperature by stalagmometer.	3 hours	
3.	Estimation of dissolved oxygen in a given sample of water.	3 hours	
4.	Determination of rate constant of acid catalyzed hydrolysis of ethyl acetate.	3 hours	
5.	Determination of partition coefficient of acetic acid between n-butanol and water	3 hours	
6.	Determination of percentage composition of sugar solution from viscosity.	3 hours	
7.	(Conductometric Titration) Determination of strength of a given solution of HCl by titration against a standard solution of NaOH.	3 hours	
8.	(pH metric Titration) Determination of strength of a given solution of HCl by titration against a standard solution of NaOH.	3 hours	
University Exam			60

### Course target attainment levels:

Attainment Level	Inference
Attainment Level 1	40% of the students have attained more than the target level of that CO
Attainment Level 2	50% of the students have attained more than the target level of that CO
Attainment Level 3	60% of the students have attained more than the target level of that CO

Overall Course Attainment Target = 60% of the students will get "A" Grade

Target has been set on the basis of last year's performance / result by the students, student quality this year and difficulty level of the course.

### University Grading System:

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

### (vi) Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes												PSOs	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	1.	2.
BSCH201.1	2								1					
BSCH201.2	2	2							1			1	1	
BSCH201.3	2	2							1			1	1	
BSCH201.4	2	2							2			1	1	
BSCH201	2	2							2			1	1	

Justification: Since BS- CH101 is a foundation course for B.Tech, CO1 to CO4 satisfy at low level of PO1 whereas CO2 to CO4 satisfy moderately with PO2. Since CO4 is satisfying through laboratory experiments and students work in group in the laboratory, it also satisfies little on individual and team work (PO9).

### (vii) Assessment Methodology

Outcome	Assessment Tool
BSCH201.1	Internal Exam, Assignment, Quiz
BSCH201.2	Internal Exam, Assignment, Quiz
BSCH201.3	Internal Exam, Assignment, Quiz
BSCH201.4	Internal Exam, Assignment, Quiz

### (VIII) A. Weekly Lesson Plan

Week	Lectures	Tutorial	Assignment
1 <sup>st</sup> week	L1- Schrodinger equation. L2- Particle in a box solution and their applications for simple sample. L3- Molecular orbitals of diatomic molecules (e.g.H <sub>2</sub> ).	Tutorial 1 Discussions on pre-requisite of the syllabus.	

<b>2<sup>nd</sup> week</b>	L4- Energy level diagrams of diatomic molecules. L5- Pi-molecular orbitals of butadiene and benzene and aromaticity. L6- Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties	Tutorial 2 Question answer discussion on basics of crystal field theory and numerical problems	
<b>3<sup>rd</sup> week</b>	L7- Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. L8- Band structure of solids and the role of doping on band structures. L9- Band structure of solids and the role of doping on band structures.	Tutorial 3 Question answer discussions on crystal defects and semiconducting materials.	<b>Assignment Term Paper</b>
<b>4<sup>th</sup> week</b>	L10- Principles of spectroscopy and selection rules. L11- Electronic spectroscopy. L12- Fluorescence and its applications in medicine.	Tutorial 4 Question answer discussion on Spectroscopy	
<b>5<sup>th</sup> week</b>	L13- Vibrational and rotational spectroscopy of diatomic molecules & applications. L14- Nuclear magnetic resonance and magnetic resonance imaging. L15- Surface characterisation techniques	Tutorial 5 Question answer discussion on selection rule	<b>Assignment Problem solving</b>
<b>6<sup>th</sup> week</b>	L16- Diffraction and scattering. L17- Ionic, dipolar and van der Waals interactions. L18 - Equations of state of real gases and critical phenomena.	Tutorial 6 Problems related to real gas equation	
<b>7<sup>th</sup> week</b>	L19- Equations of state of real gases and critical phenomena. L20- First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. L21- First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy.	Tutorial 7 Problems related to 1st law of thermodynamics. entropy, free energy.	<b>Assignment mini project</b>
<b>8<sup>th</sup> week</b>	L22- Estimations of entropy and free energies. L23- Free energy and emf. L24- Cell potentials, the Nernst equation and applications	Tutorial 8 Problems related to electrolysis and electrochemical cell and numerical problems	
<b>9<sup>th</sup> week</b>	L25- Acid base, oxidation reduction and solubility equilibria. L26 - Water chemistry. L27- Corrosion. L28- Use of free energy considerations in metallurgy through Ellingham	Tutorial 9 Question answer discussions on the basics of water chemistry and corrosion	<b>Assignment ppt presentation</b>

	diagrams		
<b>10<sup>th</sup> week</b>	L29- Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations. L30- Atomic and ionic sizes, ionization energies, electron affinity and electronegativity.	Tutorial 10. Question answer discussions on periodic properties	
<b>11<sup>th</sup> week</b>	L31- Polarizability, oxidation states, coordination numbers and geometries. L32- Hard soft acids and bases, molecular geometries. L33- Representations of 3 dimensional structures, structural isomers and stereoisomer.	Tutorial 11 Problem solving related to Slater's rule.	
<b>12<sup>th</sup> week</b>	L34- Configurations and symmetry and chirality, enantiomers, diastereomers. L35- Optical activity, absolute configurations and conformational analysis. L36- Isomerism in transitional metal compounds.	Tutorial 12 Question answer discussions on Stereochemistry	
<b>13<sup>th</sup> week</b>	L37- Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. L38- Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. L39- Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.	Tutorial 13 Question answer discussions on organic chemistry and organic conversions	<b>Quiz</b>
<b>14<sup>th</sup> week</b>	L39- Synthesis of a commonly used drug molecule.	Tutorial 14 Numerical Problem Solving.	

**(VIII) B. COMBINED DAILY LESSON PLAN & EXECUTION REPORT**

<b>NAME OF FACULTY :</b> Dr. DEBABRATA MOITRA	<b>DEPARTMENT :</b> DESH (CE)	<b>SUBJECT: <u>Chemistry</u></b> <b>CODE : <u>(BS-CH201)</u></b>	<b>SEMESTER : 2<sup>nd</sup></b>
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Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
<b>1</b>	<b>Atomic and Molecular Structure</b>		<b>12</b>					
	1.1	Schrodinger equation, Particle in a box solution and their applications for simple sample	01	16.01.19	16.01.19			
	1.2	Particle in a box solution and their applications for simple sample	01	16.01.19	16.01.19			
	1.3	Molecular orbitals of diatomic molecules (e.g.H <sub>2</sub> ).	02	16.01.19 17.01.19	16.01.19 17.01.19			
	1.4	Energy level diagrams of diatomic molecules.	02	17.01.19 24.01.19	17.01.19 24.01.19			
	1.5	Pi-molecular orbitals of butadiene and benzene and aromaticity.	02	24.01.19 30.01.19	24.01.19 30.01.19			

Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
	1.6	Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties	02	30.01.19	30.01.19			
	1.7	Band structure of solids and the role of doping on band structures.	01	31.01.19	31.01.19			
	1.8	Problem Solving	01	31.01.19	31.01.19			
2	<b>Spectroscopic Techniques and applications</b>		<b>08</b>					
	1.1	Principles of spectroscopy and selection rules.	01	06.02.19	06.02.19			
	1.2	Electronic spectroscopy.	01	06.02.19	06.02.19			
	1.3	Fluorescence and its applications in medicine	01	07.02.19	07.02.19			
	1.4	Vibrational and rotational spectroscopy of diatomic molecules & applications.	01	07.02.19	07.02.19			
	1.5	Nuclear magnetic resonance and magnetic resonance imaging.	01	13.02.19	13.02.19			
	1.6	Surface characterisation techniques	01	13.02.19	13.02.19			
	1.7	Diffraction and scattering.	01	14.02.19	14.02.19			
	1.8	Problem Solving	01	14.02.19	14.02.19			



Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
3	<b>Intermolecular Forces and potential energy Surfaces</b>		<b>04</b>					
	3.1	Ionic, dipolar and van der Waals interactions.	01	27.2.19	27.2.19			
	3.2	Equations of state of real gases and critical phenomena.	01	27.2.19	27.2.19			
	3.3	Potential Energy surfaces of H <sub>2</sub> , H <sub>2</sub> F and HCN and trajectories on these surfaces	01	28.02.19	28.02.19			
	3.4	Problem Solving	01	28.02.19	28.02.19			
4	<b>Use of Free Energy in Chemical Equilibria</b>		<b>06</b>					
	4.1	First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies	02	13.03.19	13.03.19			
	4.2	Free energy and emf. Cell potentials, the Nernst equation and applications.	01	14.03.19	14.03.19			
	4.3	Acid base, oxidation reduction and solubility equilibria, Water chemistry. Corrosion.	01	27.03.19	27.03.19			

Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
	4.4	Use of free energy considerations in metallurgy through Ellingham diagrams	01	27.03.19	27.03.19			
	4.5	Problem Solving	01	28.03.19	28.03.19			
<b>5</b>	<b>Periodic Properties</b>		<b>04</b>					
	5.1	Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations.	01	03.04.19	10.04.19			
	5.2	Atomic and ionic sizes, ionization energies, electron affinity and electronegativity. Polarizability, oxidation states, coordination numbers and geometries	01	03.04.19	10.04.19			
	5.3	Hard soft acids and bases, molecular geometries	01	4.04.19	11.04.19			
	5.4	Problem Solving	01	4.04.19	11.04.19			
<b>6</b>	<b>Stereochemistry</b>		<b>04</b>					
	6.1	Representations of 3 dimensional structures, structural isomers and stereoisomer, Configurations	01	10.04.19	24.04.19			

Unit / Module	Comp. Index	Topic Description (to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
		and symmetry and chirality, enantiomers, diastereomers.						
	6.2	Optical activity, absolute configurations and conformational analysis	01	10.04.19	24.04.19			
	6.3	Isomerism in transitional metal compounds	01	11.04.19	25.04.19			
	6.4	Problem Solving	01	11.04.19	25.04.19			
<b>7</b>	<b>Organic Reactions and Synthesis of a Drug Molecule</b>		<b>04</b>					
	7.1	Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.	2	24.04.19	2.05.19			
	7.2	Synthesis of a commonly used drug molecule.	1	25.04.19	08.05.19			
	7.3	Problem Solving	1	08.05.19	08.05.19			
<b>45</b>								

## (IX) Teaching Strategy / Method

1. Detailed use of blackboard
2. Good oratory skill with clearly audible volume of lecture
3. Interactive classroom
4. Always encouraging the students to ask questions
5. Use of practical examples or similar models to illustrate the topics.

### (IXA) Strategy to support weak students

1. Paying attention to their problems in understanding the subject
2. Encouraging them to express their point of trouble
3. Allotting extra time beyond schedules class hours to help them understand the topics
4. Suggesting them different ways (as found suitable depending upon the case) to overcome their problem.

### (IXB) Strategy to encourage bright students

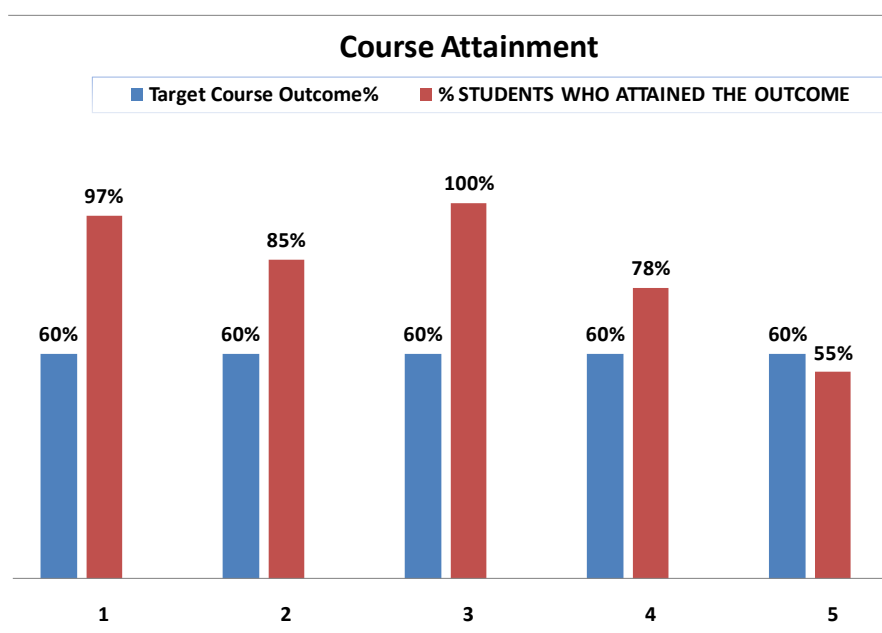
1. Try to encourage them to study beyond the syllabus
2. Ask them to develop the habit of reading anything good and rich in content
3. Advise them to try and solve higher level engineering numerical problems.

### (IXC) Efforts to keep students engaged

1. During class to avoid monotony some aptitude problems are given to solve.
2. Asking random questions to the students from the topic
3. Sometimes different tricks or techniques are shown to them to make the lecture interesting.
4. Informal technical quiz is also held.

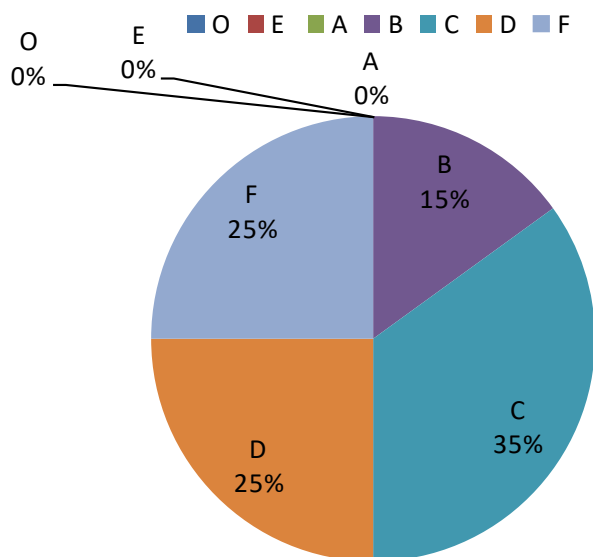
## (X) Analysis of Students performance in the course

### **INTERNAL ASSESSMENT**



## UNIVERSITY EXAMINATION

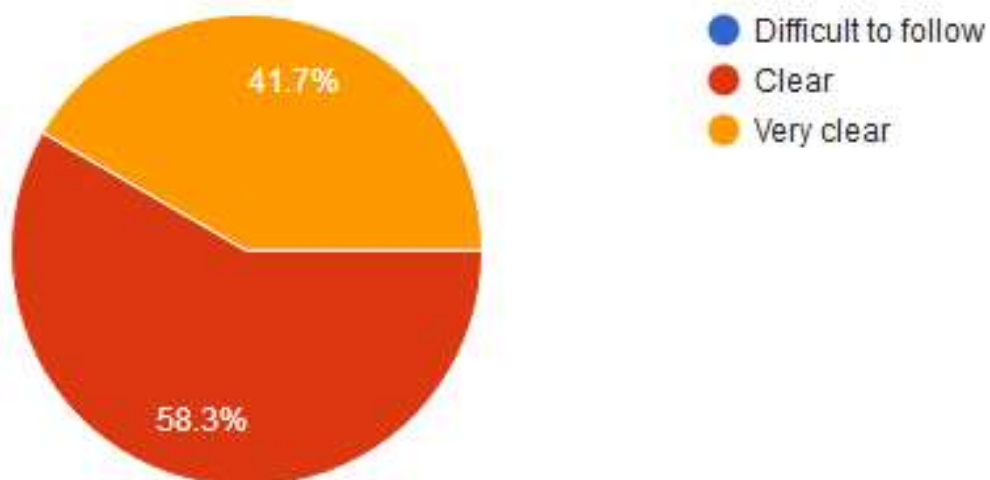
### Univerisity Result Analysis Sub: Chemistry (BS-CH-201) B.Tech (CE 2nd sem 2019)



## (XI) Analysis of Student Feed Back

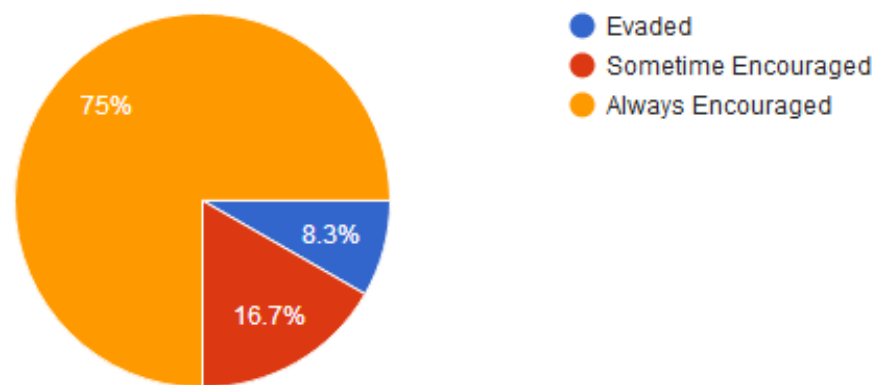
### Presentation and delivery of lecture is

12 responses



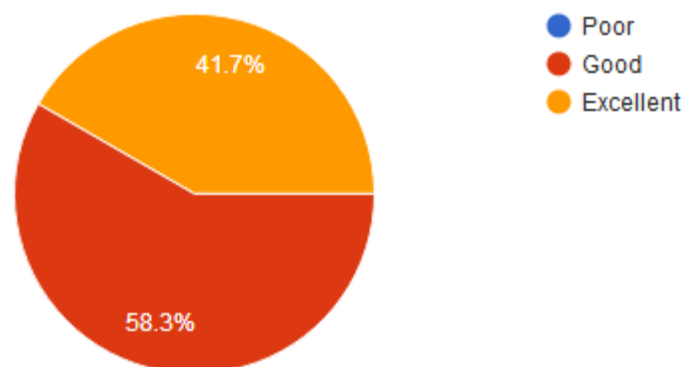
## Interaction in class are

12 responses



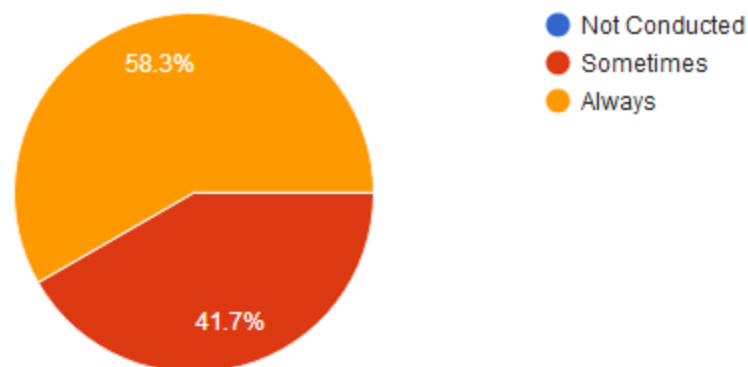
## Course progressing as per the course description

12 responses



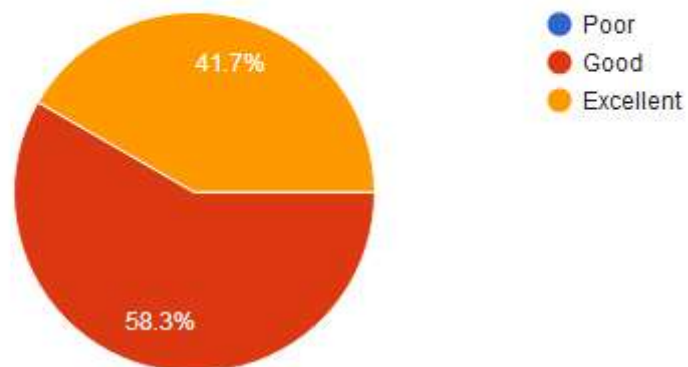
## Tutorials are conducted as per the schedule (Include if the course has a tutorial)

12 responses



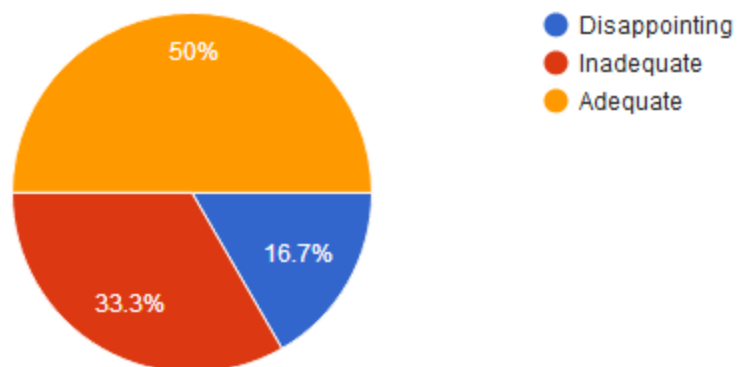
## Class room ambiance is

12 responses



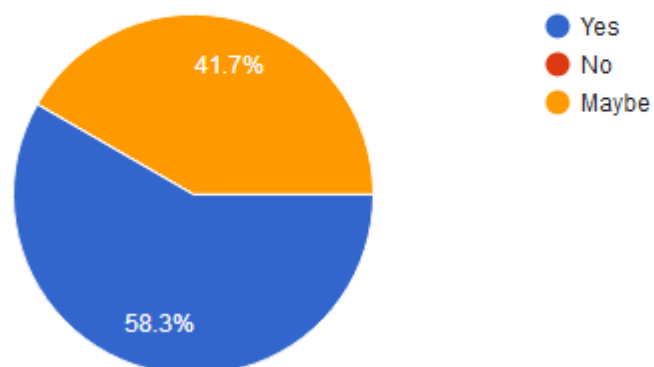
## Library support for the Course is

12 responses



## After completion of the course so far, do you understand the importance of this course in your engineering stream?

12 responses



## (XII) Teacher Self-Assessment (at the completion of course)

- Syllabus coverage was almost 100%.
- Will have to give more effort to improve their performance in university exam.

## (XIV) Recommendations/Suggestions for improvement by faculty

- To make it more interesting, syllabus of chemistry should be oriented towards more applications in engineering.
- For most of the lab classes (except expt no. 4 and 7) there is no theory part. So there is a gap between theory and lab class, which needs to be addressed by the University.
- 

### INTERNAL ASSESMENT RECORD

Subject with code: Chemistry-1, (BS CH201)

Section: Civil Engineering

Semester : 2nd

Discipline: Civil Engineering

Sl.	Roll No.	Name	Attendance		Internal Examination			Assignm ent / Quiz (50)	Total (100)
			Total (42)	Marks (5)	1 <sup>st</sup> (50)	2 <sup>nd</sup> (50)	Avg.		
1	11901318035	Swaraj Biswas	40	5	40	45	43	50	93
2	11901318036	Surajit Biswas	35	4	36	30	33	46	79
3	11901318038	Solanki Sinha	35	4	36	20	28	46	74
4	11901318039	Snehartaroy	35	4	38	31	35	46	81
5	11901318040	Shuvam Naha	39	5	35	47	41	50	91
6	11901318041	Shivam Kumar	39	5	36	50	43	50	93
7	11901318042	Ribhu Biswas	35	5	35	35	35	50	85
8	11901318043	Rajdeep Ghosh	30	4	25	22	24	50	74
9	11901318044	Protik Saha	30	4	31	20	26	46	72
10	11901318045	Prodyut Roy	30	4	29	22	26	50	76
11	11901318046	Pratiksha Pradhan	31	4	36	25	31	46	77
12	11901318047	Manab Roy	38	5	50	50	50	50	100
13	11901318048	Love Ojha	30	4	38	20	29	46	75
14	11901318049	Dipan Nath	37	5	50	50	50	50	100
15	11901318050	Dig Bijay Shaha	32	4	20	20	20	46	66
16	11901318051	Brojabihari Das	39	5	34	43	39	50	89
17	11901318052	Ashif Iqubal	32	4	43	25	34	46	80
18	11901318053	Anubrata Barman	40	5	42	30	36	50	86
19	11901318054	Anindya Mahapatra	29	4	27	22	25	46	71
20	11901318055	Ajay Kumar	38	4	27	46	37	46	83



# LIST OF PRACTICALS

Subject with code: BS-CH291

Section: Civil Engineering

Semester : 2nd

Discipline: Civil Engineering

Sl.	Details of Experiment(s)	Hours allotted
1	Determination of absorption isotherm of acetic acid by activated charcoal.	3 hours
2	Determination of surface tension of the given liquid at room temperature by stalagmometer.	3 hours
3	Estimation of dissolved oxygen in a given sample of water.	3 hours
4	Determination of rate constant of acid catalyzed hydrolysis of ethyl acetate.	3 hours
5	Determination of partition coefficient of acetic acid between n-butanol and water	3 hours
6	Determination of percentage composition of sugar solution from viscosity.	3 hours
7	(Conductometric Titration) Determination of strength of a given solution of HCl by titration against a standard solution of Na OH.	3 hours
8	(pH metric Titration) Determination of strength of a given solution of HCl by titration against a standard solution of NaOH.	3 hours

**NAME WITH ROLL NO.s OF STUDENT WHOSE ACADEMIC PERFORMANCE IS NOT SATISFACTORY**

Sl.	Roll No.	Name of Student	Remedial measures taken by teacher
	11901318042	Ribhu Biswas	<ul style="list-style-type: none"><li>• Identify and work out on the weakness.</li><li>• Teach them extra individually and in group.</li><li>• Give them extra numerical problems for practice.</li><li>• Help them to practice question answers and numerical.</li><li>• Refer them extra study materials and books.</li></ul>
	11901318043	Rajdeep Ghosh	
	11901318044	Protik Saha	
	11901318047	Manab Roy	
	11901318049	Dipan Nath	
	11901318053	Anubrata Barman	

**CERTIFICATE**

I, the undersigned, have completed the course allotted to me as shown below

Sl. No.	Semester	Subject with Code	Total Units/ Chapters	Remarks

Date :

**Signature of Faculty**

**Submitted to HOD**

**Certificate by HOD**

I, the undersigned, certify that.....has completed the course work allotted to him/ her satisfactorily/ notsatisfactorily.

Date :

**Signature of HOD**

**Submitted to Principal/Director**

Date :

**Signature of Principal/Director**



Director  
Siliguri Institute of Technology



**SILIGURI INSTITUTE OF TECHNOLOGY  
ELECTRICAL ENGINEERING**



**COURSE FILE**

**1ST SEM, 4TH YEAR, 2019**

**SEC – ALL**

**PAPER DESCRIPTION : RENEWABLE & NON-CONVENTIONAL ENERGY**

**PAPER CODE : EE-704(D)**

# **DEPARTMENT OF ELECTRICAL ENGINEERING**

## **VISION OF THE INSTITUTE :**

To be a recognised institution offering high quality education, opportunities to students to become globally employable Engineers/Professionals in best ranked industries and research organisation.

## **MISSION OF THE INSTITUTE :**

To impart quality technical education for holistic development of students who will fulfil the needs of the industry/society and be actively engaged in making a successful career in industry/research/higher education in India & abroad.

## **VISION OF THE DEPARTMENT:**

To emerge as a leading Department of Electrical Engineering that caters to the latest needs of power sector, electrical & allied industry in the region.

## **MISSION OF THE DEPARTMENT:**

To evolve as an innovative & globally competent Electrical Engineering department that contributes to the socio - economic growth of region by utilizing the advancement in Electrical Engineering by providing conducive learning and interactive environment to students and faculty.

# PROGRAM OUTCOMES (POs)

## Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## **PROGRAM SPECIFIC OUTCOMES (PSOs)**

**PSO1:** Apply science, engineering, mathematics through differential and integral calculus, complex variables to solve electrical engineering problems.

**PSO2:** Demonstrate proficiency in use of software & hardware to be required to practice Electrical engineering profession.

## **PROGRAM EDUCATION OBJECTIVE (PEO):**

The graduates of Electrical Engineering will:

1. Possess strong educational foundation in science, mathematics and Electrical Engineering which is essential in making successful careers in Industry/ research / higher education and will understand the professional responsibility in modern electrical power and energy related Industry through global and rigorous education.
2. Possess technical competence in the fields of Electrical engineering & allied disciplines and will be successful for the execution of engineering solutions which are technically sound and environment friendly.
3. Utilize their broad based knowledge, skills and resources to design, invent and develop novel technology and find creative and innovative solutions to engineering problems in a multidisciplinary work environment.
4. Be professional with leadership qualities, effective communication skills, ethical attitude and competence to excel individually and work efficiently in teams.
5. Possess attitude to learn and adopt new technologies as it evolves and be lifelong learners.

# SILIGURI INSTITUTE OF TECHNOLOGY

## Academic Calendar for the year 2018 - 2019

### **ODD SEMESTER 2019 (July 2019 – December 2019):**

<b>Activity</b>	<b>Date</b>
Eight weeks Summer Internship Program (MBA)	June 20 to August 20, 2019
FDP (supervised by R&D Committee)	July 8 to July 12, 2019
Commencement of Academic Programme (for continuing Batch, HMCT & MCA 5 <sup>th</sup> Sem)	July 8, 2019
Finishing School Program for 4 <sup>th</sup> Year students	July 12 to July 17, 2019
Commencement of Academic Programme (for continuing Batch, B. Tech.)	July 15, 2019
Commencement of Academic Programme (for newly admitted Batch, HMCT)	July 17, 2019
Commencement of Academic Programme (for newly admitted Batch, B. Tech.)	July 22, 2019
Induction program (as per the MAKAUT guideline) for newly admitted B. Tech. 1 <sup>st</sup> Year	July 22 to August 09, 2019
Commencement of Academic Programme (for continuing Batch, MCA 3 <sup>rd</sup> Sem)	July 29, 2019
Commencement of Academic Programme (for newly admitted Batch, MBA & MCA)	August 5, 2019
Finishing School Program for 4 <sup>th</sup> Year students, CIVIL & EE.	August 12 to August 17, 2019
Independence Day Celebration (supervised by Cultural Committee)	August 15, 2019
Akshay Urja Diwas Celebration (supervised by Tech-Management Fest Committee)	August 20, 2019
Commencement of Academic Programme (for continuing Batch, MBA)	August 26, 2019
Technical Training for 3 <sup>rd</sup> & 5 <sup>th</sup> Sem B. Tech.	August 26 to August 30, 2019
University Registration for newly admitted students	Last week of August (Tentative)
Continuous evaluation (Phase I)	August 29 to August 31, 2019
Fresher's Welcome	September 1 <sup>st</sup> week, 2019
Student Feedback and submission of ATR (Department Level)	September 4 to September 7, 2019
Games & Sports Activities	September 11 to September 14, 2019 (After class hours on working days)
Engineer's Day Celebration (supervised by Tech-Management Fest Committee)	September 13, 2019
Technical Training for 7 <sup>th</sup> Sem B. Tech.	September 16 to September 21, 2019
Meeting with the students with Director's Office	September 23 to September 27, 2019
Continuous evaluation (Phase II)	September 25 to September 27, 2019
Last date of reporting on Mentoring (Phase I)	September 30, 2019
22 Weeks Internship Program for 6 <sup>th</sup> Sem HMCT	October 1, 2019 Onwards
Technical Training for 1 <sup>st</sup> Sem B. Tech.	October 21 to October 24, 2019
Continuous evaluation (Phase III)	October 25 to October 28, 2019
Continuous evaluation (Phase IV)	November 18 to November 20, 2019
Practical & Project Viva	November 22 to November 30, 2019
Theory Examinations	December 4 to December 21, 2019
Last date of reporting on Mentoring (Phase II)	December 30, 2019
Inter Semester Break (For Students)	December 24, 2019 to January 12, 2020



# Course File

Course Title : RENEWABLE & NON-CONVENTIONAL ENERGY

Code : EE-704(D)

Semester 1<sup>st</sup> Year 4<sup>th</sup> 2019

Name of the Faculty: PROF. JAYANTA BHUSAN BASU

Internet Homepage: <https://sites.google.com/site/apjbbasu/>

E-mail : [jbb.sit@gmail.com](mailto:jbb.sit@gmail.com)

## Class Schedule

Lecture		
<b>Monday</b> 10.00 – 10.50 am	<b>Tuesday</b> 15.50 – 16.40 pm	<b>Thursday</b> 14.10 – 15.00 pm

Hours for meeting students:

<b>Monday</b>	14.10 -15.00 pm
<b>Wednesday</b>	13.20 – 14.00 pm
<b>Friday</b>	14.00 – 15.00 pm
<b>Or by appointment</b>	

## i) Course Objective

Students will acquire basic knowledge on different renewable energy sources and their application.

## ii) Course Outcomes

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The student will be able to:

Course Outcomes		Target
EE704D.1	Identify different Renewable and Non Renewable Energy Sources and realize their environmental impact <b>(BT 2)</b>	70% marks
EE704D.2	Illustrate Solar geometry and describe different methods of solar energy conversion. <b>(BT 3)</b>	65% marks
EE704D.3	Demonstrate knowledge about Working Principles of Wind Power generation and its application. <b>(BT 3)</b>	65% marks
EE704D.4	Explain generation & harnessing of power from Biomass, Geothermal, ocean energy. <b>(BT 3)</b>	65% marks
EE704D.5	Discuss about different direct energy conversion systems like MHD & Fuel cells. <b>(BT 3)</b>	65% marks
<b>EE704D</b>		<b>66% MARKS</b>

- i. Once the student has successfully completed this course, he/she must be able to answer the following questions or perform/demonstrate the following:

Sl.	Question	BT Level
1.	List different types of Renewable energy sources and their environmental impact.	BT 2
2.	Explain briefly the impact of conventional sources of energy on environment.	BT 2
3.	Distinguish between global radiation and diffuse radiation. Which is applicable during cloudy atmosphere?.	BT 2
4.	Calculate the day length in Srinagar on 1st July, 2012. The latitude of Srinagar is 34°05'N.	BT 3
5.	Draw the equivalent circuit of a practical solar cell and describe its I-V characteristics.	BT 3
6.	Discuss various subsystems in a solar thermal energy conversion system	BT 2
7.	Explain the fill factor and its importance as a performance parameter for a solar cell.	BT 3
8.	Estimate power output from a wind turbine	BT 3
9.	List & briefly discuss the factors that you would take into consideration in selecting a site of a land-based wind turbine system.	BT 3
10.	Describe in brief a binary cycle geothermal power plant.	BT 2
11.	Explain fluidized bed combustion in harnessing power from bio-mass.	BT 3
12.	Explain the working principle of double basin tidal power plants	BT 2
13.	What is the extractable power from a deep-sea wave of wavelength 150m and height 1.5 m if $g = 9.8 \text{ m/s}^2$ .	BT 3
14.	Calculate the open circuit voltage and maximum power output for an MHD generator having the following data : Plate area = 0.25 m <sup>2</sup> , distance between electrodes = 0.50 m, flux density = 1.8 Wb/m <sup>2</sup> , average gas velocity = 1200 m/s, gaseous conductivity = 10 mho/m.	BT 3
15.	Describe the principle of operation of Fuel Cell with suitable diagram	BT 2

### iii) Unit Layout

Unit	Lecture Hours
<b>Introduction to Energy sources</b> : Renewable and non-renewable energy sources, energy consumption as a measure of Nation's development; strategy for meeting the future energy requirements Global and National scenarios, Prospects of renewable energy sources. Impact of renewable energy generation on environment, Kyoto Protocol.	3
<b>Solar Energy</b> : Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, Solar air heaters-types, solar driers, storage of solar energy-thermal storage, solar pond , solar water heaters, solar distillation, solar still, solar cooker, solar heating & cooling of buildings, photo voltaics - solar cells, different types of PV Cells, Mono-poly Crystalline and amorphous Silicon solar cells. Design of PV array. Efficiency and cost of PV systems & its applications. PV hybrid systems.	8
<b>Wind Energy</b> : Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations	5
<b>Energy from Biomass</b> : Biomass conversion technologies, Biogas generation plants, classification, advantages and disadvantages, constructional details, site selection, digester design consideration, filling a digester for starting, maintaining biogas production, Fuel properties of bio gas, utilization of biogas	4

Unit	Lecture Hours
<b>Geothermal Energy</b> : Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.	4
<b>Energy from Ocean</b> : Ocean Thermal Electric Conversion (OTEC) systems like open cycle, closed cycle, Hybrid cycle, prospects of OTEC in India. Energy from tides, basic principle of tidal power, single basin and double basin tidal power plants, advantages, limitation and scope of tidal energy. Wave energy and power from wave, wave energy conversion devices, advantages and disadvantages of wave energy	4
<b>Magneto Hydrodynamic power generation</b> : Principle of MHD power generation, MHD system, Design problems and developments, gas conductivity, materials for MHD generators and future prospects	2
<b>Hydrogen Energy</b> : Introduction, Hydrogen Production methods, Hydrogen storage, hydrogen transportation, utilization of hydrogen gas, hydrogen as alternative fuel for vehicles	2
<b>Fuel cell</b> : Introduction, Design principle and operation of fuel cell, Types of fuel cells, conversion efficiency of fuel cell, application of fuel cells	2

#### iv) Text books

- Non conventional Energy sources, G.D. Rai, Khanna Publishers.
- Renewable energy sources and conversion technology, Bansal Keemann, Meliss, Tata Mc Graw Hill.
- Non conventional Energy, Ashok V. Desai, New Age International Publishers Ltd.

#### Reference books :

- Renewable energy resources and emerging technologies, D.P. Kothari, Prentice Hall of India Pvt. Ltd.

#### (v) Evaluation Scheme

##### 1) Theory

Evaluation Criteria	Marks
Internal Exam*	15
Assignment	10
Attendance	5
University Exam/External Exam	70
Total	100

\* The Internal Marks will be determined through the continuous evaluation (CA) which is needed to be submitted 4 times in a semester based on performance of the students assessed at the end of August, September, October and November 2019 as per academic calendar published by the University. The 4 nos of CAs could be based on test/ viva/ quiz/ presentation/seminar/ GD etc out of which 2 nos preferably would be tests. **(MAKAUT notification Ref No. COE/MAKAUT/FACULTY/1/2019-20 Date: 13/09/2019)**

### Course target attainment levels:

Attainment Level	Inference	Marks
Attainment Level 1	50% of the students have attained more than the target level of that CO	1
Attainment Level 2	60% of the students have attained more than the target level of that CO	2
Attainment Level 3	70% of the students have attained more than the target level of that CO	3

### Course Target for the university examination = 65% of the students will get "A" Grade

Target has been set on the basis of last year's performance / result by the students, student quality this year and difficulty level of the course.

### University Grading System:

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

## (vi) Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
EE704D.1	2	-	-	-	-	-	3	-	-	-	-	1	1	2
EE704D.2	3	2	-	-	-	-	2	-	-	-	-	1	2	3
EE704D.3	3	2	-	-	-	-	2	-	-	-	-	1	2	3
EE704D.4	3	-	-	-	-	-	3	-	-	-	-	1	2	3
EE704D.5	2	1	-	-	-	-	3	-	-	-	-	1	2	2
EE704D	2.6	1.7					2.6					1	1.8	2.6

1 = courses in which the student will be exposed to a topic.

2 = courses in which students will gain competency in that area.

3 = courses in which students will master that skill.

- EE704D.1 requires knowledge of renewable and non-renewable energy sources and understanding of societal impact in present scenario to provide long term solutions for energy problems. Hence it is highly linked with PO7, partially linked with PO1 and minimally linked with PO12 & PSO1.
- EE704D.2 and EE704D.3 require application of engineering knowledge to design/development of solutions & understanding of environmental contexts and also require knowledge of engineering to provide long lasting solutions of energy problem. Hence it is highly linked with PO1, partially linked with PO2, PO7 & PSO1 and minimally linked with PO12.
- EE704D.4 requires engineering knowledge & understanding of environmental conditions to providing economical and sustainable engineering solutions. Hence it is highly linked with PO1 & PO7, partially linked with PSO1 and minimally linked with PO12.
- EE704D.4 requires knowledge about understanding of engineering knowledge & understanding of environmental conditions to assess societal application and providing sustainable engineering solutions in long term. Hence it is highly linked with PO6 & PO7, partially linked with PO1, PO2 and minimally linked with PO12 & PSO1.
- EE704D.5 deals with different energy efficient technologies which require good engineering knowledge so that environment friendly sustainable solutions can be found for energy related problems. Hence it is highly linked with PO7, partially linked with PO1 & PSO1 and minimally linked with PO2 & PO12.

## (vii) Assessment Methodology

Outcome	Assessment Tool
EE704D.1	Internal Test, Quiz/Assignment/Term Paper, University Exam
EE704D.2	Internal Test, Quiz/Assignment/Term Paper, University Exam
EE704D.3	Internal Test, Quiz/Assignment/Term Paper, University Exam
EE704D.4	Internal Test, Quiz/Assignment/Term Paper, University Exam
EE704D.5	Internal Test, Quiz/Assignment/Term Paper, University Exam

**(viii) A. Weekly Lesson Plan**

<b>Week</b>	<b>Lectures</b>
1	<p><b>Discussion of Course outcome and program outcome.</b></p> <p><b>Introduction to energy sources:</b></p> <ul style="list-style-type: none"><li>• Renewable and non-renewable energy sources ,energy consumption as a measure of nations development</li><li>• Strategy for meeting the future energy requirements, Global and National scenarios</li><li>• Prospects of renewable energy sources.</li><li>• Impact of renewable energy generation on environment</li></ul>
2	<p><b>Solar Energy:-</b></p> <ul style="list-style-type: none"><li>• Solar radiation: beam and diffusion radiation ,solar constant, earth sun angel</li><li>• attenuation and measurement of solar radiation, local solar time</li><li>• Derived Solar angles, sunrise, Sunset and day length</li></ul>
3	<p><b>Solar Energy:-</b></p> <ul style="list-style-type: none"><li>• Flat Plate Collectors , Concentrating Collectors</li><li>• Solar air heater types, solar driers, storage of solar energy, thermal storage, solar pond, solar water heater</li><li>• Solar distillation, Solar still, Solar cooker.</li></ul>
4	<p><b>Solar Energy:-</b></p> <ul style="list-style-type: none"><li>• Solar heating and Cooling of buildings</li><li>• Photo voltaic, Solar cell, different types of PV Cells, Mono Poly Crystalline and amorphous Silicon Solar Cell</li><li>• Design of PV Array efficiency and cost of PV System and its application, PV Hybrid System.</li></ul>
5	<p><b>Wind Energy :-</b></p> <ul style="list-style-type: none"><li>• Principle and Wind Energy Conversion Basic Components of Wind Energy Conversion System</li><li>• Wind mill components and Various types and their constructional Feature</li><li>• Design Considerations of Horizontal and Vertical Axis Wind Machines</li></ul>
6	<p><b>Wind Energy :-</b></p> <ul style="list-style-type: none"><li>• Analysis of Aerodynamic forces acting on Wind Mill blades and Estimations of Power output</li><li>• Wind data and site selection Consideration</li></ul> <p><b>Energy From Biomass</b></p> <ul style="list-style-type: none"><li>• Biomass Conversion Technologies and Biogas generation Plant.</li></ul>
7	<p><b>Energy From Biomass</b></p> <ul style="list-style-type: none"><li>• Classification, advantages disadvantages and constructional details.</li></ul>

	<ul style="list-style-type: none"> <li>• Site Selection and digester design consideration</li> <li>• Filling a digester for Starting, maintaining</li> <li>• Biogas Production Properties and Utilization of Biogas</li> </ul>
8	<p><b>Geothermal Energy :-</b></p> <ul style="list-style-type: none"> <li>• Estimation and Nature of Geothermal Energy</li> <li>• Geothermal Resources and Resources like hydrothermal , geo-pressured and hot dry Rock magma</li> </ul>
9	<p><b>Geothermal Energy :-</b></p> <ul style="list-style-type: none"> <li>• Advantage and Disadvantage of Geothermal Energy</li> <li>• Application of Geothermal Energy</li> <li>• Prospect of Geothermal Energy in India.</li> </ul> <p><b>Energy From Ocean:-</b></p> <ul style="list-style-type: none"> <li>• OTEC systems like Open cycle and Closed Cycle and Hybrid Cycle Systems</li> <li>• Prospects of OTEC in India Energy From Tides , Basic Principle of Tidal Power Generation.</li> </ul>
10	<p><b>Energy From Ocean:-</b></p> <ul style="list-style-type: none"> <li>• Single Basin and Double Basin Tidal Power Plants advantage, limitation and Scope of Tidal Power</li> <li>• Wave Energy and Power From Wave</li> <li>• Wave Energy Conversion devices and Advantage, Disadvantages of Wave Energy</li> </ul>
11	<p><b>Magneto Hydro Dynamic Power Generation :-</b></p> <ol style="list-style-type: none"> <li>1. Principle of MHD Power Generation MHD System</li> <li>2. Design Problems and Developments gas Conductivity</li> <li>3. Materials for MHD generation and Future Prospects</li> </ol>
12	<p><b>Hydrogen Energy:-</b></p> <ul style="list-style-type: none"> <li>• Introduction, Hydrogen Production Methods, Hydrogen Storage</li> <li>• Hydrogen Transportation, Utilization of Hydrogen Gas</li> <li>• Hydrogen as a Alternative Fuel For Vehicle.</li> </ul>
13	<p><b>Fuel Cell :-</b></p> <ul style="list-style-type: none"> <li>• Introduction, Design Principle and Operation of Fuel Cell</li> <li>• Types of Fuel Cells</li> <li>• Conversion efficiency of Fuel Cell and application of Fuel Cell.</li> </ul>

## (VIII) B. COMBINED DAILY LESSON PLAN & EXECUTION REPORT

<b>NAME OF FACULTY :</b> Mr. J. B. Basu	<b>DEPARTMENT :EE</b>	<b>SUBJECT:</b> RENEWABLE & NON-CONVENTIONAL ENERGY <b>CODE :</b> EE-704D	<b>SEMESTER : 7<sup>th</sup></b>
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Unit / Module	Topic Description ( to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/min i project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
<b>1</b>	<b>Introduction</b>	<b>1</b>					
	Discussion of Course outcome and program outcome. Overview of the course.	1	22.07.2019	22.07.2019			
<b>2</b>	<b>Introduction to energy sources:</b>	<b>3</b>					
	Renewable and non-renewable energy sources ,energy consumption as a measure of nations development Strategy for meeting the future energy requirements, Global and National scenarios	1	23.07.2019	23.07.2019			
	Prospects of renewable energy sources.	1	25.07.2019	29.07.2019			
	Impact of renewable energy generation on environment	1	29.07.2019	30.07.2019			
<b>3</b>	<b>Solar Energy</b>	<b>9</b>					
	Solar radiation: beam and diffusion radiation ,solar constant, earth sun angel	1	30.07.2019	01.08.2019			
	Attenuation and measurement of solar radiation, local solar time	1	01.08.2019	01.09.2019			
	Derived Solar angles, sunrise, Sunset and day length	1	05.08.2019	06.08.2019			



Unit / Module	Topic Description ( to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/min i project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
	Flat Plate Collectors , Concentrating Collectors	1	06.08.2019	08.08.2019			
	Solar air heater types, solar driers, storage of solar energy, thermal storage, solar pond, solar water heater	1	08.08.2019	13.08.2019			
	Solar distillation, Solar still, Solar cooker.	1	13.08.2019	19.08.2019			
	Solar heating and Cooling of buildings Photo voltaic, Solar cell,	1	19.08.2019	19.08.2019			
	Different types of PV Cells, Mono Poly Crystalline and amorphous Silicon Solar Cell	1	20.08.2019	20.08.2019			
	Design of PV Array efficiency and cost of PV System and its application, PV Hybrid System	1	22.08.2019	20.08.2019			
<b>4</b>	<b>Wind Energy</b>	<b>5</b>					
	Principle and Wind Energy Conversion Basic Components of Wind Energy Conversion System	1	26.08.2019	22.08.2019			
	Wind mill components and Various types and their constructional Feature	1	27.08.2019	22.08.2019			
	Design Considerations of Horizontal and Vertical Axis Wind Machines	1	02.09.2019	26.08.2019			
	Analysis of Aerodynamic forces acting on Wind Mill blades and Estimations of Power output	1	03.09.2019	02.09.2019			
	Wind data and site selection Consideration	1	05.09.2019	02.09.2019			
<b>5</b>	<b>Energy from Biomass</b>	<b>4</b>					

Unit / Module	Topic Description ( to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
	Biomass Conversion Technologies and Biogas generation Plant.	1	09.09.2019	03.09.2019			
	Classification, advantages disadvantages and constructional details	1	23.09.2019	05.09.2019			
	Site Selection and digester design consideration	1	24.09.2019	09.09.2019			
	Filling a digester for Starting, maintaining Biogas Production Properties and Utilization of Biogas	1	30.09.2019	09.09.2019			
<b>6</b>	<b>Geothermal Energy</b>	<b>3</b>					
	Estimation and Nature of Geothermal Energy Advantage and Disadvantage of Geothermal Energy	1	01.10.2019	12.09.2019			
	Geothermal Resources and Resources like hydrothermal , geopressured and hot dry Rock magma	1	03.10.2019	16.09.2019			
	Application of Geothermal Energy Prospect of Geothermal Energy in India	1	10.10.2019	16.09.2019			
<b>7</b>	<b>Energy From Ocean</b>	<b>4</b>					
	OTEC systems like Open cycle and Closed Cycle and Hybrid Cycle Systems Prospects of OTEC in India Energy From Tides	1	14.10.2019	17.09.2019			
	Basic Principle of Tidal Power Generation	1	15.10.2019	21.10.2019			
	Single Basin and Double Basin Tidal Power Plants advantage, limitation and Scope of Tidal Power	1	17.10.2019	21.10.2019			

Unit / Module	Topic Description ( to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/min i project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
	Wave Energy and Power From Wave Wave Energy Conversion devices and Advantage, Disadvantages of Wave Energy	1	21.10.2019	22.10.2019			
<b>8</b>	<b>Magneto Hydro Dynamic Power Generation</b>	<b>2</b>					
	Principle of MHD Power Generation MHD System	1	22.10.2019	04.11.2019			
	Design Problems and Developments gas Conductivity Materials for MHD generation and Future Prospects	1	24.10.2019	05.11.2019			
<b>9</b>	<b>Hydrogen Energy</b>	<b>2</b>					
	Introduction, Hydrogen Production Methods, Hydrogen Storage	1	31.10.2019	07.11.2019			
	Hydrogen Transportation, Utilization of Hydrogen Gas Hydrogen as a Alternative Fuel For Vehicle.	1	04.11.2019				
<b>10</b>	<b>Fuel Cell</b>	<b>2</b>					
	Introduction, Design Principle and Operation of Fuel Cell	1	05.11.2019	11.11.2019			
	Types of Fuel Cells Conversion efficiency of Fuel Cell and application of Fuel Cell.	1	07.11.2019				
	<b>Recapitulation &amp; discussion on previous year's question papers</b>	2	<b>11.11.2019 14.11.2019</b>				

## **(ix) Teaching Strategy/Method**

1. Learning by example
2. Learning by question and answering
3. Learning by problem solving
4. Use of Power point presentation.
5. Use of animations to understand the working principles.

### **(ixa) Strategy to support weak students**

1. Reviewing student attendance in connection with performance, and counselling students about attending classes, advising them for making up classes missed and getting additional help.
2. Paying attention to their problems in understanding the subject
3. Encouraging them to express their point of trouble
4. Allotting extra time beyond schedules class hours to help them understand the topics
5. Suggesting them different ways (as found suitable depending upon the case) to overcome their problem.

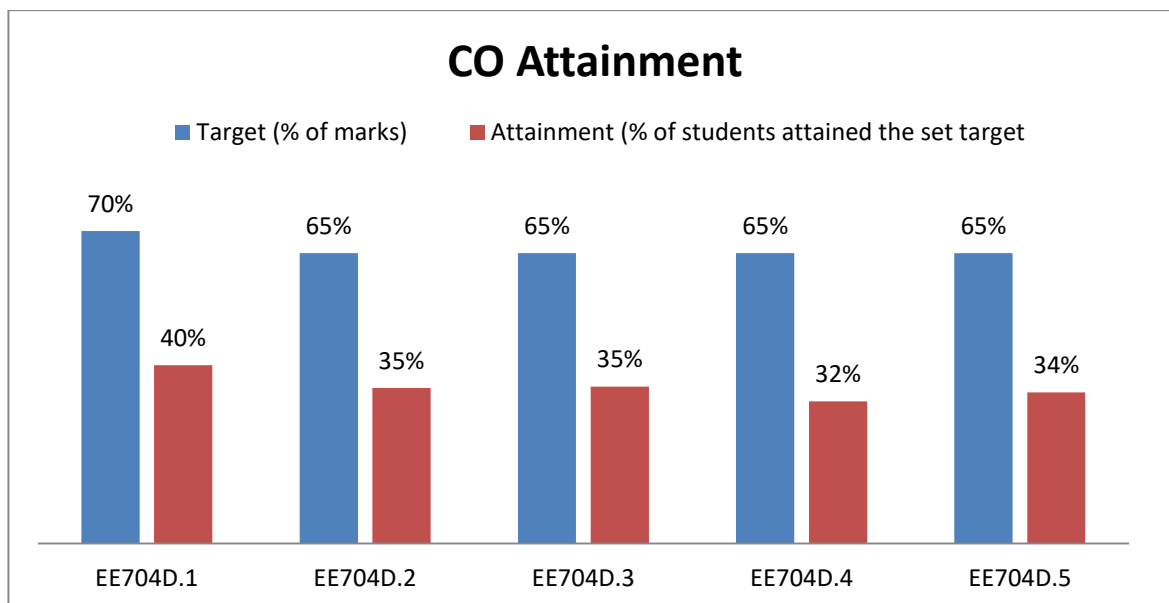
### **(ixb) Strategy to encourage bright students**

1. Try to encourage them to study beyond the syllabus
2. Ask them to develop the habit of reading anything good and rich in content to update their knowledge about the development in the field of renewable energy.
3. Encourage them to help academically weak students.
4. Encourage them to do mini projects.

### **(ixc) Efforts to keep students engaged**

1. summarize the previous day's lecture and ask random questions.
2. Providing informative data/examples/case study related to the topic from the industrial point of view.
3. Conducting Informal technical quiz/surprise tests.

### (xi) Analysis of Students performance in the course



- 40% students have attained the set target of 70% marks for EE704D.1
- 35% students have attained the set target of 65% marks for EE704D.2
- 35% students have attained the set target of 65% marks for EE704D.3
- 32% students have attained the set target of 65% marks for EE704D.4
- 34% students have attained the set target of 65% marks for EE704D.5

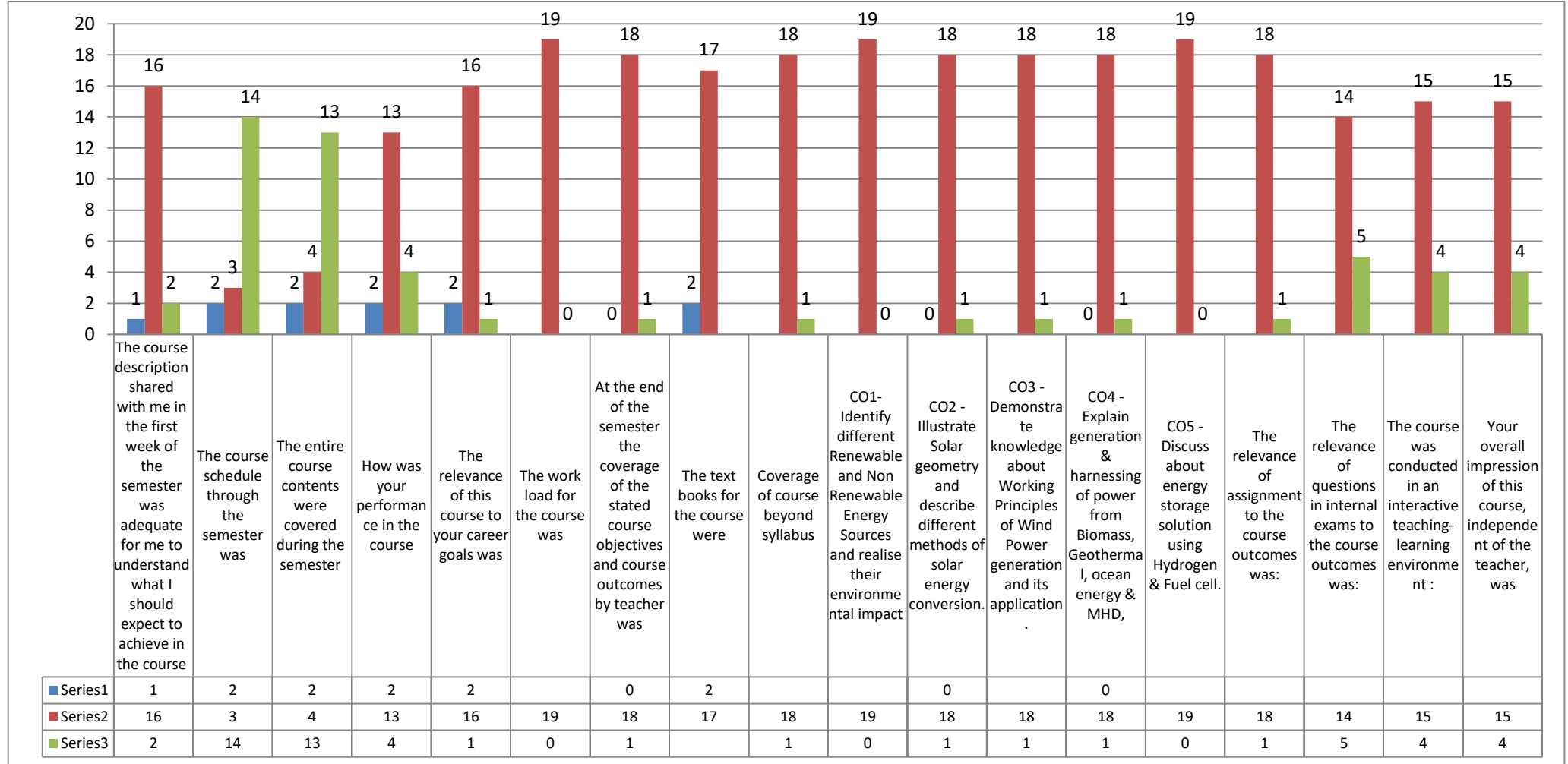
### (xii) Analysis of Students performance in the course (university results)

	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME
University				

- 60% students have attained the set target of 7 in point for University Exams

### (xiii) Analysis of Student Feed Back

Feedback is taken from 24 students based on the course survey.



#### **(xiv) Teacher Self-Assessment (at the completion of course)**

From the analysis of the results obtained it can be seen that set targets for the course outcome have been achieved moderately by the students. Since this course encompasses a wide range of activities and expertise in the optimal use of energy hence some hands-on activities will provide practical exposure for better understanding the course.

#### **(xiv) Recommendations/Suggestions for improvement by faculty**

This is a course which requires conceptual understanding of the subject. Students are needed to be motivated to understand the importance energy management & audit. They need to be motivated to understand the environmental impact due to energy consumption and the role of budding engineers to curb the same. Some practical case studies and views of industry expert will help the students to realise the importance of the subject.

# CONTINUOUS ASSESMENT (CA) RECORD

Subject with code: RENEWABLE & NON CONVENTIONAL ENERGY (EE-704D)

Section: ALL

Semester :7<sup>th</sup>

Discipline: Electrical Engineering

NAME	CA1 (25)			CA2 (25)			CA3 (25)				CA4 (25)			Grand Total (100)
	Attendance (5)	Quiz (10)	Total (25)	Quiz 1 (10)	Internal Exam (15)	Total (25)	Attendance (5)	Assignment (10)	Quiz 2 (10)	Total (25)	PPT (10)	2nd Internal Exam (15)	Total (25)	100
VEDANT SINGH SHANKAR	4	7	18	7	11	18	4	0	8	12	0	6	6	59
TAMALIKA DAS	4		4	0	11	11	4	10	5	19	0	2	2	40
TAMAL BISWAS	4	3	10	0	12	12	4	10		14	0	1	1	41
SUMAN DUTTA	5	7	19	0	15	15	5	10	8	23	10	2.5	13	72
SUBRATA PRAMANIK	5	8	21	0	15	15	5	10	8	23	10	2.5	13	74
SUBHENDU BISWAS	4	9	22	0	15	15	4	0	8	12	0	3	3	56
SUBHANKAR DAS	4	7	18	0	12	12	4	10	8	22	10	2.5	13	68
SUBHAJIT BARMAN	4	7	18	4	14	18	4	10	7	21	0	1.5	2	63
SUBARNA TRIBEDI	4	6	16	9	14	23	4	10	7	21	0	8.5	9	73
SRINJOY GHOSH	4	8	20	5	14	19	4	10	8	22	0	3.5	4	68
SOURAV THAPA	4	8	20	6	14	20	4	10	9	23	0	0	0	65
SAYANTANI DEY	4	7	18	0	13	13	4	10	7	21	0	1.5	2	58
SAYANI BHATTACHARJEE	4	4	12	0	10	10	4	10		14	0	1.5	2	42
SARVAJEET KUMAR	4	10	24	5	15	20	4	10	8	22	10	1.25	11	80
SANTANU NAG	4		4	0	10	10	4	0	5	9	0	2	2	32
SAMBHU ROY	4	10	24	0	15	15	4	0		4	0	0	0	51
SAIBAL DAS	4	4	12	0	12	12	4	10	5	19	10	1.5	12	59
SAHIL RAI	4	8	20	0	14	14	4	10		14	0	2.5	3	55
RIYA SARKAR	5		5	0	14	14	5	10	8	23	10	3.5	14	58
RAKESH KUMAR NEOPANE	4		4	4	13	17	4	10	2	16	0	1	1	42



NAME	CA1 (25)			CA2 (25)			CA3 (25)				CA4 (25)			Grand Total (100)
	Attendance (5)	Quiz (10)	Total (25)	Quiz 1 (10)	Internal Exam (15)	Total (25)	Attendance (5)	Assignment (10)	Quiz 2 (10)	Total (25)	PPT (10)	2nd Internal Exam (15)	Total (25)	100
RAJAT KUMAR MAZUMDER	4	8	20	5	14	19	4	10	8	22	10	1	11	75
RAJA BABU	4		4	5	12	17	4	0		4	0	1	1	34
PUSHP RAJ ROY	4	6	16	6	13	19	4	0		4	0	2.5	3	49
PRIYANKA DAS	4	7	18	0	13	13	4	0	5	9	0	3	3	48
PRATUSHA GUPTA	4		4	0	13	13	4	0	2	6	0	2	2	33
PAULAMI GHOSH	5	6	17	1	12	13	5	0	5	10	0	2.5	3	47
NIRVESANKA ROY	4		4	7	12	19	4	10	7	21	0	2.5	3	50
NILRUDRA SARKAR	5	7	19	0	14	14	5	10	7	22	10	1.5	12	70
NEHA RANI	4	10	24	6	15	21	4	10	9	23	10	1.5	12	81
NAVA MALAKAR	5	7	19	4	12	16	5	0	7	12	10	2.5	13	64
MRINAL CHANDA	5	7	19	6	12	18	5	10		15	10	3.5	14	69
KUSHAL GURUNG	4	8	20	0	14	14	4	10	8	22	10	10	20	79
JOYDEB ROY	4	1	6	0	10	10	4	0		4	0	2.5	3	31
ISHITA ROY	4	6	16	0	12	12	4	0	4	8	0	2.5	3	45
DIPU DAS	4	8	20	5	14	19	4	10	8	22	10	2.5	13	77
DEBANGANA DAS	5	5	15	6	14	20	5	10	9	24	0	5.5	6	65
CHITRALEKHA CHOUHAN	5	7	19	0	12	12	5	10		15	0	4.5	5	55
CHHAYA KUMARI TUDDU	4	7	18	5	14	19	4	10		14	0	1.5	2	57
BINIT KUMAR YADAV	4		4	0	12	12	4	10		14	0	1	1	35
BASUDEB MOHANTA	4	8	20	0	14	14	4	10	5	19	10	4.5	15	72
BAPPADITYA SHOME	4	6	16	0	13	13	4	0	7	11	10	3	13	57
ARINDAM MONDAL	4	7	18	5	13	18	4	10	1	15	10	1	11	66
ANUSKA ROY	4	4	12	0	12	12	4	0	2	6	10	1.5	12	50
ANIRUDDHA CHAKI	5	7	19	9	14	23	5	10	7	22	10	10.5	21	88
AKASH SARKAR	5	4	13	0	13	13	5	10	2	17	0	4	4	51
AKASH PAUL	5	10	25	7	15	22	5	10	9	24	10	3	13	85
AISHIK BHATTACHARJEE	4	8	20	0	13	13	4	10	9	23	10	3.5	14	72

NAME	CA1 (25)			CA2 (25)			CA3 (25)				CA4 (25)			Grand Total (100)
	Attendance (5)	Quiz (10)	Total (25)	Quiz 1 (10)	Internal Exam (15)	Total (25)	Attendance (5)	Assignment (10)	Quiz 2 (10)	Total (25)	PPT (10)	2nd Internal Exam (15)	Total (25)	100
ABHISHEK DEY	4	2	8	0	10	10	4	0	3	7	0	1.5	2	34
ABHISEK SARKAR	5	1	7	0	10	10	5	10	4	19	10	1.5	12	52
ABHINABA ROY CHOUDHURY	5	5	15	0	12	12	5	10	9	24	10	1.5	12	64
ABHINAB TALUKDAR	5	10	25	7	15	22	5	10	9	24	10	4.5	15	87
SURAJIT CHANDA	4	10	24	4	15	19	4	10		14	0	3.5	4	65
SUJOY MODAK	5	5	15	8	12	20	5	10	1	16	0	1.5	2	56
SUDIPTA ROY	4	10	24	4	15	19	4	10	3	17	10	1.5	12	76
SUBRATA GOSWAMI	4		4	0	12	12	4	0		4	0	1.5	2	30
SOURAV MAJUMDER	4	10	24	3	15	18	4	0	8	12	10	2	12	70
SANCHARI GHOSH	5	10	25	6	15	21	5	10	10	25	10	2.5	13	84
SAJAN PRADHAN	5	10	25	11	15	26	5	10	9	24	10	6	16	92
PRITAM GAUTAM	5	9	23	10	15	25	5	10	9	24	10	4	14	87
HIMADRI DAS	4	9	22	3	15	18	4	10	3	17	10	1	11	72
GOURAB SARKAR	5	9	23	3	15	18	5	10	8	23	0	3	3	69
BISWAJIT KARMAKAR	5	3	11	6	12	18	5	10	7	22	0	3	3	57
BAPPADITYA BARMAN	5	10	25	5	15	20	5	10	8	23	0	2.5	3	73
ANAMIKA DUTTA	5	10	25	6	15	21	5	10	6	21	0	1.5	2	72
ABHRANEEL BHATTCHARJEE	4		4	5	10	15	4	10		14	0	1.5	2	38
UDAY ROY	5	10	25	6	15	21	5	10	9	24	10	5.5	16	87

**NAME WITH ROLL NO.s OF STUDENT WHOSE ACADEMIC PERFORMANCE IS NOT SATISFACTORY**

Gr.	Roll No.	Name of Student	Remedial measures taken by teacher
<b>ALL</b>	11901616027	SANTANU NAG	<ul style="list-style-type: none"><li>• Additional doubt clearing sessions beyond the class hours</li><li>• Providing extra assignments to students.</li><li>• Asking them to solve previous question papers.</li><li>• Highlighting important and frequently asked questions</li></ul>
	11901616034	RAJA BABU	
	11901616037	PRATUSHA GUPTA	
	11901616046	JOYDEB ROY	
	11901616052	BINIT KUMAR YADAV	
	11901616062	ABHISHEK DEY	
	11901617004	SUBRATA GOSWAMI	
	11901617016	ABHRANEEL BHATTCHARJEE	

# CERTIFICATE

I, the undersigned, have completed the course allotted to me as shown below

Sl. No.	Semester	Subject with Code	Total Units/ Chapters	Remarks
1	7th	Renewable & Non conventional Energy (EE704D)	09 Units	

Date :

**Signature of Faculty**

## Submitted to HOD

### Certificate by HOD

I, the undersigned, certify that *Prof. Jayanta Bhusan Basu* has completed the course work allotted to him / her satisfactorily / not satisfactorily.

Date :

**Signature of HOD**

## Submitted to Principal/Director

Date :

**Signature of Principal/Director**

## Student Feedback on Course Objectives & Outcomes

**Faculty** Prof. Jayanta Bhusan Basu

**Semester** 1<sup>st</sup> Year 4<sup>th</sup>

**Course code** EE-704D

**Course Title** Renewable & Non conventional Energy

Dear Students

This feedback that I intend to take from you is very precisely about fulfillment of course objectives and course outcomes. My course objectives and course outcomes are as follows that I had shared with you in the beginning of the semester, the same is repeated here.

### **Course Objectives**

Students will acquire basic knowledge about current energy scenario, energy management, auditing and conservation.

### **Course Outcomes**

The students will be able to:

- EE704D.1 Identify different Renewable and Non Renewable Energy Sources and realize their environmental impact (BT 2)
- EE704D.2 Illustrate Solar geometry and describe different methods of solar energy conversion. (BT 3)
- EE704D.3 Demonstrate knowledge about Working Principles of Wind Power generation and its application. (BT 3)
- EE704D.4 Explain generation & harnessing of power from Biomass, Geothermal, ocean energy. (BT 3)
- EE704D.5 Discuss about different direct energy conversion systems like MHD & Fuel cells. (BT 3)

The survey questions below has been designed to obtain your feedback so as to determine the extent of attainment of the intended course objectives and course outcomes.

**1 = Poor                  2= Good                  3= Excellent**

	<b>Parameter</b>	<b>1</b>	<b>2</b>	<b>3</b>
1.	The course description shared with me in the first week of the semester was adequate for me to understand what I should expect to achieve in the course			
2.	The course schedule through the semester was			
3.	The entire course contents were covered during the semester			
4.	How was your performance in the course			
5.	The relevance of this course to your career goals was			
6.	The work load for the course was			
7.	At the end of the semester the coverage of the stated course objectives and course outcomes by teacher was			
8.	The text books for the course were			
9.	Coverage of course beyond syllabus			
10.	The relevance of laboratory experiment to the course outcomes was:			
11.	Through the course, got the opportunity and confidence to:			
	<ul style="list-style-type: none"><li>• <b>Identify different Renewable and Non Renewable Energy Sources and realize their environmental impact (BT 2)</b></li></ul>			
	<ul style="list-style-type: none"><li>• <b>Illustrate Solar geometry and describe different methods of solar energy conversion. (BT 3)</b></li></ul>			
	<ul style="list-style-type: none"><li>• <b>Demonstrate knowledge about Working Principles of Wind Power generation and its application. (BT 3)</b></li></ul>			
	<ul style="list-style-type: none"><li>• <b>Explain generation &amp; harnessing of power from Biomass, Geothermal, ocean energy. (BT 3)</b></li></ul>			
	<ul style="list-style-type: none"><li>• <b>Discuss about different direct energy conversion systems like MHD &amp; Fuel cells. (BT 3)</b></li></ul>			
12.	The relevance of assignment to the course outcomes was:			
13.	The relevance of quiz to the course outcomes was:			
14.	The relevance of questions in internal exams to the course outcomes was:			
15.	The course was conducted in an interactive teaching-learning environment :			
16.	Your overall impression of this course, independent of the teacher, was			

**Thank You**

# Department of EE

## Quiz-1, 2019

Paper Name: RENEWABLE AND NON-CONVENTIONAL ENERGY

Paper Code: EE-704D,

Full Marks : 10

1. Which of these is not a renewable source of energy? EE704D.1  
i. The sun            **ii. Natural gas**            iii. Wind            iv. Tidal energy
2. Global warming is mainly caused due to EE704D.1  
i. emission of heat from engines            **ii. emission of CO<sub>2</sub> due to burning of fossil fuels**  
iii. use of nuclear energy            iv. air pollution
3. The materials that do not decay and remain in the environment called EE704D.1  
i. biodegradable wastes    ii. Garbage    **iii. Non-biodegradable wastes**    iv. Solid waste
4. The radiations absorbed by ozone layer are \_\_\_\_\_. EE704D.1  
i. infra-red            **ii. ultra-violet**            iii. Visible            iv. gamma rays
5. Direct Solar energy is used for EE704D.2  
i. Water heating            ii. Distillation            iii. Drying            **iv. All of the above**
6. Solar energy moves through space to the earth by EE704D.2  
i. conduction            ii. Convection            **iii. radiation**            iv. Transportation
7. Maximum efficiency is obtained in EE704D.2  
i. Flat plate collector            ii. Evacuated tube collector            iii. Line focussing collector  
**iv. Paraboloid dish collector**
8. Electrical output of a solar cell depends on EE704D.2  
**i. intensity of solar radiation**            ii. Heat component of solar radiation  
iii. UV component of solar radiation    iv. MIR component of solar radiation
9. Wind turbine uses EE704D.3  
**i. kinetic energy**    ii. Potential energy            iii. Chemical energy            iv. Thermal energy
10. A wind generator produces 5.0 kW of power for a wind speed of 6.0 m/sec . The best estimate for the power produced for a wind speed of 12.0 m/sec is EE704D.3  
i. 10 kW            ii. 25 kW            **iii. 40 kW**            iv. 125 kW.

# Department of EE

## Quiz-2, 2019

Paper Name: RENEWABLE AND NON-CONVENTIONAL ENERGY

Paper Code: EE-704D,

Full Marks : 10

1. Offshore wind farms are being seriously considered because \_\_\_\_\_. EE704D.3
  - i) they are more aesthetically pleasing
  - ii) they do not interfere with bird migration routes
  - iii) wind speeds are higher and turbulence is lower**
  - iv) maintenance costs are less than they are on land
2. Global Cold wind move from EE704D.3
  - i) Polar to equatorial region**
  - ii) Equatorial to polar region
  - iii) Equatorial to oceanic region
  - iv) Oceanic to Equatorial region
3. The molten rock within the earth is EE704D.4
  - i) Igneous
  - ii) Magma**
  - iii) Sedimentary
  - iv) Metamorphic
4. Floating generators are used in the sea to harness \_\_\_\_\_. EE704D.4
  - i) tidal energy
  - ii) wave energy**
  - iii) hydel energy
  - iv) energy from OTEC power plant
5. Hydrothermal fluids are \_\_\_\_\_ in nature. EE704D.4
  - i) Corrosive
  - ii) Abrasive
  - iii) Both (i) and (ii)**
  - iv) None of the above
6. Biogas is predominantly EE704D.4
  - i) Hydrogen
  - ii) carbon monoxide
  - iii) carbon dioxide
  - iv) methane**
7. Hydrogen can be used EE704D.5
  - i) as a primary energy source only
  - ii) as an energy carrier only**
  - iii) both as primary energy source as well as energy carrier
  - iv) neither as primary energy source as well as energy carrier
8. What do fuel cells emit? EE704D.5
  - i) Oxygen
  - ii) Hydrogen
  - iii) Nothing
  - iv) **Water**
9. When was the first fuel cell invented? EE704D.5
  - i) 1701
  - ii) 1901
  - iii) 1839**
  - iv) 1879
10. One difficulty with the process of using hydrogen as a power source is that it \_\_\_\_\_. EE704D.5
  - i) is not properly understood
  - ii) is less efficient than fossil fuels
  - iii) requires a fuel that is a nonrenewable resource
  - iv) requires an energy investment to begin the process**

**Siliguri Institute of Technology**  
**Department of Electrical Engineering**  
**B. Tech. 4<sup>th</sup> Year 1<sup>st</sup> Semester 1<sup>st</sup> Internal Examination, 2019**

Paper Name: Renewable & Non conventional Energy  
Full Marks: 50

Paper Code: EE704D  
Time: 1h 30m

**Question 1. ANSWER ANY TWO (02) QUESTIONS**

**(EE704D.1)**

**5 X 2 = 10**

- a. Discuss the advantages & limitations of renewable energy sources.
- b. Explain briefly the impact of conventional sources of energy on environment.
- c. Discuss the environmental impact due to power generation from solar energy
- d. Write a short note on Kyoto Protocol.

**Question 2. ANSWER QUESTION NO. a AND ANY THREE(03) QUESTIONS FROM REST**

**(EE704D.2)**

**10+(5 X 3) = 25**

- a. Choose the correct answer
  - (i) What is the standard value of solar constant  
A. 1 kW/m<sup>2</sup>                      B. 1.367 kW/m<sup>2</sup>                      C. 1.5 kW/m<sup>2</sup>                      D. 5 kW/m<sup>2</sup>
  - (ii) At the inclination angle of 30°, what will be the magnitude of zenith angle?  
A. 30°                      B. 120°                      C. 130°                      D. 60°
  - (iii) At solar noon, the hour angle is-  
A. +90°                      B. -90°                      C. 0°                      D. +180°
  - (iv) Which is the most common material used for making solar cells  
A. Silver    B. Iron                      C. Aluminium                      D. Silicon
  - (v) Solar still is a device which is used for  
A. heating of water    B. Cooling of water    C. distillation of water    D. Production of electricity
- b. Define latitude, declination, hour angles with proper diagram
- c. Draw the equivalent circuit of a practical solar cell and describe its I-V characteristics.
- d. Write a short note on solar cooker
- e. With neat sketches, discuss important parts of flat plate solar collector.

**Question 3. ANSWER QUESTION NO. a AND ANY TWO (02) QUESTIONS FROM REST**

**(EE704D.3)**

**6+(4.5X 2) = 15**

- a. Choose the correct answer
  - (i) Horizontal axis and vertical axis are the types of:  
A. Nuclear reactor                      B. Wind mills                      C. Biogas reactor                      D. Solar cell
  - (ii) The amount of energy available in the wind at any instant is proportional to \_\_\_\_ of the wind speed.  
A. Square                      B. Square root                      iii. Cube                      iv. None of these
  - (iii) Wind turbine uses  
A. kinetic energy    B. Potential energy    C. Chemical energy    D. Thermal energy
- b. Discuss the main consideration in selecting site for wind generation.
- c. Define 'Betz Limit'.
- d. Discuss the advantages & disadvantages of WEC system



**Siliguri Institute of Technology**  
**Department of Electrical Engineering**  
**B. Tech. 4<sup>th</sup> Year 1<sup>st</sup> Semester 2<sup>nd</sup> Internal Examination, 2019**

Paper Name: Renewable & Non conventional Energy  
Full Marks: 30

Paper Code: EE704D  
Time: 1h

**Question 1. Choose the correct answer (EE704D.4) 5 X 1 = 5**

- (i) Which of the following fuels can be produced by fermenting sugar cane, sawdust, corn or wood  
A. Alcohol B. Biogas C. Producer gas D. Bio-diesel
- (ii) The present estimated potential of small hydropower in our country is about  
A. 15000 MW B. 12000 MW C. 11000 MW D. 10000 MW
- (iii) Biogas is predominantly  
A. Hydrogen B. carbon monoxide C. carbon dioxide D. methane
- (iv) The temperature in the earth crust increases with depth at a rate of  
A. 3000C/km B. 100C/km C. 10C/km D. 300C/km
- (v) The minimum tidal range required for power generation is about  
A. 1 m B. 5 m C. 10 m D. 20 m

**Question 2. ANSWER ANY TWO(02) QUESTIONS (EE704D.4) (5 X 2) = 10**

- a. Write down the advantages & disadvantages of a tidal barrage scheme as a source of electrical power.
- b. Write short note on Biodiesel.
- c. Discuss the environmental effects of geothermal energy sources.
- d. Explain the principle of open cycle OTEC system with suitable diagram

**Question 3. 7.5 X 2 = 15**

- a. Describe the major components of a three bladed HAWT generator unit. (EE704D.3)  
OR

Explain the types of generators used with wind turbines for producing electricity

- b. Briefly describe the production process of hydrogen through electrolysis of water with suitable diagram. (EE704D.5)

OR

Write short note on Alkaline fuel cell.

OR

Calculate the open circuit voltage and maximum power output of MHD engine with following specifications.

Plant area – 0.2 sq. m

Distance between plates – 0.4 m

Flux density – 2 Wb/sq.m.

Average gas velocity – 1000 m/s

Conductivity of gas – 10 mho/m

**Siliguri Institute of Technology**  
**Department of Electrical Engineering**  
 B. Tech. 4<sup>th</sup> Year 1<sup>st</sup> Semester, 2019

Paper Name: Renewable & Non conventional Energy

Paper Code: EE704D

## ASSIGNMENT / TERM PAPER

SL	ROLL	NAME	TOPIC FOR TERM PAPER	TOPIC FOR PPT
1	11901616013	VEDANT SINGH SHANKAR	Scope of renewable energy in Siliguri City.	Solar Chimney.
2	11901616014	TAMALIKA DAS		
3	11901616015	TAMAL BISWAS		
4	11901616016	SUMAN DUTTA		
5	11901616017	SUBRATA PRAMANIK		
6	11901616018	SUBHENDU BISWAS	Comparative study of different types of generators used with wind turbines	Hydrogen as an alternative fuel for vehicles
7	11901616019	SUBHANKAR DAS		
8	11901616020	SUBHAJIT BARMAN		
9	11901616021	SUBARNA TRIBEDI		
10	11901616022	SRINJOY GHOSH		
11	11901616023	SOURAV THAPA	Biogas as a Sustainable Energy Source in India	Design principle and operation of fuel cell
12	11901616024	SAYANTANI DEY		
13	11901616025	SAYANI BHATTACHARJEE		
14	11901616026	SARVAJEET KUMAR		
15	11901616027	SANTANU NAG		
16	11901616028	SAMBHU ROY	Hydrogen storage methods	Wave energy conversion devices
17	11901616029	SAIBAL DAS		
18	11901616030	SAHIL RAI		
19	11901616031	RIYA SARKAR		
20	11901616032	RAKESH KUMAR NEOPANE		
21	11901616033	RAJAT KUMAR MAZUMDER	Concentrating solar power tower technology	MHD power generation
22	11901616034	RAJA BABU		
23	11901616035	PUSHP RAJ ROY		
24	11901616036	PRIYANKA DAS		
25	11901616037	PRATUSHA GUPTA		
26	11901616038	PAULAMI GHOSH	Energy storage and its importance in renewable energy	Double basin tidal power plants,
27	11901616039	NIRVESANKA ROY		
28	11901616040	NILRUDRA SARKAR		
29	11901616041	NEHA RANI		
30	11901616042	NAVA MALAKAR		
31	11901616043	MRINAL CHANDA		
32	11901616044	KUSHAL GURUNG		

SL	ROLL	NAME	TOPIC FOR TERM PAPER	TOPIC FOR PPT
33	11901616046	JOYDEB ROY	<b>Role of renewable energy in smart cities.</b>	<b>Prospects of rooftop solar in India</b>
34	11901616047	ISHITA ROY		
35	11901616048	DIPU DAS		
36	11901616049	DEBANGANA DAS		
37	11901616050	CHITRALEKHA CHOUHAN		
38	11901616051	CHHAYA KUMARI TUDDU		
39	11901616052	BINIT KUMAR YADAV	<b>Importance of renewable energy in developing countries</b>	<b>Hybrid cycle Ocean Thermal Electric Conversion (OTEC)</b>
40	11901616053	BASUDEB MOHANTA		
41	11901616054	BAPPADITYA SHOME		
42	11901616055	ARINDAM MONDAL		
43	11901616056	ANUSKA ROY		
44	11901616057	ANIRUDDHA CHAKI	<b>Environmental impacts from the solar energy technologies</b>	<b>Biogas Digester</b>
45	11901616059	AKASH SARKAR		
46	11901616060	AKASH PAUL		
47	11901616061	AISHIK BHATTACHARJEE		
48	11901616062	ABHISHEK DEY		
49	11901616063	ABHISEK SARKAR	<b>Proton exchange membrane fuel cells (PEMFC)</b>	<b>Kyoto Protocol</b>
50	11901616064	ABHINABA ROY CHOUDHURY		
51	11901616065	ABHINAB TALUKDAR		
52	11901617001	SURAJIT CHANDA		
53	11901617002	SUJOY MODAK		
54	11901617003	SUDIPTA ROY	<b>Prospects of solar rooftop in India</b>	<b>Solar heating &amp; cooling of buildings</b>
55	11901617004	SUBRATA GOSWAMI		
56	11901617005	SOURAV MAJUMDER		
57	11901617007	SANCHARI GHOSH		
58	11901617008	SAJAN PRADHAN		
59	11901617009	PRITAM GAUTAM		
60	11901617011	HIMADRI DAS	<b>Socio-economic and environmental impacts of renewable energy systems</b>	<b>Impact of renewable energy generation on environment</b>
61	11901617012	GOURAB SARKAR		
62	11901617013	BISWAJIT KARMAKAR		
63	11901617014	BAPPADITYA BARMAN		
64	11901617015	ANAMIKA DUTTA		
65	11901617016	ABHRANEEL BHATTCHARJEE		
66	11901617081	UDAY ROY		

**Siliguri Institute of Technology**  
**Course Outcome Attainment**  
**Course Code: EE-704D**  
**Course Name: RENEWABLE AND NON CONVENTIONAL ENERGY**

Record of Assesment Carried from different Sheets									
Total No of Students in the Class:			66						
S.No.	Exam	EE704D.1	EE704D.2	EE704D.3	EE704D.4	EE704D.5	Target	Overall Achievement	
1	1st Internal Exam	11	1	5			67%	6	
2	2nd Internal Exam			9	0	4	65%	4	
3	Assignments	29	29	29	29	29	66%	29	
4	Quize-1	39	39	39			67%	39	
5	Quize-2			34	34	34	65%	34	
	Average Internals	26	23	23	21	22	66%	23	

Record of Assesment Through Internals					
Course Outcome	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME	Attainment Level of Each Course Outcome
EE704D.1	70%	66	26	40%	1
EE704D.2	65%	66	23	35%	1
EE704D.3	65%	66	23	35%	1
EE704D.4	65%	66	21	32%	1
EE704D.5	65%	66	22	34%	1
EE503	66%	66	23	35.11%	1

Attainment Levels			
Attainment Level	Inference	Marks	Co-relation
Attainment Level 1	50% of the students have attained more than the target level of that CO	1	L
Attainment Level 2	60% of the students have attained more than the target level of that CO	2	M
Attainment Level 3	70% of the students have attained more than the target level of that CO	3	H

Record of Attainment Level of A Course through University and Internal Assessments					
	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME	Attainment Level
Internal Assessment	66%	66	23	35%	1
Assessment through University Exam					
Overall Attainment of Course Outcome					



Director

Siliguri Institute of Technology



**SILIGURI INSTITUTE OF TECHNOLOGY  
ELECTRICAL ENGINEERING**



**COURSE FILE**

**4<sup>TH</sup> YEAR 2<sup>ND</sup> SEMESTER, 2019**

**GROUP A/B**

**PAPER DESCRIPTION : ENERGY MANAGEMENT & AUDIT**

**PAPER CODE : EE-801C**

# **DEPARTMENT OF ELECTRICAL ENGINEERING**

## **VISION OF THE INSTITUTE :**

To be a recognised institution offering high quality education, opportunities to students to become globally employable Engineers/Professionals in best ranked industries and research organisation.

## **MISSION OF THE INSTITUTE :**

To impart quality technical education for holistic development of students who will fulfil the needs of the industry/society and be actively engaged in making a successful career in industry/research/higher education in India & abroad.

## **VISION OF THE DEPARTMENT:**

To emerge as a leading Department of Electrical Engineering that caters to the latest needs of power sector, electrical & allied industry in the region.

## **MISSION OF THE DEPARTMENT:**

To evolve as an innovative & globally competent Electrical Engineering department that contributes to the socio - economic growth of region by utilizing the advancement in Electrical Engineering by providing conducive learning and interactive environment to students and faculty.

# PROGRAM OUTCOMES (POs)

## Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



## **PROGRAM SPECIFIC OUTCOMES (PSOs)**

**PSO1:** Apply science, engineering, mathematics through differential and integral calculus, complex variables to solve electrical engineering problems.

**PSO2:** Demonstrate proficiency in use of software & hardware to be required to practice Electrical engineering profession.

## **PROGRAM EDUCATION OBJECTIVE (PEO):**

The graduates of Electrical Engineering will:

1. Possess strong educational foundation in science, mathematics and Electrical Engineering which is essential in making successful careers in Industry/ research / higher education and will understand the professional responsibility in modern electrical power and energy related Industry through global and rigorous education.
2. Possess technical competence in the fields of Electrical engineering & allied disciplines and will be successful for the execution of engineering solutions which are technically sound and environment friendly.
3. Utilize their broad based knowledge, skills and resources to design, invent and develop novel technology and find creative and innovative solutions to engineering problems in a multidisciplinary work environment.
4. Be professional with leadership qualities, effective communication skills, ethical attitude and competence to excel individually and work efficiently in teams.
5. Possess attitude to learn and adopt new technologies as it evolves and be lifelong learners.

# **Siliguri Institute of Technology**

## **Electrical Engineering Department**

### Academic & Activity Calendar

#### **EVEN SEMESTER 2019 (January to June 2019):**

<b>Activity</b>	<b>Date</b>
Commencement of Academic Program	January 14, 2019
Observation of Birthday of Netaji	January 23, 2019
Republic Day Celebration	January 26, 2019
Annual Cultural program (SITEX), Tech-Mgmt Fest & Annual games & sports	Feb 19 to Feb 23, 2019
Student Feedback and submission of ATR (Department Level)	Feb 25 to Feb 28, 2019
1 <sup>st</sup> Internal Test	March 4 to March 7, 2019
Technical Training	4 <sup>th</sup> & 6 <sup>th</sup> Sem B.Tech: March 11 to March 15, 2019
Meeting with the students with Director's Office	March 11 to March 16, 2019
Technical Training	2 <sup>nd</sup> Sem B.Tech: April 16 to April 20, 2019
2 <sup>nd</sup> Internal Test	May 2 to May 6, 2019
Observation of Birthday of Rabindranath Tagore	May 9, 2019
Farewell to final Yr. Students	2 <sup>nd</sup> week of May , 2019
Practical Examinations & Viva – Voce	May 13 to May 20, 2019
Theory Exam	May 23 to June 12, 2019
Summer Break (For students)	June 13 to July 12, 2019

# Course File

Course Title : ENERGY MANAGEMENT & AUDIT

Code : EE-801C

Semester 2<sup>ND</sup> Year 4<sup>th</sup>

Name of the Faculty: Prof. Jayanta Bhusan Basu / Dr. S. Dawn

Internet Homepage: <https://sites.google.com/site/apjbbasu/>

E-mail : [jbb.sit@gmail.com](mailto:jbb.sit@gmail.com) / [subhojit.dawn@gmail.com](mailto:subhojit.dawn@gmail.com)

## Class Schedule

Lecture		
<b>Monday</b> 12.30 – 13.20 pm	<b>Tuesday</b> 10.50 – 11.40 am	<b>Wednesday</b> 12.30 – 13.20 pm

Hours for meeting students:

<b>Monday</b>	14.10 -15.00 pm
<b>Tuesday</b>	14.10 -15.00 pm
<b>Friday</b>	14.10 -15.00 pm
<b>Or by appointment</b>	

## i) Course Objective

Students will acquire basic knowledge about current energy scenario, energy management, auditing and conservation.

## ii) Course Outcomes

- i. After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

**The student will be able to:**

		<b>Target</b>
<b>C801C.1</b>	Demonstrate knowledge about Energy management and energy auditing approaches <b>(BT 2)</b>	Students will attain 65% marks
<b>C801C.2</b>	Explain Energy Scenario. <b>(BT 2)</b>	Students will attain 65% marks
<b>C801C.3</b>	Understand the importance of energy conservation and related policies <b>(BT 2)</b>	Students will attain 65% marks
<b>C801C.4</b>	Explain reasons for climate change and related protocols & adaptations for sustainable development. <b>(BT 2)</b>	Students will attain 65% marks
<b>C801C.5</b>	Discuss about different energy efficient technologies in electrical systems. <b>(BT 3)</b>	Students will attain 65% marks

- ii. Once the student has successfully complete this course, he/she must be able to answer the following questions or perform/demonstrate the following:

<b>Sl.</b>	<b>Question</b>	<b>BT Level</b>
1.	List down the objective of energy management.	BT 2
2.	State the importance of energy policy for industries.	BT 2
3.	Write the benefits of benchmarking energy consumption	BT 3
4.	Explain briefly the difference between preliminary and detailed energy audits	BT 2
5.	Define the following terms with three examples for each - a) Primary and Secondary Energy. b) Commercial and Non-commercial Energy	BT 2
6.	Describe how is economic growth linked to energy consumption?	BT 3
7.	Explain CDM and its objectives.	BT 2
8.	Discuss the main role of UNFCCC?	BT 2
9.	Discuss the benefits of standard & Labeling (S & L)	BT 2
10.	Compute the generation cost per Kwh from the following data.  Installed capacity – 200 MW Capital cost – Rs. 3000.00 per Kw Interest & depreciation – 12%	BT 3

Sl.	Question	BT Level
	Fuel consumption – 0.9 Kg/Kw Fuel cost – Rs. 70.00 per Tonnes Misc. cost – 20% of Fuel cost Load Factor – 80% Peak load – 170 MW	
11.	Explain the terms cell, module and array as applicable to photovoltaic.	BT 2
12.	Discuss the criteria for selection of wind mill installation?	BT 3
13.	What are the advantages of energy efficient motors?	BT 2
14.	Explain the working of a soft starter and its advantage over other conventional starters.	BT 3

### iii) Topic/Unit/Chapter Layout

Topic/Unit/Chapter	Lecture Hours
<b>Energy Management &amp; Audit:</b> Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments and intervals of EA regulation.	6
<b>Energy Scenario:</b> Commercial and Non-Commercial Energy, Primary Energy Resources, Commercial Energy Production, Final Energy Consumption, Energy Needs of Growing Economy, Long Term Energy Scenario, Energy Pricing, Energy Sector Reforms, Concept of smart grid, Tariff.	6
<b>Energy Conservation Act-2001 and related policies:</b> Energy Conservation Act-2001 and its features, Notification Under the act, Designated agencies, Schemes of Bureau of Energy Efficiency(BEE)-ECBC, S & L, DSM, BLY, SME's, Designated Consumers, Electricity Act 2003, Integrated Energy Policy,	6
<b>Energy Efficiency and Climate changes:</b> Energy and environment, Air pollution, Climate change, United Nations Framework Convention on climate change (UNFCCC), Kyoto Protocol, Clean Development Mechanism (CDM), CDM methodology and Procedures, Sustainable development	6
<b>Non-Conventional Energy Sources:</b> Concept of renewable Energy and importance, Different types of renewable Energy, Solar energy, Wind energy, Biomass energy, Hydro-energy, Fuel cells, Energy from wastes, Wave, Tidal and geothermal. Concept of energy storing device.	6
<b>Energy Efficient Technologies in Electrical Systems:</b> Maximum demand controllers, Automatic power factor controllers, Energy efficient motors, Soft starters with energy saver, Variable speed drives, Energy efficient transformers, Electronic ballast, Occupancy sensors, Energy efficient lighting controls, Energy saving potential of each technology	6

### iv) Text books

1. Energy Management Supply and Conservation, Dr. Clive Beggs, Butterworth Heinemann, 2002 .
2. Handbook of Energy Engineering, Albert Thumann & Paul Mehta, The Fairmont Press, INC.
3. Plant Engineers & Manager Guide to Energy Conservation, Albert.
4. Energy Management Handbook, Wayne C, John Willey and Sons

### Reference books :

1. NPC energy audit manual and reports
2. Guide to Energy Management, Cape Hart, Turner and Kennedy
3. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council
4. www.bee.org

## (v) Evaluation Scheme

### 1) Theory

Evaluation Criteria	Marks
Internal Exam*	15
Quiz / assignment	10
Attendance	5
University Exam/External Exam	70
Total	100

\* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

### Course target attainment levels:

Attainment Level	Inference	Marks
Attainment Level 1	50% of the students have attained more than the target level of that CO	1
Attainment Level 2	60% of the students have attained more than the target level of that CO	2
Attainment Level 3	70% of the students have attained more than the target level of that CO	3

### Course Target for the university examination = 65% of the students will get “A” Grade

Target has been set on the basis of last year’s performance / result by the students, student quality this year and difficulty level of the course.

### University Grading System:

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

**(vi) Mapping of Course Outcomes and Program Outcomes:**

Course Outcomes	Program Outcomes												PSOs	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	1.	2.
<b>EE801C.1</b>	-	2	-	-	-	-	2	-	-	-	1	1	2	-
<b>EE801C.2</b>	2	-	-	-	-	-	2	-	-	-	1	1	2	-
<b>EE801C.3</b>	2	2	-	-	-	3	3	-	-	-	1	1	2	-
<b>EE801C.4</b>	2	2	-	-	-	3	3	-	-	-	-	1	1	-
<b>EE801C.5</b>	2	2	-	-	-	2	3	-	-	-	-	1	3	-
<b>EE801C</b>	<b>2</b>	<b>2</b>	-	-	-	<b>3</b>	<b>3</b>	-	-	-	<b>1</b>	<b>1</b>	<b>2</b>	-

1 = courses in which the student will be exposed to a topic

2 = courses in which students will gain competency in that area

3 = courses in which students will master that skill

- CO1 requires finding engineering solution by the understanding of societal impact in present scenario and basic knowhow of financial conditions to provide long term solutions for energy problems. Hence it is partially linked with PO2, PO7 & PSO1 and minimally linked with PO11 & PO12.
- CO2 requires application of engineering knowledge & understanding of environmental contexts and also requires knowledge of engineering to provide long lasting solutions of energy problem. Hence it is partially linked with PO1, PO7 & PSO1 and minimally linked with PO11 & PO12.
- CO3 requires knowledge about application of engineering knowledge & understanding of environmental contexts and providing economical engineering solutions for intelligent consumption of energy which is sustainable in long term. Hence it is highly linked with PO6 & PO7, partially linked with PO1, PO2 & PSO1 and minimally linked with PO11 & PO12.
- CO4 requires knowledge about understanding of engineering knowledge & understanding of environmental conditions to assess societal application and providing sustainable engineering solutions in long term. Hence it is highly linked with PO6 & PO7, partially linked with PO1, PO2 and minimally linked with PO12 & PSO1.
- CO5 deals with different energy efficient technologies in electrical systems which requires good engineering knowledge so that environment friendly sustainable solutions can be found for energy related problems. Hence it is highly linked with PO7 & PSO1, partially linked with PO1, PO2 & PO6 and minimally linked with PO12.

## (vii) Assessment Methodology

Outcome	Assessment Tool
EE801C.1	Internal Test, Quiz, University Exam
EE801C.2	Internal Test, Quiz, University Exam
EE801C.3	Internal Test, Quiz, University Exam
EE801C.4	Internal Test, Quiz, University Exam
EE801C.5	Internal Test, Quiz, University Exam

## (viii) A. Weekly Lesson Plan

Week	Lectures
1	<p>Discussion of Course outcome and program outcome.</p> <p><b>Energy Management &amp; Audit:</b></p> <ul style="list-style-type: none"><li>• Definition</li><li>• Energy audit- need</li><li>• Types of energy audit</li><li>• Energy management (audit) approach-understanding energy costs</li><li>• Bench marking</li><li>• Energy performance</li></ul>
2	<p><b>Energy Management &amp; Audit:</b></p> <ul style="list-style-type: none"><li>• Matching energy use to requirement</li><li>• Maximizing system efficiencies</li><li>• Optimizing the input energy requirements</li><li>• Fuel and energy substitution</li><li>• Energy audit instruments and intervals of EA regulation.</li></ul>
3	<p><b>Energy Scenario:</b></p> <ul style="list-style-type: none"><li>• Commercial and Non-Commercial Energy</li><li>• Primary Energy Resources</li><li>• Commercial Energy Production</li><li>• Final Energy Consumption</li><li>• Energy Needs of Growing Economy</li><li>• Long Term Energy Scenario</li></ul>
4	<p><b>Energy Scenario:</b></p> <ul style="list-style-type: none"><li>• Energy Pricing</li><li>• Energy Sector Reforms</li><li>• Concept of smart grid</li><li>• Tariff</li></ul>



Week	Lectures
5	<p><b>Energy Conservation Act-2001 and related policies:</b></p> <ul style="list-style-type: none"> <li>• Energy Conservation Act-2001 and its features</li> <li>• Notification Under the act</li> <li>• Designated agencies</li> <li>• Schemes of Bureau of Energy Efficiency(BEE) <ul style="list-style-type: none"> <li>○ ECBC</li> <li>○ S &amp; L</li> </ul> </li> </ul>
6	<p><b>Energy Conservation Act-2001 and related policies:</b></p> <ul style="list-style-type: none"> <li>• Schemes of Bureau of Energy Efficiency(BEE) <ul style="list-style-type: none"> <li>○ ECBC</li> <li>○ DSM</li> <li>○ BLY</li> <li>○ SME's</li> <li>○ Designated Consumers</li> </ul> </li> <li>• Electricity Act 2003</li> <li>• Integrated Energy Policy</li> </ul>
7	<p><b>Energy Efficiency and Climate changes:</b></p> <ul style="list-style-type: none"> <li>• Energy and environment</li> <li>• Air pollution</li> <li>• Climate change</li> <li>• United Nations Framework Convention on climate change (UNFCCC)</li> </ul>
8	<p><b>Energy Efficiency and Climate changes:</b></p> <ul style="list-style-type: none"> <li>• Kyoto Protocol</li> <li>• Clean Development Mechanism (CDM)</li> <li>• CDM methodology and Procedures</li> <li>• Sustainable development</li> </ul>
9	<p><b>Non-Conventional Energy Sources:</b></p> <ul style="list-style-type: none"> <li>• Concept of renewable Energy and importance</li> <li>• Different types of renewable Energy</li> <li>• Solar energy</li> <li>• Wind energy</li> <li>• Biomass energy</li> </ul>
10	<p><b>Non-Conventional Energy Sources:</b></p> <ul style="list-style-type: none"> <li>• Hydro-energy</li> <li>• Fuel cells</li> <li>• Energy from wastes</li> <li>• Wave energy</li> <li>• Tidal energy</li> <li>• Geothermal energy</li> <li>• Concept of energy storing device</li> </ul>
11	<p><b>Energy Efficient Technologies in Electrical Systems:</b></p> <p>Maximum demand controllers</p>

<b>Week</b>	<b>Lectures</b>
	Automatic power factor controllers Energy efficient motors Soft starters with energy saver
12	<b>Energy Efficient Technologies in Electrical Systems:</b>  Variable speed drives Energy efficient transformers Electronic ballast Occupancy sensors Energy efficient lighting controls Energy saving potential of each technology

## (VIII) B. COMBINED DAILY LESSON PLAN & EXECUTION REPORT

<b>NAME OF FACULTY :</b> Mr. J. B. Basu / Dr. S. Dawn	<b>DEPARTMENT :EE</b>	<b>SUBJECT:</b> ENERGY MANAGEMENT & AUDIT <b>CODE : EE-801C</b>	<b>SEMESTER : 8<sup>th</sup></b>
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Unit / Module	Topic Description ( to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
	<b>Introduction</b>	<b>01</b>					
	Discussion of Course outcome and program outcome. Overview of the course.	1	14.01.2019	21.01.2019	Students were asked to determine the connected load in their classroom		
<b>1</b>	<b>Energy Management &amp; Audit:</b>	<b>06</b>					
	Definition, Energy audit-need, Types of energy audit		15.01.2019	22.01.2019		Discussed about Energy policy & Energy statement. Shown a sample energy policy statement of <b>Heineken</b>	
	Energy management (audit) approach-understanding energy costs, Bench marking		16.01.2019	28.01.2019			
	Energy performance, Matching energy use to requirement		21.01.2019	29.01.2019			
	Maximizing system efficiencies, Optimizing the input energy		22.01.2019	30.01.2019			

Unit / Module	Topic Description ( to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
	requirements						
	Fuel and energy substitution		28.01.2019	04.02.2019			
	Energy audit instruments and intervals of EA regulation		29.01.2019	05.02.2019	Students were asked to measure current using Clamp Meter.		
<b>2</b>	<b>Energy Scenerio</b>	<b>06</b>					
	Commercial and Non-Commercial Energy, Primary Energy Resources, Commercial Energy Production,		30.01.2019	06.02.2019			
	Final Energy Consumption, Energy Needs of Growing Economy		04.02.2019	11.02.2019			
	Long Term Energy Scenario		05.02.2019	12.02.2019			
	Energy Pricing, Energy Sector Reforms		06.02.2019	13.02.2019			
	Concept of smart grid		11.02.2019	04.03.2019	Students were asked to collect information on the smart grid project in Siliguri		
	Tariff		12.02.2019	05.03.2019			
<b>3</b>	<b>Energy Conservation Act-2001 and related policies:</b>	<b>06</b>					
	Energy Conservation Act-2001 and its features,		13.02.2019	06.03.2019			
	Notification Under the act, Designated agencies		18.02.2019	11.03.2019			
	Schemes of Bureau of Energy Efficiency(BEE)-ECBC, S & L, DSM, BLY, SME's,		26.02.2019	12.03.2019			

Unit / Module	Topic Description ( to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
	Designated Consumers		27.02.2019	13.03.2019			
	Electricity Act 2003		04.03.2019				
	Integrated Energy Policy		05.03.2019	25.03.2019			
<b>4</b>	<b>Energy Efficiency and Climate changes</b>	<b>06</b>					
	Energy and environment,		06.03.2019	26.03.2019			
	Air pollution		11.03.2019				
	Climate change, United Nations Framework Convention on climate change (UNFCCC)		12.03.2019	01.04.2019			
	Kyoto Protocol		13.03.2019	02.04.2019			
	Clean Development Mechanism (CDM)		18.03.2019	03.04.2019			
	CDM methodology and Procedures, Sustainable development		19.03.2019				
<b>5</b>	<b>Non-Conventional Energy Sources:</b>	<b>06</b>					
	Concept of renewable Energy and importance, Different types of renewable Energy,		20.03.2019	29.04.2019			
	Solar energy, Wind energy		25.03.2019	30.04.2019 06.05.2019			
	Biomass energy, Hydro-energy		26.03.2019	07.05.2019			
	Fuel cells, Energy from wastes		27.03.2019	08.05.2019 13.05.2019			
	Wave, Tidal and geothermal		01.04.2019	13.05.2019			

Unit / Module	Topic Description ( to be quoted from syllabus )	No. of Lecture(s)	Plan Date(s)	Execution Date(s)	Details of home work/assignment/mini project/ ICT used/ partial delivery of courses by industry experts, Eminent speakers etc.)	Details of topics that are beyond syllabus (if any)	Remarks
	Concept of energy storing device		02.04.2019				
<b>6</b>	<b>Energy Efficient Technologies in Electrical Systems:</b>	<b>06</b>					
	Maximum demand controllers, Automatic power factor controllers,		03.04.2019	08.04.2019			
	Energy efficient motors,		08.04.2019	09.04.2019			
	Soft starters with energy saver		09.04.2019	10.04.2019			
	Variable speed drives, Energy efficient transformers,		10.04.2019	22.04.2019			
	Electronic ballast, Occupancy sensors		16.04.2019	23.04.2019			
	Energy efficient lighting controls, Energy saving potential of each technology		17.04.2019	24.04.2019			
	<b>Recapitulation of the course &amp; discussions on the previous year's University question papers</b>	<b>1</b>	22.04.2019	13.05.2019			

## **(ix) Teaching Strategy/Method**

1. Learning by example
2. Learning by question and answering
3. Learning by problem solving
4. Use of Power point presentation.
5. Use of animations to understand the working principles.

### **(ixa) Strategy to support weak students**

1. Reviewing student attendance in connection with performance, and counselling students about attending classes, advising them for making up classes missed and getting additional help.
2. Paying attention to their problems in understanding the subject
3. Encouraging them to express their point of trouble
4. Allotting extra time beyond schedules class hours to help them understand the topics
5. Suggesting them different ways (as found suitable depending upon the case) to overcome their problem.

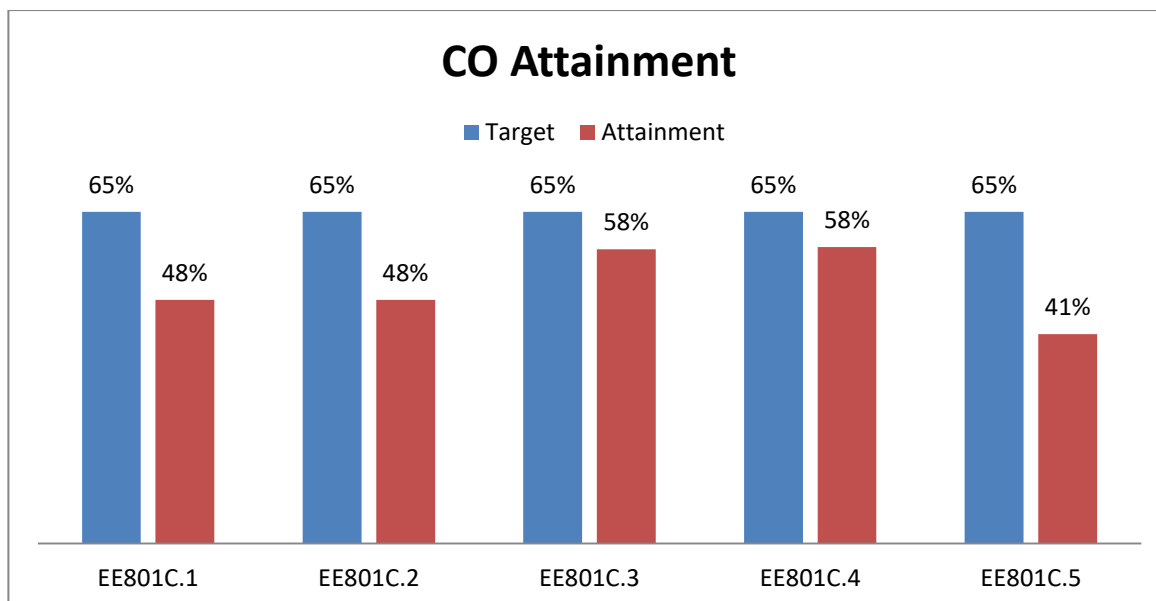
### **(ixb) Strategy to encourage bright students**

1. Try to encourage them to study beyond the syllabus
2. Ask them to develop the habit of reading anything good and rich in content to update their knowledge about the development in the field of renewable energy.
3. Encourage them to help academically weak students.
4. Encourage them to do mini projects.

### **(ixc) Efforts to keep students engaged**

1. summarize the previous day's lecture and ask random questions.
2. Providing informative data/examples/case study related to the topic from the industrial point of view.
3. Conducting Informal technical quiz/surprise tests.

### (xi) Analysis of Students performance in the course



- 48% students have attained the set target of 65% marks for EE801C.1
- 48% students have attained the set target of 65% marks for EE801C.2
- 58% students have attained the set target of 65% marks for EE801C.3
- 58% students have attained the set target of 65% marks for EE801C.4
- 41% students have attained the set target of 65% marks for EE801C.5

### (xii) Analysis of Students performance in the course (university results)

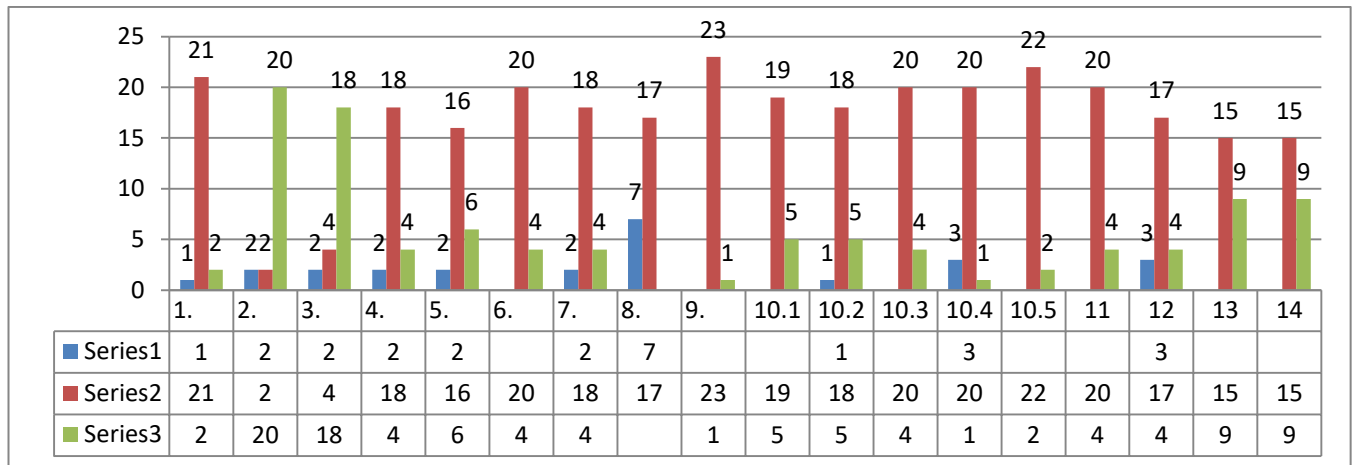
	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME
University	7	78	76	97%

- 97% students have attained the set target of 7 in point for University Exams



### (xiii) Analysis of Student Feed Back

Feedback is taken from 24 students based on the course survey.



### (xiv) Teacher Self-Assessment (at the completion of course)

From the analysis of the results obtained it can be seen that set targets for the course outcome have been achieved moderately by the students. Since this course encompasses a wide range of activities and expertise in the optimal use of energy hence some hands-on activities will provide practical exposure for better understanding the course.

### (xiv) Recommendations/Suggestions for improvement by faculty

This is a course which requires conceptual understanding of the subject. Students are needed to be motivated to understand the importance energy management & audit. They need to be motivated to understand the environmental impact due to energy consumption and the role of budding engineers to curb the same. Some practical case studies and views of industry expert will help the students to realise the importance of the subject.

## INTERNAL ASSESSMENT RECORD

**Subject with code: ENERGY MANAGEMENT & AUDIT (EE-801C)**

**Section: A / B**

**Semester :8<sup>th</sup>**

**Discipline: Electrical Engineering**

Sl.	Roll No.	Name	Attendance		Internal Examination			Quiz/Assignment			Total
			Total (%)	Marks	1st	2nd	Evaluated	Quiz	Assignment	Evaluated	
1	11901615001	AISHIKA NANDY	0.74	3	34	16	8	9	10	10	22
2	11901615002	AMARTYA SUR	0.65	3	22	0	3	7	10	8	18
3	11901615003	AMIT MONDAL	0.71	3	19	10	4	8	10	9	20
4	11901615004	ANJUM IQBAL	0.56	3	0	12	2	6	0	8	17
5	11901615005	ANKITA CHAKRABORTY	0.74	3	33	16	7	6	10	8	17
6	11901615006	ANUPAMA PRASAD	0.71	3	24	20	7	5	0	3	11
7	11901615007	ANWESHA KAR	0.65	3	25	15	6	9	10	9	21
8	11901615008	ANWESHA MAITRA	0.62	3	28	0	4	6	0	3	11
9	11901615009	APARUPA DEY	0.59	3	33	28	9	6	10	8	16
10	11901615010	ARCHISHMAN DAS	0.71	3	23	24	7	0	10	5	8
11	11901615011	ARPITA SARKAR	0.62	3	32	13	7	4	10	7	13
12	11901615012	ARUNIMA BHATTACHARYYA	0.71	3	27	22	7	4	10	7	13
13	11901615013	ARUNIMA PAUL	0.59	3	37	15	8	7	10	9	19
14	11901615014	BARNAMOY CHOWDHURY	0.68	3	25	0	4	0	0	0	3
15	11901615015	CHANDRIKA MUKHOPADHYAYA	0.62	3	21	12	5	7	10	8	18
16	11901615016	DEBARATI PAL	0.53	3	22	10	5	7	10	9	19
17	11901615017	DEBJYOTI DEY	0.62	3	0	13	2	1	10	6	10
18	11901615018	DEBOPAM KUMAR ROY	0.71	3	17	13	5	0	10	7	10
19	11901615019	DEEPJYOTI ROY	0.50	3	27	0	4	7	10	8	18
20	11901615020	DIPAYAN KAR	0.74	3	22	0	3	6	0	3	12
21	11901615021	EATHENA DUTTA	0.62	3	23	27	8	7	10	8	18
22	11901615023	INDRAJIT BASAK	0.62	3	0	9	1	0	0	0	3
23	11901615024	ISHITA BARMAN	0.62	3	0	8	1	6	10	8	16
24	11901615025	JALIMA KHATUN	0.62	3	24	11	5	6	10	8	17
25	11901615026	JAYSHANKHA PAL CHOWDHURY	0.62	3	20	8	4	0	0	0	3
26	11901615027	JOYRUP SINGH	0.44	3	28	10	6	0	0	0	3
27	11901615028	JYOTIRMOY MAHATO	0.71	3	31	2	5	9	10	9	21
28	11901615029	KISHOR KUMAR THAKUR	0.59	3	33	13	7	5	10	8	16
29	11901615030	KUNDAN KUMAR	0.76	3	26	4	5	6	10	8	16
30	11901615031	KUNZANG GYAMTSO DUKPA	0.59	3	0	14	2	6	10	8	16
31	11901615032	LEE YANG FUNG	0.50	3	35	12	7	9	10	9	21

Sl.	Roll No.	Name	Attendance		Internal Examination			Quiz/Assignment			Total
			Total (%)	Marks	1st	2nd	Evaluated	Quiz	Assignment	Evaluated	
32	11901615033	MD MINH AZ ALAM	0.74	3	34	0	5	0	0	0	3
33	11901615034	MD. SAHARUK	0.59	3	28	0	4	0	10	5	8
34	11901615035	MD.WAIJ ALI	0.68	3	22	20	6	9	10	9	21
35	11901615036	MITHLESH KUMAR	0.62	3	24	8	5	0	0	7	10
36	11901615037	MITHUN KUMAR	0.59	3	29	15	7	0	10	5	8
37	11901615038	PRANOY THAPA	0.56	3	26	16	6	10	0	5	17
38	11901615039	PRAYAG TAMANG	0.76	3	30	7	6	5	0	6	14
39	11901615040	PRITAMBAR MONDAL	0.62	3	18	10	4	10	10	10	23
40	11901615041	PROJOY ROY	0.68	3	37	2	6	10	10	10	22
41	11901615042	RAJDEEP BARMAN	0.62	3	28	2	5	6	10	8	16
42	11901615043	RAJDEEP MALAKAR	0.59	3	26	0	4	0	0	0	3
43	11901615045	REBATI RAY	0.65	3	25	12	6	0	0	0	3
44	11901615046	RIJU MANDAL	0.68	3	29	0	4	0	10	7	10
45	11901615047	ROJIKA DARNAL	0.74	3	21	14	5	2	0	1	5
46	11901615048	SABYASACHI MUKHERJEE	0.65	3	37	6	6	7	10	8	18
47	11901615049	SAIKAT SARKAR	0.68	3	0	16	2	2	10	6	10
48	11901615050	SAMIR RAJAK	0.65	3	0	15	2	3	0	1	7
49	11901615051	SHAHID ANSARI	0.59	3	33	13	7	6	10	8	16
50	11901615052	SHUBHAM KUMAR	0.79	3	21	18	6	3	10	7	13
51	11901615053	SIBANSU GHOSH	0.71	3	28	12	6	8	10	9	19
52	11901615054	SIDDHARTH RAI	0.65	3	20	18	6	0	0	0	3
53	11901615055	SNIGDHA CHAKRABORTY	0.53	3	37	7	7	3	10	7	13
54	11901615056	SNIGHDHA DAS	0.62	3	35	28	9	5	10	8	16
55	11901615057	SOMRAJ ROY	0.71	3	34	15	7	7	10	8	18
56	11901615058	SONIA PAUL	0.71	3	12	0	2	1	10	6	10
57	11901615059	SOURAV DEBNATH	0.74	3	24	0	4	7	0	3	13
58	11901615060	SOURAV DUTTA	0.79	3	21	19	6	7	10	8	18
59	11901615061	SOYEL PERVES	0.68	3	17	0	3	9	10	10	22
60	11901615062	SUBAN ROY	0.74	3	20	0	3	10	10	10	22
61	11901615063	SUBHAJIT DAS	0.53	3	25	0	4	6	10	8	17
62	11901615064	SUBHAM DAS	0.74	3	0	17	3	7	10	8	18
63	11901615065	SUBHAMAY BANIK	0.68	3	18	14	5	0	0	8	11
64	11901615066	SUBHOBRATA PANJA	0.74	3	0	20	3	5	10	8	16
65	11901615067	SUMAN KUMAR	0.74	3	13	12	4	8	10	9	19
66	11901615068	SUSMITA GUHA SARKAR	0.56	3	26	33	9	7	10	9	19
67	11901615069	WAQAR AHMED	0.65	3	0	12	2	5	10	8	16
68	11901616002	SUMAN ROY	0.74	3	28	19	7	5	10	8	16
69	11901616003	SUBHAM BHOWAL	0.82	4	19	23	6	0	10	5	9
70	11901616004	SRIJOY HORE	0.65	3	25	6	5	0	0	0	3
71	11901616005	SOURAV DATTA	0.76	3	6	21	4	7	10	8	18
72	11901616006	SHARMISTHA KARJEE	0.82	4	0	15	2	0	10	5	9
73	11901616007	RESHMA GIRI	0.56	3	0	19	3	7	10	8	18
74	11901616008	RAKESH GURUNG	0.68	3	0	0	0	0	0	8	11
75	11901616009	NEHAL SHARMA	0.71	3	0	24	4	7	0	3	13
76	11901616010	MAINAK BISWAS	0.65	3	14	15	4	5	10	8	16
77	11901616011	BHASKAR ROY	0.71	3	40	25	10	9	10	9	21
78	11901616012	ARUP SARKAR	0.74	3	28	9	6	0	10	8	11

**NAME WITH ROLL NO.s OF STUDENT WHOSE ACADEMIC PERFORMANCE IS NOT SATISFACTORY**

Gr.	Roll No.	Name of Student	Remedial measures taken by teacher
<b>A/B</b>	11901615014	BARNAMOY CHOWDHURY	<ul style="list-style-type: none"><li>• Additional doubt clearing sessions beyond the class hours</li><li>• Providing extra assignments to students.</li><li>• Asking them to solve previous question papers.</li><li>• Highlighting important and frequently asked questions</li></ul>
	11901615023	INDRAJIT BASAK	
	11901615026	JAYSHANKHA PAL CHOWDHURY	
	11901615027	JOYRUP SINGH	
	11901615033	MD MINHAZ ALAM	
	11901615043	RAJDEEP MALAKAR	
	11901615045	REBATI RAY	
	11901615054	SIDDHARTH RAI	
	11901616004	SRIJOY HORE	

# **CERTIFICATE**

I, the undersigned, have completed the course allotted to me as shown below

Sl. No.	Semester	Subject with Code	Total Units/ Chapters	Remarks

Date :

**Signature of Faculty**

## **Submitted to HOD**

### **Certificate by HOD**

I, the undersigned, certify that.....has completed the course work allotted to him / her satisfactorily / not satisfactorily.

Date :

**Signature of HOD**

## **Submitted to Principal/Director**

Date :

**Signature of Principal/Director**

## Student Feedback on Course Objectives & Outcomes

**Faculty** Prof. Jayanta Bhusan Basu  
**Course code** EE-801C

**Semester** 2<sup>nd</sup> **Year** 4<sup>th</sup>  
**Course Title** Energy Management & Audit

Dear Students

This feedback that I intend to take from you is very precisely about fulfillment of course objectives and course outcomes. My course objectives and course outcomes are as follows that I had shared with you in the beginning of the semester, the same is repeated here.

### **Course Objectives**

Students will acquire basic knowledge about current energy scenario, energy management, auditing and conservation.

### **Course Outcomes**

The students will be able to:

- EE801C.1 - Demonstrate knowledge about Energy management and energy auditing approaches (BT 2)
- EE801C.2 - Explain Energy Scenario. (BT 2)
- EE801C.3 - Understand the importance of energy conservation and related policies (BT 2)
- EE801C.4 - Explain reasons for climate change and related protocols & adaptations for sustainable development. (BT 2)
- EE801C.5 - Discuss about different energy efficient technologies in electrical systems. (BT 3)

The survey questions below has been designed to obtain your feedback so as to determine the extent of attainment of the intended course objectives and course outcomes.

**1 = Poor                      2= Good                      3= Excellent**

1.	Parameter	1	2	3
2.	The course description shared with me in the first week of the semester was adequate for me to understand what I should expect to achieve in the course			
3.	The course schedule through the semester was			
4.	The entire course contents were covered during the semester			
5.	How was your performance in the course			
6.	The relevance of this course to your career goals was			
7.	The work load for the course was			
8.	At the end of the semester the coverage of the stated course objectives and course outcomes by teacher was			
9.	The text books for the course were			
10.	Coverage of course beyond syllabus			
11.	The relevance of laboratory experiment to the course outcomes was:			
12.	Through the course, got the opportunity and confidence to:			
	<ul style="list-style-type: none"><li>• <b>Identify different Renewable and Non Renewable Energy Sources and realize their environmental impact (BT 2)</b></li></ul>			
	<ul style="list-style-type: none"><li>• <b>Illustrate Solar geometry and describe different methods of solar energy conversion. (BT 3)</b></li></ul>			
	<ul style="list-style-type: none"><li>• <b>Demonstrate knowledge about Working Principles of Wind Power generation and its application. (BT 3)</b></li></ul>			
	<ul style="list-style-type: none"><li>• <b>Explain generation &amp; harnessing of power from Biomass, Geothermal, ocean energy. (BT 3)</b></li></ul>			
	<ul style="list-style-type: none"><li>• <b>Discuss about different direct energy conversion systems like MHD &amp; Fuel cells. (BT 3)</b></li></ul>			
13.	The relevance of assignment to the course outcomes was:			
14.	The relevance of quiz to the course outcomes was:			
15.	The relevance of questions in internal exams to the course outcomes was:			
16.	The course was conducted in an interactive teaching-learning environment :			
17.	Your overall impression of this course, independent of the teacher, was			

**Thank You**

# Department of EE

Quiz-1,

Paper Name: ENERGY MANAGEMENT & AUDIT,

Paper Code: EE-801C,

F.M-07 (ALL QUESTIONS ARE OF EQUAL MARKS)

1. Energy consumption per unit of GDP is called as EE801C.1
  - a. Energy Ratio
  - b. Per capita consumption
  - c. Energy intensity**
2. Name the Act, which is proposed to bring the qualitative transformation of the electricity sector EE801C.1
  - a. Regulatory Commission Act 1998
  - b. Supply Act 1948
  - c. Electricity Act 2003**
  - d. Indian Electricity Act 1910
3. "The judicious and effective use of energy to maximise profits and enhance competitive positions". This can be the definition of: EE801C.1
  - a. Energy conservation
  - b. Energy management**
  - c. Energy policy
  - d. Energy Audit
4. Replacement of steam based hot water generation by solar system is an example of EE801C.1
  - a. Matching energy usage to the requirement
  - b. Performance improvement
  - c. Maximising system efficiency
  - d. Energy substitution**
5. Which instrument is used to monitor O<sub>2</sub>, CO in flue gas? EE801C.1
  - a. Power analyser
  - b. Combustion analyser**
  - c. Pyrometer
  - d. Fyrite
6. Non contact speed measurements can be carried out by EE801C.1
  - a. Tachometer
  - b. Oscilloscope
  - c. Speedometer
  - d. Stroboscope**
7. Energy manger should be well versed with EE801C.1
  - a. Manufacturing and processing skills
  - b. Managerial and technical skills**
  - c. Technical and marketing skills
  - d. Managerial and commercial skills

# Department of EE

Quiz-2,

Paper Name: ENERGY MANAGEMENT & AUDIT,

Paper Code: EE-801C,

F.M-13 (ALL QUESTIONS ARE OF EQUAL MARKS)

1. The energy sources, that are either found or stored in nature are: (EE801C.2)  
A. Secondary Energy Sources  
**B. Primary Energy Sources**  
C. Both Primary & Secondary sources
2. Indian per capita energy consumption is \_\_\_\_\_ of the world average. (EE801C.2)  
A. 1      B. 4      C. 10      **D. 20**
3. AMI means (EE801C.2)  
A. Automated Metering Instrument      B. Alternate Metering Instrument  
C. Advanced Metering Instrument      **D. Advanced Metering Infrastructure**
4. Bureau of Energy Efficiency (BEE) has been established in the Year (EE801C.3)  
A. 2001      **B. 2002**      C. 2003      D. 2004
5. "A public expression of organisation's commitment to energy conservation and environmental protection" is called as (EE801C.3)  
A. Company policy      B. Management philosophy  
**C. Energy policy**      D. Corporate plan
6. Which one of the following is a positive force towards achieving goal of reduced energy consumption? (EE801C.3)  
**A. tax on energy consumption**      B. competing corporate priorities  
C. Insufficient financial resources to fund      D. Absence of corporate energy policy
7. Under Energy Conservation of Act 2001, data on energy consumed & action on recommendations of accredited energy auditor should be reported to (EE801C.3)  
**A. BEE and state level agency once a year**  
B. BEE and state level agency twice year  
C. BEE only  
D. State level designated agency only
8. The United Nations Framework Convention on Climate Change, UNFCCC was signed in the year (EE801C.4)  
A. 1990      B. 1991      **C. 1992**      D. 1993
9. Kyoto protocol addresses the issues of (EE801C.4)  
A. Biodiversity Conservation      B. Ground water pollution  
**C. Climate change**      D. Soil Pollution
10. For sustainable development in developing countries, Kyoto protocol defines the Clean Development Mechanism, CDM (EE801C.4)  
**A. true**      B. false
11. The core used in Energy Efficient Transformer is made of (EE801C.5)  
A. silicon alloyed iron      **B. metallic glass alloy**      C. Ferrite core      D. Air core
12. Typical loss in conventional magnetic chokes for a 40 W FTL is of the order of (EE801C.5)  
**A. 8 Watts**      B. 14 Watts      C. 20 Watts      D. 6 Watts
13. Occupancy Sensors can be used in Energy Efficient Lighting Controls (EE801C.5)  
**A. True**      B. False



**Siliguri Institute of Technology**  
**Department of Electrical Engineering**  
**B. Tech. 4<sup>th</sup> Year 8<sup>th</sup> Semester 1<sup>st</sup> Internal Examination, 2019**

Paper Name: Energy Management & Audit  
Full Marks: 50

Paper Code: EE-801C  
Time: 1h 30m

**Answer all questions:**

<b>Question 1.</b>	<b>(Aligned to C801C.1)</b>	<b>10</b>
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State in your own words what are the principles of energy management?

OR

Explain briefly about the steps involved in conducting detailed energy audits.

<b>Question 2.</b>	<b>(Aligned to C801C.1)</b>	<b>10</b>
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Write down the responsibilities & duties of an energy manager.

OR

What are the benefits of benchmarking energy consumption?

<b>Question 3.</b>	<b>(Aligned to C801C.1)</b>	<b>10</b>
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What do you understand by the term fuel substitution? Give examples.

OR

What are the various steps in the implementation of energy management in an organization?

<b>Question 4.</b>	<b>(Aligned to C801C.2)</b>	<b>10</b>
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Define the following terms with two examples for each -

- a) Primary and Secondary Energy.
- b) Commercial and Non-commercial Energy.
- c) Renewable and Non-renewable Energy

OR

Define smart Grid. Discuss the advantages of smart grid.

<b>Question 5.</b>	<b>(Aligned to C801C.2)</b>	<b>10</b>
--------------------	-----------------------------	-----------

A factory has a maximum load of 240 kW at 0.8 p.f. lagging with an annual consumption of 50,000 units. The tariff is Rs. 50 per kVA of maximum demand plus 10 paise per unit. Calculate the flat rate of energy consumption. What will be annual saving if p.f. is raised to unity.

**Siliguri Institute of Technology**  
**Department of Electrical Engineering**

**B. Tech. 4<sup>th</sup> Year 8<sup>th</sup> Semester 2<sup>nd</sup> Internal Examination, 2019**

**Paper Name: Energy Management & Audit**  
**Full Marks: 50**

**Paper Code: EE-801C**  
**Time: 1h 30m**

**Answer all questions:**

<b>Question 1.</b>	<b>(Aligned to C801C.3)</b>	<b>10</b>
--------------------	-----------------------------	-----------

Briefly discuss the energy scenario in India and the importance of new and renewable energy sources to meet the energy requirement.

OR

Mention some of the long-term energy strategies available for the better energy secured nation?

<b>Question 2.</b>	<b>(Aligned to C801C.4)</b>	<b>10</b>
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Explain effects of Ozone layer depletion.

OR

Explain clean development mechanism (CDM) with its methodology and procedures

<b>Question 3.</b>	<b>(Aligned to C801C.4)</b>	<b>10</b>
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What are the criteria for selection of wind mill installation?.

OR

What do you mean by photovoltaic? Explain the terms cell, module and array as applicable to photovoltaic

<b>Question 4.</b>	<b>(Aligned to C801C.5)</b>	<b>10</b>
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Explain the principle of automatic power factor controller.

OR

Explain the working of a soft starter and its advantage over other conventional starters.

<b>Question 5.</b>		<b>5x2=10</b>
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A. The objective of energy management includes **(C801C.1)**

- i) Minimising energy costs   ii) minimising waste   iii) Minimising environmental degradation  
iv) all of these*

B. Inexhaustible energy sources are known as **(C801C.2)**

- i) commercial Energy   ii) renewable Energy   iii) primary energy   iv) secondary energy*

C. The Sector which is not a Designated consumer as per the latest Gazette is **(C801C.3)**

- i) Railways   ii) Iron & Steel   iii) Thermal Power plants   iv) Commercial Buildings*

D. The agency to look after the climate changes and for action to cut GHG is **(C801C.4)**

- i) UNFCCC   ii) WHO   iii) DOE   iv) GOI*

E. Typical loss in conventional magnetic chokes for a 40 W FTL is of the order of **(C801C.5)**

- i) 8 Watts   ii) 14 Watts   iii) 20 Watts   iv) 6 Watts*

## TERM PAPER FOR 8<sup>TH</sup> SEM EE

**Last Date of submission: 30.04.2019**

**SUB : ENERGY MANAGEMENT & AUDIT**

**PAPER CODE : EE-801C**

SL	ROLL	NAME	TOPIC FOR THE TERM PAPER
1	11901615001	AISHIKA NANDY	Need & strategy for Energy Management
2	11901615002	AMARTYA SUR	
3	11901615003	AMIT MONDAL	
4	11901615004	ANJUM IQBAL	
5	11901615005	ANKITA CHAKRABORTY	Energy scenario in India in terms of overall production & consumption
6	11901615006	ANUPAMA PRASAD	
7	11901615007	ANWESHA KAR	
8	11901615008	ANWESHA MAITRA	Need of Energy conservation in Indian energy scenario
9	11901615009	APARUPA DEY	
10	11901615010	ARCHISHMAN DAS	
11	11901615011	ARPITA SARKAR	Role of Bureau of Energy Efficiency (BEE) in energy conservation program in India
12	11901615012	ARUNIMA BHATTACHARYYA	
13	11901615013	ARUNIMA PAUL	
14	11901615014	BARNAMOY CHOWDHURY	Objectives under energy policy of India
15	11901615015	CHANDRIKA MUKHOPADHYAYA	
16	11901615016	DEBARATI PAL	
17	11901615017	DEBJYOTI DEY	Potential of Energy conservation in India in various sectors
18	11901615018	DEBOPAM KUMAR ROY	
19	11901615019	DEEPJYOTI ROY	
20	11901615020	DIPAYAN KAR	
21	11901615021	EATHENA DUTTA	Present Indian Power Sector & its future prospect
22	11901615023	INDRAJIT BASAK	
23	11901615024	ISHITA BARMAN	
24	11901615025	JALIMA KHATUN	Energy saving measures to conserve energy in offices
25	11901615026	JAYSHANKHA PAL CHOWDHURY	
26	11901615027	JOYRUP SINGH	
27	11901615028	JYOTIRMOY MAHATO	Need & objective of Demand Side Management (DSM)
28	11901615029	KISHOR KUMAR THAKUR	
29	11901615030	KUNDAN KUMAR	
30	11901615031	KUNZANG GYAMTSO DUKPA	
31	11901615032	LEE YANG FUNG	
32	11901615033	MD MINHAZ ALAM	
33	11901615034	MD. SAHARUK	Need & objective of Demand Side Management (DSM)
34	11901615035	MD.WAIJ ALI	
35	11901615036	MITHLESH KUMAR	
36	11901615037	MITHUN KUMAR	

SL	ROLL	NAME	TOPIC FOR THE TERM PAPER
37	11901615038	PRANOY THAPA	Objectives of clean development mechanism (CDM)
38	11901615039	PRAYAG TAMANG	
39	11901615040	PRITAMBAR MANDAL	
40	11901615041	PROJOY ROY	
41	11901615042	RAJDEEP BARMAN	Methodology for clean development mechanism (CDM)
42	11901615043	RAJDEEP MALAKAR	
43	11901615045	REBATI RAY	
44	11901615046	RIJU MANDAL	
45	11901615047	ROJKA DARNAL	Role of Computer in Energy Management
46	11901615048	SABYASACHI MUKHERJEE	
47	11901615049	SAIKAT SARKAR	
48	11901615050	SAMIR RAJAK	
49	11901615051	SHAHID ANSARI	Economics related to use of solar energy in various fields
50	11901615052	SHUBHAM KUMAR	
51	11901615053	SIBANSU GHOSH	
52	11901615054	SIDDHARTH RAI	
53	11901615055	SNIGDHA CHAKRABORTY	Benchmarking & Energy performance
54	11901615056	SNIGHDHA DAS	
55	11901615057	SOMRAJ ROY	
56	11901615058	SONIA PAUL	
57	11901615059	SOURAV DEBNATH	Energy Audit Instruments
58	11901615060	SOURAV DUTTA	
59	11901615061	SOYEL PERVES	
60	11901615062	SUBAN ROY	
61	11901615063	SUBHAJIT DAS	Energy storing Device
62	11901615064	SUBHAM DAS	
63	11901615065	SUBHAMAY BANIK	
64	11901615066	SUBHOBRATA PANJA	
65	11901615067	SUMAN KUMAR	Working of Maximum Demand controller
66	11901615068	SUSMITA GUHA SARKAR	
67	11901615069	WAQAR AHMED	
68	11901616002	Suman Roy	
69	11901616003	Subham Bhowal	Energy Efficient Transformer
70	11901616004	Srijoy Hore	
71	11901616005	Sourav Datta	
72	11901616006	Sharmistha Karjee	
73	11901616007	Reshma Giri	Energy Efficient Motor
74	11901616008	Rakesh Gurung	
75	11901616009	Nehal Sharma	
76	11901616010	Mainak Biswas	
77	11901616011	Bhaskar Roy	
78	11901616012	Arup Sarkar	

**Siliguri Institute of Technology**  
**Course Outcome Attainment**  
**Course Code: EE-801C**  
**Course Name: ENERGY MANAGEMENT & AUDIT**

Record of Assessment Carried from different Sheets									
Total No of Students in the Class:			78						
S.No.	Exam	EE801C.1	EE801C.2	EE801C.3	EE801C.4	EE801C.5		Target	Overall Achievement
1	1st Internal Exam	12	30					65%	21
2	2nd Internal Exam	52	34	50	51	11		65%	40
3	Lab								
4	Assignments	56	56	56	56	56		65%	56
5	Quizzes	29	29	29	29	29		65%	29
	Average Internals	37	37	45	45	32		65%	39

Record of Assessment Through Internals					
Course Outcome	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME	Attainment Level of Each Course Outcome
EE801C.1	65%	78	37	48%	1
EE801C.2	65%	78	37	48%	1
EE801C.3	65%	78	45	58%	1
EE801C.4	65%	78	45	58%	1
EE801C.5	65%	78	32	41%	1
0					
EE503	65%	78	39	50.47%	3

## Record of Attainment Level of A Course through University and Internal Assessments

	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME	Attainment Level
Internal Assessment	65%	78	39	50%	1
Assessment through University Exam	7	78	76	97%	3
<b>Overall Attainment of Course Outcome</b>					<b>2</b>

<b>EE801C.1</b>	Demonstrate knowledge about Energy management and energy auditing approaches (BT 2)
<b>EE801C.2</b>	Explain Energy Scenario. (BT 2)
<b>EE801C.3</b>	Understand the importance of energy conservation and related policies (BT 2)
<b>EE801C.4</b>	Explain reasons for climate change and related protocols & adaptations for sustainable development. (BT 2)
<b>EE801C.5</b>	Discuss about different energy efficient technologies in electrical systems. (BT 3)



Director

**Siliguri Institute of Technology**



**SILIGURI INSTITUTE OF  
TECHNOLOGY  
ELECTRONICS & COMMUNICATION ENGINEERING**



**COURSE FILE**  
**1<sup>ST</sup> SEM, 3<sup>RD</sup> YEAR, ECE, 2016**

**PAPER NAME : Analog Communication**

**PAPER CODE : EC 501 & EC 591**

# Course File

Course Title: Analog communication (EC- 501) & analog communication Lab (EC- 591)

Semester: 1<sup>st</sup> Year 3<sup>rd</sup>, 2016

Name of the Faculty: **Prof Sudip Kumar Ghosh & Aritra De**

E-mail: *ghsh\_sdp@yahoo.com*

## Class Schedule:

Lecture		Tutorial	Practical	
<b>Wednesday</b> 10.50am – 11.40am ( 1L)	<b>Thursday</b> 11.40am – 1.20pm (2L)	<b>Wednesday</b> 03.00pm – 03.50pm (GR-A1)1L 03.50pm – 04.40pm (GR-A2)1L	<b>Monday</b> – 10.50am – 1.20pm (3L)	<b>Tuesday –</b> 10.50am – 1.20pm (3L)

- An additional Lecture per week has been incorporated for facilitating better understanding and coverage of the syllabus.

## Hours for meeting students:

Monday	Saturday	Other Days
3.00pm – 4.50pm	2.10pm – 4pm	1.30pm – 2pm or by appointment

## i) Course Objective

Student will be able to analyze the concept of various continuous wave modulations and evaluate their performance.

## ii) Course Outcomes

- After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The student will be able to:

EC501	co	Target
EC501.1	<b>Describe</b> the need for modulation and identify type of modulation to be used in analog communication system [B.T LEVEL 1]	60% marks
EC501.2	<b>Understand</b> about AM transmission and reception including noise	60% marks



	analysis [B.T LEVEL 2]	
<b>EC501.3</b>	<b>Understand</b> about FM transmission and reception including noise analysis [B.T LEVEL 2]	60% marks
<b>EC501.4</b>	<b>Apply</b> and relate the analog modulation and demodulation techniques to real time applications. B.T LEVEL 3]	60% marks
<b>EC501.5</b>	<b>Generate</b> various types of modulated signals and perform their basic operations [B.T LEVEL 5]	60% marks
<b>EC501.6</b>	<b>Design</b> the analog modulator and demodulator circuits in communication system [B.T LEVEL 6]	60% marks

ii) Once the student has successfully complete this course, he/she must be able to answer the following questions or perform/demonstrate the following:

Sl.	Question	BT Level
1.	<b>Explain</b> the basic block diagram of communication system	1
2.	<b>Calculate</b> maximum limit of transmission efficiency of an AM signal for a Single tone message.	3
3.	<b>Determine</b> i) Modulation index ii) Frequency present in the modulated signal iii) Total transmission power of a modulating signal is given by $V_m = 2 \sin(2\pi \times 500 t)$ t) amplitude modulates a carrier signal given by $V_c = 10 \sin(2\pi \times 10^6 t)$	3
4.	<b>Calculate</b> the maximum limit of RC component of a envelope detector to avoid diagonal clipping	3
5.	<b>Draw</b> and Sketch the spectrum of DSB-FC and DSB-SC signal and show their bandwidth.	3
6.	<b>Design</b> 98.3MHz FM using indirect method	5
7.	<b>Evaluate</b> SNR of various AM and FM signal	5
8.	<b>Design</b> a FM Transmitter using IC 8038	6
9.	<b>Design</b> a FM demodulator using PLL	6
10.	<b>Design</b> a PLL using IC-565, whose free running frequency is 54 kHz (where $R_1 = 5.6 \text{ k}\Omega$ ) & draw the VCO linearity curve..	6

### iii) Unit Layout

Unit	Lecture Hours	Tutorials	Laboratory hours
Mod-1 Introduction to Analog Communication	10 HRS	2 HR.	3 HR
Mod-2 Generation & Detection of Amplitude Modulation	9 HRS	2 HR.	12 HR
Mod-3 Angle Modulation	8 HRS	2HR.	9 HR
Mod - 4 Multiplexing Random Signals and Noise in Communication System	9 HRS	2 HR.	
Total	36 HRS	8 HR	24 HRS

### iv)Textbooks

1. Taub and Schilling , “Principles of Communication Systems”, 2<sup>nd</sup> ed., Mc-Graw Hill
2. B.P.Lathi -Communication Systems- BS Publications
3. V Chandra Sekar – Analog Communication- Oxford University Press

#### Reference Books:

4. Carlson—Communication System,4/e , Mc-Graw Hill
5. Proakis &Salehi Fundamentals of Communication Systems- Pearson
6. Singh & Sapre—Communication Systems: 2/e, TMH
7. P K Ghosh- Principles of Electrical Communications- University Press
8. L.W.Couch Ii, “Digital and Analog Communication Systems”, 2/e, Macmillan Publishing
9. S Sharma, Analog Communication Systems- Katson Books

## (v) Evaluation Scheme

### 1) Theory

Evaluation Criteria	Marks
Internal Exam*	15
QUIZ	10
Attendance	5
University Exam	70
Total	100

\* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

### University Grading System:

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

### 2) Laboratory

Evaluation Criteria	Marks
Internal Exam*	40
University Exam	60
Total	100

\* Internal Evaluation will be based on daily lab performance as per the following schedule:

Expt. No.	Experiment Name	Schedule	Marks
EXP1	Measurement of modulation index of an AM signal.	3 HRS	40
EXP2	Measurement of output power with varying modulation index an AM signal (for both DSB- & SSB).	3 HRS	40
EXP3	Measurement of distortion of the demodulated output with varying modulation index of an AM signal (for both DSB-SC & SSB).	3 HRS	40
EXP4	Generation of FM signal and measurement of Bandwidth	3 HRS	40
EXP5	Design a PLL using VCO & to measure the lock frequency	3 HRS	40
EXP6	Design a FM demodulator using PLL	3 HRS	40
EXP7	Measurement of selectivity ,sensitivity, fidelity of a superhetrodyne receiver	3 HRS	40
EXP 8	Measurement of SNR of a RF amplifier	3 HRS	40
EXP 9	Study of waveforms of various functional points (output of RF,IF & video) of a B/W TV receiver	3 HRS	40
EXP10	Study of the vertical & horizontal sweep of the time base unit of a B/W TV	3 HRS	40
EXP11	One innovative experiment	3 HRS	40

**Course target attainment levels:**

Attainment Level	Inference	Marks
Attainment Level 1	50% of the students have attained more than the target level of that CO	1
Attainment Level 2	60% of the students have attained more than the target level of that CO	2
Attainment Level 3	70% of the students have attained more than the target level of that CO	3

**Overall Course Attainment Target** (70% of university and 30% of the internal exam) will be = Attainment Level 3

Target has been set on the basis of last year's performance / result by the students, student quality this year and difficulty level of the course.

## (vi) Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes												PSOs			
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	1.	2.		
EC501.1	2	2	0	0	0	0	0	0	0	0	0	0	2	0		
EC501.2	2	2	0	0	0	0	0	0	2	0	0	0	2	1		
EC501.3	2	2	0	0	0	0	0	0	2	0	0	0	2	2		
EC501.4	2	2	0	0	0	0	0	0	2	0	0	0	2	2		
EC501.5	2	2	0	0	0	0	0	0	2	0	0	0	2	2		
EC501.6	2	2	0	0	0	0	0	0	2	0	0	0	2	2		
EC501	2	2	0	0	0	0	0	0	2	0	0	0	2	1.8		

### Justification:

- CO1 to co6 partially satisfies with the application of knowledge of mathematics, science, engineering fundamentals to the solution of complex engineering problems (PO1).
- CO1, to co6 partially satisfies with Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and Electronics & Communication engineering sciences. (PO2).
- CO3 to co6 partially satisfies with the Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings (PO9)

## (vii) Delivery Methodology

Outcome	Method	Supporting Tools	Demonstration
EC 501.1	Structured (partially Supervised)	Video Lecture, NPTEL materials	<b>Explain</b> the block diagram of basic communication, needs of modulation in a communication system and find the relation between antenna height and frequency.
EC 501.2	Structured (partially Supervised)	Video Lecture, NPTEL materials	<b>Explain</b> the types of AM system. <b>Application</b> of various AM systems.
EC 501.3	Structured (partially Supervised)	Video Lecture, NPTEL materials	<b>Explain</b> the types of FM system. <b>Application</b> of various FM systems.

EC 501.4	Structured (partially Supervised)	Video Lecture, NPTEL materials	<b>Evaluate</b> F.O.M of different AM and FM system.
EC 501.5	Structured (Partially Supervised Independent work)	hardware Based	<b>Generation</b> & detection of AM and measure the Modulation index.  <b>Design</b> a FM Transmitter using IC 8038.
EC 501.6	Structured (Partially Supervised Independent work)	hardware Based	<b>Design</b> a FM receiver using PLL.

## (viii) Assessment Methodology

Outcome	Assessment Tool	Specific Question / activity aligned to the Outcome
EC 501.1	Internal Test	<ol style="list-style-type: none"> <li>explain the basic block diagram of communication</li> <li>why modulation is needed in a communication system</li> </ol>
	QUIZ	<ol style="list-style-type: none"> <li>The length of the antenna to transmit a signal must be at least a) <math>1/3</math> wavelength b) <math>1/4</math> wavelength c) <math>2/3</math> wavelength d) <math>3/4</math> wavelength</li> <li></li> </ol>
	University Exam	<ol style="list-style-type: none"> <li>What are the basic components of a communication System?</li> <li>Describe why modulation is necessary for Communication.</li> </ol>
EC 501.2	Internal Test	<ol style="list-style-type: none"> <li>A carrier signal <math>A_c \cos \omega_c t</math> is amplitude modulated by a message signal <math>A_m \cos \omega_m t</math> where <math>A_m &lt; A_c</math>. Write down the expression for the modulated signal. Write down the expression for carrier component and side band components</li> <li>What is envelope detector? Explain (with circuit diagram)? What is diagonal clipping?</li> <li>Explain the term quadrature-null effect?</li> <li>Calculate <math>SNR_0</math> in DSB-SC system</li> </ol>
	QUIZ	<ol style="list-style-type: none"> <li>The detection of an AM waveform in an Envelope – a.) One side band and full amplitude carrier are needed b.) Both side bands and full amplitude carrier are needed c.) Only two side bands are needed d.) Upper side band and part of carriers are needed</li> <li>Noise figure is calculated as? a) i/p signal to noise ratio X o/p signal to noise ratio b) i/p S/N Ratio / O/P S/N Ratio c) i/p S/N Ratio / O/P S/N Ratio X 100 d) i/p S/N Ratio + O/P S/N Ratio</li> <li>In AM transmission the frequency, which is not transmitted is (a) carrier frequency (b) audio frequency (c) upper side frequency (d) lower side frequency</li> </ol>

	University Exam	<p>1. Prove that the efficiency for a single tone AM is 33.33 % for perfect modulation. What will be the efficiency if the Value of modulation index is 0.5 ?</p> <p>2. <math>s(t) = 12 \sin [ 6 \times 10^8 t + 5 \sin 1250 t ]</math>. Calculate : (i) carrier frequency (ii) modulating frequency (iii) modulation index (iv) frequency deviation (v) Power dissipated in 10 Ohm resistor.</p> <p>3. Define SNR and Noise Figure. Why is the noise performance of the first stage of a cascade receiver so important? If each stage of a two-stage cascade amplifier has a gain of 10 dB and noise figure of 10 dB, calculate the total noise figure in dB</p>
EC 501.3	Internal Test	<p>1. <b>Explain</b> with block diagram the Armstrong method of FM generation.</p> <p>2. A single tone FM signal is given by <b><math>e_{FM} = 10 \sin ( 16\pi \times 10^6 t + 20 \sin 2\pi \times 10^3 t )</math> volts.</b> <b>Determine</b> modulation index, frequency deviation, bandwidth and carrier swing.</p>
	QUIZ	<p>1. An FM radio receiver is tuned to a 90.6 MHz broadcast station. It will receive an image frequency of - a) 110 MHz b) 112 Hz c) 114 MHz d) 120 MHz</p> <p>2. In a FM receiver, the channel bandwidth is around- a.) 10 KHz b.) 20 KHz c.) 75 KHz d.) 200 KHz</p> <p>3. An FM transmitter has maximum frequency deviation of 75 KHz and reproduces audio signal up to 15 KHz. Minimum channel width required, in KHz is (a) 180 (b) 120 (c) 90</p>
	University Exam	<p>1. Explain with suitable block diagram the generation of FM signal using Armstrong method.</p> <p>2. a) What is angle modulation ? b) Show that FM and PM are basically same</p> <p>3. Explain FM demodulation scheme using PLL. Mention the advantages of PLL demodulator</p>
EC 501.4	Internal Test	<p>1. <b>Draw</b> and explain the block diagram of super-heterodyne receiver. What is image frequency?</p>



		2. <b>explain</b> the characteristics of a super-heterodyne receiver
	QUIZ	<p>1. An FM radio receiver is tuned to a 90.6 MHz broadcast station. It will receive an image frequency of - a) 110 MHz b) 112 Hz c) 114 MHz d) 120 MHz</p> <p>2. In a FM receiver, the channel bandwidth is around- a.) 10 KHz b.) 20 KHz c.) 75 KHz d.) 200 KHz</p> <p>3. In commercial FM broadcasting, the maximum frequency deviation is normally a. 5 KHz b. 15 KHz c. 75 KHz d. 200 KHz</p>
	University Exam	<p>1.<b>Draw</b> the block diagram of a super heterodyne receiver and explain the function of each block.</p> <p>2. For a broadcast super heterodyne AM receiver having no RF amplifier, the loaded quality factor Q of the antenna coupling circuit is 100. Now if the intermediate frequency is 455 kHz, then determine the image frequency and its rejection ratio at an incoming frequency of 1MHz.</p> <p>3. Write short notes on noise performance in FM system</p>
EC 501.5	LAB	<p>1.<b>Generate</b> AM signal and Measure the modulation index of a given modulated signal AM. (At least 5 different M.I. to be measured). Which type of demodulator is used to receive DSB-FC signal and why</p> <p>2. <b>Draw</b> the sensitivity response curve of the super heterodyne receiver (using trainer kit ST-2202). Write the advantages of a super heterodyne receiver over TRF receiver</p>
EC 501.6	LAB	<p>1. <b>Design</b> a PLL using IC-565, whose free running frequency is 54 kHz (where <math>R_1 = 5.6 \text{ k}\Omega</math>) &amp; draw the VCO linearity curve. Draw &amp; explain the block diagram of PLL.</p> <p>2. <b>Design</b> a FM modulator using IC8038 and measure the modulation index and band width (BW) of the modulated signal applying a appropriate modulating signal from the function generator. Write the difference between NBFM &amp; WBFM</p> <p>3. <b>Design</b> a PLL using IC-565, whose free running frequency is 54 kHz (where <math>R_1 = 5.6 \text{ k}\Omega</math>) &amp; find the lock range &amp; capture range and verify the observed value with calculated (theoretical) value. Define Lock range &amp; Capture range</p>

**(ix) A. Weekly Lesson Plan**

Week	Lectures	Tutorial	Laboratory
1	Elements of communication system. Modulation, its needs and types of modulation Double side band suppressed carrier (DSBSC) modulation	Review of signal and its spectrum.	Familiarization with spectrum analyzer
2	Synchronous detection for AM-SC. Amplitude modulation (AM-DSB/TC): Time domain	Calculation the height of antenna for different frequency and numerical. effect on synchronous demodulator in AM	Measurement of modulation index of an AM signal
3	Modulation index of AM, band width, calculation of transmitted power, AM-FC generation (Switching Modulator) and detection (envelope detector) using diode circuit.	Calculation of TRANSMISION power.  Envelope detector and condition of avoid diagonal clipping.	Measurement of output power with varying modulation index an AM signal (for both DSB- & SSB).
4	FDM multiplexing, SSB-SC generation and detection .SSB-C Modulation, Basic concept of VSB modulation and applications. Numerical discussion on AM modulation.	Percentage of power saving of DSB-SC and uses of non linear devices and distortion due to synchronization.	Measurement of distortion of the demodulated output with varying modulation index of an AM signal (for both DSB-SC & SSB).
5	Super heterodyning principle, intermediate frequency, operation image frequency, numerical discussion on AM system. Multiplexing Angle modulation, Generation of FM direct and indirect (Armstrong) method.	Numerical discussion on AM modulation,	Generation of FM signal and measurement of Bandwidth
6	Demodulation of FM, Concept of frequency discriminators, Phase Locked Loop, FM Radio receiver, numerical discussion on angle modulation.	Super heterodyning receiver, image frequency calculation.	Design a PLL using VCO & to measure the lock frequency

7	Noise in Communication systems Noise performance in Analog Communication systems: SNR calculation for DSB-SC, SSB-SC,SSB-C	Design different carrier frequency for indirect method FM	Design a FM demodulator using PLL
8	Noise performance in DSB-FC and FM system.	Thermal noise, noise figure calculation for two port network.	Measurement of selectivity ,sensitivity, fidelity of a superhetrodyne receiver
9	Discussion of WBUT question papers, revision & doubt clpearing		Measurement of SNR of a RF amplifier
10	Discussion of WBUT question papers		Study of waveforms of various functional points (output of RF,IF & video) of a B/W TV receiver
11	Discussion of WBUT question papers		Study of the vertical & horizontal sweep of the time base unit of a B/W TV
12	Discussion of WBUT question papers		One innovative experiment

## B. Daily Lesson Plan

UNIT: 1

Title: **Introduction to Analog communication**

Day 1, Date: 03.08.2016 [10.50am to 11.40am]Wednesday

CONTENTS

Discussion on course objectives and outcome, text & reference books, evaluation scheme and weekly lesson plan. Introduction to communication systems

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. To identify and differentiate the various types of communication systems
2. To recognize the various application areas of the course in diverse disciplines

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Define Signal and System, analog communication and digital communication [L1]
2. Identify the application areas of communication system. [L1]

**Remarks, if any**

**Day 1, Date: 03.08.2016**, Wednesday 03.00pm – 03.50pm (GR-A1)1L and 03.50pm – 04.40pm (GR-A2)1L

### Tutorial1:

1. Explain different types of signal?
2. What is spectrum? How spectrum is formed? Find the Fourier transform of double-sided exponential function  $e^{-at|t|}$  and draw its spectrum
3. What is unit-step signal and find the Fourier transform of its
4. Power of in the signal  $x(t)=8 \cos(20\pi t- \pi/2) + 4 \sin (15\pi t)$  is  
(a) 40 (b) 41 (c) 42 (d) 82

UNIT: 1

Title: Introduction to Analog communication

Day 2, Date: **04.08.2016** Thursday [ 11.40am – 1.20pm] (2L)

CONTENTS

Elements of communication system -Transmitters, Transmission channels & receivers, Concept of

Modulation, its needs and types of modulation.

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. To recognize, use, and analyze analog signal transmission over various elementary blocks of communication system.
2. To understand need for modulation of a communication system

Once the student has completed this topic/ chapter he/she will be able to answer following questions/performance the following activities with Levels of Bloom's Taxonomy):

1. Define continuous and discrete time signal. [L1]
2. What do you understand by wired communication and wireless communication? [L2]
3. What is the point to point communication and broadcasting? [L1]
4. Identify the application areas of analog communication system [L2]
5. Why modulation is needed in a communication system [L2]

Remarks, if any

UNIT: 1

Title: Introduction to Analog communication

**Day 3, Date: 10.08.2016 [10.50am – 11.40am] Wednesday**

CONTENTS: Double side band suppressed carrier (DSBSC) modulation: generation and Detection with block diagram, time and frequency domain expressions, and bandwidth calculation.

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. To understand need for modulation of a communication system and suppressed carrier modulation

Once the student has completed this topic/ chapter he/she will be able to answer following questions/performance the following activities with Levels of Bloom's Taxonomy):

1. explain DSB-SC system [L2]
2. Identify the side band frequencies and carrier frequencies. [L3]

Remarks, if any

**Day 3, Date: 10.08.2016, Wednesday 03.00pm – 03.50pm (GR-A1)1L and 03.50pm – 04.40pm (GR-A2)1L**

## Tutoria2:

1. Why different height of antenna is being required for transmission of various kind of signal?
2. To transmit 5 kHz information signal, what should be the size of antenna?
3. Explain co-herent and non coherent demodulation?
4. What effect on synchronous demodulator in AM if transmitted generated carrier signal are not identical with receiver generated carrier signal.

UNIT: 2

Title: Generation & Detection of Amplitude Modulation

**Day 4, Date: 11.08.2016 Thursday [ 11.40am – 1.20pm] (2L)**

**CONTENTS**

Amplitude modulation (AM-DSB/TC): Time domain representation of AM signal (expression derived using a single tone message , modulation index , frequency domain (spectral) representations, illustration of the carrier and side band components, transmission bandwidth for AM, Calculation of Transmitted power & sideband power & Efficiency; concept of under, over and critical modulation of AM-DSB-TC and AM-SC.

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. To understand the time domain and frequency domain nature of tone AM and how much power is being required to transmit AM signal.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Deduce the expression of transmission efficiency. [L1]
2. How much power is being wastage for transmission of carrier signal? [L2]
3. What is range of modulation index? [L1]
4. Describe AM modulation [L1]
5. Deduce the expression for single tone AM signal [L2]

Remarks, if any

UNIT: 2

Title: Generation & Detection of Amplitude Modulation

**Day 5, Date: 17.08.2016 [10.50am to 11.40am]Wednesday**

**CONTENTS:** AM-FC generation using diode circuit (Switching Modulator).

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. To understand the generation and detection of AM using diode circuit.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What is switching modulator? [L1]
2. How AM can be generated using non linear device? [L1]

Remarks, if any

**Day5, Date: 17.08.2016, Wednesday 03.00pm – 03.50pm (GR-A1)1L and 03.50pm – 04.40pm (GR-A2)1L**

## **Tutoria3:**

**Tutorial 3:** Calculation of power of various AM signal.

1. Calculate the transmission efficiency of an AM signal when the signal is modulated in a depth of 50% and

- 100%.
2. How much power is being wastage for transmission of carrier signal? Draw the spectrum of AM signal in variation of different modulation index.
  3. Numerical discussion on AM .

UNIT: 2

Title: Generation & Detection of Amplitude Modulation

**Day 6, Date: 18.08.2016 Thursday [ 11.40am – 1.20pm] (2L)**

CONTENTSAM-SC generation using diode circuit. (Balanced Modulator) ,Demodulation of AM signals: Detection of AM by envelope detector , Multiplexing, Frequency Division Multiplexing

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. To understand the asynchronous demodulation process of AM signal& multiple signal transmission over common channel.
2. To understand the generation of AM using diode circuit

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What is asynchronous demodulation? [L2]
2. What is the advantage of asynchronous demodulation over synchronous demodulation? [L2]
3. What is FDM system? [L2]
4. What is balanced modulator? Why is called balanced? [L2]
5. explain the operation of modulator [L2]

Remarks, if any

UNIT: 2

Title: Generation & Detection of Amplitude Modulation

**Day 7, Date: 24.08.2016 [10.50am to 11.40am]Wednesday**

CONTENTS

Single side band modulation (SSB) both TC & SC. Generation of SSB: Filter method

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. Understand the generation of single side band

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. what is SSB-SC and SSB-TC[L2]
2. advantage of SSB-SC over other AM modulation[L1]

3. What is selective filtering method? [L2]

Remarks, if any

**Day7, Date: 24.08.2016, Wednesday 03.00pm – 03.50pm (GR-A1)1L and 03.50pm – 04.40pm (GR-A2)1L**

## Tutorial 4:

: Percentage of power saving of DSB-SC and uses of non linear devices and distortion due to synchronization.

1. Calculate the % of power saving of a DSB-SC signal when the signal is modulated in a depth of 50% and 100%.
2. What is balanced modulator? Why is it called balanced?
3. Why nonlinear device produce DSB-FC signal.
4. What is envelope detection? What is diagonal clipping? Find the value of RC to avoid diagonal clipping

UNIT: 2

Title: Generation & Detection of Amplitude Modulation

**Day 8, Date: 18.08.2016 Thursday [ 11.40am – 1.20pm] (2L)**

CONTENTS Generation of SSB: Phase shift method, Basic concept of VSB, Spectra and band-width and power calculation.

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. Understand the basic concept vestigial side.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Define VSB [L1]
2. Why is VSB used for TV broadcasting? [L2]

Remarks, if any

UNIT: 2

Title: Generation & Detection of Amplitude Modulation

**Day 9, Date: 24.08.2016 [10.50am to 11.40am]Wednesday**

CONTENTS Super heterodyning principle, intermediate frequency, Local oscillator frequency, image frequency

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. Understand the selectivity, sensitivity, [L1]
2. Understand the mixing [L1] 3. Understand the IF and Image frequency. [L1]

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):



1. What is mixing? [L1]
2. which block are responsible for selectivity and sensitivity.[L2]

Remarks, if any

**Day9, Date: 24.08.2016**, Wednesday 03.00pm – 03.50pm (GR-A1)1L and 03.50pm – 04.40pm (GR-A2)1L

## Tutorial 5:

**Tutorial 5:**Numerical discussion on AM modulation

1. In AM system carrier power is 400mw and total power is 600mw. Calculate the modulation index.
2. A single tone AM wave has a modulation in due of 100% what is the saving in power if the carrier component is removed to yield DSB-SC signal
  - a.31.25% b.75.81 c.50% d. 66.67%
- 3.A modulating signal is given by  $V_m = 2 \sin(2\pi \times 600 t)$  amplitude modulates a carrier signal given by  $V_c = 5 \sin(2\pi \times 100 t)$ . Determine
  - i) Modulation index ii) Frequency present in the modulated signal iii) Total transmission power iv) Band width.

:

UNIT: 3

Title: Angle modulation

**Day 10, Date: 31.08.2016 [10.50am to 11.40am]Wednesday**

CONTENTS Frequency Modulation (FM) and Phase Modulation (PM): Time and Frequency domain representations, Spectral representation of FM for a single tone  
Generation of FM : Basic block diagram representation of generation of FM ,NBFM

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. understand about narrowband FM and identify side band frequency

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What NBFM? [L1]
2. Define FM signal. [L1]
3. Conversion between FM and PM [L2].

Remarks, if any

**Day10, Date: 31.08.2016**, Wednesday 03.00pm – 03.50pm (GR-A1)1L and 03.50pm – 04.40pm (GR-A2)1L

## Tutorial 6:

**Tutorial 6:** Super heterodyning receiver, image frequency calculation.

1. Compare TRF receiver with super heterodyning receiver.
2. What is IF?
3. What is image frequency? How to reject image frequency.
4. What is the propose of the AGC circuit in the receiver?
5. What type of coupling is used in the RF & IF section of the Super-het-Receiver?

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<b>UNIT: 3</b> Title: Angle modulation <b>Day 11, Date: 01.09.2016 Thursday [ 11.40am – 1.20pm] (2L)</b>
<b>CONTENTS</b> Single tone FM and PM, Wide-band angle modulation, Bessel's functions and Fourier series. Generation of FM: direct method (VCO), Generation of FM: indirect method.
<b>Unit Objectives:</b> Broad Objectives of the chapter/topic are: 1. Understand about single tone FM and PM.
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Find the relation between FM and PM. [L3] 2. what is frequency deviation [L2] 3. Explain Armstrong Method. [L3] 4. Convert NBFM to WBFM. [L3]
Remarks, if any

<b>UNIT: 3</b> Title: Angle modulation <b>Day 12, Date 07.09.2016 [10.50am to 11.40am]Wednesday</b>
<b>CONTENTS</b> Demodulation of FM, slope detection method, Concept of frequency discriminators .
<b>Unit Objectives:</b> Broad Objectives of the chapter/topic are: 1. Understand the extracting of demodulated signal using slope detection and discriminators.
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. what is slope detection method[L3] 2. what is nonlinear distortion [L2]
Remarks, if any
<b>Day12, Date: 07.09.2016, Wednesday 03.00pm – 03.50pm (GR-A1)1L and 03.50pm – 04.40pm (GR-A2)1L</b>

## Tutorial 7:

Design different carrier frequency for indirect method FM

1. Explain with block diagram the Armstrong method of FM generation.

2. Design radio HIGH FM using indirect method. Where deviation  $\Delta f_1 = 25$  Hz, carrier  $f_{c1} = 200$  KHz are given of a NBFM signal.
3. When the modulating frequency in an FM system is 500 Hz, the modulating voltage is 2.4 volt,  $\beta = 50$ , calculate the frequency deviation. What will be the modulation index when modulating frequency is reduced to 250 Hz & modulating voltage is raised to 4 volt
4. Consider a single tone FM signal with peak frequency deviation of 5 kHz and frequency modulation sensitivity  $k_f = 10^4$  Hz/Volt. Let the modulating signal frequency be 1 kHz and the carrier frequency be 100 kHz. a) Obtain the FM index  $\beta$ , b) What is the FM transmission bandwidth? C) Is this NBFM or WBFM? Why

UNIT: 3

Title: FM demodulation

**Day 13, Date: 08.09.2016 Thursday [ 11.40am – 1.20pm] (2L)**

CONTENTS

Discriminator, foster-seeley discriminator. Phase Locked Loop ,demodulation of FM using PLL, FM Radio receiver

Unit Objectives:

Broad Objectives of the chapter/topic are:

1 Understand the demodulation of FM signal using phase shift discriminator and PLL .

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What is the discriminator? [L1]
2. Explain the foster seeley discriminator. [L2]
3. Advantage of discriminator over slope detector. [L2]
4. what is free running frequency, [L1]
5. What is lock range, capture range? [L2]
6. How FM can be demodulated using PLL? [L2]

Remarks, if any

UNIT: 4

Title: Random signal and noise in communication system

**Day 14, Date 14.09.2016 [10.50am to 11.40am]Wednesday**

CONTENTS: Basic concepts with block diagrams, Noise in Communication systems – Internal & External noise, Noise Temperature, Signal-to-Noise ratio, White noise, thermal noise, Figure of Merit

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. Understand the various type of noise.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

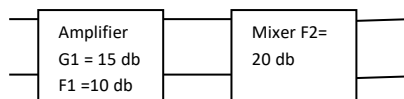
1. What noise?. [L1]
2. What is white noise? Thermal noise? [L2]
3. waht is noise temperature [L2]

**Day14, Date: 14.09.2016**, Wednesday 03.00pm – 03.50pm (GR-A1)1L and 03.50pm – 04.40pm (GR-A2)1L

## Tutorial 8:

**Tutorial 8:** Thermal noise, noise figure calculation for two port network.

1. In a radio receiver an RF amplifier and mixer are connected in cascade mode. The amplifier has a noise figure of 10db and the power gain of 15 db. The noise figure of the mixer stage is 20 db .calculate overall noise figure referred to the input.



2. Explain the effect of R-C low pass filter on noise

UNIT: 4

Title: Random signal and noise in communication system

**Day 15, Date: 15.09.2016 Thursday [ 11.40am – 1.20pm] (2L)**

CONTENTS

Noise performance in Analog Communication systems: SNR calculation for DSB-SC and SSB-SC .

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. Knowledge on SNR calculation for DSB-SC,

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What do you mean by Gaussian noise? [L1]
2. What is band pass noise? [L1]
3. Calculate SNR & F.O.M of coherent DSBSC system. [L5]

Remarks, if any

UNIT: 4

Title: Random signal and noise in communication system

**Day 16, Date 21.09.2016 [10.50am to 11.40am]Wednesday**

CONTENTS

Noise performance in Analog Communication systems: SNR calculation for DSB-FC

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. Knowledge on SNR calculation for SSB-FC and SSB-SC system.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What do you mean by threshold effect of envelope detection? [L1]

2. Calculate SNR & F.O.M of non-coherent DSBFC and coherent SSB-SC system [L1]

Remarks, if any

**Day14, Date: 21.09.2016, Wednesday 03.00pm – 03.50pm (GR-A1)1L and 03.50pm – 04.40pm (GR-A2)1L**

## Tutorial 9:

**Tutorial 9:** University question paper discussion on Various Communication

UNIT: 4

Title: Random signal and noise in communication system

**Day 15, Date: 15.09.2016 Thursday [ 11.40am – 1.20pm] (2L)**

CONTENTS

Noise performance in Analog Communication systems: CNR calculation for FM.

Unit Objectives:

Broad Objectives of the chapter/topic are:

1. Knowledge on random variable & process

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What do you mean by carrier to noise ratio? [L1]

2. Write short notes on Pre-emphasis and De-emphasis. [L1]

3. Explain effect on noise in FM system for low CNR case. [L2]

Remarks, if any

### **(x) Teaching Strategy/Method**

1. **Real-World” Learning**
2. Learning by memorizing and understanding
3. Solving numerical
4. Interactive sessions.

### **(xa) Strategy to support weak students**

1. Frequently asked Question
2. mentor to student
3. Merging of weak students with bright students.
4. Doubt clear session

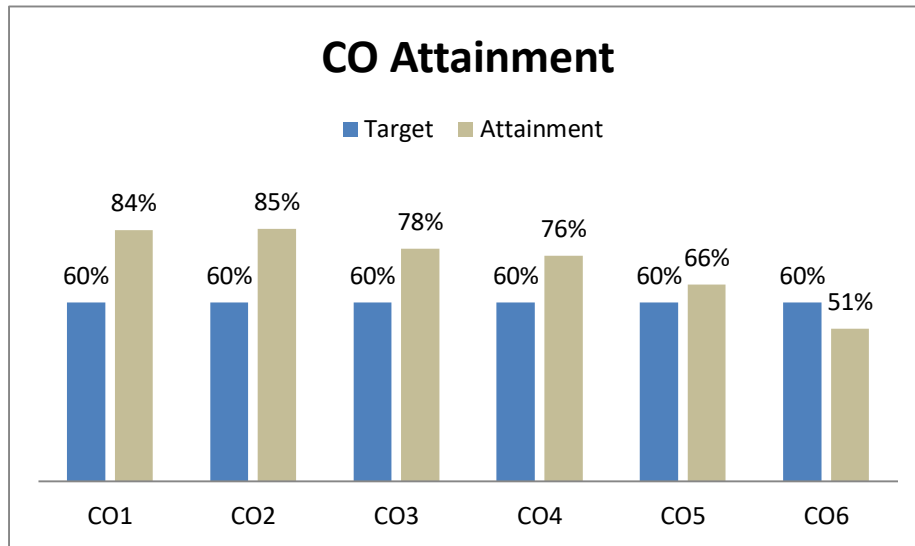
### **(xb) Strategy to encourage bright students**

1. Award to good student.(References books are given to good students)
2. Motivate for higher study..
3. Complex numerical discuss on completion of each module
4. Encourage students to participate in different tech fest.

### **(xc) Efforts to keep students engaged**

1. Assign them for class presentation.
2. Searching of real life application from the internet after discussion of each topic/unit.
3. Motivate student to prepare GATE Exam.

**(xi) Analysis of Students performance in the course (Internal Results)**



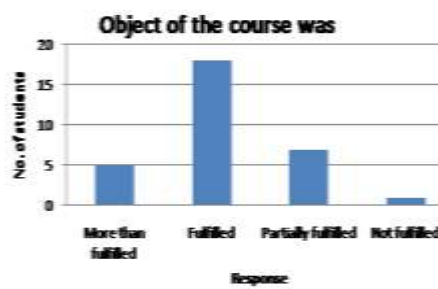
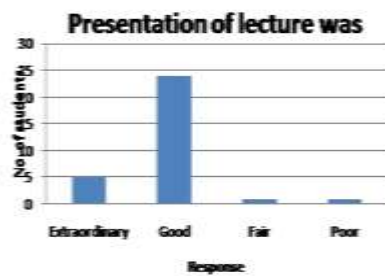
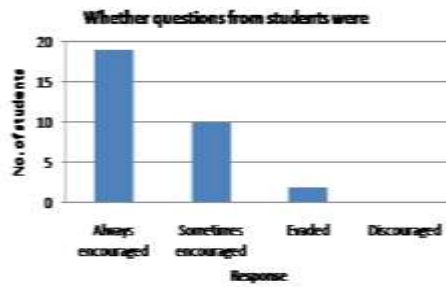
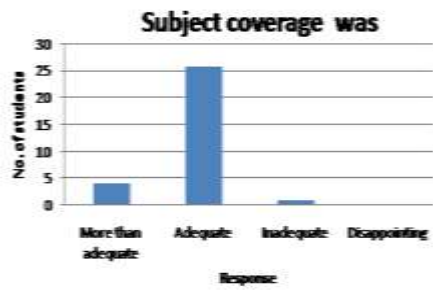
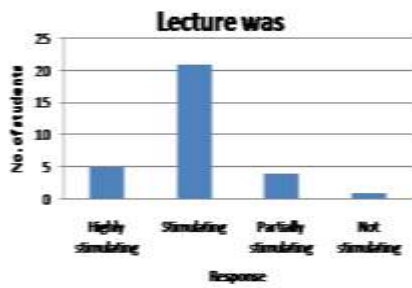
- 84% students have attained the set target of 60% marks for CO1
- 85% students have attained the set target of 60% marks for CO2
- 78% students have attained the set target of 60% marks for CO3
- 76% students have attained the set target of 60% marks for CO4
- 66% students have attained the set target of 60% marks for CO5
- 51% students have attained the set target of 60% marks for CO6

**(xii) Analysis of Students performance in the course (University Results)**

As per NBA SAR Example given in 3.2.2: Record of Attainment Level of A Course through University and Internal Assessments					
	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME	Attainment Level
University	65%	41	35	84%	3
<b>Overall Attainment of Course Outcome=70% University +30% Internals</b>					<b>3.0</b>

### **(xiii) Analysis of Student Feed Back**





#### **(xiv) Teacher Self-Assessment (at the completion of course)**

From the graphical analysis of the results obtained it can be seen that most of the course outcome have been achieved successfully by the students. More prominence should be given to clear the concepts related to frequency domain analysis and concept of filter to understand the analog communication system.

#### **(xv) Recommendations/Suggestions for improvement by faculty**

1. Mat lab program should be included in Lab to understand the modulated signal and their spectrum to understand analog communication.
2. Pulse type analog modulation should be included in Analog communication to understand Digital communication

Evaluation Number	Subject	Schedule	Marks
EXP1	Measurement of modulation index of an AM signal.	3 HRS	5
EXP2	Measurement of output power with varying modulation index an AM signal (for both DSB- & SSB).	3 HRS	5
EXP3	Measurement of distortion of the demodulated output with varying modulation index of an AM signal (for both DSB-SC & SSB).	3 HRS	5
EXP4	Generation of FM signal and measurement of Bandwidth	3 HRS	5
EXP5	Design a PLL using VCO & to measure the lock frequency	3 HRS	6
EXP6	Design a FM demodulator using PLL	3 HRS	7
EXP7	Measurement of selectivity ,sensitivity, fidelity of a superhetrodyne receiver	3 HRS	7

## INTERNAL ASSESMENT RECORD

**Subject with code: Analog communication (EC- 501) Semester : 5<sup>th</sup> sem, 2016**

**Discipline: ELECTRONICS & COMMUNICATION ENGINEERING**

Sl. No.	Roll No.	Attendance		Internal exam Marks				Quiz (10)	Total (30)
		Total (%)	Marks (5)	1st Internal (30)	2nd Internal (30)	Average (30)	Internal marks (15)		
1	ABHIJEET KUMAR	0%	1	0	0	0	0	0	1
2	AMBIKA CHAKRABORTY	82%	5	20	11	15.5	7.75	9	21.75
3	ANASUYA BHATTACHARJEE	89%	5	16	20	18	9	6	20
4	ANKITA SAHA	79%	5	30	26	28	14	8	27
5	ANKUR CHAKRABORTY	89%	5	20	21	20.5	10.25	6	21.25
6	ARNAB DAS	96%	5	19	19	19	9.5	8	22.5
7	ARPAN SARKAR	89%	5	19	23	21	10.5	8	23.5
8	BHISHMA DEB ROY	0%	1	0	0	0	0	0	1
9	BISHAL JAIN	75%	5	22	20	21	10.5	10	25.5
10	CHAMPA PAUL	89%	5	25	24	24.5	12.25	8	25.25
11	GAUTAM CHANDRA DEY	75%	5	22	22	22	11	10	26
12	JAYANTIKA MITRA	86%	5	24	24	24	12	9	26
13	JUI GHOSH	96%	5	23	21	22	11	8	24
14	KAJAL KUMARI	93%	5	29	26	27.5	13.75	10	28.75

15	KARAN SAHA	86%	5	23	21	22	11	7	23
16	KOUSIK PURKAIT	86%	5	24	22	23	11.5	8	24.5
17	MEGHNA KARMAKAR	89%	5	27	20	23.5	11.75	8	24.75
18	PARTHA PROTIM SARKAR	0%	1	0	0	0	0	0	1
19	PIYALI PAUL	76%	5	0	22	11	5.5	10	20.5
20	PRITHIRAJ DUTTA	79%	5	22	20	21	10.5	9	24.5
21	PRIYANKA BHADRA	89%	5	22	22	22	11	9	25
22	RAJDEEP BHATTACHARJEE	76%	5	24	0	12	6	8	19
23	RATUL PAUL	76%	5	21	19	20	10	7	22
24	RISHAV MAZUMDER	76%	5	20	22	21	10.5	7	22.5
25	ROMITA CHOWDHURY	83%	5	20	24	22	11	7	23
26	RUNNU KUMARI	86%	5	21	19	20	10	8	23
27	SARANSH CHOUDHARY	75%	5	30	26	28	14	10	29
28	SARITA KUMARI	79%	5	24	20	22	11	9	25
29	SAYAN KUNDU	86%	5	21	23	22	11	9	25
30	SAYANTANY ROY	93%	5	20	21	20.5	10.25	9	24.25
31	SHUBHAM CHAKRABARTY	79%	5	16	22	19	9.5	8	22.5
32	SIRSHA DAS	82%	5	29	18	23.5	11.75	9	25.75
33	SOUMYA CHATTERJEE	89%	5	22	23	22.5	11.25	6	22.25
34	SOUMYADEV BANDOPADHYAY	93%	5	19	21	20	10	8	23
35	SOURODIP DEY	89%	5	18	23	20.5	10.25	7	22.25
36	SUBHRA PAL	82%	5	17	21	19	9.5	8	22.5
37	SUBRATA SARKAR	82%	5	19	20	19.5	9.75	9	23.75

38	SWAPNIL PRADHAN	86%	5	26	20	23	11.5	8	24.5
39	SWETA MITRA	86%	5	21	26	23.5	11.75	10	26.75
40	VAIBHAV SINGH	76%	5	19	21	20	10	8	23
41	PINAK PRODHAN	0%	1	0	0	0	0	0	1



## LIST OF PRACTICALS

Subject with code: Analog communication (EC- 501) Semester : 5<sup>th</sup> sem, 2016

Discipline: ELECTRONICS & COMMUNICATION ENGINEERING

Sl.	Details of Experiment(s)	Hours allotted
EXP1	Measurement of modulation index of an AM signal.	3 HRS
EXP2	Measurement of output power with varying modulation index an AM signal (for both DSB- & SSB).	3 HRS
EXP3	Measurement of distortion of the demodulated output with varying modulation index of an AM signal (for both DSB-SC & SSB).	3 HRS
EXP4	Generation of FM signal and measurement of Bandwidth	3 HRS
EXP5	Design a PLL using VCO & to measure the lock frequency	3 HRS
EXP6	Design a FM demodulator using PLL	3 HRS
EXP7	Measurement of selectivity ,sensitivity, fidelity of a superhetrodyne receiver	3 HRS

## **ATTENDANCE SHEET (Practical)**

**Subject with code: Analog communication (EC- 501) Semester : 5<sup>th</sup> sem, 2015**



**Discipline: ELECTRONICS & COMMUNICATION ENGINEERING****ATTENDANCE SHEET (Practical)**

Subject with code: Analog Communication Lab (EC591)

Sem:

5<sup>th</sup>sem ECE Group: GRA

S.No.	Name	Roll No.	1	2	3	4	5	6	7	8	9	TOTAL= 9
1.	ANKITA SINGH	11900313002	1	1	1	1	1	1	1			7
2.	APURBA ROY	11900313003	1	1	1	1	1	1	1			7
3.	ARNAV GHOSH	11900313004	1	1	1	1	1	1	1			7
4.	ARUNDHUTEE DUTTA	11900313005	1	1	1	1	1	1	1			7
5.	AVEEK SAHA	11900313006	1	1	1	1	1	1	1			7
6.	AVERI RAY	11900313007	1	1	1	1	1	1	1			7
7.	AYANTIKA DEY	11900313008	1	1	1	1	1	1	1			7
8.	BIKKY ROKA	11900313009	1	1	1	1	1	1	1			7
9.	BIKRAM CHAKRABORTY	11900313010	1	1	1	0	1	1	1			6
10.	DEBABRATA BANERJEE	11900313011	1	1	1	1	1	1	1			7
11.	DEBASHISH MUKHERJEE	11900313012	1	1	1	1	1	1	1			7
12.	DHRITIKANA DAS	11900313014	1	1	1	1	1	1	1			7
13.	DIBAKAR SAHA	11900313015	1	1	0	1	1	1	1			7
14.	DIPAYAN BHATTACHARY A	11900313016	1	1	1	1	1	1	1			7
15.	DISHA MANDAL	11900313017	1	1	1	1	1	1	1			7

16.	KUNDAN KUMAR CHOURASIA	11900313019	1	1	1	1	1	1	1			7
17.	MANORANJAN KUMAR	11900313020	1	1	1	1	1	1	1			7
18.	MAYANK KUMAR	11900313021	1	1	1	1	1	1	1			7
19.	MD NASIR KHAN	11900313022	1	1	1	1	1	1	1			7
20.	MONA	11900313023	1	1	1	1	1	1	1			7
21.	MUNNA PRASAD KOIRI	11900313024	1	1	1	1	1	1	1			7
22.	NAVIN KUMAR	11900313025	1	1	1	1	1	1	1			7
23.	NIDHI PRIYA	11900313026	1	1	1	1	1	1	1			7
24.	PANKAJ GUPTA	11900313028	1	1	1	1	1	1	1			7
25.	PARTHA SARMA	11900313029	1	1	1	1	1	1	1			7
26.	PRADYUT DATTA	11900313030	1	1	1	1	1	1	1			7
27.	PRAGATI KUMARI	11900313031	1	1	1	1	1	1	1			7
28.	PRAGYA ROY CHOWDHURY	11900313032	1	1	1	1	1	1	1			7
29.	PRANOY DAS	11900313033	1	1	1	1	1	1	1			7
30.	PRAVEEN KUMAR OJHA	11900313034	1	1	1	1	1	1	1			7
31.	Souvik Bose	11900314044	0	1	0	1	0	1	1			4

## LAB PERFORMANCE RECORD

Subject with code: Analog communication (EC- 501) Semester : 5<sup>th</sup> sem, 2015

**Discipline: ELECTRONICS & COMMUNICATION ENGINEERING**

### LAB PERFORMANCE RECORD

Subject Analog Communication Lab Code EC591

Semester 5th sem GR A Discipline ECE

S.No.	Name	Roll No.	Marks in experimentation							TOTAL (40)
			1	2	3	4	5	6	7	
1.	ANIRBRATA DAS	11900313001								
2.	ANKITA SINGH	11900313002	3	2	4	3	2	4	4	22
3.	APURBA ROY	11900313003	2	2	1	1	3	3	3	15
4.	ARNAV GHOSH	11900313004	2	1	2	1	3	3	3	15
5.	ARUNDHUTEE DUTTA	11900313005	4	4	4	3	4	3	3	25
6.	AVEEK SAHA	11900313006	4	4	4	4	4	3	3	26
7.	AVERI RAY	11900313007	5	5	6	6	6	5	5	38
8.	AYANTIKA DEY	11900313008	4	4	5	5	4	4	4	30
9.	BIKKY ROKA	11900313009	4	3	4	4	3	3	3	24
10.	BIKRAM CHAKRABORTY	11900313010	5	4	5	x	5	4	4	27
11.	DEBABRATA BANERJEE	11900313011	5	5	6	6	5	5	5	37
12.	DEBASHISH MUKHERJEE	11900313012	2	3	3	2	3	2	3	18
13.	DHRITIKANA DAS	11900313014	4	4	5	4	6	5	2	30
14.	DIBAKAR SAHA	11900313015	3	4	4	3	5	4	4	27
15.	DIPAYAN BHATTACHARYA	11900313016	4	4	5	5	3	5	4	30

16.	DISHA MANDAL	11900313017	5	4	5	4	5	6	5		34
17.	KUNDAN KUMAR CHOURASIA	11900313019	4	4	4	4	4	4	4		28
18.	MANORANJAN KUMAR	11900313020	4	4	5	5	4	4	4		30
19.	MAYANK KUMAR	11900313021	4	4	5	5	4	4	5		31
20.	MD NASIR KHAN	11900313022	3	3	4	3	5	3	3		25
21.	MONA	11900313023	4	4	5	4	5	5	3		30
22.	MUNNA PRASAD KOIRI	11900313024	4	4	4	5	5	4	4		30
23.	NAVIN KUMAR	11900313025	5	5	6	6	5	6	5		38
24.	NIDHI PRIYA	11900313026	4	4	3	4	4	3	3		25
25.	PANKAJ GUPTA	11900313028	5	5	5	5	6	6	6		38
26.	PARTHA SARMA	11900313029	3	3	3	3	3	3	2		20
27.	PRADYUT DATTA	11900313030	5	5	5	5	6	6	6		38
28.	PRAGATI KUMARI	11900313031	4	4	5	5	5	3	4		30
29.	PRAGYA ROY CHOWDHURY	11900313032	5	5	5	5	5	4	4		33
30.	PRANOY DAS	11900313033	4	4	5	5	5	3	3		29
31.	PRAVEEN KUMAR OJHA	11900313034	5	5	5	5	6	6	6		38
32.	Souvik Bose	11900314044	X	4	X	5	X	6	5		20

## Records of Quiz

**Subject with code: Analog communication (EC- 501)**

**Semester : 5<sup>th</sup> sem, 2015**

**Discipline: ELECTRONICS & COMMUNICATION  
ENGINEERING**

S.No.	Name	Roll No.	QUIZ
1.	ANKITA SINGH	11900313002	1
2.	APURBA ROY	11900313003	1
3.	ARNAV GHOSH	11900313004	1
4.	ARUNDHUTEE DUTTA	11900313005	1
5.	AVEEK SAHA	11900313006	1
6.	AVERI RAY	11900313007	1
7.	AYANTIKA DEY	11900313008	1
8.	BIKKY ROKA	11900313009	1
9.	BIKRAM CHAKRABORTY	11900313010	1
10.	DEBABRATA BANERJEE	11900313011	1
11.	DEBASHISH MUKHERJEE	11900313012	1
12.	DHRITIKANA DAS	11900313014	1
13.	DIBAKAR SAHA	11900313015	1
14.	DIPAYAN BHATTACHARYA	11900313016	1
15.	DISHA MANDAL	11900313017	1

16.	KUNDAN KUMAR CHOURASIA	11900313019	1
17.	MANORANJAN KUMAR	11900313020	1
18.	MAYANK KUMAR	11900313021	1
19.	MD NASIR KHAN	11900313022	1
20.	MONA	11900313023	1
21.	MUNNA PRASAD KOIRI	11900313024	1
22.	NAVIN KUMAR	11900313025	1
23.	NIDHI PRIYA	11900313026	1
24.	PANKAJ GUPTA	11900313028	1
25.	PARTHA SARMA	11900313029	1
26.	PRADYUT DATTA	11900313030	1
27.	PRAGATI KUMARI	11900313031	1
28.	PRAGYA ROY CHOWDHURY	11900313032	1
29.	PRANOY DAS	11900313033	1
30.	PRAVEEN KUMAR OJHA	11900313034	1
31.	Souvik Bose	11900314044	1

# TUTORIAL RECORD

Subject with code: Analog communication (EC- 501) Semester : 5<sup>th</sup> sem, 2016

Discipline: ELECTRONICS & COMMUNICATION ENGINEERING

## TUTORIAL PERFORMANCE RECORD

Subject Analog Communication Code EC501

Semester 5th sem Discipline ECE

S.No.	Name	Tutorial class										
		T1	T2	T3	T4	T5	T6	T7	T8	T9	Total =8	
1	ABHIJEET KUMAR	0	0	0	0	0	0	0	0	0	0	0
2	AMBIKA CHAKRABORTY	1	1	1	1	1	0	1	1	1	1	8
3	ANASUYA BHATTACHARJEE	1	1	1	1	1	1	1	1	1	1	9
4	ANKITA SAHA	1	1	1	1	1	1	1	1	1	1	9
5	ANKUR CHAKRABORTY	1	1	1	1	1	1	1	1	0	1	8
6	ARNAB DAS	1	1	1	1	1	1	1	1	1	0	8
7	ARPAN SARKAR	1	1	1	1	1	0	1	1	0	1	7
8	BHISHMA DEB ROY	0	0	0	0	0	0	0	0	0	0	0
9	BISHAL JAIN	1	1	0	1	1	1	0	1	1	1	7
10	CHAMPA PAUL	1	1	1	1	1	1	1	1	1	1	9
11	GAUTAM CHANDRA DEY	1	1	1	1	0	0	1	1	1	1	7
12	JAYANTIKA MITRA	1	1	1	1	1	1	1	1	0	1	8
13	JUI GHOSH	1	1	1	1	1	1	1	1	1	1	9
14	KAJAL KUMARI	1	1	1	1	1	1	1	1	1	1	9
15	KARAN SAHA	1	1	1	0	1	1	1	1	0	1	7

16	KOUSIK PURKAIT		1	1	1	1	1	1	1	1	1	9
17	MEGHNA KARMAKAR		1	1	1	1	1	1	1	1	0	8
18	PARTHA PROTIM SARKAR		0	0	0	0	0	0	0	0	0	0
19	PIYALI PAUL		1	1	1	1	1	1	1	0	1	8
20	PRITHIRAJ DUTTA		1	1	1	1	1	1	1	1	1	9
21	PRIYANKA BHADRA		1	1	1	1	1	1	1	1	1	9
22	RAJDEEP BHATTACHARJ E		1	1	1	1	1	1	1	1	1	9
23	RATUL PAUL		1	1	1	0	1	1	0	0	1	6
24	RISHAV MAZUMDER		1	1	0	1	1	1	1	0	0	6
25	ROMITA CHOWDHURY		0	1	1	1	1	0	1	1	1	7
26	RUNNU KUMARI		0	1	1	1	1	1	1	0	1	7
27	SARANSH CHOUHDARY		1	1	1	1	1	1	1	1	1	8
28	SARITA KUMARI		1	1	1	1	1	1	0	0	1	6
29	SAYAN KUNDU		1	1	1	1	1	1	1	1	1	8
30	SAYANTANY ROY		0	1	1	1	1	1	0	1	0	6
31	SHUBHAM CHAKRABARTY		1	0	1	0	1	1	1	1	1	7
32	SIRSHA DAS		1	1	1	1	1	1	1	1	1	9
33	SOUMYA		0	1	1	1	1	1	0	1	0	6





**NAME WITH ROLL Nos. OF STUDENT WHOSE ACADEMIC  
PERFORMANCE IS NOT SATISFACTORY**

Sl.	Name of Student	Roll No	Remedial measures taken by teacher
1.	ABHIJEET KUMAR	11900314001	<ul style="list-style-type: none"><li>• Additional doubt clearing sessions</li><li>• Providing extra time to students with poor attendance.</li><li>• Guiding them through previous question papers</li><li>• Highlighting important and frequently asked questions</li></ul>
2.	RAJDEEP BHATTACHARJEE	11900314024	
3.	PARTHA PROTIM SARKAR	11900314020	
4.	PINAK PRODHAN	11900315066	
5.	BHISHMA DEB ROY	11900314008	



Director  
Siliguri Institute of Technology

# CERTIFICATE

I, the undersigned, have completed the course allotted to me as shown below

Sl. No.	Semester	Subject with Code	Total Units	Remarks
1.	5 <sup>th</sup>	Analog communication (EC- 501) & Analog communication Lab. (EC591)	04	

Date :

Signature of Faculty

## Submitted to HOD

### Certificate by HOD

I, the undersigned, certify that **Prof.Sudip kumar Ghosh & Aritra De** has completed the course work allotted to him satisfactorily / not satisfactorily.

Date :

Signature of HOD

## Submitted to Director

Date :

  
Director  
Siliguri Institute of Technology

Signature of Director





**SILIGURI INSTITUTE OF TECHNOLOGY**  
**ELECTRONICS & COMMUNICATION ENGINEERING**



# **COURSE FILE**

**1<sup>ST</sup> SEM, 3<sup>RD</sup> YEAR, 2015**

**PAPER NAME: Microprocessor & Microcontroller**

**PAPER CODE : CS-502 & CS-592**

# Course File

Course Title : **Microprocessor & Microcontroller (CS-502) &  
Microprocessor & Microcontroller Lab. (CS-592)**

Semester : **3<sup>rd</sup> Year 1<sup>st</sup> , 2015**

Name of the Faculty: **Prof. Sarmistha Mondal**

E-mail: **sharmi2301@yahoo.co.in**

## Class Schedule:

Lecture			Tutorial	Practical	
<b>Monday</b> 10:00 a.m -10:50 a.m	<b>Tuesday</b> 11:40 a.m - 12:30 p.m	<b>Wednesday</b> 10:50 a.m - 11:40 a.m	<b>Thursday</b> 15:50 p.m - 16:40 p.m	<b>Monday</b> 10:50 a.m -1:20 p.m	<b>Thursday</b> 10:50 a.m -1:20 p.m

## Hours for meeting students:

<b>Wednesday</b>	<b>Saturday</b>	<b>Other Days</b>
10:50-11:40pm	10.00 a.m - 10.50 a.m	1.30pm – 2:10pm or by appointment

## i) Course Objective

Students will be able to demonstrate architecture & programming technique of 8085 & 8086 microprocessors , 8051 microcontroller and design system based on them.

## ii) Course Outcomes

- After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The student will be able to:

Outcomes		Target
CS-502.1	Recognizing the internal architecture organization of 8085. [B.T Level-1]	50% marks

<b>CS-502.2</b>	<b>Understand</b> the interrupt and subroutine call mechanism of microprocessor & <b>utilize</b> 8255 / 8237/ 8259 /8251 for peripheral interfacing. [ <b>B.T Level-2</b> ]	50% marks
<b>CS-502.3</b>	<b>Analyze</b> 8086 microprocessors & 8051 microcontrollers , addressing modes, registers and instruction sets and <b>apply</b> them in writing assembly language program. [ <b>B.T Level-4</b> ]	50% marks
<b>CS-502.4</b>	<b>Debug</b> their assembly language programs. [ <b>B.T Level-5</b> ]	70% marks
<b>CS-502.5</b>	<b>Design</b> microprocessors/microcontrollers-based systems. [ <b>B.T Level-6</b> ]	70% marks

- ii. Once the student has successfully complete this course, he/she must be able to answer the following questions or perform/demonstrate the following:

<b>Sl.</b>	<b>Question</b>	<b>BT Level</b>
<b>1.</b>	<b>Write</b> the basic difference between microprocessor & microcontroller .	<b>1</b>
<b>2.</b>	<b>Describe</b> the functions of the following pins: ALE,HOLD,RD',READY,IO/M'	<b>1</b>
<b>3.</b>	<b>Summarize</b> the different addressing modes of 8085.	<b>2</b>
<b>4.</b>	Briefly <b>discuss</b> the sequence of events that takes place while <b>executing</b> CALL instruction.	<b>3</b>
<b>5.</b>	<b>Analyze</b> the memory segmentation scheme with reference to 8086 microprocessor.	<b>4</b>
<b>6.</b>	<b>Compare</b> the role of MIN mode and MAX mode operation of 8086.	<b>4</b>
<b>7.</b>	<b>Find</b> the largest number or data from a given set of 10 8-bit data using 8085 assembly language.	<b>4</b>
<b>8.</b>	<b>Study</b> the display of square-wave on CRO integrating the interfacing of 8085 & 8255 PPI. Consider Port-A as output port and Port-B as input port.	<b>4</b>
<b>9.</b>	<b>Identify</b> the particular data 02H using table look-up program of 8085 assembly language from a set of 5, 8-bit numbers. If found , store FFH, otherwise store 00H in register E .	<b>4</b>
<b>10.</b>	Write an assembly language program to generate quotient and remainder after the division of 2, 8-bit numbers using 8051 microcontroller.	<b>5</b>

### iii) Unit Layout

Unit	Lecture Hours	Laboratory Hours	Tutorial Hours
I. Introduction to Microcomputer based system. History of evolution of Microprocessor & Microcontrollers and their advantages and Disadvantages. Architecture of 8085 Microprocessor, Pin description of 8085. Address/databus Demultiplexing, Status Signals and the control signals. Instruction set of 8085 microprocessor, Addressing modes, Timing diagram of the instructions, Assembly language programming with examples, Counter and Time Delays	12	15	4
II. Stack and Subroutine, Interrupts of 8085 processor (software and hardware), I/O Device Interfacing-I/O Mapped I/O and Memory Mapped I/O,	6	3	2
III. Serial (using SID and SOD pins and RIM, SIM Instructions) and Parallel data transfer. Memory interfacing with 8085. Support IC chips- 8255, 8251, 8237 / 8257, 8259	12	6	4
IV. 8086 Microprocessor, Brief introduction to PIC microcontroller (16F877), 8051 Microcontroller, Memory interfacing with 8086. Support IC chips- 8255, 8251, 8237 / 8257, 8259,	8	6	2

### iv) Textbooks

1. MICROPROCESSOR architecture, programming and Application with 8085 - **R. Gaonkar** (Penram international Publishing LTD.)
2. Microprocessors and Microcontrollers - **N. Senthil Kumar**, M. Saravanan and Jeevananthan (Oxford university press)
3. Fundamentals of Microprocessor and Microcontroller – **B. Ram** (Dhanpat Rai Publications)

#### Reference books:

1. Microprocessor 8085 and its Interfacing—S Mathur (PHI)
2. Microprocessors and Interfacing – 8086, 80286, 80386, 80486 - Douglas V. Hall (Tata Mcgraw-hill)
3. The X-86 PC Assembly language, Design and Interfacing - Mazidi, Mazidi and Causey (PEARSON)
4. 8051 Microcontroller – K. Ayala (Cengage learning)
5. Fundamentals of Microprocessor & its Application - Singh, Chhabra (S. Chand publication)

### (v) Evaluation Scheme

#### 1) Theory

Evaluation Criteria	Marks
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Internal Exam*	15
Assignment	10
Attendance	5
University Exam	70
Total	100

\* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

### University Grading System:

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

## 2) Laboratory

Evaluation Criteria	Marks
Internal Exam*	40
University Exam	60
Total	100

\* Internal Evaluation will be based on daily lab performance as per the following schedule:

Expt. No.	Experiment Name	Schedule	Marks
1	<b>Introduction</b> - Study of prewritten programs on 8085 trainer kit using the basic instruction set ( data transfer, load/store, arithmetic, logical).	3HRS.	4
2	<u>To perform the programs on 8085 trainer kit:</u> <b>1 . Write a program to add 2, 8 bit data stored in internal registers.</b> <b>2 . Write a program to subtract 2, 8 bit data stored in internal registers.</b> <b>3 . Write a program to add 2, 8 bit data after storing it two consecutive memory location and store the output in the next location.</b> <b>4 . Store any 8 bit data in register D and another data in 8000H memory location. Subtract the data of memory from the data of</b>	3 HRS.	4

	register and store the output in 8002H memory location.		
3	<p><u>To perform the programs on 8085 trainer kit :</u></p> <ol style="list-style-type: none"> <li>1 . Write a program add to 16 bit data using DAD instruction.</li> <li>2 . Write a program add to 16 bit data using without DAD instruction.</li> <li>3 . Write a program to add n natural nos.</li> <li>4 . Write a program n natural nos. after storing it in consecutive memory location.</li> </ol>	3 HRS.	4
4	<p><u>To perform the programs on 8085 trainer kit :</u></p> <ol style="list-style-type: none"> <li>1. Write a program to multiply 2, 8 bit data.</li> <li>2. Write a program to divide 2, 8 bit data.</li> <li>3. Write a program to copy a block of memory and shift it into another memory location.</li> <li>4. Write a program to add n even/odd data stored in consecutive memory location.</li> </ol>	3 HRS.	4
5	<p><u>To perform the programs on 8085 trainer kit :</u></p> <ol style="list-style-type: none"> <li>1. Write a program to add n BCD nos.</li> <li>2. Write a program to arrange a set of data in ascending/ descending order in consecutive memory location.</li> <li>3. Write a program to pack 2 BCD nos.</li> <li>4. Write a program to unpack 2 BCD nos.</li> </ol>	3 HRS.	4
6	<p><u>To perform the programs on 8085 trainer kit :</u></p> <ol style="list-style-type: none"> <li>1. Write a program to search a particular data in a set of data store in consecutive memory location (table look up).</li> <li>2. Write a program to check whether two set of data in memory are match or not (string matching).</li> <li>3. Write a program to convert BCD no. into binary no.</li> <li>4. Write a program to convert binary no. to BCD no.</li> </ol>	3 HRS.	4
7	<p><u>To perform the programs on 8085 trainer kit :</u></p> <ol style="list-style-type: none"> <li>1. Write a program to add n 16 bit data.</li> <li>2. Write a program to convert any hexadecimal no. into ASCII no.</li> <li>3. Write a program to convert any binary no. into ASCII no.</li> <li>4. Write a program to convert any ASCII no. into binary no.</li> </ol>	3 HRS.	4
8	<p><u>To perform the programs on 8085 trainer kit :</u></p> <ol style="list-style-type: none"> <li>1. Write a program to ON LED's after reading the status of its switch.</li> </ol>	3 HRS.	4

	<p><b>2. Write a program to ON all LED's at the same time.</b></p> <p><b>3. Write a program to ON all the LED's one by one with particular delay.</b></p> <p><b>4. Write a program to display a square/rectangular wave in CRO.</b></p>		
9	<p><u>Familiarization with 8051 microcontroller kit and perform the programs in it :</u></p> <p><b>1. Write a program to add 2, 8 bit data stored in registers.</b></p> <p><b>2. Write a program to subtract 2, 8 bit data stored in registers.</b></p>	3 HRS.	4
10	<p><u>To perform the programs on 8051 trainer kit :</u></p> <p><b>1. Write a program to multiply 2, 8 bit data stored in registers.</b></p> <p><b>2. Write a program to divide 2, 8 bit data stored in registers.</b></p> <p><b>3. Serial communication between 2, 8085 trainer kit.</b></p>	3 HRS.	4
11	Revision ( on the programming of 8085)	3 HRS.	-
12	Revision ( on the programming of 8051)	3 HRS.	-

### Course target attainment levels:

Attainment Level	Inference	Marks
Attainment Level 1	40% of the students have attained more than the target level of that CO	1
Attainment Level 2	50% of the students have attained more than the target level of that CO	2
Attainment Level 3	60% of the students have attained more than the target level of that CO	3

**Overall Course Attainment Target** (70% of university and 30% of the internal exam) will be = Attainment Level 3

Target has been set on the basis of last year's performance / result by the students, student quality this year and difficulty level of the course.

## (vi) Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes												PSOs	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	1.	2.
CS-502.1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CS-502.2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CS-502.3	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CS-502.4	1	-	2	-	-	1	-	-	1	-	-	1	1	1
CS-502.5	1	-	2	-	-	1	-	-	1	-	-	1	1	1
CS-502	1	-	2	-	-	1	-	-	1	-	-	1	1	1

- CO1 to CO5 partially satisfies the application of knowledge of mathematics, science, engineering fundamentals to the solution of complex engineering problems (**PO1**).
- CO4 & CO5 fully satisfies the Design solutions for design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, & the cultural and societal, environmental consideration(**PO3**).
- CO4 & CO5 minimally satisfies for the students to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice (**PO6**).
- CO4 & CO5 minimally satisfies for the students to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings (**PO9**).
- CO4 & CO5 minimally satisfies for the students to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change (**PO12**).

## (vii) Delivery Methodology

Outcome	Method	Supporting Tools	Demonstration
CS-502.1	Structured (Partially Supervised Whole-Class Grouping)	Blackboard & Chalk, Video Lecture, NPTEL materials	Memorizing the internal architecture & organization of 8085, its addressing mode.
CS-502.2	Structured (Partially Supervised Whole-Class Grouping)	Blackboard & Chalk, Video Lecture, NPTEL materials	<b>Understanding</b> the interrupt and subroutine call mechanism of microprocessor & <b>utilize</b> 8255 / 8237/ 8259 /8251 for peripheral interfacing.
CS-502.3	Structured (Partially Supervised Whole-Class Grouping)	Blackboard & Chalk, Video Lecture, NPTEL materials	<b>Studying</b> the basics of 8086 microprocessors & 8051 microcontrollers , addressing modes, registers and instruction sets and <b>apply</b> them in writing assembly language program.
CS-502.4	Structured (Partially Supervised Independent work)	Experimental Kit of 8085	Demonstrate 8085 assembly language programming
CS-502.5	Structured (Partially Supervised Independent work)	Experimental Kit of 8051	Ability to design microprocessor/microcontroller based systems using assembly language programming.

### (viii) Assessment Methodology

Outcome	Assessment Tool	Specific Question / activity aligned to the Outcome
CS-502.1	Internal Test	<p>1. If the clock frequency is 5MHZ, then the execution time of the instruction MVI B,00 H is</p> <p>a) 1.8 <math>\mu</math>s  b) 1.4 <math>\mu</math>s  c) 1.4 ms  d) 0.4 ms</p> <p>2. Address line required for addressing 32k-byte memory chip is</p> <p>a) 13  b) 14  c) 15</p>

		d) 16 3. Briefly discuss the different addressing modes of 8085.
	Assignment	1. What are the functions of ALE, HOLD, READY ,RD,WR? 2. Interface 2K×8 RAM with 8085 microprocessor using IC 74138 such that starting address assign to them are 8000H. 3. Define instruction cycle, machine cycle and T-state
	University Exam	1. 2.
CS-502.2	Internal Test	1. Which of the following interrupt is both edge and level sensitive- a) RST 5.5 b) RST 6.5 c) RST 7.5 d) TRAP 2. The total I/O space available in 8085 if used peripheral mapped I/O is a) 64 b) 128 c) 256 d) 512 3. What is the difference between RIM and SIM instruction?
	Assignment	1. Discuss the different bits of control word of 8255. 2. Discuss the BSR mode operation of 8255.
	University Exam	1
CS-502.3	Internal Test	1. Discuss the flag register of 8086. 2. How 8086 supports pipelining? Explain. 3. State the function of BIU and EU in 8086. 4. What are the advantage of having segmentation?
	University Exam	1.
CS-502.4	Lab	1. Write an assembly language program to add two 16 bit numbers without using DAD instruction. 2. Write an assembly language program to divide 09H by 02H. Store the result in register D and remainder in register C. 3. Write an assembly language program to read the switch state & glowing LEDs according to switch state using 8255 PPI.

CS-502.5	Lab	<p>1. Write an 8051 assembly language program for the multiplication of 2, 8-bit numbers stored in internal register.</p> <p>2. Write an 8051 assembly language program for the subtraction of 2, 8-bit numbers, stored in internal register.</p>
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### (ix) A. Weekly Lesson Plan

Week	Lectures	Tutorial	Practical
1	<p>Introduction to Microprocessor based system, History of microprocessor, SSI,MSI,LSI &amp; VLSI; Microprocessor &amp; Microcontroller, 8-bit &amp; 16-bit microprocessor, word length, bit, byte, software &amp; hardware of a microprocessor, Memory &amp; I/o, pin description of 8085, Organization of microprocessor based system-ALU, reg. Array &amp; control unit, Computer languages-High level, low level, Assembly &amp; Machine language, compiler, interpreter &amp; assembler. MP architecture &amp; operations, Address bus, Data bus, Control bus &amp; their functions in reference to 8085, demultiplexed address-data bus, 8085 register array, internal data operations,</p>	<p><b>Revision of :</b>  Microprocessor based system History of microprocessor, SSI,MSI,LSI &amp; VLSI; Microprocessor &amp; Microcontroller, 8-bit &amp; 16-bit microprocessor, Bit, byte, software &amp; hardware of a microprocessor, Memory &amp; I/o, pin description of 8085, Organization of microprocessor based system-ALU, reg. Array &amp; control unit, Address bus, Data bus, Control bus &amp; their functions in reference to 8085, demultiplexed address-data bus, 8085 register array</p>	-
2	<p>8085 assembly &amp; machine languages: mnemonics, hexcode, operand; Writing &amp; execution of A.L.P, introduction to 8085</p>	<p>Revision: mnemonics, hexcode, operand, introduction to 8085</p>	-

	instructions, Tri state logic, function of buffer, decoder, latches, R/W memory model, memory organization, memory addressing,	instructions, Tri state logic, function of buffer, decoder, latches, op-code fetch cycle,R/W memory model, Writing program in assembly language of 8085	
3	8085 instruction sets: data transfer, arithmetic, logical & branching instruction,Counter and time delay, Memory mapping, Memory interfacing using IC-74138 decoder, Sequence of fetching of opcode with examples; Instruction cycle, Machine cycle & T-state, calculation of T-states of a given instruction,	Revision: Memory interfacing using IC-74138 decoder, Instruction cycle, Machine cycle & T-state, Counter and time delay calculation	-
4	Timing Diagram of a given instruction- 1 byte, 2-byte, 3- byte instruction, Addressing modes of 8085	Revision of : Timing Diagram of a given instruction-SUB C; MOV A,M; ANI F0 H; LDA ; addressing modes of 8085	Assgn. – 1 Classification of Signals and Systems
5	Stack & Stack pointer, PC & their uses, Assembly language programming, Instructions: PUSH,POP related to stack, PUSH/POP & their timing diagram, Assembly language programming using Stack,	<b>Revision of: STACK and related instructions- PUSH/POP</b>	-
6	Subroutine & its uses, CALL & RET , Sequence of program execution while a subroutine is called, Assembly language programming using subroutine, Conditional CALL/RET, Multiple ending, common ending & nesting subroutine	Revision on Subroutine & its uses, CALL & RET , Sequence of program execution while a subroutine is called, Assembly language programming using subroutine	-



7	Interrupts of 8085 : software & hardware, RIM & SIM, their uses. serial data transfer using SID, SOD & RIM/SIM , I/O mapped I/O & memory mapped I/O,	Revision on Software & hardware, RIM & SIM, their uses. serial data transfer using SID, SOD & RIM/SIM	Assgn. – 2 Signal Transformation
8	Discussion of 1 <sup>st</sup> internal exam question & answer and result,	Assembly language programming	-
9	Introduction to Programmable Peripheral Interfacing(PPI) using 8255, various operating modes : I/O and BSR, mode-0,mode-1,mode-2 operations along with their control-word format. Instructions: IN & Out, Assembly language programming using 8255 interfaced with 8085.	Revision on 8255 : various operating modes : I/O and BSR, mode-0,mode-1,mode-2, Instructions: IN & Out, Assembly language programming using 8255 interfaced with 8085	Assgn. – 3 Fourier Transform
10	Functions of 8259- programmable interrupt controller, Process of DMA, 8237- programmable DMA controller	Revision on 8259, 8237	-
11	8251-USART, 8086 introduction, architecture, addressing modes, Interrupts of 8086, segmentation & pipelining.	Revision on 8251, Basics of 8086	-
12	Basic idea on PIC microcontroller 8051 microcontroller, pin description, 8051-interrupts, architecture, Assembly language programming of 8051	Revision on microcontroller, Assembly language programming of 8051	

## B. Daily Lesson Plan

Unit : 1 Title : <b>Introduction to Microprocessor based system</b> Date: 20/7/15 Day 1: Monday, 10:00-10:50
CONTENTS Introduction to signals and systems. Discussion on course objectives and outcome, text & reference books, evaluation scheme and weekly lesson plan. Introduction to Microprocessor based system History of microprocessor,

SSI,MSI,LSI & VLSI; Microprocessor & Microcontroller, 8-bit & 16-bit microprocessor.
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. capable of understanding the need of microprocessor</li> <li>2.learn the basic concept of processor</li> <li>3. Learn the relationship between binary code &amp; hexadecimal code.</li> <li>4. capable of understanding the term SSI,MSI,VLSI</li> <li>5.be able to understand the difference between MP &amp; MC</li> <li>3. capable of understanding the word length of a processor</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1.Draw a block diagram of microprocessor based system.[B.T Level 1]</li> <li>2.Find the role of I/o . [B.T Level 1]</li> <li>3. What is the role of memory in MP based system? [B.T Level 2]</li> </ol>
Remarks, if any

<p>Unit : 1</p> <p>Title : Introduction to Microprocessor based system</p> <p>Date: 21/7/15 Day2: Tuesday, 11:40-12:30</p>
<p>CONTENTS</p> <p>Bit, byte, software &amp; hardware of a microprocessor, Memory &amp; I/o, pin description of 8085, Organization of microprocessor based system-ALU, reg. Array &amp; control unit, Computer languages-High level, low level, Assembly &amp; Machine language, compiler, interpreter &amp; assembler.</p>
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. To understand the difference between H/W &amp; S/W.</li> <li>2. To Learn the difference between bit, byte and wordlength.</li> <li>3. To realize the difference between compiler, interpreter &amp; assembler</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Define bit, byte &amp; word. [ B.T Level 2]</li> <li>2. Differentiate between compiler and interpreter .[ B.T Level 2]</li> <li>3.What is called software? [ B.T Level 2]</li> </ol>
Remarks, if any

<p>Unit : 1</p> <p>Title : Introduction to Microprocessor architecture &amp; organization</p> <p>Date: 22/7/15 Day3: Wednesday, 10:50-11:40</p>
CONTENTS

MP architecture & operations, Address bus, Data bus ,Control bus & their functions in reference to 8085, demultiplexed address-data bus, 8085 register array, internal data operations.
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Be able to understand the different bus system</li> <li>2. Learn the different signal classification of 8085.</li> <li>3. Realize the role of demultiplexed address-data bus.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1.What is ROM &amp; RAM? [Level 2]</li> <li>2.What is the function of WR' signal on memory chip? [Level 2]</li> <li>3.What are the control signals of 8085? [Level 2]</li> </ol>
Remarks, if any

<b>Tutorial-1</b>
Title : Date: 23/7/15 Day4: Thursday, 15:50-16:40
<p>CONTENTS</p> <p><b>Revision of :</b> Microprocessor based system ,pin description of 8085, Organization of microprocessor based system-ALU, reg. Array &amp; control unit, Address bus, Data bus ,Control bus &amp; their functions in reference to 8085, demultiplexed address-data bus, 8085 register array</p>
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. To understand basic Microprocessor based system ,pin description of 8085,</li> <li>2. To realize ALU, reg. Array &amp; control unit, Address bus, Data bus ,Control bus &amp; their functions in reference to 8085</li> </ol>
Tutorial sheet-1
<ol style="list-style-type: none"> <li>1. <b>Write</b> the main difference between Microprocessor &amp; Microcontroller.</li> <li>2. <b>Find</b> the purpose of demultiplexed address-data bus.</li> <li>3. <b>Compare</b> software-hardware &amp; compiler-interpreter.</li> <li>4. <b>Explain</b> the function of different control &amp; status signal of 8085.</li> <li>5. <b>Describe</b> the register array of 8085</li> </ol>
Remarks, if any

Unit : 1
Title : 8085 assembly & machine languages: Date: 27/7/15 Day5: Monday, 10:00-10:50
<p>CONTENTS</p> <p>8085 assembly &amp; machine languages: mnemonics, hexcode,operand</p>
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Understand the role assembly &amp; machine languages .</li> <li>2. To define the mnemonics, hexcode, operand</li> </ol>

<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1.What is opcode? [B.T Level 2]</li> <li>2.Define mnemonics. [B.TLevel 2]</li> </ol>
Remarks, if any

<p><b>UNIT: 1</b>  Title : Machine &amp; assembly language related to Instruction format of 8085.  Date: 28/7/15 Day6: Tuesday, 11:40-12:30</p>
<p><b>CONTENTS</b>  Writing &amp; execution of A.L.P, introduction to 8085 instructions</p>
<p><b>UNIT Objectives:</b>  Broad Objectives of the chapter/topic are:  1. To introduce with different instruction format</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What is 1-byte, 2-byte and 3-byte instructions? [B.T Level 2]</li> <li>2. What are the different instruction format of 8085? [B.T Level 2]</li> </ol>
Remarks, if any

<p><b>UNIT: 1</b>  Title : Tri state logic, function of buffer, decoder, latches, R/W memory model,  Date: 29/7/15 Day7: Wednesday, 10:50-11:40</p>
<p><b>CONTENTS</b>  Utility of Tri state logic, function of buffer, decoder, latches, R/W memory model</p>
<p><b>UNIT Objectives:</b>  Broad Objectives of the chapter/topic are:  1. 1.To understand the function of buffer, decoder, latches in microprocessor  2. To understand the different parts of memory block  3. To realize the different sequence of op-code fetch cycle</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What is assembly language? [B.TLevel 2]</li> <li>2.What do you mean by mnemonics? [B.T Level 2]</li> <li>3.What is the difference between opcode &amp; operand? [B.T Level 2]</li> <li>4. Learn about the steps of op-code fetch cycle. [B.TLevel 2]</li> </ol>
Remarks, if any

<p>UNIT: 1</p> <p>Date: 30/7/15 Day8 : Thursday, 15:00-15:50 – <b>Tutorial -2</b></p>
<p>CONTENTS</p> <p>Revision: mnemonics, hexcode,operand, introduction to 8085 instructions, Tri state logic, function of buffer, decoder, latches, op-code fetch cycle,R/W memory model,</p>
<p>Tutorial sheet-2</p>
<ol style="list-style-type: none"> <li>1. <b>Write</b> the difference between opcode &amp; operand.</li> <li>2. <b>List</b> out the categories of the 8085 instructions. Give examples of the instructions for each group.</li> <li>3. <b>Write</b> the output if the input is F0: <ul style="list-style-type: none"> <li>LXI H,2050H</li> <li>MOV A,M</li> <li>CMA</li> <li>ADI 01</li> <li>STA 2060</li> </ul> </li> <li>4. <b>Describe</b> the opcode fetch cycle of 8085.</li> <li>5. <b>Discuss</b> about the basic R/W memory model.</li> </ol>

<p>UNIT: 1</p> <p>Title : Memory mapping &amp; interfacing using IC-74138 decoder</p> <p>Date: 03/08/15 Day9: Monday, 10:50-11:40</p>
<p>CONTENTS</p> <p>Memory mapping, memory organization, memory addressing, Memory interfacing using IC-74138 decoder</p>
<p>Unit Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Realize the Memory mapping, Memory interfacing</li> <li>2. Be able to understand the operation of IC 74138.</li> </ol>



1.Draw the timing diagram of opcode fetch cycle of 8085.[B.TLevel 2]
Remarks, if any

TOPIC/UNIT/ CHAPTER: 3 Date: 06/08/15 Day12: Thursday, 15:50-16:40- <b>Tutorial - 3</b>
CONTENTS Revision: Memory interfacing using IC-74138 decoder, Instruction cycle, Machine cycle & T-state, Counter and time delay calculation
<b>Tutorial Sheet-3</b> <ol style="list-style-type: none"> <li>1. <b>Define</b> instruction cycle, machine cycle and T-state.</li> <li>2. <b>Write</b> a single instruction to clear the lower four bits of the accumulator in 8085 assembly language.</li> <li>3. <b>Determine</b> how much time is s required to execute the instruction ADI F0H. [B.T Level 2]</li> <li>4. If the clock frequency is 5MHZ, then what is the execution time of the instruction MVI B,00 H? [B.T Level 3]</li> <li>5. Draw the opcode fetch cycle of 8085. [B.T Level 2]</li> </ol>

UNIT: 1  <p style="text-align: center;">Title : Timing Diagram of a given instruction Date: 10/08/15 Day13: Monday, 10:00-10:50</p>
CONTENTS Timing Diagram of a given instruction- 1 byte, 2-byte, 3- byte instruction
UNIT Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1.To understand the timing diagram of 1-byte , 2-byte</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following

<p>questions/perforM the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Draw the timing diagram of MOV A,B. [ B.T Level 2]</li> <li>2. Draw the timing diagram of ADD M. [ B.T Level 2]</li> <li>3. Draw the timing diagram of MVI C, 08 H. [B.T Level 2]</li> </ol>
Remarks, if any

<p><b>UNIT: 4</b>  Title : Timing Diagram of a given instruction- 1 byte, 2-byte, 3- byte instruction  Date: 11/08/15 Day14: Tuesday, 12:30-13:20</p>
<p><b>CONTENTS</b>  Timing Diagram of a given instruction- 1 byte, 2-byte, 3- byte instruction</p>
<p><b>UNIT Objectives:</b>  Broad Objectives of the chapter/topic are:  1. To understand the timing diagram of 2-byte instruction</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perforM the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. How many number of T-states required to execute JNZ 8050H H? [B.T Level 3]</li> <li>2. Draw the timing diagram of LDA 9000H. [B.T Level 2]</li> </ol>
Remarks, if any

<p><b>UNIT: 5</b>  Title : Timing Diagram of a given instruction, Addressing modes of 8085  Date: 12/08/15 Day15: Wednesday, 10:50-11:40</p>
<p><b>CONTENTS</b>  Timing Diagram of a given instruction- 3- byte instruction, Addressing modes of 8085</p>
<p><b>UNIT Objectives:</b>  Broad Objectives of the chapter/topic are:  1. To understand the different Addressing modes of 8085</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perforM the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What are the different addressing mode of 8085? explain with examples. [B.T Level 2]</li> </ol>
Remarks, if any



<b>CHAPTER: 4</b> <b>Title : Timing Diagram of a given instruction- 1 byte, 2-byte, 3- byte instruction, addressing modes of 8085</b> <b>Date: 13/08/15 Day16: Thursday, 15:50-16:40(Tutorial-4)</b>
<b>CONTENTS</b>  Revision of : Timing Diagram of a given instruction- 1 byte, 2-byte, 3- byte instruction, addressing modes of 8085
<b>Tutorial sheet – 4</b>  <ol style="list-style-type: none"> <li><b>1. Draw</b> the timing diagram of opcode fetch cycle of a 2- byte instruction.</li> <li><b>2. List</b> the number of machine cycles does 8085 have, mention them.</li> <li><b>3.</b> Draw the timing diagram for the instructions-a. LDA, b. ADD M.</li> <li><b>4. Classify</b> the different addressing modes of 8085.</li> </ol>

<b>UNIT: 2</b>  Title : Stack & Stack pointer, PC & their uses Date: 17/08/15 Day 17: Monday, 10:00-10:50
<b>CONTENTS</b> Stack & Stack pointer, PC & their uses,
Unit Objectives: Broad Objectives of the chapter/topic are: 1.capable of understanding the concept of Stack & Stack pointer, PC & their uses,
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom’s Taxonomy): <ol style="list-style-type: none"> <li>1. What is the use of stack memory? [B.T Level 2]</li> <li>2.Which stack is used in 8085, LIFO or FIFO? [B.T Level 2]</li> </ol>
Remarks, if any

UNIT: 2 Title : STACK & Instructions: PUSH,POP Date: 18/08/15 Day18 : Tuesday, 11:40-12:30
CONTENTS <b>Instructions- PUSH, POP</b> related to stack & their timing diagram
UNIT Objectives: Broad Objectives of the chapter/topic are: 1.Capable of understanding the requirement of the instruction <b>PUSH, POP</b> 2. Be able to Draw the timing diagram of <b>PUSH, POP</b>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Draw the timing diagram of PUSH B. [B.T Level 2]
Remarks, if any

UNIT: 2 Title : Assembly language programming using Stack Date: 19/8/15 Day19 : Wednesday, 10:50-11:40
CONTENTS Assembly language programming using Stack
UNIT Objectives: Broad Objectives of the chapter/topic are: 1. To Perform the different assembly language program using STACK 2.
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Write an ALP for exchanging the data of two registerpair using PUSH & POP. [B.T Level-3]
Remarks, if any

UNIT: 2 Title : STACK & its use Date: 20/8/15 Day20: Thursday, 15:50-16:40 (Tutorial – 5)
CONTENTS <b>Revision of: STACK and related instructions- PUSH/POP</b>

### Tutorial Sheet-5

1. Which stack is used in 8085, LIFO or FIFO?
2. **Write** short notes on: Stack memory.
3. What is the **utilization** of STACK memory?
4. Draw the timing diagram of : POP H.

UNIT: 2

Title : Subroutine & its uses,

Date: 24/08/15 Day 21: Monday, 10:00-10:50

CONTENTS

Subroutine & its uses, , Sequence of program execution while a subroutine is called

UNIT Objectives:

Broad Objectives of the chapter/topic are:

1. Understand Sequence of program execution while a subroutine is called

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Why we use subroutine? [ Level 2]
2. Explain the purpose of stack while calling a subroutine. [B.T Level 2]

Remarks, if any

### Assignment-1

1. What is Microprocessor? Give the power supply & clock frequency of 8085 .
2. What are the functions of accumulator?
3. List the 16 – bit registers of 8085 microprocessor.
4. List the allowed register pairs of 8085.
5. What is an Opcode and Operand?
6. What is the function of IO/M,RD,WR signals in the 8085?
7. If the clock frequency is 5MHZ, then what is the execution time of the instruction MVI B,00 H ?
8. List out the categories of the 8085 instructions. Give examples of the instructions for each group.
9. How many address lines in a 4096 x 8 EPROM CHIP?
10. Name the three instructions to clear accumulator content .
11. What is the signal classification of 8085?
12. MOV A,M- How many number of T-states are required ?
13. Define instruction cycle, machine cycle and T-state .
14. What is an instruction?
15. What is the use of ALE ?
16. How many machine cycles does 8085 have, mention them .

17. Explain LDA, STA and POP instructions.
18. Explain the different instruction formats with examples .
19. Why do we use XRA A instruction ?
20. Why 8085 is called 8-bit microprocessor?

**UNIT: 2**

Introduction to Assembly Language Programming using Subroutine- CALL & RET instruction

Date: 25/8/15 Day 22: Tuesday, 11:40-12:30

**CONTENTS**

Assembly language programming using STACK

**UNIT Objectives:**

Broad Objectives of the chapter/topic are:

1. Capable of understanding the use of CALL/RET
2. Be able to write the simple programs
3. Timing diagram of CALL/RET.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Draw the timing diagram of CALL 9050H. [B.T Level 3]
2. Draw the timing diagram of RET. [B.T Level 3]

Remarks, if any

<p>UNIT: 2  Title : Subroutine-CALL/RET, nesting  Date: 26/8/15 Day23: Thursday, 10:00-10:50</p>
<p>CONTENTS  Conditional CALL/RET, Multiple ending, common ending &amp; nesting subroutine</p>
<p>UNIT Objectives:  Broad Objectives of the chapter/topic are:  1. Differentiate between Multiple ending, common ending &amp; nesting subroutine</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):  1. . What are called nesting subroutine? [ Level 3]  2. Define multiple ending subroutine. [ Level 3]</p>
<p>Remarks, if any</p>

<p>UNIT: 2  Title : <b>Subroutine</b>  Date: 27/8/15 Day24: Thursday, 15:50-16:40(<b>Tutorial-6</b>)</p>
<p>CONTENTS</p> <p><b>Subroutine</b></p> <p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. When a subroutine is called, the address of the instruction next to CALL instruction is stored Stack- explain. [ Level 2]</li> <li>2. What is meant by "subroutine"? Briefly discuss the sequence of events that takes place while executing CALL instruction. [ Level 2]</li> </ol>

<p>UNIT: 2  Title : Interrupts of 8085: software &amp; hardware,  Date: 31/8/15 Day25: Monday, 10:00-11:00</p>
<p>CONTENTS  Interrupts of 8085,;software &amp; hardware</p>
<p>UNIT Objectives:  Broad Objectives of the chapter/topic are:  1. To understand the Interrupts mechanism of 8085  2. To learn about the software &amp; hardware Interrupts of 8085</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):  1. What is an interrupt? Why it is used? [Level-2]  2. What are hardware interrupts of 8085? [Level-2]  3. What are software interrupts? [Level-2]</p>
<p>Remarks, if any</p>

<p>UNIT: 2  Title : <b>Interrupts of 8085</b>RIM &amp; SIM, their uses.  Date: 01/9/15 Day26: Tuesday, 11:40-12:30</p>
<p>CONTENTS  Maskable interrupts, RIM &amp; SIM, their uses</p>
<p>UNIT Objectives:  Broad Objectives of the chapter/topic are:  1. Understand the various properties Maskable interrupts, RIM &amp; SIM, their uses</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):  1. List the maskable interrupts of 8085. [ Level 2]  2. What are the difference between RIM &amp; SIM? [ Level 3]</p>
<p>Remarks, if any</p>

<p>UNIT: 2  Title : Serial data transfer using SID,SOD &amp; RIM/SIM, I/O mapped I/O &amp; memory mapped I/O,  Date: 02/9/15 Day27: Wednesday, 10:50-11:40</p>
<p>CONTENTS  Serial data transfer using SID,SOD &amp; RIM/SIM, I/O mapped I/O &amp; memory mapped I/O,</p>
<p>UNIT Objectives:  Broad Objectives of the chapter/topic are:  1. To learn about the serial data communication  2. To memorize the difference between I/O mapped I/O &amp; memory mapped I/O</p>

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):
1. What is the difference between I/O mapped I/O & memory mapped I/O,? [ Level 3]
2. How the serial data communication is achieved using SID,SOD & RIM/SIM? [ Level 3]
Remarks, if any

<b>UNIT: 2</b>
<b>Date: 3/9/15 Day28: Thursday, 15:50-16:40(Tutorial-7)</b>
<b>CONTENTS</b>
Interrupts of 8085
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):
1. Write the instructios to set mask for the interrupts RST 5.5 & RST 6.5.
2.How can we know about the pending interrupts?
3. Explain RIM.
4. Give two difference between RIM & SIM.
5. What is the function of SOD & SID?
.

<b>UNIT: 3</b>
Title : Introduction to Programmable Peripheral Interfacing(PPI) using 8255, various operating modes : I/O and BSR,
Date: 7/9/15 Day29: Monday, 10:50-11:00
<b>CONTENTS</b>
Programmable Peripheral Interfacing(PPI) using 8255, various operating modes : I/O and BSR
<b>UNIT Objectives:</b>
Broad Objectives of the chapter/topic are:
1. Understand the use of PPI
2. Study 8255 as PPI with 8085
3. Memorize the different modes of 8255
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):
1. What is Programmable Peripheral Interfacing? [ Level 3]
2. Draw & explain the internal architecture of 8255. [ Level 3]
3. What are the different modes of 8255? [ Level 3]
Remarks, if any

<p>UNIT: 3</p> <p>Title : mode-0,mode-1,mode-2 operations along with their control-word format</p> <p>Date: 8/9/15 Day30: Tuesday, 12:30-13:20</p>
<p>CONTENTS</p> <p>Different modes of 8255- mode-0,mode-1,mode-2 operations along with their control-word format</p>
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Know the on Different modes of 8255</li> <li>2. Study their control-word format</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What do you mean by Mode-0 operation of 8255? [L1]</li> <li>2. Write short notes I/O mode of 8255. [L1]</li> </ol>
<p>Remarks, if any</p>

<p>UNIT: 3</p> <p>Title : mode-0,mode-1,mode-2 operations along with their control-word format</p> <p>Date: 8/9/15 Day30: Tuesday, 12:30-13:20</p>
<p>CONTENTS</p> <p>Different modes of 8255- mode-0,mode-1,mode-2 operations along with their control-word format</p>
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Know the on Different modes of 8255</li> <li>2. Study their control-word format</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What do you mean by Mode-0 operation of 8255? [L1]</li> <li>2. Write short notes I/O mode of 8255. [L1]</li> </ol>
<p>Remarks, if any</p>

<p>UNIT: 3</p> <p>Title : mode-0,mode-1,mode-2 operations along with their control-word format</p> <p>Date: 8/9/15 Day30: Tuesday, 12:30-13:20</p>
<p>CONTENTS</p> <p>Different modes of 8255- mode-0,mode-1,mode-2 operations along with their control-word format</p>
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Know the on Different modes of 8255</li> <li>2. Study their control-word format</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What do you mean by Mode-0 operation of 8255? [L1]</li> </ol>



2. Write short notes I/O mode of 8255. [L1]
Remarks, if any

<p>UNIT: 3</p> <p>Title : . Instructions: IN &amp; Out, Assembly language programming using 8255 interfaced with 8085.</p> <p>Date: 9/9/15 Day31: Wednesday, 10:00-10:50</p>
<p>CONTENTS</p> <p>Different modes of 8255- mode-0,mode-1,mode-2 operations along Instructions: IN &amp; Out, Assembly language programming using 8255 interfaced with 8085.</p>
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Know the instruction IN/OUT for Different modes of 8255</li> <li>2. Study their Timing diagram</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom’s Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Which instructions are used to RD/WR I/O? [B.T Level 2]</li> <li>2. Draw the timing diagram of IN 80H. [ B.T Level 2]</li> </ol>
Remarks, if any

<p><b>UNIT:3</b></p> <p><b>Title : Revision of : 8255 PPI</b></p> <p><b>Date: 10/9/15 Day32: Thursday, 15:50-16:40 (Tutorial -8)</b></p>
<p>CONTENTS</p>
<p><b>Revision of : 8255 PPI</b></p> <ol style="list-style-type: none"> <li>1. What are the different modes of 8255? Explain.</li> <li>2. Generate the control word format for the I/O mode operation of 8255.</li> <li>3. Explain BSR mode of 8255.</li> <li>4. Discuss bi-directional data transfer using 8255.</li> <li>5. Write a program to set PC<sub>4</sub> and reset PC<sub>7</sub> using BSR mode of 8255. Assume the control register address is 83H</li> </ol>

UNIT: 3
Title : Process of DMA, 8237- programmable DMA controller

Date: 14/9/15 Day33: Monday, 10:00-10:50
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Know the DMA operation in accordance with 8237/57</li> <li>2. Study total DMA mechanism</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What do you mean DMA? How it can be achieved using 8237/57? [L3]</li> </ol>
Remarks, if any

<p>UNIT: 3</p> <p style="text-align: center;">Title : Functions of 8259- programmable interrupt controller</p> <p>Date: 15/9/15 Day34: Tuesday, 11:40-12:30</p>
<p>CONTENTS</p> <p>Block diagram and operations of 8259- programmable interrupt controller</p>
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Know the on Different parts of 8259</li> <li>2. Study how it controls multiple interrupts</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. How many interrupts can be handled by 8259? [L3]</li> <li>2. Write short notes 8259 as programmable DMA controller?. [L3]</li> </ol>
Remarks, if any

<p>UNIT: 3</p> <p style="text-align: center;">Title : 8251-USART,</p> <p>Date: 16/9/15 Day35: Wednesday, 10:50-11:40</p>
<p>CONTENTS</p> <p>Different modes of operation of 8251</p>
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Know the on Different modes of operation of 8251</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Explain the operation of 8251. [L1]</li> </ol>
Remarks, if any

UNIT-3
Date: 17/9/15 Day36: Thursday, 15:50-16:40(Tutorial-9)
CONTENTS

**8257,8259,8251**

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. Revision of **8257,8259,8251**

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Write short notes on 8251-USART. [ Level 3]
2. How many interrupts can be handled by 8259 at a time?

UNIT: 4  Title : 8086- introduction, architecture Date: 28/9/15 Day37: Monday, 10:00-10:50
CONTENTS Architecture of 8086
UNIT Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"><li>1. Concept about 16-bit processor</li><li>2. Know the Architecture of 8086</li><li>3. Study the difference between 8085 &amp; 8086</li><li>4. Memorize the different registers of 8086</li></ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): <ol style="list-style-type: none"><li>1. What do you mean by 16-bit microprocessor?[Level-3]</li><li>2. What is the function of BIU &amp; EU? [Level-3]</li><li>3. Write short notes on- the register array of 8086.[Level3]</li><li>4. What are the flag registers of 8086? [Level3]</li></ol>
Remarks, if any

UNIT: 4  Title : Addressing modes of 8086, segmentation & pipelining Date: 29/9/15 Day38: Tuesday, 11:40-12:30
CONTENTS Different addressing modes of 8086 with examples ,Memory segmentation & pipelining, Different segment registers
UNIT Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"><li>1. Know the on Different modes of 8255</li><li>2. Study their control-word format</li></ol>
Once the student has completed this topic/ chapter he/she will be able to answer following

<p>questions/perfrom the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. How pipelining is achieved in 8086? [B.T Level 3]</li> <li>2. How many segment registers are there in 8086? [B.T Level 3]</li> </ol>
Remarks, if any

<p>UNIT: 4</p> <p style="text-align: center;">Title : Interrupts of 8086</p> <p>Date: 30/9/15 Day39: Wednesday, 10:50-11:00</p>
<p>CONTENTS</p> <p>Different interrupts of 8086 along with their mechanism</p>
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Know the on Different interrupts of 8086</li> <li>2. Study their mechanism</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perfrom the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What are the different interrupts of 8086? [Level-3]</li> <li>2. Write short notes the interrupts of 8086. [L1]</li> </ol>
Remarks, if any

<p style="text-align: center;">UNIT: 4</p> <p style="text-align: center;">Title : Revision</p> <p style="text-align: center;">Date: 1/10/15 Day40: Thursday, 15:50-16:40 (Tutorial-10)</p>
<p style="text-align: center;">CONTENTS</p>
<p>Revision: 8086</p>
<p>Topic/Unit/Chapter Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li><b>1. Assembly language programming on 8086</b></li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perfrom the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Write the assembly language statement which will perform the following operations: <ol style="list-style-type: none"> <li>i. Copy the BP register content into SP register.</li> <li>ii. Copy the contents of AX register to the DX register</li> <li>iii. Load the number F2H into AL register</li> <li>iv. Load the number 1456H into BP register</li> </ol> </li> </ol>

<p style="text-align: center;"><b><u>Assignment-2</u></b></p> <ol style="list-style-type: none"> <li>1. Write an ALP to find out the largest number from a given array of 10 numbers.</li> <li>2. What is the difference between RIM and SIM instruction?</li> <li>3. Discuss the BSR mode operation of 8255.</li> <li>4. Write down the mode-0 control word for the following: Port A=input, port-b is not used, port c upper= input, Port c lower= output</li> <li>5. Write a program to set PC<sub>6</sub> and reset PC<sub>3</sub> using BSR mode of 8255.</li> </ol>
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UNIT: 4	Title : Basic idea on PIC microcontroller
Date: 5/10/15	Day41: Monday, 10:00-10:50
CONTENTS	
UNIT Objectives:	
Broad Objectives of the chapter/topic are:	
1. To understand the basics of PIC microcontroller	
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):	
1. What do you mean by PIC microcontroller? [L3]	
2. How it differs from microprocessor?. [L2]	
Remarks, if any	

UNIT: 4	Title : Introduction to 8051 microcontroller, pin description
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Date: 6/10/15 Day42: Tuesday, 11:40-12:30
<b>CONTENTS</b> Different pin description & their functions
<b>UNIT Objectives:</b> Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. Know the on functions of Different pins of 8051</li> <li>2. Study their control-word format</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): <ol style="list-style-type: none"> <li>2. Write short notes on- PIC microcontroller. [L1]</li> </ol>
Remarks, if any

<b>UNIT: 6</b> Title : 8051-architecture, Assembly language programming of 8051 Date: 7/10/15 Day43: Wednesday, 10:50-11:00
<b>CONTENTS</b> 8051-architecture,SFR, DPTR, Assembly language programming of 8051
<b>UNIT Objectives:</b> Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. Know the architecture of 8051</li> <li>2. Be able to write Assembly language programming of 8051</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): <ol style="list-style-type: none"> <li>1. Write an ALP for the addition of 2, 8-bit numbers using 8051. [L4]</li> </ol>
Remarks, if any

<b>UNIT-4</b> Title : 8051 microcontroller Date: 8/10/15 Day44: Thursday, 15:50-16:40 ( <b>Tutorial-11</b> )
<b>CONTENTS</b>
Revision:8051 microcontroller- programming <b>Topic/Unit/Chapter Objectives:</b> Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1.Capable of understanding the need of 8051 microcontroller, ,</li> <li>2.Be able to understand the pin description of 8051.</li> <li>3. Write the assembly language programming</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): <ol style="list-style-type: none"> <li>1. What are the major registers in 8051? [ Level 3]</li> </ol>

- 2. What is SFR? [ Level 3]
- 3. Write an ALP for the division of 2, 8-bit numbers.[ Level 3]
- 4.
- 4.
- 5.
- 6.

UNIT: 4	Title : Interrupts of 8051 Date: 13/10/15 Day45: Tuesday, 11:40-12:30
CONTENTS Different interrupts of 8051	
UNIT Objectives: Broad Objectives of the chapter/topic are: <ul style="list-style-type: none"> <li>1. Know the Different interrupts of 8051</li> <li>2. Study their functions</li> </ul>	
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. What are the different interrupts of 8051? [L1]	
Remarks, if any	

UNIT: 4	Title : <b>Assembly language programming of 8051</b> Date: 14/10/15 Day46: Wednesday, 11:40-12:30
CONTENTS Different instruction format & programming of 8051	
UNIT Objectives: Broad Objectives of the chapter/topic are: <ul style="list-style-type: none"> <li>1. Know the Different instructions of 8051</li> <li>2. Study their applications</li> </ul>	
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):	

1. Write
Remarks, if any

<b>UNIT-4</b>
Title : 8051 microcontroller
Date: 15/10/15 Day47: Thursday, 15:50-16:40 (Tutorial-12)
<b>CONTENTS</b>
8051 microcontroller- programming
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1.Capable of understanding the programming of 8051 microcontroller
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):  <ol style="list-style-type: none"> <li>1. What are the major registers in 8051? [ Level 3]</li> <li>2. What is SFR? [ Level 3]</li> <li>3. Explain the different interrupts of 8051. [ Level 4]</li> </ol>

UNIT: 4
Title : Assembly language programming using 8085
Date: 28/10/15 Day48: Wednesday, 11:40-12:30
<b>CONTENTS</b>
Different programming on 8085
UNIT Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. Know the Different program techniques</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): <ol style="list-style-type: none"> <li>1. Write an ALP to find the largest number from a given sets of data. [Level-4]</li> <li>2. Write an ALP to convert the binary numbers to ASCII. [Level-4]</li> </ol>



Remarks, if any

<b>UNIT-4</b> <b>Title : 8085/86 programming</b> Date: 29/10/15 Day49: Thursday, 15:50-16:40 ( <b>Tutorial-13</b> )
<b>CONTENTS</b>
8085/86 - programming
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1.capable of understanding the different program methodology of 8085/86 2.be able to understand the interfacing techniques using 8255
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):  1. Display the squarewave in CRO using BSR mode of 8255.[ Level 4]  2. Write an ALP for the speed control of stepper motor. [ Level 4]

<b>UNIT: 5</b>  Title : Revision on 8085 Date: 02/11/15 Day50: Monday, 10:00-10:50
<b>CONTENTS</b> Doubt clearing of previous topics from 8085, WBUT question paper discussion from 8085

<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Prepare them for university exam</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1.</li> <li>2.</li> </ol>
<p>Remarks, if any</p>

<p>UNIT: 5</p> <p style="text-align: center;">Title : Revision on 8086</p> <p style="text-align: center;">Date: 3/11/15 Day51: Tuesday, 12:30-13:20</p>
<p>CONTENTS</p> <p>Doubt clearing of previous topics from 8086, WBUT question paper discussion from 8086</p>
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Prepare them for university exam</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1.</li> <li>2.</li> </ol>
<p>Remarks, if any</p>

<p>UNIT: 5</p> <p style="text-align: center;">Title : Revision on peripheral devices</p> <p style="text-align: center;">Date: 4/11/15 Day52: Wednesday, 11:40-12:30</p>
<p>CONTENTS</p> <p>Doubt clearing of previous topics from 8255/8237/8251/8259, WBUT question paper discussion from said devices</p>
<p>UNIT Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Prepare them for university exam</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1.</li> <li>2.</li> </ol>
<p>Remarks, if any</p>

<p>UNIT: 5</p> <p style="text-align: center;">Title : Revision on 8051</p> <p style="text-align: center;">Date: 5/11/15 Day53: Thursday, 15:50-16:40</p>
<p>CONTENTS</p> <p>Doubt clearing of previous topics from 8051, WBUT question paper discussion from 8051</p>
<p>UNIT Objectives:</p>

Broad Objectives of the chapter/topic are: 1. Prepare them for university exam
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. 2.
Remarks, if any

UNIT: 5  Title : Revision on programming of 8085/86/8051 Date: 5/11/15 Day54: Thursday, 15:50-16:40
CONTENTS Doubt clearing of 8085/86/8051, WBUT question paper discussion
UNIT Objectives: Broad Objectives of the chapter/topic are: 1. Prepare them for university exam
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. 2.
Remarks, if any

UNIT: 5  Title : Special classes for weaker students Date: 9/11/15 Day55 Monday, 10:00-10:50
CONTENTS: Total syllabus
UNIT Objectives: Broad Objectives of the chapter/topic are: 1. Prepare them for university exam
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. 2.
Remarks, if any

**(x) Teaching Strategy/Method**

- Assembly language programming
- 2. Interactive question-answer session
- 3. Arrangement of MCQ/quiz
- 4. Real life examples
- Learning by question answers
- projects & assignments
- 7. Group discussion

### **(xa) Strategy to support weak students**

- Extra Doubt clearing session beyond class hour
- Assignment
- Weak students grouped with good students
- Viva after completion of each chapter
- Surprise Test
- Mentor to student meet
- Parent meet in connection with poor attendance & performance

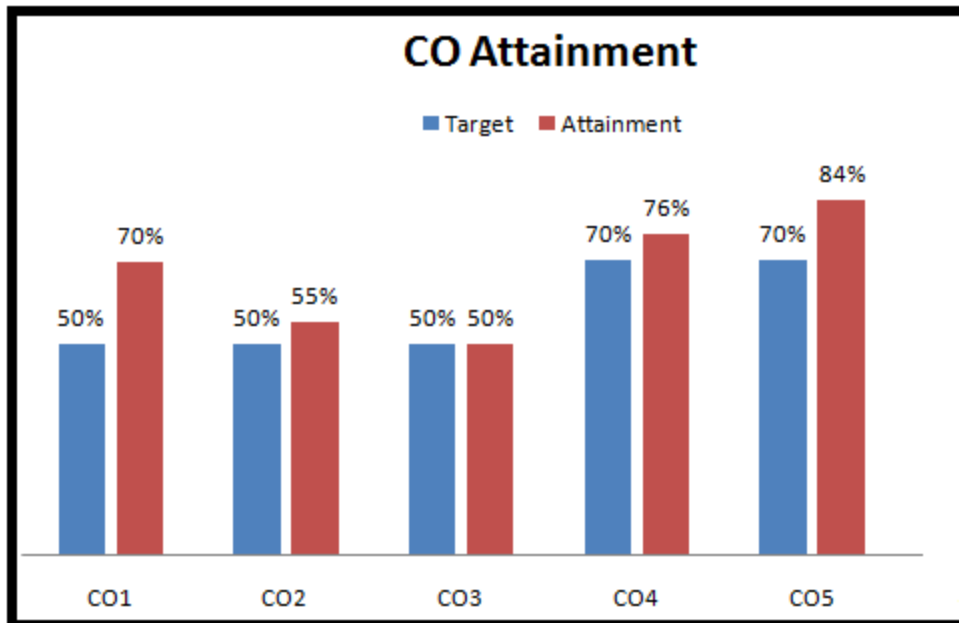
### **(xb) Strategy to encourage bright students**

- High level assignment
- Award to good students
- Select bright student as Class Representative
- Motivate them for higher study/publication

### **(xc) Efforts to keep students engaged**

- Asking students to share idea what they learned with fellow students.
- Small project
- Technical writing
- Library use
- Tutorial
- Model preparation for different Techfest

### **(xi) Analysis of Students performance in the course (Internal Results)**



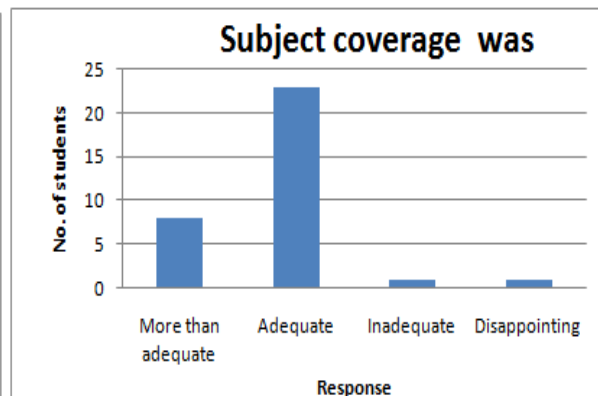
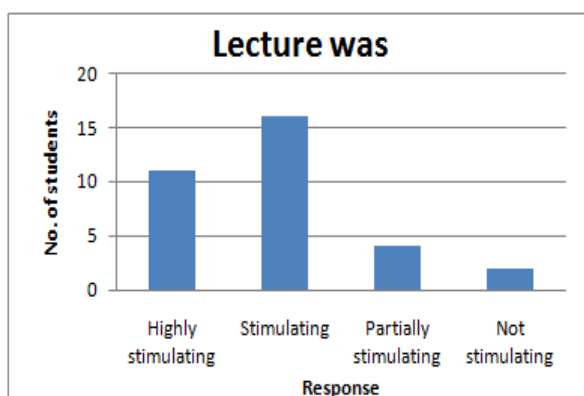
- 70% students have attained the set target of 50% marks for CO1
- 55% students have attained the set target of 50% marks for CO2
- 50% students have attained the set target of 50% marks for CO3
- 76% students have attained the set target of 70% marks for CO4
- 84% students have attained the set target of 70% marks for CO5

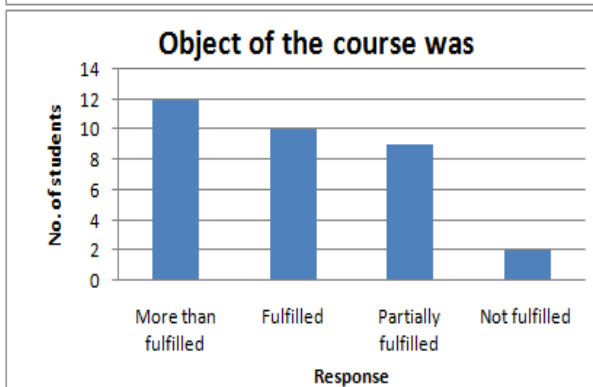
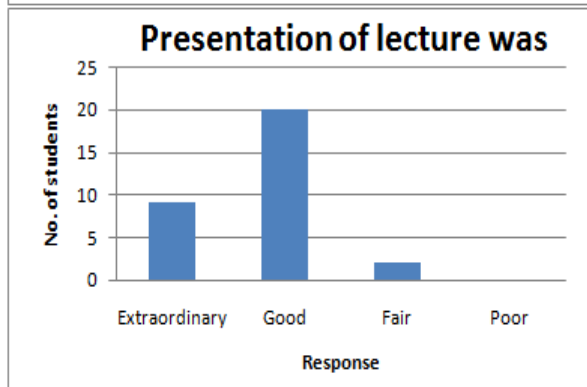
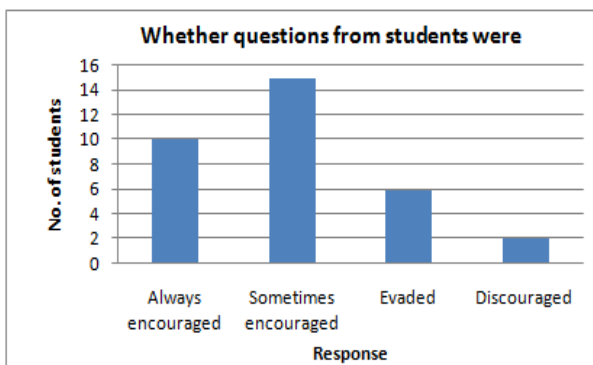
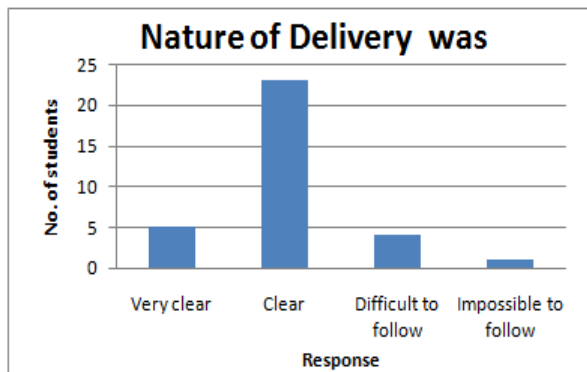
**(xii) Analysis of Students performance in the course (University Results)**

	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME
University	65%	38	33	87%

- 65% students have attained the set target of 50% marks for University Exams

**(xiii) Analysis of Student Feed Back**





**(xiv) Teacher Self-Assessment (at the completion of course)**

From the analysis of the results obtained it can be seen that set targets for the course outcome have been achieved successfully by the students. Since this subject will help them for designing systems based on 8085/86/8051, more emphasis must be given for developing theoretical concept and different programming techniques.

**(xv) Recommendations/Suggestions for improvement by faculty**

- More emphasis should be given to clear the concepts related to 8086/8051.
- MCQ/viva may be arranged after the completion of each module in the syllabus.

**INTERNAL ASSESSMENT RECORD**

Subject with code: Microprocessor & Microcontroller (CS-502) Semester : 5<sup>TH</sup> Sem, 2015

Discipline: COMPUTER SCIENCE & ENGINEERING

SL	Name	Roll No.	Attendance		Marks in Internal Test			Internal marks( 15)	Assignmen t (=10)	Total (30)	Actual Int. Marks
			Total (%)	Marks (5)	I (30)	II (30)	Avg of 2 tests (30)				

1.	ABHISHEK DEY	11900113001	75	5	20	11	15.5	7.75	9	21.75	22
2.	ADITYA SAHA	11900113002	56	3	20	12	16	8	7	18	18
3.	AKANKSHA KUMARI	11900113003	84	5	16	17	16.5	8.25	9	22.25	23
4.	AKHILESH SINGH	11900113004	62	4	7	9	8	4	6	14	14
5.	AMIT KUMAR	11900113005	98	5	16	16	16	8	10	23	23
6.	AMRITA KUNDU	11900113007	56	5	16	18	17	8.5	8	21.5	22
7.	ANGSHUMAN HALDER	11900113008	67	4	17	8	12.5	6.25	8	18.25	19
8.	ANIRBAN DUTTA	11900113009	16	4	14	7	10.5	5.25	6	15.25	16
9.	ANKITA GUPTA	11900113011	42	5	17	18	17.5	8.75	6	23.75	24
10.	ANURAG SHARMA	11900113012	82	5	11	8	9.5	4.75	8	17.75	18
11.	AYUSH AMAN	11900113013	64	4	14	8	11	5.5	8	17.5	18
12.	BASANT RAJ	11900113014	87	2	9	10	9.5	4.75	10	16.75	17
13.	BHAWESH PRASAD	11900113016	84	3	15	13	14	7	9	19	19
14.	BINITA AGARWAL	11900113017	76	3	19	14	16.5	8.25	7	19.25	20
15.	BISWAJIT DOLUI	11900113018	98	3	11	17	14	7	7	17	17
16.	CHIRANJIB MUKHERJEE	11900113019	87	5	13	17	15	7.5	6	18.5	19
17.	GANESH CHANDRA SAHA	11900113020	64	4	11	13	12	6	7	17	17
18.	JAYDEET KARMAKAR	11900113021	76	5	20	20	20	10	7	22	22
19.	JUHI RANI	11900113022	60	5	25	22	23.5	11.75	8	26.75	27
20.	JYOTI SINHA	11900113023	58	5	15	22	18.5	9.25	7	23.25	24
21.	KARISHMA KUMARI	11900113024	51	5	11	27	19	9.5	6	24.5	25
22.	KRIKA BIBHU	11900113025	78	5	20	28	24	12	8	27	27
23.	KUMAR NISHANT	11900113026	33	1	12	7	9.5	4.75	5	10.75	11
24.	KUNAL KUMAR	11900113027	84	2	8	9	8.5	4.25	6	12.25	13
25.	MILAN SHIT	11900113028	76	2	7	13	10	5	10	17	17
26.	MOHAMMAD MAYAR ALAM	11900113030	24	1	0	15	7.5	3.75	6	10.75	11

27.	MONALISA SINHA	11900113031	60	4	10	13	11.5	5.75	7	18.75	19
28.	MRINAL BARMAN	11900113032	62	3	7	7	7	3.5	7	13.5	14
29.	NEHA GOYAL	11900113033	71	4	18	9	13.5	6.75	8	19.75	20
30.	NEHA SINGH	11900113034	64	2	17	10	13.5	6.75	7	15.75	16
31.	NIRAJ SONAR	11900113035	58	1	8	13	10.5	5.25	6	12.25	13
32.	PRABHAKAR PAUL	11900113036	64	4	8	9	8.5	4.25	8	16.25	15
33.	PRAGYA KUMARI	11900113037	64	4	16	12	14	7	6	17	18
34.	PRASANJIT BANIK	11900113038	64	4	12	15	13.5	6.75	7	17.75	18
35.	PRITAM KUMAR GHOSH	11900113039	64	4	15	11	13	6.5	6	16.5	17
36.	PRITI KUMARI	11900113040	64	4	14	13	13.5	6.75	6	16.75	17
37.	PRIYANKA KUMARI	11900113041	64	4	17	8	12.5	6.25	6	16.25	17
38.	PRONIL CHAKRABORTY	11900113042	64	4	10	16	13	6.5	6	16.5	17

## ATTENDANCE SHEET (Practical)

**Subject with code: Microprocessor & MicrocontrollerLab (CS-592)**

**Semester : 5<sup>TH</sup> Sem, 2015**

**Discipline: COMPUTER SCIENCE & ENGINEERING**

S L	Name	Roll No.	1	2	3	4	5	6	7	8	9	10	TOTAL
			31/7/15	7/8/15	2/8/15	28/8/15	4/9/15	11/9/15	18/9/15	7/11/15			
1.	ABHISHEK DEY	11900113001	0	1	1	1	1	1	1	1			7
2.	ADITYA SAHA	11900113002	0	1	1	1	1	1	1	1			7
3.	AKANKSHA KUMARI	11900113003	1	1	1	1	1	1	1	1			8
4.	AKHILESH SINGH	11900113004	0	1	1	1	1	1	1	1			7
5.	AMIT KUMAR	11900113005	1	1	1	1	0	1	1	1			7
6.	AMRITA KUNDU	11900113007	1	1	1	1	1	1	1	1			8





# ATTENDANCE SHEET (Practical)

Subject with code: Microprocessor & Microcontroller Lab (CS-592)

Semester : 5<sup>TH</sup> Sem, 2015

Discipline: COMPUTER SCIENCE & ENGINEERING

SL	Name	Roll No.	1	2	3	4	5	6	7	8	9	10	TOTAL
			1/8/ 15	12/ 9/1 5	3/1 0/1 5	7/1 1/1 5							
20.	JYOTI SINHA	11900113023	2	2	2	2							8
21.	KARISHMA KUMRI	11900113024	2	2	2	2							8
22.	KRITIKA BIBHU	11900113025	2	2	2	2							8
23.	KUMAR NISHANT	11900113026	2	2	2	2							8
24.	KUNAL KUMAR	11900113027	2	2	2	2							8
25.	MILAN SHIT	11900113028	2	2	2	2							8
26.	MOHAMMA D MAYAR ALAM	11900113030	2	2	2	2							8
27.	MONALISA SINHA	11900113031	2	2	2	2							8
28.	MRINAL BARMAN	11900113032	2	2	0	2							6
29.	NEHA GOYAL	11900113033	2	2	2	2							8
30.	NEHA SINGH	11900113034	2	2	2	2							8
31.	NIRAJ	11900113035	2	0	2	2							6

	SONAR												
32.	PRABHAKAR PAUL	11900113036	2	2	2	2							8
33.	PRAGYA KUMARI	11900113037	2	2	2	2							8
34.	PRASANJIT BANIK	11900113038	2	2	2	2							8
35.	PRITAM KUMAR GHOSH	11900113039	2	2	2	2							8
36.	PRITI KUMARI	11900113040	2	2	2	2							8
37.	PRIYANKA KUMARI	11900113041	0	2	2	2							6
38.	PRONIL CHAKRABORTY	11900113042	2	2	2	2							8

**Records of Assignment / Quiz**  
**Subject with code: Microprocessor & Microcontroller**  
**(CS-502)**  
**Semester : 5<sup>TH</sup> Sem, 2015**  
**Discipline: COMPUTER SCIENCE & ENGINEERING**

SL	Name	Roll No.	Assgn. 1	Assgn. 2
1.	ABHISHEK DEY	11900113001	1	1
2.	ADITYA SAHA	11900113002	1	1
3.	AKANKSHA KUMARI	11900113003	1	1
4.	AKHILESH SINGH	11900113004	1	1
5.	AMIT KUMAR	11900113005	1	1

6.	AMRITA KUNDU	11900113007	1	1
7.	ANGSHUMAN HALDER	11900113008	1	1
8.	ANIRBAN DUTTA	11900113009	1	1
9.	ANKITA GUPTA	11900113011	1	1
10.	ANURAG SHARMA	11900113012	1	1
11.	AYUSH AMAN	11900113013	1	1
12.	BASANT RAJ	11900113014	1	1
13.	BHAWESH PRASAD	11900113016	1	1
14.	BINITA AGARWAL	11900113017	1	1
15.	BISWAJIT DOLUI	11900113018	1	1
16.	CHIRANJIB MUKHERJEE	11900113019	1	1
17.	GANESH CHANDRA SAHA	11900113020	1	1
18.	JAYDEET KARMAKAR	11900113021	1	1
19.	JUHI RANI	11900113022	1	1
20.	JYOTI SINHA	11900113023	1	1
21.	KARISHMA KUMARI	11900113024	1	1
22.	KRITIKA BIBHU	11900113025	1	1
23.	KUMAR NISHANT	11900113026	1	1
24.	KUNAL KUMAR	11900113027	1	1
25.	MILAN SHIT	11900113028	1	1
26.	MOHAMMAD MAYAR ALAM	11900113030	1	1
27.	MONALISA SINHA	11900113031	1	1
28.	MRINAL BARMAN	11900113032	1	1
29.	NEHA GOYAL	11900113033	1	1
30.	NEHA SINGH	11900113034	1	1
31.	NIRAJ SONAR	11900113035	1	1
32.	PRABHAKAR PAUL	11900113036	1	1
33.	PRAGYA KUMARI	11900113037	1	1
34.	PRASANJIT BANIK	11900113038	1	1
35.	PRITAM KUMAR GHOSH	11900113039	1	1

36.	PRITI KUMARI	11900113040	1	1
37.	PRIYANKA KUMARI	11900113041	1	1
38.	PRONIL CHAKRABORTY	11900113042	1	1

<p style="text-align: center;"><b>LIST OF PRACTICALS</b>  <b>Subject with code: Microprocessor &amp; Microcontroller Lab (CS-592)</b>  <b>Semester : 5<sup>TH</sup> Sem, 2015</b>  <b>Discipline: COMPUTER SCIENCE &amp; ENGINEERING</b></p>		
Sl.	Details of Experiment(s)	Hours allotted
P1.	Study of prewritten programs on 8085 trainer kit using the basic instruction set ( data transfer, load/store, arithmetic, logical).	3 hr
P2.	<u>To perform the programs on 8085 trainer kit:</u> 1. Write a program to add 2, 8 bit data stored in internal registers. 2. Write a program to subtract 2, 8 bit data stored in internal registers. 3. Write a program to add 2, 8 bit data after storing it two consecutive memory location and store the output in the next location. 4. Store any 8 bit data in register D and another data in 8000H memory location. Subtract the data of memory from the data of register and store the output in 8002H memory location.	3 hr
P3.	<u>To perform the programs on 8085 trainer kit :</u> 1. Write a program add to 16 bit data using DAD instruction. 2. Write a program add to 16 bit data using without DAD instruction. 3. Write a program to add n natural nos. 4. Write a program n natural nos. after storing it in consecutive memory location.	3 hr
P4.	<u>To perform the programs on 8085 trainer kit :</u> 1. Write a program to multiply 2, 8 bit data. 2. Write a program to divide 2, 8 bit data. 3. Write a program to copy a block of memory and shift it into another memory location. 4. Write a program to add n even/odd data stored in consecutive memory location.	3 hr
P5.	<u>To perform the programs on 8085 trainer kit :</u> 1. Write a program to add n BCD nos. 2. Write a program to arrange a set of data in ascending/ descending order in consecutive memory location. 3. Write a program to pack 2 BCD nos.  4. Write a program to unpack 2 BCD nos.	3 hr
P6.	<u>To perform the programs on 8085 trainer kit :</u> 1. Write a program to search a particular data in a set of data store in consecutive memory location (table look up). 2. Write a program to check whether two set of data in memory are match or not (string matching). 3. Write a program to convert BCD no. into binary no. 4. Write a program to convert binary no. to BCD no.	3 hr
P7.	<u>To perform the programs on 8085 trainer kit :</u> 1. Write a program to add n 16 bit data. 2. Write a program to convert any hexadecimal no. into ASCII no.	3 hr

	3. Write a program to convert any binary no. into ASCII no. 4. Write a program to convert any ASCII no. into binary no.	
P8.	To perform the programs on 8085 trainer kit : 1. Write a program to ON LED's after reading the status of its switch. 2. Write a program to ON all LED's at the same time. 3. Write a program to ON all the LED's one by one with particular delay. 4. Write a program to display a square/rectangular wave in CRO.	3 hr
P9.	Familiarization with 8051 microcontroller kit and perform the programs in it : 1. Write a program to add 2, 8 bit data stored in registers. 2. Write a program to subtract 2, 8 bit data stored in registers.	3 hr
P10.	To perform the programs on 8051 trainer kit : 1. Write a program to multiply 2, 8 bit data stored in registers. 2. Write a program to divide 2, 8 bit data stored in registers. 3. Serial communication between 2 8085 trainer kit.	3 hr
P11.	Revision ( on the programming of 8085)	3 hr
P12.	Revision ( on the programming of 8051)	3 hr

## Sessional/Practical Performance Record

**Subject with code: Microprocessor & Microcontroller Lab (CS-592)**

**Semester : 5<sup>TH</sup> Sem, 2015**

**Discipline: COMPUTER SCIENCE & ENGINEERING**

SI	Name	Roll No.	Marks in experimentation										Total (40)
			1	2	3	4	5	6	7	8	9	10	
1.	ABHISHEK DEY	11900113001	0	4	4	3	4	3	3	4			<b>25</b>
2.	ADITYA SAHA	11900113002	0	4	4	4	4	4	4	4			<b>28</b>
3.	AKANKSHA KUMARI	11900113003	0	4	4	3	4	3	3	4			<b>25</b>
4.	AKHILESH SINGH	11900113004	2	3	2	3	2	3	2	3			<b>20</b>
5.	AMIT KUMAR	11900113005	4	4	4	0	4	4	4	4			<b>28</b>
6.	AMRITA KUNDU	11900113007	4	4	4	4	4	4	4	2			<b>30</b>
7.	ANGSHUMAN HALDER	11900113008	4	4	4	4	4	4	4	4			<b>32</b>
8.	ANIRBAN DUTTA	11900113009	3	1	2	3	4	4	1	2			<b>20</b>
9.	ANKITA GUPTA	11900113011	2	4	2	4	2	2	2	1			<b>19</b>
10.	ANURAG SHARMA	11900113012	4	4	4	4	4	3	3	3			<b>29</b>
11.	AYUSH AMAN	11900113013	4	4	4	4	4	4	4	4			<b>32</b>
12.	BASANT RAJ	11900113014	0	4	3	3	0	3	3	4			<b>29</b>



35.	PRITAM KUMAR GHOSH	11900113039	8	8	8	8								<b>32</b>
36.	PRITI KUMARI	11900113040	8	6	6	8								<b>28</b>
37.	PRIYANKA KUMARI	11900113041	0	8	8	8								<b>24</b>
38.	PRONIL CHAKRABORTY	11900113042	8	6	6	8								<b>28</b>

**NAME WITH ROLL Nos. OF STUDENT WHOSE ACADEMIC PERFORMANCE IS NOT SATISFACTORY**

Sl.	Roll No.	Name of Student	Remedial measures taken by teacher
1	11900113004	AKHILESH SINGH	<ul style="list-style-type: none"> <li>• Preparing them by solving previous year WBUT question papers</li> <li>• Additional doubt clearing sessions</li> <li>• Providing extra assignments</li> <li>• Highlighting important and frequently asked questions</li> </ul>
2	11900113014	BASANT RAJ	
3	11900113027	KUNAL KUMAR	
4	11900113028	MILAN SHIT	
5	11900113030	MOHAMMAD MAYAR ALAM	
6	11900113035	NIRAJ SONAR	



# CERTIFICATE

I, the undersigned, have completed the course allotted to me as shown below:

Sl. No.	Semester	Subject with Code	Total Units	Remarks
1.	5 <sup>TH</sup>	1. Microprocessor & Microcontroller (CS-502) 2. Microprocessor & Microcontroller Lab (CS-592)	04	

Date :

Signature of Faculty

## Submitted to HOD

### Certificate by HOD

I, the undersigned, certify that **Prof. SARMISTHA MONDAL** has completed the course work allotted to him satisfactorily / not satisfactorily.

Date :

Signature of HOD

## Submitted to Director

Date :

Signature of Director

  
Director  
Siliguri Institute of Technology



**SILIGURI INSTITUTE OF TECHNOLOGY**  
**ELECTRONICS & COMMUNICATION ENGINEERING**



**COURSE FILE**  
**1<sup>ST</sup> SEM, 4<sup>TH</sup> YEAR, 2016 (GR. A)**

**PAPER NAME : *Microelectronics and VLSI Designs* (EC-702) & VLSI Design Lab (EC- 792)**

**PAPER CODE : EC 702 & EC 792**

# Course File

Course Title: **Microelectronics and VLSI Designs (EC- 702) &VLSI Design Lab (EC- 792)**

Semester: **1<sup>st</sup> Year 4<sup>th</sup>, 2016**

Name of the Faculty: **Prof. Manas Kumar Parai & Prof. Saroj Mondal**

E-mail: **manasparai@gmail.com, sarojmondal@gmail.com**

## Class Schedule:

Lecture				Practical	
Tuesday	Wednesday	Thursday	Friday	Wednesday	Thursday
11.40am – 12.30pm	10.00am – 10.50am	2.10pm – 3 pm	2.10pm – 3 pm	10.50am – 1.20pm	10.50am – 1.20pm

- An additional Lecture per week (which is not as per university syllabus) has been incorporated for facilitating better understanding and coverage of the syllabus.

## Hours for meeting students:

Tuesday	Thursday	Saturday	Other Days
1.30pm – 2.45pm	3pm – 4pm	1.30pm – 4pm	1.30pm – 2pm or by appointment

## i) Course Objective

Student will possess sufficient knowledge about the principles of VLSI design, Fabrication Process and simulate large-scale Digital and Analog Integrated Circuits.

## ii) Course Outcomes

- After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The student will be able to:

Outcomes		Target
EC702.1	<b>Describe</b> the basic concept of VLSI design: Microelectronic evaluation, Scale of Integration, Types of VLSI Chips, different design domains and design principles. [B.T. LEVEL 1]	70% marks

EC702.2	<b>Understand</b> Silicon Semiconductor Technology and CMOS processing technology: P-well, N-well, Twin Tub process, layout Design rules. [B.T. LEVEL 2]	70% marks
EC702.3	<b>Implement</b> CMOS logic circuits, Complex logic circuits, Advanced Logic circuits and different sequential CMOS logic circuits. [B.T. LEVEL 3]	60% marks
EC702.4	<b>Test</b> different combinational and sequential logic circuits and verify their behavior with Spice Simulation and EDA tools for VLSI Design. [B.T. LEVEL 5]	75% marks
EC702.5	<b>Design</b> and develop CPLD/FPGA based small prototype. [B. T. LEVEL 6]	95% marks

- ii. Once the student has successfully complete this course, he/she must be able to answer the following questions or perform/demonstrate the following:

Sl.	Question	BT Level
1.	<b>Describe</b> the flow chart of VLSI Design Flow.	1
2.	<b>Explain</b> with neat diagram the basic steps involved in fabrication Process flow.	2
3.	<b>Explain</b> the Stick Diagram of 3-input NAND Gate.	2
4.	<b>Utilize</b> the operation of CMOS Inverter circuit and Show the Voltage Transfer Characteristic.	3
5.	<b>Apply</b> CMOS technology to implement Half Adder, Full Adder, D FF.	3
6.	<b>Construct</b> a Resistor using Switched Capacitor.	3
7.	<b>Verify</b> DC, AC and Transient response of different logic gates using Spice Simulation and EDA tools.	5
8.	<b>Test</b> the operations of CMOS full adder, Flip-Flops, Counter, and Registers.	5
9.	<b>Design</b> 12-bit CPU using VHDL to check its functions and validate on FPGA/CPLD.	6

### iii) Module Layout

Module	Lecture Hours	Laboratory hours
I. Introduction to VLSI Design	8 HRS.	6HRS.
II. Microelectronic Processes for VLSI Fabrication	10 HRS.	-
III. CMOS for Digital VLSI Circuits	12 HRS.	24HRS
IV. Analog VLSI Circuits	10 HRS.	-

### iv) Textbooks

1. Digital Integrated Circuit, J. M. Rabaey, Chandrasan, Nicolic, Pearson Education.
2. CMOS Digital Integrated Circuit, S. M. Kang & Y. Leblebici, TMH.
3. Modern VLSI Design, Wayne Wolf, Pearson Education.
4. Advance Digital Design Using Verilog, Michel D. Celliti, PHI
5. M.J.S Smith, Application Specific Integrated circuits, Pearson.
6. P.J Anderson, The designer' s guide to VHDL, Morgan Kaufman, 2nd edition, 2002.
7. W. Wolf, Modern VLSI Design: Systems on silicon, Pearson
8. G. Hatchel and F. Somenzi, logic Synthesis and verification Algorithms,Kluwer,1998

#### Reference books:

1. Digital Integrated Circuits, Demassa & Ciccone, John Willey & Sons.
2. Modern VLSI Design: system on silicon, Wayne Wolf; Addison Wesley Longman Publisher
3. Basic VLSI Design, Douglas A. Pucknell & Kamran Eshranghian, PHI
4. CMOS Circuit Design, Layout & Simulation, R. J. Baker, H. W. Lee, D.E. Boyee, PHI
5. CMOS Analog Circuit Design by P.E. Allen & D.R. Holberg; OUP
6. J. Bhasker, A VHDL Primer, BS Publications/Pearson Education.

### (v) Evaluation Scheme

#### 1) Theory

Evaluation Criteria	Marks
Internal Exam*	15
Quiz Test	10
Attendance	5
University Exam	70
Total	100

\* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

## University Grading System:

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

## 2) Laboratory

Evaluation Criteria	Marks
Internal Exam*	40
University Exam	60
Total	100

\*Internal Evaluation will be based on daily lab performance as per the following schedule:

Expt. No.	Experiment Name	Schedule	Marks (40)
1	Familiarity with Spice simulation tool & EDA tools	6HRS.	6
2	Spice Simulation of Inverter , NAND , NOR Gates	6 HRS.	6
3	Design of CMOS XOR/XNOR Gates	3 HRS.	6
4	Design of CMOS Full adder	3 HRS.	5
5	Design of CMOS Flip flops ( R-S ,D , J-K)	3 HRS.	5
6	Design of 8 bit synchronous Counter	3 HRS.	5
7	Design of 8 bit bi-directional register	3 HRS.	5
8	Design of a 12 bit CPU with few instructions and implementation and validation on FPGA	3 HRS.	2

## Course target attainment levels:

Attainment Level	Inference	Marks
Attainment Level 1	50% of the students have attained more than the target level of that CO	1
Attainment Level 2	60% of the students have attained more than the target level of that CO	2
Attainment Level 3	70% of the students have attained more than the target level of that CO	3

**Overall Course Attainment Target** (70% of university and 30% of the internal exam) will be =Attainment Level 3

Target has been set on the basis of last year's performance / result by the students, student quality this year and difficulty level of the course.

### (vi) Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes (POs)												PSOs	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	1.	2.
EC 702.1	1	2	0	2	0	0	0	0	0	0	0	0	1	0
EC 702.2	1	2	0	2	0	0	0	0	2	0	0	0	1	2
EC 702.3	2	2	0	3	0	0	0	0	2	0	0	0	2	2
EC 702.4	1	2	0	3	0	0	0	0	2	0	0	0	2	2
EC 702.5	1	0	0	3	0	0	0	0	2	0	0	0	1	2
<b>EC 702</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>

- CO1, 2, 4 & 5 minimally satisfy whereas CO3 partially satisfies the application of knowledge of mathematics, science, engineering fundamentals to the solution of complex engineering problems (PO1).
- CO1, 2, 3 & 4 partially satisfies the ability of the student to identify, formulate, and analyze engineering problems to arrive at substantiated conclusions (PO2).
- CO3, 4 & 5 fully satisfies & 1, 2 partially satisfy the research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions in the field of Electronics & Communication Engineering. (PO4).
- CO2, 3, 4 & 5 partially satisfies the student's ability to function effectively as an individual and as a member in a team (PO9).



**(vii) Delivery Methodology**

Outcome	Method	Supporting Tools	Demonstration
EC 702.1	Structured (Partially Supervised Whole-Class Grouping)	Video Lecture, NPTEL materials	Basic concept of VLSI design
EC 702.2	Structured (Partially Supervised Whole-Class Grouping)	Video Lecture, NPTEL materials	Microelectronic Processes for VLSI Fabrication
EC 702.3	Structured (Partially Supervised Whole-Class Grouping)	Video Lecture, NPTEL materials	CMOS Analog and digital logic circuits
EC 702.4	Structured (Partially Supervised Independent work)	Whiteboard & Marker, PPT & Software Based	Simulation using T-Spice & Xilinx
EC 702.5	Structured (Partially Supervised Independent work)	Whiteboard & Marker, PPT & Software Based	Simulation using T-Spice & Xilinx

**(viii) Assessment Methodology**

Outcome	Assessment Tool	Specific Question/activity aligned to the Outcome
EC 702.1	Internal Test	Q1. Draw the flow chart of VLSI Design Flow and Explain.
	Quiz	<p>1. What is meant by the term VLSI? A device containing between (a) <math>10^3</math> and <math>10^5</math> transistors (c) <math>10^7</math> and <math>10^9</math> transistors (b) <math>10^5</math> and <math>10^7</math> transistors (d) <math>10^9</math> and <math>10^{11}</math> transistors</p> <p>2. Sub threshold operation occurs in (a) Strong inversion region (c) Saturation region (b) Weak inversion region (d) Cut-off region</p>
	University Exam	1. Explain the basic block diagram of FPGA with diagram.

EC 702.2	Internal Test	1. Explain with neat diagram the basic steps involved in fabrication Process flow
	Quiz	<ol style="list-style-type: none"> <li>Material used for the fabrication of gate in modern MOSFET is               <ol style="list-style-type: none"> <li>Highly pure si</li> <li>Highly pure SiO<sub>2</sub></li> <li>Epitaxial Si</li> <li>Highly doped polysilicon</li> </ol> </li> <li>Photo-etching is a process of               <ol style="list-style-type: none"> <li>Selective removal of layer</li> <li>Diffusion of impurities</li> <li>Removal of photo-resist</li> <li>Making dicing marks</li> </ol> </li> </ol>
	University Exam	1. Show the different steps to fabricate a CMOS Inverter
EC 702.3	Internal Test	1. Explain the operation of CMOS Inverter circuit and Show the Voltage Transfer Characteristic.
	Quiz	<ol style="list-style-type: none"> <li>AND terms are realized by which connections of NMOS in PDN               <ol style="list-style-type: none"> <li>Series</li> <li>Cascade</li> <li>parallel</li> <li>Either Series or Parallel</li> </ol> </li> <li>Which one effect does not cause any deviation of a Current Mirror circuit from the ideal situation?               <ol style="list-style-type: none"> <li>Channel length modulation</li> <li>Threshold offset between the two transistors</li> <li>imperfect geometrical matching</li> <li>DIBL effects</li> </ol> </li> </ol>
	University Exam	<ol style="list-style-type: none"> <li>Realize a 2:1MUX using CMOS Transmission gate.</li> <li>Design two inputs X-OR gate using CMOS Transmission gate.</li> <li>Realize a function using CMOS Transmission gate.</li> </ol>
EC 702.4	Quiz	<ol style="list-style-type: none"> <li>The full form of VHDL is               <ol style="list-style-type: none"> <li>Very High Digital Logic</li> <li>Verilog Hardware Description Language</li> <li>Very High Speed Digital Logic</li> <li>None of these</li> </ol> </li> <li>In VHDL, Sequential statements are defined in the               <ol style="list-style-type: none"> <li>Architecture</li> <li>Process</li> <li>Package</li> <li>None of these</li> </ol> </li> </ol>
	Lab	<ol style="list-style-type: none"> <li>Using T-spice obtain the transient analysis of the CMOS Inverter.</li> <li>Write the VHDL code for a Half Adder Circuit in Dataflow style of modeling.</li> </ol>
EC 702.5	Quiz	<ol style="list-style-type: none"> <li>In VHDL, Components must be declared               <ol style="list-style-type: none"> <li>Within the architecture body</li> <li>Anywhere in the program</li> <li>In a separate VHDL file</li> <li>Within the entity declaration</li> </ol> </li> </ol>

		ii. The if-else statements must be (a) Within a process block (b) Within the architecture body (c) Under the entity declaration (d) Within a while loop
	Lab	Design of a 12 bit CPU with few instructions and implementation and validation on FPGA

### (ix) A. Weekly Lesson Plan

Week	Lectures	Practical	Quiz
1	VLSI Design Concepts, Moor's Law, Scale of Integration (SSI, MSI, LSI, VLSI, ULSI, Types of VLSI Chips (Analog & Digital VLSI chips)	Familiarity with Spice simulation tool & EDA tools	-
2	ASIC, PLA, FPGA, Design principles (Digital VLSI – Concept of Regularity, Granularity etc), Design Domains (Behavioral, Structural etc.)	Familiarity with Spice simulation tool & EDA tools	-
3	Silicon Semiconductor Technology- An Overview, Wafer processing, Oxidation, Epitaxial deposition, Ion-implantation & Diffusion, Cleaning, Etching, Photo-lithography – Positive & Negative photo-resist, Basic CMOS Technology – (Steps in fabricating CMOS)	Spice Simulation of Inverter	<b>Quiz1:</b> Based on CO1. <b>Topic:</b> Scale of Integration, VLSI Design flow, Programmable Logic
4	Basic n-well CMOS process, p-well CMOS process, Twin tub Process	Spice Simulation of Inverter	-

5	Layout Design Rule: Stick diagram with examples, CMOS inverter characteristics.	Design of CMOS XOR/XNOR Gates	<b>Quiz2:</b> Based on CO2. <b>Topic:</b> Fabrication Process, Design Rule.
6	NAND & NOR Gates, CMOS logic circuits, Complex logic circuits	Design of CMOS Full adder	-
7	CMOS Full Adder, CMOS Transmission GATE, Sequential CMOS logic circuits, SR Latch circuit.	Design of CMOS Flip flops ( R-S ,D , J-K)	-
8	Clocked JK Latch/ Master-Slave JK, CMOS D-latch & Edge triggered flip-flop, Analog VLSI design steps, Basic building blocks of Analog VLSI chips, MOS switch, Active load / resistors; Voltage dividers.	Design of 8 bit synchronous Counter	<b>Quiz3:</b> Based on CO3. <b>Topic:</b> Design of Digital and Analog VLSI circuits (Theoretical).
9	CMOS Current source & sink, CMOS Differential amplifier; Output amplifiers [Basic circuits only].	Design of 8 bit bi-directional register	<b>Quiz4:</b> Based on CO4. <b>Topic:</b> Design of Digital and Analog VLSI circuits (Lab Oriented).
10	CMOS OPAMP, Switched capacitor filter.	Design of a 12 bit CPU with few instructions and implementation and validation on FPGA	
11	Discussion of WBUT question papers, Revision & Doubt Clearing		<b>Quiz5:</b> Based on CO5. <b>Topic:</b> Design of Prototype.

## B. Daily Lesson Plan

MODULE: 1 Title: <b>Introduction to VLSI Design</b> Day 1, Tuesday, Date: 02.08.16 [11.40am to 12.30pm]
CONTENTS Introduction to VLSI Design Concepts. Discussion on course objectives and outcome, text & reference books, evaluation scheme and weekly lesson plan.
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. To gather the knowledge of Different VLSI designs Flow.
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Draw the flow chart of VLSI Design Flow and Explain [L1] 2. What are different VLSI design styles? Explain each of them. [L2]
<b>Remarks, if any</b>

MODULE: 1 Title: <b>Introduction to VLSI Design</b> Day 2, Wednesday, Date: 03.08.16 [10.00am to 10.50am]
CONTENTS Moor's Law, Scale of Integration (SSI, MSI, LSI, VLSI, ULSI)
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. To recognize the application areas of Moore's Law and the course in diverse disciplines. 2. To understand the level of complexity due to integration of analog and digital circuits embedded in single integrated circuit.
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. What is Moore's Law? Justify it. [L1]. 2. Does the Moore's law satisfy the modern integration Technology? [L2]
<b>Remarks, if any</b>

MODULE: 1 Title: <b>Introduction to VLSI Design</b> Day 3, Thursday, Date: 04.08.16 [2.10pm to 3.00pm]
CONTENTS Types of VLSI Chips (Analog & Digital VLSI chips, General purpose, ASIC)
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. To understand basic difference between analog and digital VLSI chip.

2. To understand different types of ASICs available.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What is ASIC? [L1]
2. What are the different architectures available for the ASIC? [L1]
3. Explain the semi-custom and full-custom styles of VLSI System Design.
4. What are different types of integrated circuits?
5. Explain the gate-array based VLSI system design.
6. Explain the standard cell based VLSI system design.

**Remarks, if any**

MODULE: 1

Title: **Introduction to VLSI Design**

Day 4, Friday, Date: 05.08.16 [2.10pm to 3.00pm]

CONTENTS

Programmable Logic Devices. PAL

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. To understand the operation of Programmable logic devices.
2. To implement different functions using PAL

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Realize 1 bit full adder circuit using PAL. [L3]

**Remarks, if any**

MODULE: 1

Title: **Introduction to VLSI Design**

Day 5, Tuesday, Date: 09.08.16 [11.40am to 12.30pm]

CONTENTS

Programmable Logic Devices. PLA & PROM.

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. To understand the operation of Programmable logic Array and PROM.
2. To implement different functions using PLA & PROM.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Realize 1 bit full adder circuit using PLA & PROM. [L2, L3]

**Remarks, if any**

MODULE: 1

Title: **Introduction to VLSI Design**

Day 6, Wednesday, Date: 10.08.16 [10.00am to 10.50am]

<p>CONTENTS CPLD, FPGA</p>
<p>Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. To understand the Internal Architecture of CPLD &amp; FPGA.</li> <li>2. To implement different functions using CPLD &amp; FPGA.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Explain the basic building block of FPGA with diagram [L1]</li> <li>2. Explain the basic building block of CPLD with diagram [L2]</li> <li>3. Implementation of a function using CPLD &amp; FPGA. [L2, L3]</li> </ol>
<p><b>Remarks, if any</b></p>

<p>MODULE: 1 Title: <b>Introduction to VLSI Design</b> Day 7, Thursday, Date: 11.08.16 [2.10pm to 3.00pm]</p>
<p>CONTENTS Design principles (Digital VLSI –Concept of Regularity, Granularity, modularity, Localityetc)</p>
<p>Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. To understand the concept of Regularity, Granularity, modularity, Locality.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What are regularity, Granularity,modularity and Locality? [L1]</li> <li>2. What are their significances in modern IC technology? [L2]</li> </ol>
<p><b>Remarks, if any</b></p>

<p>MODULE: 1 Title: Introduction to signal and systems Day 8, Friday, Date: 12.08.16 [2.10pm to 3.00pm]</p>
<p>CONTENTS Different Design Domains (Behavioral, Structural, Physical etc.)</p>
<p>Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. To understand the VLSI Design Domains.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Draw the Y-Chart and explain the VLSI design process. [L1]</li> <li>2. What do you mean by Hierarchical Abstraction?</li> </ol>
<p><b>Remarks, if any</b></p>

<p>MODULE: 2 Title: <b>Micro-electronic Processes for VLSI Fabrication</b></p>
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Day 9, Tuesday, Date: 16.08.16 [11.40am to 12.30pm]
<p>CONTENTS</p> <p>Silicon Semiconductor Technology- An Overview, Wafer processing, Oxidation, Epitaxial deposition, Ion-implantation &amp; Diffusion.</p>
<p>Topic/Unit/Chapter Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <p>1. To understand the basics of Silicon Semiconductor Technology.</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <p>1. Explain the fabrication of SiO<sub>2</sub> using wet oxidation technique. Explain the relative merits and demerits over the dry one [L2]</p> <p>2. List the processes for fabrication of VLSI circuits. [L1]</p> <p>3. Discuss the chemical vapour deposition process for VLSI. [L1]</p> <p>4. Describe the Si oxidation mechanism. What are the uses of SiO<sub>2</sub> in VLSI circuits [L1]</p>
Remarks, if any

<p>MODULE: 2</p> <p>Title: <b>Micro-electronic Processes for VLSI Fabrication</b></p> <p>Day 10, Wednesday, Date: 17.08.16.15 [10.00am to 10.50am]</p>
<p>CONTENTS</p> <p>Cleaning, Etching, Photo-lithography – Positive &amp; Negative photo-resist.</p>
<p>Topic/Unit/Chapter Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <p>1. To understand the basics of Silicon Semiconductor Technology.</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <p>1. What is meant by a clean room class? [L2]</p> <p>2. Describe briefly how you can achieve the desired clean room condition necessary for IC fabrication. [L2]</p> <p>3. Compare wet etching and dry etching. [L2]</p> <p>4. What are different types of lithography process? [L1]</p> <p>5. Discuss the various steps of wafer preparation. [L1]</p>
Remarks, if any

<p>MODULE: 2</p> <p>Title: <b>Micro-electronic Processes for VLSI Fabrication</b></p> <p>Day 11, Thursday, Date: 18.08.16 [2.10pm to 3.00pm]</p>
<p>CONTENTS</p> <p>Basic CMOS Technology – (Steps in fabricating CMOS)</p>
<p>Topic/Unit/Chapter Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <p>1. Understand the basic steps involved in fabricating CMOS.</p>
Once the student has completed this topic/ chapter he/she will be able to answer following



<p>questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Explain with neat diagram the basic steps involved in fabrication Process flow[L3]</li> <li>2. Why is metallization needed in the final step of IC fabrication? What materials are suitable for this purpose? [L3]</li> </ol>
<b>Remarks, if any</b>

<p>MODULE: 2  Title: <b>Micro-electronic Processes for VLSI Fabrication</b>  Day 12, Friday, Date: 19.08.16 [2.10pm to 3.00pm]</p>
<p>CONTENTS  Basic n-well CMOS process</p>
<p>Topic/Unit/Chapter Objectives:  Broad Objectives of the chapter/topic are:  1. Understand the basic steps involved in fabricating NMOS process.</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Describe how anMOS device is fabricated? Use diagram to show the steps. [L2]</li> <li>2. What are the uses of poly-Si? [L2]</li> <li>3. How is metallization done in VLSI fabrication? [L2]</li> </ol>
<p><b>Quiz Based on CO1:</b></p> <ol style="list-style-type: none"> <li>i. What is meant by the term VLSI?  A device containing between  (b) <math>10^3</math> and <math>10^5</math> transistors  <math>10^5</math> and <math>10^7</math> transistors  (c) <math>10^7</math> and <math>10^9</math> transistors  (d) <math>10^9</math> and <math>10^{11}</math> transistors</li> <li>ii. Subthreshold operation occurs in  (c) Strong inversion region  (d) Weak inversion region  (c) Saturation region  (d) Cut-off region</li> </ol>
<b>Remarks, if any</b>

<p>MODULE: 2  Title: <b>Micro-electronic Processes for VLSI Fabrication</b>  Day 13, Tuesday, Date: 23.08.16 [11.40am to 12.30pm]</p>
<p>CONTENTS  Basic n-well CMOS process</p>
<p>Topic/Unit/Chapter Objectives:  Broad Objectives of the chapter/topic are:  1. Understand the basic steps involved in fabricating n-Well CMOS process</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p>

1. Draw the device structure of CMOS Inverter. [L2] 2. Show the different steps to fabricate a CMOS Inverter [L2]
<b>Remarks, if any</b>

<p>MODULE: 2  Title: <b>Micro-electronic Processes for VLSI Fabrication</b>  Day 14, Wednesday, Date: 24.08.16 [10.00am to 10.50am]</p>
<p>CONTENTS  p-well CMOS process</p>
<p>Topic/Unit/Chapter Objectives:  Broad Objectives of the chapter/topic are:  1. Understand the basic steps involved in fabricating p-Well CMOS process</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):  1. Draw the device structure of CMOS Inverter. [L2]  2. Show the different steps to fabricate a CMOS Inverter [L2]</p>
<b>Remarks, if any</b>

<p>MODULE: 2  Title: <b>Micro-electronic Processes for VLSI Fabrication</b>  Day 15, Friday, Date: 26.08.16 [2.10pm to 3.00pm]</p>
<p>CONTENTS  Twin tub Process</p>
<p>Topic/Unit/Chapter Objectives:  Broad Objectives of the chapter/topic are:  1. Understand the basic steps involved in fabricating Twin-Tub CMOS process</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):  1. Draw the device structure of CMOS Inverter. [L2]  2. Show the different steps to fabricate a CMOS Inverter [L2]</p>
<b>Remarks, if any</b>

<p>MODULE: 2  Title: <b>Micro-electronic Processes for VLSI Fabrication</b>  Day 16, Tuesday, Date: 30.08.16 [11.40am to 12.30pm]</p>
<p>CONTENTS  Twin tub Process</p>
<p>Topic/Unit/Chapter Objectives:  Broad Objectives of the chapter/topic are:  1. Understand the basic steps involved in fabricating Twin-Tub CMOS process.</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p>

1. Draw the device structure of CMOS Inverter. [L2] 2. Show the different steps to fabricate a CMOS Inverter [L2]
<b>Remarks, if any</b>

<p>MODULE: 2  Title: <b>Micro-electronic Processes for VLSI Fabrication</b>  Day 17, Wednesday, Date: 31.08.16 [10am to 10.50am]</p>
<p>CONTENTS  Layout Design Rule</p>
<p>Topic/Unit/Chapter Objectives:  Broad Objectives of the chapter/topic are:  1. Understand how to design the layout of a circuit following the design rule.</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):  1. What is DRC in context of layout design?[L2]  2. Discuss the design rules in details. [L2]</p>
<b>Remarks, if any</b>

<p>MODULE: 2  Title: <b>Micro-electronic Processes for VLSI Fabrication</b>  Day 18, Thursday, Date: 01.09.16 [2.10pm to 3.00pm]</p>
<p>CONTENTS  Stick diagram with examples</p>
<p>Topic/Unit/Chapter Objectives:  Broad Objectives of the chapter/topic are:  1. Understand the basic concepts of Stick diagram.</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):  1. What do you mean by DRC, LVS and extraction? [L2]  2. What is Stick diagram? Draw the stick diagram of CMOS 3-input NAND gate. [L3]  3. Draw the stick diagram of CMOS 2-input XOR gate. [L3]</p>
<b>Remarks, if any</b>

<p>MODULE: 3  Title: <b>CMOS for Digital VLSI Circuits</b>  Day 19, Friday, Date: 02.09.16 [2.10pm to 3.00pm]</p>
<p>CONTENTS  CMOS inverter characteristics</p>
<p>Topic/Unit/Chapter Objectives:</p>

Broad Objectives of the chapter/topic are:

1. Understand the operation of CMOS Inverter.
2. Understand the Voltage Transfer characteristics of CMOS Inverter.
3. Understand the Layout, power and area requirement

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Explain the operation of CMOS Inverter circuit [L2]
2. Show the Voltage Transfer Characteristic. [L2]

**Quiz Based on CO2:**

3. Material used for the fabrication of gate in modern MOSFET is  
(c) Highly pure si (c) Epitaxial Si  
(d) Highly pure SiO<sub>2</sub> (d) Highly doped polysilicon
4. Photo-etching is a process of  
(c) Selective removal of layer (c) Removal of photo-resist  
(d) Diffusion of impurities (d) Making dicing marks

**Remarks, if any**

MODULE: 3

Title: **CMOS for Digital VLSI Circuits**

Day 20, Tuesday, Date: 06.09.16 [11.40am to 12.30pm]

CONTENTS

CMOS inverter characteristics

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. Understand the calculation of different parameters and design of CMOS inverter.
2. Understand the Noise Immunity and Noise Margin.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What is noise immunity and noise margin? [L1]
2. How to calculate the different voltages involved to draw the Voltage Transfer Characteristics. [L2]
3. How to design a CMOS Inverter? [L2]
4. Draw the Layout and Stick diagram of CMOS Inverter. [L3]

**Remarks, if any**

MODULE: 3

Title: **CMOS for Digital VLSI Circuits**

Day 21, Wednesday, Date: 07.09.16 [10am to 10.50am]

CONTENTS

NAND & NOR Gates

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. Understand the design procedure for implementing CMOS NAND and NOR gates.

<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. How to design CMOS Logic gates? [L2]</li> <li>2. Draw the Layout and Stick diagram of CMOS NAND and NOR gates.[L3]</li> </ol>
<b>Remarks, if any</b>

<p>MODULE: 3  Title: <b>CMOS for Digital VLSI Circuits</b>  Day 22, Thursday, Date: 08.09.16 [2.10pm to 3.00pm]</p>
<p>CONTENTS  CMOS logic circuits</p>
<p>Topic/Unit/Chapter Objectives:  Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Understand the design procedure for implementing CMOS logic circuits.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. How to design any CMOS Logic circuits? [L3]</li> <li>2. Draw the Layout and Stick diagram of CMOS Logic gates and simple logic circuits. [L3]</li> </ol>
<b>Remarks, if any</b>

<p>MODULE: 3  Title: <b>CMOS for Digital VLSI Circuits</b>  Day 23, Friday, Date: 09.09.16 [2.10pm to 3.00pm]</p>
<p>CONTENTS  Complex logic circuits</p>
<p>Topic/Unit/Chapter Objectives:  Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Understand the design procedure for implementing Complex CMOS logic circuits.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Draw the Layout and Stick diagram of CMOS complex logic circuits. [L3]</li> </ol>
<b>Remarks, if any</b>

<p>MODULE: 3  Title: <b>CMOS for Digital VLSI Circuits</b>  Day 24, Tuesday, Date: 13.09.16 [11.40am to 12.30pm]</p>
<p>CONTENTS  Complex logic circuits.</p>
<p>Topic/Unit/Chapter Objectives:  Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Knowledge on designing complex logic circuits</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p>

1. Draw the Layout and Stick diagram of CMOS complex logic circuits. [L3]
<b>Remarks, if any</b>
MODULE: 3 Title: <b>CMOS for Digital VLSI Circuits</b> Day 25, Wednesday, Date: 14.09.16 [10.00pm to 10.50am]
CONTENTS CMOS Full Adder
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. Understand the design procedure for implementing CMOS Full Adder Circuit.</li> <li>2. Simplification of designing by using suitable techniques</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): <ol style="list-style-type: none"> <li>1. Design a CMOS Half Adder Circuit. [L3]</li> <li>2. Draw the CMOS full adder circuit and explain its operation. [L3]</li> <li>3. Draw Stick diagram of CMOS complex logic circuits. [L3]</li> </ol>
<b>Remarks, if any</b>
MODULE: 3 Title: <b>CMOS for Digital VLSI Circuits</b> Day 26, Thursday, Date: 15.09.16 [2.10pm to 3.00pm]
CONTENTS CMOS Transmission GATE
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. Understand the operation of Transmission GATE</li> <li>2. Reduction of the complexity using transmission gate technology.</li> <li>3. Knowledge on designing complex logic circuits using transmission gate</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): <ol style="list-style-type: none"> <li>1. Realize a 2:1MUX using CMOS Transmission gate. [L5]</li> <li>2. Design two inputs X-OR gate using CMOS Transmission gate. [L5]</li> <li>3. Realize a function using CMOS Transmission gate. [L5]</li> </ol>
<b>Remarks, if any</b>
MODULE: 3 Title: <b>CMOS for Digital VLSI Circuits</b> Day 27, Friday, Date: 16.09.16 [2.10pm to 3.00pm]
CONTENTS Sequential CMOS logic circuits, SR Latch circuit
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. Understand the design procedure for implementing Sequential CMOS logic circuits.</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): <ol style="list-style-type: none"> <li>1. Design a CMOS NAND Based SR Latch Circuit. [L3]</li> </ol>
<b>Remarks, if any</b>
MODULE: 3 Title: <b>CMOS for Digital VLSI Circuits</b> Day 28, Tuesday, Date: 27.9.16 [11.40am to 12.30pm]

<p><b>CONTENTS</b> Sequential CMOS logic circuits, SR Latch circuit</p>
<p>Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Understand the design procedure for implementing Sequential CMOS logic circuits.</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Design a CMOS NOR Based SR Latch Circuit. [L3]</p>
<p><b>Remarks, if any</b></p>
<p>MODULE: 3 Title: <b>CMOS for Digital VLSI Circuits</b> Day 29, Wednesday, Date: 28.9.16 [10.00pm to 10.50am]</p>
<p><b>CONTENTS</b> Clocked JK Latch/ Master-Slave JK</p>
<p>Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Understand the design procedure for implementing CMOS Clocked JK Latch/ Master-Slave JKFF Circuit.</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Design a CMOS NAND Based Clocked JK Latch/ Master-Slave JK FF Circuit. [L3]</p>
<p><b>Remarks, if any</b></p>
<p>MODULE: 3 Title: <b>CMOS for Digital VLSI Circuits</b> Day 30, Thursday, Date: 29.09.16 [2.10pm to 3.00pm]</p>
<p><b>CONTENTS</b> CMOS D-latch &amp; Edge triggered flip-flop</p>
<p>Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Understand the design procedure for implementing CMOS Clocked JK D FF Circuit.</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Realize a D FF using CMOS Transmission gate. [L6]</p>
<p><b>Remarks, if any</b></p>
<p>MODULE: 4 Title: <b>Analog VLSI Circuits</b> Day 31, Tuesday, Date: 04.10.16 [11.40am to 12.30pm]</p>
<p><b>CONTENTS</b> Analog VLSI design steps, Basic building blocks of Analog VLSI chips</p>
<p>Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Understand the design steps involved in designing Analog VLSI processes. 2. Understand the Basic building blocks of Analog VLSI chips.</p>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. What are the different steps involved in designing analog IC? [L1] 2. What are the Basic building blocks of Analog VLSI chips? [L1]</p>

<b>Remarks, if any</b>
MODULE: 4 Title: <b>Analog VLSI Circuits</b> Day 32, Wednesday, Date: 05.10.16 [10.00pm to 10.50am]
CONTENTS MOS switch, Active load / resistors; Voltage dividers
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. To gather the Knowledge of using the MOSFET as a switch, resistor.</li> <li>2. To understand the operation of voltage divider.</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): <ol style="list-style-type: none"> <li>1. What is a MOS switch? [L2]</li> <li>2. How is it different from CMOS switch? [L4]</li> <li>3. Draw the resistance characteristics of the CMOS switch. [L3]</li> <li>4. What is MOS diode/active resistor? [L1]</li> <li>5. Draw the small signal equivalent circuit and find the expression for output resistance. [L5]</li> <li>6. Explain with circuit diagram and necessary expressions how voltage division is achieved using MOS circuits. [L4]</li> </ol>
<b>Remarks, if any</b>
MODULE: 4 Title: <b>Analog VLSI Circuits</b> Day 33, Tuesday, Date: 18.10.16 [11.40am to 12.30pm]
CONTENTS CMOS Current source & sink
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. Understand the Characteristics of CMOS Current source &amp; sink.</li> <li>2. To apply the technique to increase the output resistance.</li> <li>3. Understand the operation of cascade current sink.</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): <ol style="list-style-type: none"> <li>1. Explain how a MOSFET can be used as Current source &amp; sink. [L4]</li> <li>2. Explain the operation of the MOS current reference circuit with circuit diagram. [L3]</li> <li>3. How the output resistance of current sink can be increased? [L5]</li> <li>4. Draw the equivalent circuit of cascade current sink and explain its operation. [L2]</li> </ol>
<b>Remarks, if any</b>
MODULE: 4 Title: <b>Analog VLSI Circuits</b> Day 34, Wednesday, Date: 19.10.16 [10.00pm to 10.50am]
CONTENTS Current Mirror
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. Understand the operation of Current mirror circuit</li> <li>2. Understand the deviation from ideal situation</li> <li>3. Realization of cascade current mirror</li> </ol>



<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What is the principle of operation of a current mirror? [L2]</li> <li>2. How the circuit is affected due to deviation from ideal situation. [L5]</li> <li>3. What is the principle of operation of a cascade current mirror? [L2]</li> </ol>
<p><b>Remarks, if any</b></p>
<p>MODULE: 4  Title: <b>Analog VLSI Circuits</b>  Day 35, Thursday, Date: 20.10.16 [2.10pm to 3.00pm]</p>
<p>CONTENTS  CMOS Differential amplifier</p>
<p>Topic/Unit/Chapter Objectives:  Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Understand the operation of CMOS differential amplifier.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Draw the CMOS differential amplifier circuit and explain how it works as a differential amplifier? [L2]</li> </ol>
<p><b>Quiz Based on CO3:</b></p> <ol style="list-style-type: none"> <li>iii. AND terms are realized by which connections of NMOS in PDN <ul style="list-style-type: none"> <li>(c) Series (c) parallel</li> <li>(d) Cascade (d) Either Series or Parallel</li> </ul> </li> <li>iv. Which one effect does not cause any deviation of a Current Mirror circuit from the ideal situation? <ul style="list-style-type: none"> <li>(c) Channel length modulation (c) imperfect geometrical matching</li> <li>(d) Threshold offset between the two transistors (d) DIBL effects</li> </ul> </li> </ol>
<p><b>Remarks, if any</b></p>
<p>MODULE: 4  Title: <b>Analog VLSI Circuits</b>  Day 36, Friday, Date: 21.10.16 [2.10pm to 3.00pm]</p>
<p>CONTENTS  Output amplifiers</p>
<p>Topic/Unit/Chapter Objectives:  Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Understand the operation of Output amplifier.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What are purposes of an output amplifier? [I2]</li> <li>2. What are the implementation schemes? [L4]</li> </ol>
<p><b>Quiz Based on CO4:</b></p> <ol style="list-style-type: none"> <li>i. The full form of VHDL is <ul style="list-style-type: none"> <li>(a) Very High Digital Logic (b) Verilog Hardware Description Language</li> </ul> </li> </ol>

<p>(c) Very High Speed Digital Logic (d) None of these</p> <p>ii. In VHDL, Sequential statements are defined in the</p> <p>(a) Architecture (b) Process (c) Package (d) None of these</p>
<b>Remarks, if any</b>
<p>MODULE: 4</p> <p>Title: <b>Analog VLSI Circuits</b></p> <p>Day 37, Tuesday, Date: 25.10.16 [11.40am to 12.30pm]</p>
<p>CONTENTS</p> <p>CMOS OPAMP</p>
<p>Topic/Unit/Chapter Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Understand the basic building blocks of CMOS OPAMP.</li> <li>2. Compensation of CMOS OPAMP and its use.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What are basic building blocks of CMOS OPAMP? Draw them. [L3]</li> <li>2. What is compensation of CMOS OPAMP and why is it used?</li> </ol>
<b>Remarks, if any</b>
<p>MODULE: 4</p> <p>Title: <b>Analog VLSI Circuits</b></p> <p>Day 38, Wednesday, Date: 26.10.16 [10.00pm to 10.50am]</p>
<p>CONTENTS</p> <p>Resistor Realization using Switched capacitor</p>
<p>Topic/Unit/Chapter Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Understand the operation of a switched capacitor.</li> <li>2. Purpose of using switched capacitor instead of a resistor.</li> <li>3. Realization of resistor using switched capacitor.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Realize a resistor using switched capacitor. [L5]</li> <li>2. What are the basic advantages and limitations of a switched capacitor? [L5]</li> <li>3. Explain the working of a switched capacitor first order LPF with circuit diagram. [L3]</li> </ol>
<b>Remarks, if any</b>
<p>MODULE: 4</p> <p>Title: <b>Analog VLSI Circuits</b></p> <p>Day 39, Thursday, Date: 27.10.16 [2.10pm to 3.00pm]</p>
<p>CONTENTS</p> <p>Switched capacitor Filter</p>
<p>Topic/Unit/Chapter Objectives:</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Understand the design steps involved in designing switched capacitor filter.</li> <li>2. Understand the operation of switched capacitor filter.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Explain the working of a switched capacitor first order LPF with circuit diagram. [L3]</li> </ol>

**Quiz Based on CO5:**

i. In VHDL, Components must be declared

- (e) Within the architecture body
- (f) Anywhere in the program
- (g) In a separate VHDL file
- (h) Within the entity declaration

ii. The if-else statements must be

- (e) Within a process block
- (f) Within the architecture body
- (g) Under the entity declaration
- (h) Within a while loop**

Remarks, if any

**(x) Teaching Strategy/Method**

- **Learning by Recapitulating** the previous knowledge and understanding the topic based on memorizing them. If students fail to give any answer of the questions from the previous semesters it is advised to cover the topics from books, internet or any other resources. Sometimes video lecture, NPTEL study materials are very much useful for the students to clear their doubt. So resources are provided them to gather knowledge. Students share their knowledge through verbal discussion or by using social networks keeping in mind that “it is easy to gather knowledge but it is not so easy to assimilate”. Sharing of knowledge can increase the level of knowledge.
- **Drawing suitable Analogy:** Wherever necessary analogy helps the students to make them understand in better way.
- **Solving the numerical problems** not only engage the students but also help them to think, understand and write the topic. Doubts are cleared during solving a problem.
- **Simulation** through EDA tools validates the theoretical knowledge. Sometimes the students expect the result of the theoretical part by simulating the circuit or any model. In this way their interest level may be uplifted.
- **Question and Answer sessions** clears the doubts. If the questions are repeatedly asked and the answers are also discussed repeatedly the weak students can remember them very easily. Next time they will be able to answer.

### **(xa) Strategy to support weak students**

- Forming a pair with the bright students
- Reviewing the real problem sympathetically. Motivating them to do the classes regularly and encouraging by floating easy questions in the theory classes.
- Advising them for getting additional help from teachers as well as bright student.
- Providing continuous assistance.
- Additional doubt clearing sessions (Beyond Class hours)

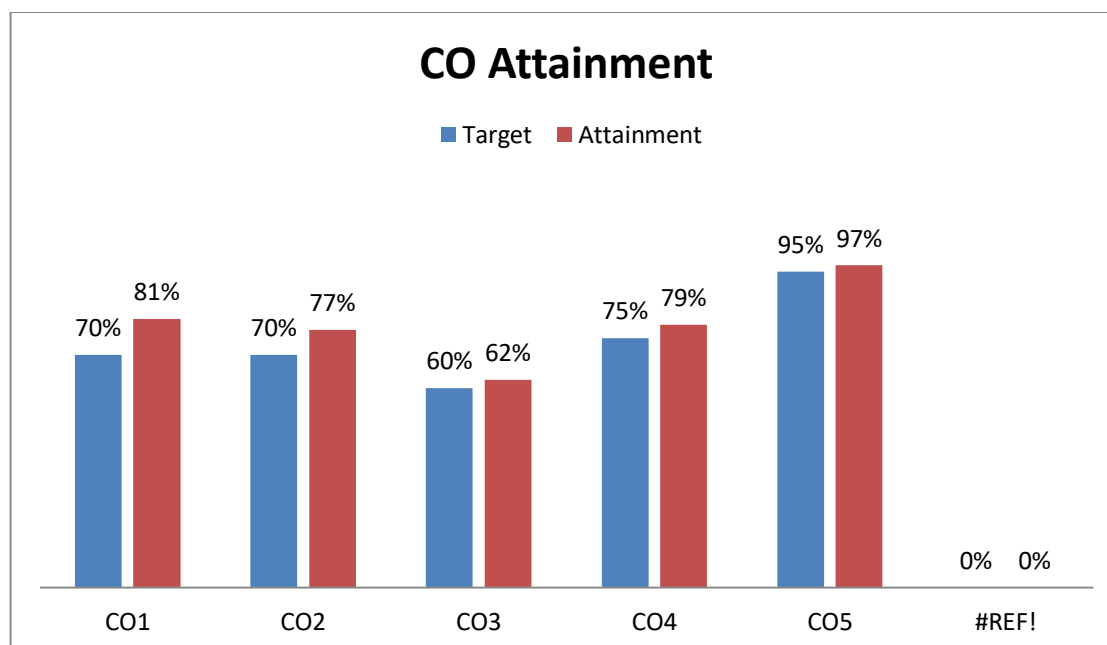
### **(xb) Strategy to encourage bright students**

- Involving them to solve complex numerical problems.
- Motivate them to write paper for publications. Thus they got the knowledge about the topic and know the emerging technologies, find the gap and try to bridge it.
- Giving Board work or power point presentation on a given topic.
- Bright students are involved to boost up the weak students. Sometimes it is the measuring parameter for the bright students that how much extent they can lift the weak students.

### **(xc) Efforts to keep students engaged**

- Giving numerical problem or writing something on a topic and finally the copies are checked by other students arbitrarily chosen. The accepted answer will be finally explained by few of them.
- Providing Questionnaire session. Any student may be asked to answer the question. Other students will be randomly chosen to justify the answers.
- To write the questions they may have and try to find out the solutions after discussion among them.

### (xi) Analysis of Students performance in the course (Internal Results)



- 81% students have attained the set target of 70% marks for CO1
- 77% students have attained the set target of 70% marks for CO2
- 62% students have attained the set target of 60% marks for CO3
- 79% students have attained the set target of 75% marks for CO4
- 97% students have attained the set target of 95% marks for CO5

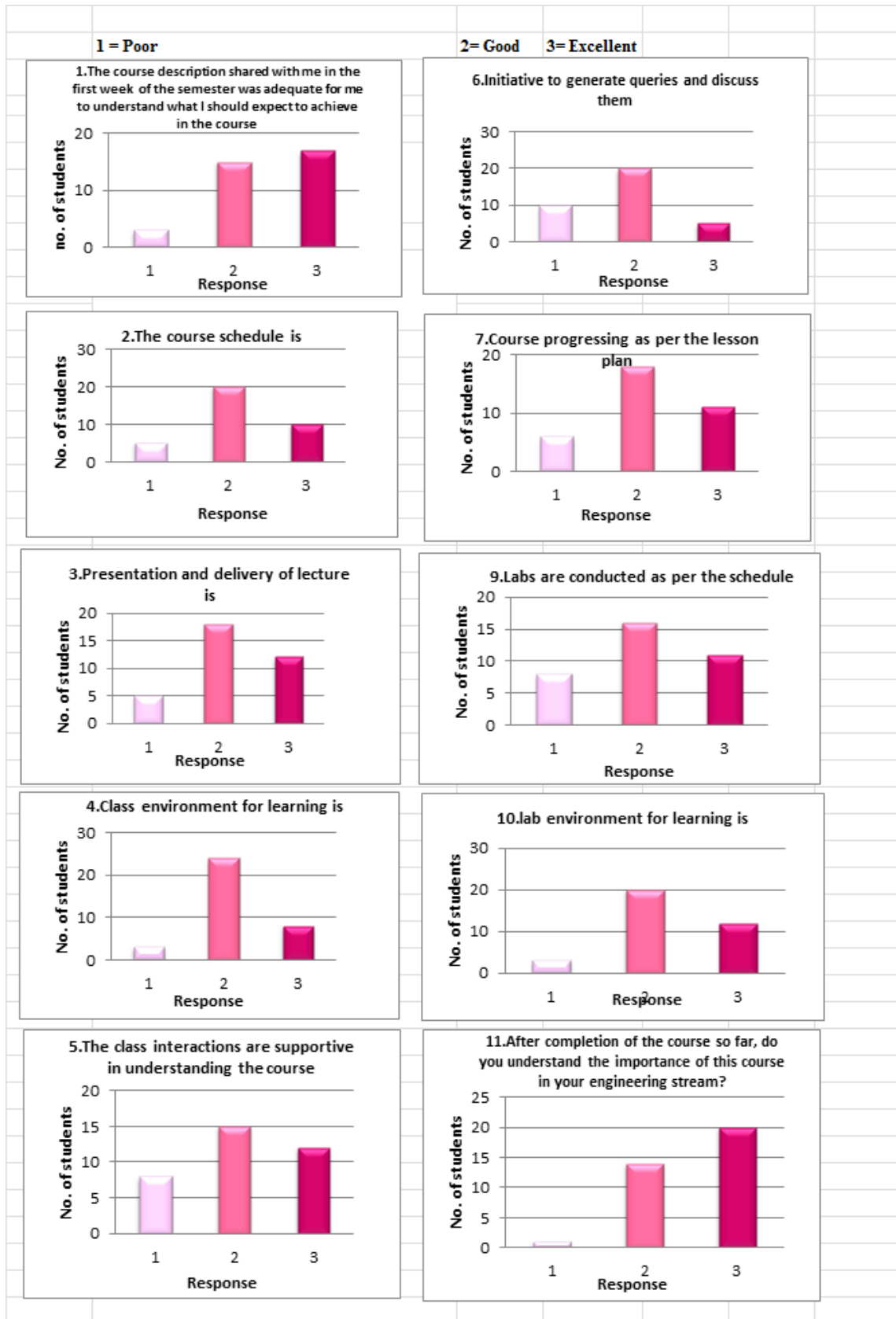
### (xii) Analysis of Students performance in the course (University Results)

	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME
University	70%	31	28	90%

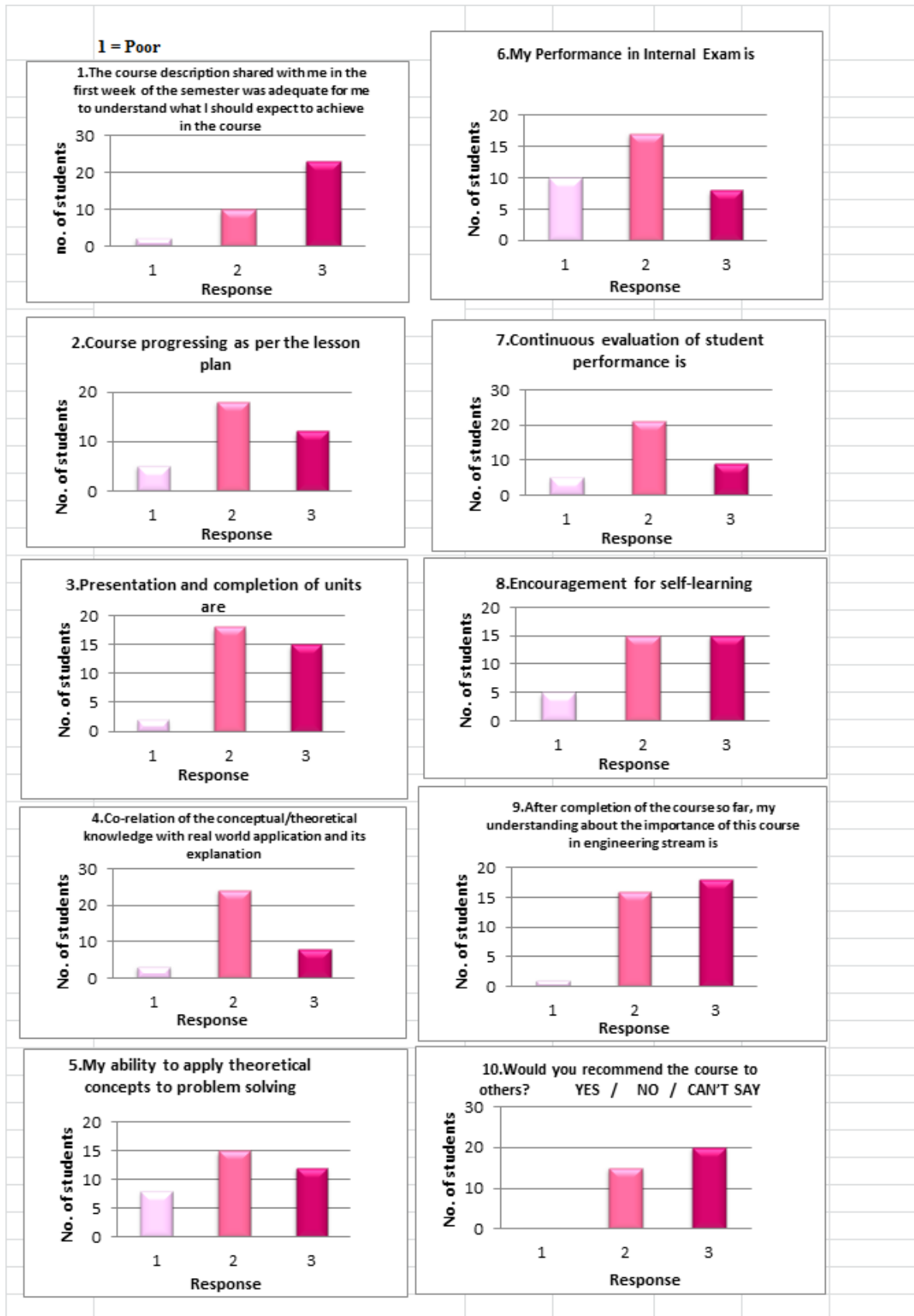
- 90% students have attained the set target of 70% marks for University Exams

## (xiii) Analysis of Student Feed Back

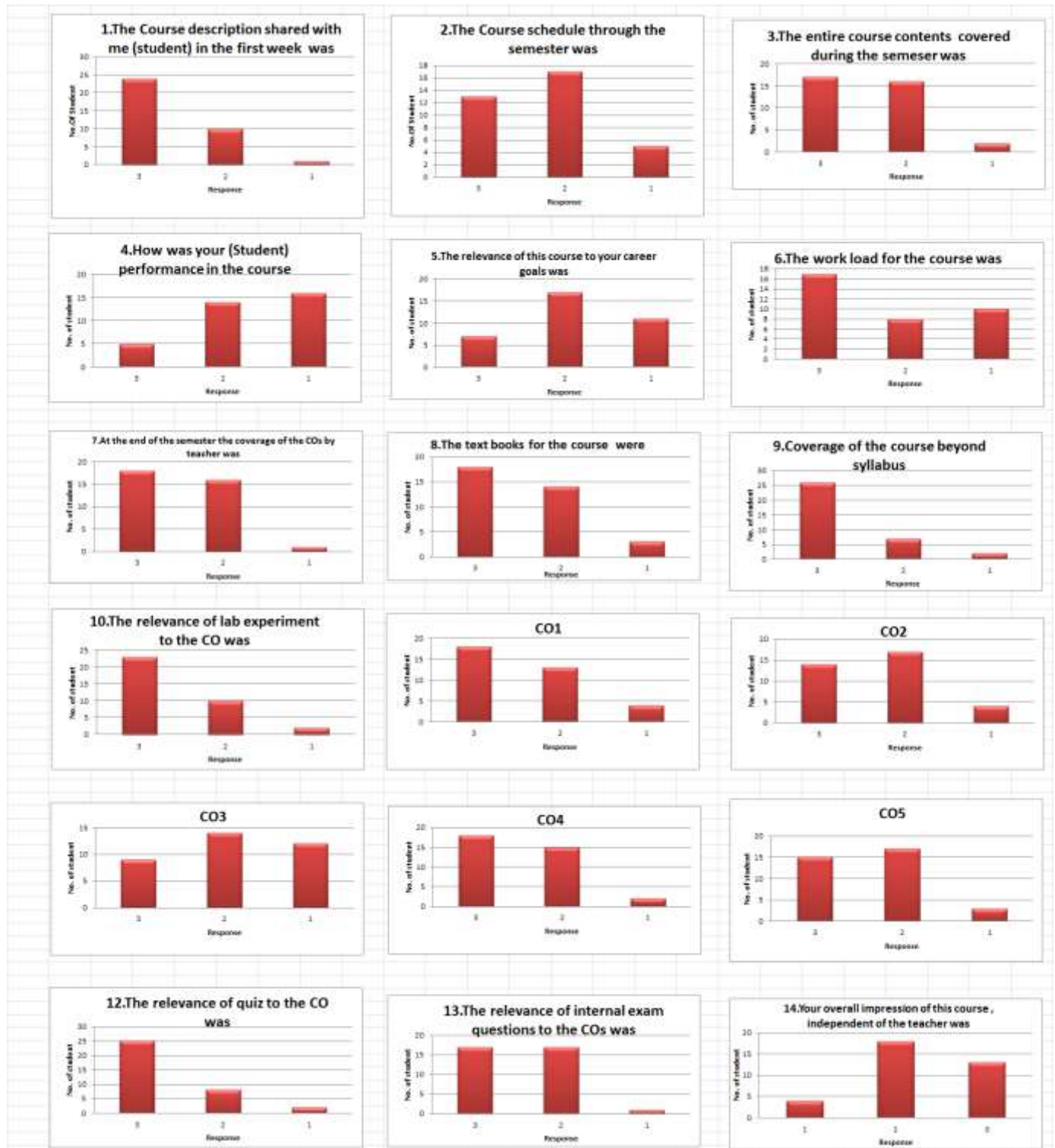
Formative:



**Summative:**



## CO-Based:





#### **(xiv) Teacher Self-Assessment (at the completion of course)**

From the graphical analysis of the results obtained, it can be seen that most of the course outcome have been achieved successfully by the students but the set target for CO 3 has just touched the attainment level due to difficulty in understanding the analog VLSI circuits to which they are exposed for the first time.

#### **(xv) Recommendations/Suggestions for improvement by faculty**

- More emphasis should be given to clear the concepts related to Analog VLSI circuits.

# INTERNAL ASSESMENT RECORD

Subject with code: *Microelectronics and VLSI Designs (EC- 702)*

Semester : 7<sup>th</sup>Sem, 2016 Discipline: ELECTRONICS & COMMUNICATION ENGINEERING

S. No.	Name	Roll No.	Attendance		Marks in Internal Test				Quiz (10)	Total (30)
			Total	Marks (5)	I (30)	II (30)	Avg. of 2 tests (30)	Internal Marks (15)		
1.	ANKITA SINGH	11900313002	78%	5	16	16	16	8	8	21
2.	APURBA ROY	11900313003	75%	5	24	24	24	12	10	27
3.	ARNAV GHOSH	11900313004	81%	5	24	21	22.5	11.25	8	24.25
4.	ARUNDHUTEE DUTTA	11900313005	80%	5	25	21	23	11.5	10	26.5
5.	AVEEK SAHA	11900313006	90%	5	22	23	22.5	11.25	9	25.25
6.	AVERI RAY	11900313007	82%	5	15	14	14.5	7.25	10	22.25
7.	AYANTIKA DEY	11900313008	75%	5	26	27	26.5	13.25	10	28.25
8.	BIKKY ROKA	11900313009	85%	5	20	18	19	9.5	9	23.5
9.	BIKRAM CHAKRABORTY	11900313010	83%	5	20	19	19.5	9.75	9	23.75
10.	DEBABRATA BANERJEE	11900313011	92%	5	25	22	23.5	11.75	8	24.75
11.	DEBASHISH MUKHERJEE	11900313012	80%	5	23	18	20.5	10.25	8	23.25
12.	DHRITIKANTA DAS	11900313014	96%	5	23	20	21.5	10.75	10	25.75
13.	DIBAKAR SAHA	11900313015	75%	5	20	20	20	10	10	25

14.	DIPAYAN BHATTACH ARYA	11900313016	79%	5	25	22	23.5	11.75	8	24.75
15.	DISHA MANDAL	11900313017	86%	5	22	26	24	12	10	27
16.	KUNDAN KUMAR CHOURASIA	11900313019	89%	5	27	26	26.5	13.25	10	28.25
17.	MANORANJ AN KUMAR	11900313020	75%	5	24	21	22.5	11.25	6	22.25
18.	MAYANK KUMAR	11900313021	76%	5	19	24	21.5	10.75	10	25.75
19.	MD NASIR KHAN	11900313022	81%	5	24	23	23.5	11.75	10	26.75
20.	MONA	11900313023	90%	5	21	20	20.5	10.25	8	23.25
21.	MUNNA PRASAD KOIRI	11900313024	82%	5	22	22	22	11	9	25
22.	NAVIN KUMAR	11900313025	85%	5	21	22	21.5	10.75	9	24.75
23.	NIDHI PRIYA	11900313026	75%	5	20	20	20	10	9	24
24.	PANKAJ GUPTA	11900313028	81%	5	25	16	20.5	10.25	9	24.25
25.	PARTHA SARMA	11900313029	85%	5	20	18	19	9.5	7	21.5
26.	PRADYUT DATTA	11900313030	84%	5	21	18	19.5	9.75	8	22.75
27.	PRAGATI KUMARI	11900313031	85%	5	25	24	24.5	12.25	9	26.25
28.	PRAGYA ROY CHOWDHU RY	11900313032	83%	5	22	20	21	10.5	9	24.5
29.	PRANOY	11900313033	96%	5	19	23	21	10.5	9	24.5

	DAS									
30.	PRAVEEN KUMAR OJHA	11900313034	95%	5	23	24	23.5	11.75	7	23.75
31.	SOUVIK BOSE	11900314044	75%	5	22	14	18	9	9	23

## RECORDS OF QUIZ

Subject with code: *Microelectronics and VLSI Designs (EC- 702)*

&

VLSI Design Lab(EC792)

Semester : 7<sup>th</sup>Sem, 2016 Discipline: ELECTRONICS & COMMUNICATION ENGINEERING

Sl. No	Name	Roll No.	Quiz1	Quiz2	Quiz3	Quiz4	Quiz5
1.	ANKITA SINGH	11900313002	1	1	2	2	2
2.	APURBA ROY	11900313003	2	2	2	2	2
3.	ARNAV GHOSH	11900313004	2	2	1	1	2
4.	ARUNDHUT EE DUTTA	11900313005	2	2	2	2	2
5.	AVEEK SAHA	11900313006	2	2	1	2	2
6.	AVERI RAY	11900313007	2	2	2	2	2
7.	AYANTIKA DEY	11900313008	2	2	2	2	2
8.	BIKKY ROKA	11900313009	2	2	1	2	2
9.	BIKRAM	11900313010	2	2	1	2	2

	CHAKRABORTY						
10.	DEBABRATA BANERJEE	11900313011	1	2	1	2	2
11.	DEBASHISH MUKHERJEE	11900313012	2	2	1	1	2
12.	DHRITIKANTA DAS	11900313014	2	2	2	2	2
13.	DIBAKAR SAHA	11900313015	2	2	2	2	2
14.	DIPAYAN BHATTACHARYA	11900313016	1	1	2	2	2
15.	DISHA MANDAL	11900313017	2	2	2	2	2
16.	KUNDAN KUMAR CHOURASIA	11900313019	2	2	2	2	2
17.	MANORANJAN KUMAR	11900313020	1	1	1	1	2
18.	MAYANK KUMAR	11900313021	2	2	2	2	2
19.	MD NASIR KHAN	11900313022	2	2	2	2	2
20.	MONA	11900313023	1	2	1	2	2
21.	MUNNA PRASAD KOIRI	11900313024	2	1	2	2	2
22.	NAVIN KUMAR	11900313025	2	2	1	2	2
23.	NIDHI PRIYA	11900313026	2	2	1	2	2
24.	PANKAJ GUPTA	11900313028	2	1	2	2	2

25.	PARTHA SARMA	11900313029	1	2	1	2	1
26.	PRADYUT DATTA	11900313030	2	1	1	2	2
27.	PRAGATI KUMARI	11900313031	2	1	2	2	2
28.	PRAGYA ROY CHOWDHU RY	11900313032	2	2	1	2	2
29.	PRANOY DAS	11900313033	2	1	2	2	2
30.	PRAVEEN KUMAR OJHA	11900313034	1	1	1	2	2
31.	SOUVIK BOSE	11900314044	2	2	2	1	2

## LIST OF PRACTICALS

Subject with code: VLSI Design Lab (EC- 792)

Semester : 7<sup>th</sup>Sem, 2016

**Discipline: ELECTRONICS & COMMUNICATION ENGINEERING**

Sl.	Details of Experiment(s)	Hours allotted
1	Familiarity with Spice simulation tool& EDA tools	6.
2	Spice Simulation of Inverter , NAND , NOR Gates and different analysis using EDA Tools	6
3	Design of CMOS XOR/XNOR Gates and different analysis using EDA Tools	3
4	Design of CMOS Full adder and different analysis using EDA Tools	3
5	Design of CMOS Flip flops ( R-S ,D , J-K)and different analysis using EDA Tools	3
6	Design of 8 bit synchronous Counter and different analysis using EDA Tools	3
7	Design of 8 bit bi-directional register and different analysis using EDA Tools	3
8	Design of a 12 bit CPU with few instructions and implementation and validation on FPGA	3

# Sessional/Practical Performance Record

Subject with code: VLSI Design Lab (EC- 792)

Semester : 7<sup>th</sup>Sem, 2016 Group: A

Discipline: ELECTRONICS & COMMUNICATION ENGINEERING

Sl.No.	Name	Roll No.	Marks in experimentation								TOTAL (40)
			1	2	3	4	5	6	7	8	
1.	ANKITA SINGH	11900313002	5	4	5	5	4	3	3	2	32
2.	APURBA ROY	11900313003	4	4	5	5	5	5	5	2	35
3.	ARNAV GHOSH	11900313004	4	5	4	5	4	4	4	2	32
4.	ARUNDHUTEE DUTTA	11900313005	4	5	4	4	3	4	4	2	30
5.	AVEEK SAHA	11900313006	4	5	4	4	5	5	4	2	33
6.	AVERI RAY	11900313007	4	5	4	4	4	4	4	2	31
7.	AYANTIKA DEY	11900313008	3	0	3	2	4	4	5	2	23
8.	BIKKY ROKA	11900313009	4	5	5	4	4	4	3	2	31
9.	BIKRAM CHAKRABORTY	11900313010	4	5	5	5	4	3	3	2	31
10.	DEBABRATA BANERJEE	11900313011	4	5	5	5	5	5	5	2	36
11.	DEBASHISH MUKHERJEE	11900313012	4	5	5	5	5	4	4	2	34
12.	DHRITIKANA DAS	11900313014	4	5	5	5	4	5	4	2	34
13.	DIBAKAR SAHA	11900313015	4	5	4	4	4	3	3	2	29
14.	DIPAYAN BHATTACHARY A	11900313016	4	5	5	4	4	5	4	2	33
15.	DISHA	11900313017	4	5	5	4	4	5	3	2	32



	MANDAL										
16.	KUNDAN KUMAR CHOURASIA	11900313019	4	5	5	4	4	5	4	2	33
17.	MANORANJAN KUMAR	11900313020	4	5	5	4	5	5	5	2	35
18.	MAYANK KUMAR	11900313021	4	5	5	5	5	5	5	2	36
19.	MD NASIR KHAN	11900313022	4	5	5	5	5	4	4	2	34
20.	MONA	11900313023	4	5	5	5	4	4	3	2	32
21.	MUNNA PRASAD KOIRI	11900313024	4	5	5	5	5	4	5	2	35
22.	NAVIN KUMAR	11900313025	4	5	4	4	4	4	3	2	30
23.	NIDHI PRIYA	11900313026	4	5	5	5	5	4	4	2	34
24.	PANKAJ GUPTA	11900313028	4	5	4	4	4	4	3	2	30
25.	PARTHA SARMA	11900313029	4	3	3	2	4	3	3	2	24
26.	PRADYUT DATTA	11900313030	4	5	4	4	4	4	3	2	30
27.	PRAGATI KUMARI	11900313031	4	5	5	5	4	4	3	2	32
28.	PRAGYA ROY CHOWDHURY	11900313032	4	3	4	3	4	4	4	2	28
29.	PRANOY DAS	11900313033	4	5	5	5	5	4	3	2	33
30.	PRAVEEN KUMAR OJHA	11900313034	4	5	5	5	5	5	5	2	36
31.	SOUVIK BOSE	11900314044	4	3	3	4	3	4	3	0	24

**NAME WITH ROLL Nos. OF STUDENT WHOSE ACADEMIC PERFORMANCE IS NOT SATISFACTORY**

Sl.	Name of Student	Roll No.	Remedial measures taken by teacher
1	BIKRAM CHAKRABORTY	11900313010	<ul style="list-style-type: none"><li>• Additional doubt clearing sessions</li><li>• Providing extra Viva-Voce to students with poor attendance.</li><li>• Guiding them through previous question papers</li><li>• Highlighting important and frequently asked questions</li></ul>
2	ANKITA SINGH	11900313002	
3	PARTHA SARMA	11900313029	

# CERTIFICATE

I, the undersigned, have completed the course allotted to me as shown below

Sl. No.	Semester	Subject with Code	Total Modules	Remarks
1.	7th	<i>Microelectronics and VLSI Designs (EC- 702) &amp;VLSI Design Lab (EC- 792)</i>	04	

Date :

**Signature of Faculty**

## Submitted to HOD

### Certificate by HOD

I, the undersigned, certify that **Prof. Manas kumar Parai & Prof. Saroj Mondal** have completed the course work allotted to them satisfactorily/ not satisfactorily.

Date :

**Signature of HOD**

## Submitted to Director

Date :

**Signature of Director**



**SILIGURI INSTITUTE OF TECHNOLOGY**  
**INFORMATION TECHNOLOGY**



# **COURSE FILE**

**2<sup>ND</sup> SEM, 3<sup>RD</sup> YEAR, 2017**

**PAPER NAME : Database Management System**

**PAPER CODE : IT 601 & IT 691**

## **Vision of IT dept.**

To produce competent IT professionals who will contribute towards the advancement of engineering, science and technology for the benefit of society, industry and academia.

## **Mission of IT dept.**

- To impart quality and value based education towards achieving excellence in teaching-learning and inculcate research environment.
- To produce successful graduates with professional ethics, responsibilities and commitment towards the society.
- To enable graduates for providing effective solutions to real life engineering problems and thereby incorporate self-development entrepreneurship skills.

## **Program educational objectives (PEOs) of IT dept.**

### **The graduates will be:**

- Work productively as IT Engineers, including supportive and leadership roles in multidisciplinary domain with ethical values.
- Solve real life problems as qualified professionals with a commitment towards society and environment.
- Be adapted to new technologies with an attitude towards lifelong learning
- Imbibe Research and Development, and Entrepreneurships in the modern computing environment.

## **Program outcomes (PO)**

### **Engineering Graduates will be able to:**

**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PSOs of IT Dept**

PSO1: Apply fundamental knowledge of mathematics, basic science & engineering and programming aptitude to identify and define the basic computations.

PSO2: Use of programming languages, computer organization & architecture, algorithmic principles & database for the design of computing systems in a way that demonstrates the construction of software systems of varying complexity.

PSO3: Take up higher studies and will be able to work professionally in software industries and implement projects in recent technologies.

# Course File

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Course Title/Code: Database Management System/IT601 & IT691

Semester:- 2<sup>nd</sup> Year:- 3<sup>rd</sup>

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Name of the Faculty: Prof. Sathi Balll  
E-mail: sathiball@gmail.com

## Theory Class Schedule :

Day	Monday	Tuesday	Friday
Timing	3.50 pm - 4.40 pm	10.00am - 11.40am	10.50am - 11.40am

## Practical Class Schedule :

Day	Monday
Timing	10.00am - 12.30pm (All)

## Hours for meeting students: (by appointment)

Day	Tuesday	Wednesday	Thursday	Friday
Timing	3.50 pm - 4.45 pm	3.50 pm - 4.45 pm	3.50 pm - 4.45 pm	3.50 pm - 4.45 pm

## i) Course Objective

Students will be able to design normalized database and apply it to build secure and efficient applications.

## ii) Course Outcomes

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes :

CODE	OUTCOME	TARGET
IT601.1	<b>Explain</b> the fundamentals of DBMS and design of logical databases using design principles of ERD and relate the logic with RDBMS. [ <b>BT - Level - 2</b> ]	60% marks
IT601.2	<b>Identify</b> query processing methodologies of Relational Algebra, Relational Calculus and determine the query optimization techniques. [ <b>BT - Level - 4</b> ]	60% marks
IT601.3	<b>Construct</b> simple and moderately advanced database queries using SQL and PL/SQL blocks for ensuring data integrity and security. [ <b>BT - Level - 6</b> ]	60% marks
IT601.4	<b>Design</b> normalized database to simplify logical Structure. [ <b>BT - Level - 6</b> ]	60% marks
IT601.5	<b>Implement</b> the basic issues of transaction processing, concurrency control and recovery mechanisms in applications. [ <b>BT - Level - 3</b> ]	60% marks

ii) Once the student has successfully complete this course, he/she must be able to answer the following questions or perform/demonstrate the following:

SN	QUESTION	BT- LEVEL
1.	<b>What</b> do you mean by a Database Management System?	1
2.	<b>Explain</b> disadvantages of a file processing system over DBMS.	2
3.	<b>Describe</b> 3-tire Architecture of DBMS.	2
4.	<b>Define</b> E-R model.	2
5.	<b>Define</b> PROJECTION operation.	2
6.	Write the <b>functions</b> of various set operations with examples.	4
7.	<b>Explain</b> the purpose of View in SQL.	5
8.	Describe Triggers. How are they <b>created</b> ?	6
9.	<b>What</b> is Functional Dependencies? Give examples.	2
10.	<b>Discuss</b> various Normal forms with example.	6
11.	<b>What</b> do you mean by query processing? What is a query tree?	2
12.	<b>Explain</b> state transition diagram.	2
13.	<b>Construct</b> a B+ tree with the following key : ORDER- 3, KEY = 8, 5, 1, 7, 3, 12, 9, 6.	3



## **Database Management System (IT601)**

**Contact: 4L**

**Credits: 3**

### **Introduction**

Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

### **Entity-Relationship Model**

Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

### **Relational Model**

Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.

### **SQL and Integrity Constraints**

Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Sub queries, Database security application development using SQL, Stored procedures and triggers.

### **Relational Database Design**

Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF

### **Internals of RDBMS**

Physical data structures, Query optimization: join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management: transaction model properties, state serializability, lock base protocols, two phase locking.

### **File Organization & Index Structures**

File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree.

## **Database management System Lab (IT691 )**

**Contacts: 3**

**Credits: 2**

### **Structured Query Language**

#### **1. Creating Database**

- 1.Creating a Database
- 2.Creating a Table
- 3.Specifying Relational Data Types
- 4.Specifying Constraints
- 5.Creating Indexes

#### **2.Table and Record Handling**

- 1.INSERT statement
- 2.Using SELECT and INSERT together
- 3.DELETE, UPDATE, TRUNCATE statements
- 4.DROP, ALTER statements

#### **3.Retrieving Data from a Database**

- 1.The SELECT statement
- 2.Using the WHERE clause
- 3.Using Logical Operators in the WHERE clause
- 4.Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause
- 5.Using Aggregate Functions
- 6.Combining Tables Using JOINS
- 7.Subqueries

#### **4. Database Management**

- 1.Creating Views
- 2.Creating Column Aliases
- 3.Creating Database Users
- 4.Using GRANT and REVOKE

#### **5. Cursors in Oracle PL / SQL**

**Writing Oracle PL / SQL Stored Procedures**

### iii) Chapter Layout

Chapter No.	Chapter	Lecture Hours	Tutorials	Laboratory hours
Chapter - 1	Introduction	4 HRS	NOT APPLICABLE	
Chapter - 2	Entity-Relationship Model	6 HRS		
Chapter - 3	Relational Model	5 HRS		
Chapter - 4	SQL and Integrity Constraints	8 HRS		26 HRS
Chapter - 5	Relational Database Design	9 HRS		2 HRS
Chapter - 6	Internals of RDBMS	7 HRS		
Chapter - 7	File Organization & Index Structures	6 HRS		2HRS
Total		45 HRS		30 HRS

### iv) Textbooks

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. Fundamentals of Database Systems", Ramez Elmasri, S hamkant B.Navathe, Addison Wesley Publishing Edition

### v) Reference Books:

1. Ramakrishnan: Database Management System , McGraw-Hill
2. "Database Management Systems", Arun K.Majumdar, Pr itimay Bhattacharya, Tata McGraw Hill
3. James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of India, New Delhi

### (vi) Evaluation Scheme

#### 1) Theory

Evaluation Criteria	Marks
Internal Exam 1 & 2 *	15
Quiz Exam	10
Attendance	5
University Exam	70
Total	100

\* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

#### 2) LABORATORY

Evaluation Criteria	Marks
Internal Exam*	40
University Exam	60
Total	100

\* Internal Evaluation will be based on daily lab performance as per the following schedule:

**vii) Laboratory Evaluation :**

Expt. No.	Experiment Name	Schedule	Marks																														
P1	<p>Q1. a) Create a table 'STUDENT' with following structures:-</p> <table border="1"> <thead> <tr> <th>Col. Name</th> <th>Type</th> <th>Width</th> </tr> </thead> <tbody> <tr> <td>ROLL</td> <td>NUMBER</td> <td>2</td> </tr> <tr> <td>NAME</td> <td>VARCHAR2</td> <td>15</td> </tr> <tr> <td>EXAMDATE</td> <td>DATE</td> <td></td> </tr> </tbody> </table> <p>b) Add a primary key constraint on column 'NAME'.            c) Drop the primary key of the table 'STUDENT'.            d) Add a primary key on col. 'ROLL' in table 'STUDENT'.            e) Insert following data:-</p> <table border="1"> <thead> <tr> <th><i>ROLL</i></th> <th><i>NAME</i></th> <th><i>EXAMDATE</i></th> </tr> </thead> <tbody> <tr> <td>11</td> <td>Sourav</td> <td>01-JUN-10</td> </tr> <tr> <td>12</td> <td>Kamal</td> <td>01-JUN-10</td> </tr> <tr> <td>13</td> <td>Rahul</td> <td>01-JUN-10</td> </tr> <tr> <td>14</td> <td>Sovan</td> <td>01-DEC-10</td> </tr> <tr> <td>15</td> <td>Shyamal</td> <td>01-DEC-10</td> </tr> </tbody> </table>	Col. Name	Type	Width	ROLL	NUMBER	2	NAME	VARCHAR2	15	EXAMDATE	DATE		<i>ROLL</i>	<i>NAME</i>	<i>EXAMDATE</i>	11	Sourav	01-JUN-10	12	Kamal	01-JUN-10	13	Rahul	01-JUN-10	14	Sovan	01-DEC-10	15	Shyamal	01-DEC-10	1 HRS	3
Col. Name	Type	Width																															
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15	Shyamal	01-DEC-10																															
P2	<p>Q2. a) Create a table 'MARKS' with following structures:-</p> <table border="1"> <thead> <tr> <th>Col. Name</th> <th>Type</th> <th>Width</th> </tr> </thead> <tbody> <tr> <td>ROLL</td> <td>NUMBER</td> <td>2</td> </tr> <tr> <td>MATH</td> <td>NUMBER</td> <td>2</td> </tr> <tr> <td>ENG</td> <td>NUMBER</td> <td>3</td> </tr> </tbody> </table> <p><b>b)</b> Add a foreign key constraint on column 'ROLL' in 'MARKS' table referencing column 'ROLL' in table 'STUDENT' and name the constraint as FK_ROLL.  <b>c)</b> Change width of 'MATH' column to 3.  <b>d)</b> Add a check constraint on 'ENG' column so that permissible value</p>	Col. Name	Type	Width	ROLL	NUMBER	2	MATH	NUMBER	2	ENG	NUMBER	3	1 HRS	3																		
Col. Name	Type	Width																															
ROLL	NUMBER	2																															
MATH	NUMBER	2																															
ENG	NUMBER	3																															

	<p>for 'ENG' attribute lies between 0 and 50 and name the constraint as CHK_ENG.</p> <p>e) Try to insert following data:-                    &lt;11,90,80&gt;</p> <p>f) Now insert following data:</p> <table border="1"> <thead> <tr> <th>ROLL</th> <th>MATH</th> <th>ENG</th> </tr> </thead> <tbody> <tr> <td>11</td> <td>90</td> <td>45</td> </tr> <tr> <td>12</td> <td>45</td> <td>46</td> </tr> <tr> <td>13</td> <td>70</td> <td>30</td> </tr> <tr> <td>14</td> <td>90</td> <td>20</td> </tr> <tr> <td>15</td> <td>45</td> <td>46</td> </tr> </tbody> </table> <p>g) Add a new column 'TOTAL' in table 'MARKS'. The data type is number and width is 3.</p> <p>h) Update column 'TOTAL' in 'MARKS' table with proper data.</p>	ROLL	MATH	ENG	11	90	45	12	45	46	13	70	30	14	90	20	15	45	46		
ROLL	MATH	ENG																			
11	90	45																			
12	45	46																			
13	70	30																			
14	90	20																			
15	45	46																			
P3	<p>a) Display data from table 'STUDENT' with column heading ROLL_NO, STD_NAME.</p> <p>b) List students having name starting with letter 'S'.</p> <p>c) List students where second character of name is 'a'.</p> <p>d) Display EXAMDATE in 'DD/MM/YYYY' format.</p> <p>e) Display NAME, MATH, ENG and PER of all students. Assume, total marks of math are 100 and eng is 50.</p> <p>f) Display names of all students who are getting above 65 of math.</p> <p>g) Display names of students getting marks in eng between 20 and 40.</p> <p>h) Display name of the student, who get the same marks (math) as that of 'Shyamal'.</p>	1 HRS	3																		
P4	<p>HOTEL (HOTEL_NO, NAME, ADDRESS )</p> <p>ROOM( ROOM_NO, HOTEL_NO, TYPE, PRICE)</p> <p>BOOKING(HOTEL_NO, GUEST_NO, DATE_FROM, DATE_TO, ROOM_NO)</p>	2 HRS	3																		

	<p>GUEST(GUEST_NO, NAME, ADDRESS)</p> <p>Where HOTEL contains hotel details and HOTEL_NO is the Primary Key. ROOM contains room details for each hotel and (HOTEL_NO,ROOM_NO) forms the Primary key. BOOKING contains details of the bookings and the Primary Key comprises (HOTEL_NO, GUEST_NO, DATE_FORM) and GUEST contains guest details and GUEST_NO is the Primary key and mention the Foreign Key constraints.</p>																				
P5	<ul style="list-style-type: none"> <li>i. List full details of hotels in Mumbai</li> <li>ii. List the name and addresses of all guests in New Delhi, alphabetically ordered by the name.</li> <li>iii. List all double or family rooms with a price below Rs. 800 per day, in ascending ordered.</li> <li>iv. List the bookings for which no date_to has been specified.</li> <li>v. What is the total daily revenue from all the double room?</li> <li>vi. How many different guests have made booking for august, 2015</li> <li>vii. List the price and type of all rooms at the hotel Land Mark.</li> <li>viii. What is the total income from booking for the hotel Manor today.</li> </ul>	2 HRS	3																		
P6	<p><b>1.a)</b> Create tables for following functional Dependencies –</p> <p style="padding-left: 40px;">eno → { ename,address}</p> <p style="padding-left: 40px;">pno → {pname, plocation}</p> <p style="padding-left: 40px;">{eno,pno} → hours</p> <p>plocation must be among MUMBAI,KOLKATA,CHENNAI, and DELHI.</p> <p><b>b)</b> Mention primary key, foreign key and CHECK constraints.</p> <p><b>c)</b> i. Insert following data for EMP:-</p> <table style="margin-left: 20px;"> <thead> <tr> <th><i>ENO</i></th> <th><i>ENAME</i></th> <th><i>ADDRESS</i></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Swarnali</td> <td>MUMBAI</td> </tr> <tr> <td>2</td> <td>Deboshree</td> <td>MUMBAI</td> </tr> <tr> <td>3</td> <td>Moumita</td> <td>KOLKATA</td> </tr> <tr> <td>4</td> <td>Piyali</td> <td>CHENNAI</td> </tr> <tr> <td>5</td> <td>Surupa</td> <td>DELHI</td> </tr> </tbody> </table>	<i>ENO</i>	<i>ENAME</i>	<i>ADDRESS</i>	1	Swarnali	MUMBAI	2	Deboshree	MUMBAI	3	Moumita	KOLKATA	4	Piyali	CHENNAI	5	Surupa	DELHI	3 HRS	3
<i>ENO</i>	<i>ENAME</i>	<i>ADDRESS</i>																			
1	Swarnali	MUMBAI																			
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4	Piyali	CHENNAI																			
5	Surupa	DELHI																			

	<p><b>ii.</b> Insert following data for Proj:-</p> <table border="1"> <thead> <tr> <th><i>PNO</i></th> <th><i>PNAME</i></th> <th><i>PLOCATION</i></th> </tr> </thead> <tbody> <tr> <td>101</td> <td>BANKING</td> <td>DELHI</td> </tr> <tr> <td>102</td> <td>LIBRARY</td> <td>MUMBAI</td> </tr> <tr> <td>103</td> <td>RAILWAY</td> <td>KOLKATA</td> </tr> <tr> <td>104</td> <td>FINANCE</td> <td>CHENNAI</td> </tr> <tr> <td>105</td> <td>ANALYZER</td> <td>DELHI</td> </tr> </tbody> </table> <p><b>iii.</b> Insert following data for EmpProj:-</p> <table border="1"> <thead> <tr> <th><i>ENO</i></th> <th><i>PNNO</i></th> <th><i>HOURS</i></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>101</td> <td>10</td> </tr> <tr> <td>2</td> <td>103</td> <td>12</td> </tr> <tr> <td>3</td> <td>104</td> <td>19</td> </tr> <tr> <td>3</td> <td>105</td> <td>29</td> </tr> <tr> <td>5</td> <td>102</td> <td>6</td> </tr> </tbody> </table> <p><b>d)</b> List the name of employees who are working on more than one project</p>	<i>PNO</i>	<i>PNAME</i>	<i>PLOCATION</i>	101	BANKING	DELHI	102	LIBRARY	MUMBAI	103	RAILWAY	KOLKATA	104	FINANCE	CHENNAI	105	ANALYZER	DELHI	<i>ENO</i>	<i>PNNO</i>	<i>HOURS</i>	1	101	10	2	103	12	3	104	19	3	105	29	5	102	6		
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3	104	19																																					
3	105	29																																					
5	102	6																																					
P7	<p><b>2.a)</b> Create a table PHONE_BOOK. The fields of the table are NAME, ADDRESS, PHONE_NO.</p> <p><b>b)</b> Insert at least 6 entries into the table of which there are two pairs of duplicate entries.</p> <p><b>c)</b> Delete duplicate rows from the table.</p> <p><b>d)</b> Write a query to select first two rows from the table.</p> <p><b>e)</b> Write a query to select last two rows from the table.</p>	3 HRS	3																																				
P8	<p><b>3.a)</b> Create a table employee and insert following data into the table.</p> <table border="1"> <thead> <tr> <th><i>EMPNO</i></th> <th><i>EMPNAME</i></th> <th><i>MANAGERNO</i></th> <th><i>SALARY</i></th> </tr> </thead> <tbody> <tr> <td>E1</td> <td>Amal</td> <td>--</td> <td>30,000</td> </tr> <tr> <td>E2</td> <td>Bimal</td> <td>E1</td> <td>25,000</td> </tr> <tr> <td>E3</td> <td>Kamal</td> <td>E1</td> <td>20,000</td> </tr> </tbody> </table>	<i>EMPNO</i>	<i>EMPNAME</i>	<i>MANAGERNO</i>	<i>SALARY</i>	E1	Amal	--	30,000	E2	Bimal	E1	25,000	E3	Kamal	E1	20,000	4 HRS	3																				
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	<p>E4    Nirmal            E2            15,000</p> <p>E5    Shymal            E2            21,000</p> <p>E6    Parimal            E3            10,000</p> <p><b>b)</b> Retrieve the names of the employees and the names of their respective managers from the employee table.</p> <p><b>c)</b> Retrieve the name of the employee who is earning second maximum salary.</p> <p><b>d)</b> Retrieve the name of the employee who is earning nth highest salary.</p> <p><b>e)</b> Retrieve the names of employees whose salary is greater than the salary of all the employees whose manager no. is E1.</p> <p><b>f)</b> Get the details of all employees whose salary is lesser than the average salary of the employee.</p>																																			
P9	<p><b>4.a)</b> Create a table account and insert following data into the table Account.</p> <table border="1"> <thead> <tr> <th>ACCOUNTNO</th> <th>BRANCHNAME</th> <th>AMOUNT</th> </tr> </thead> <tbody> <tr> <td>A1</td> <td>Kolkata</td> <td>50000</td> </tr> <tr> <td>A2</td> <td>Howrah</td> <td>40000</td> </tr> <tr> <td>A3</td> <td>Howrah</td> <td>40000</td> </tr> <tr> <td>A4</td> <td>Kolkata</td> <td>20000</td> </tr> <tr> <td>A5</td> <td>Durgapur</td> <td>30000</td> </tr> </tbody> </table> <p><b>b)</b> Create a view that will show branch name and total amount of that branch. The name of view will be acc_view.</p> <p><b>c)</b> Select the branch names having total amount greater than 50,000</p> <p>    i) Using account1 view</p> <p>    ii) Without using view.</p> <p><b>5.a)</b> Create a table Marks and insert following data into the table.</p> <table border="1"> <thead> <tr> <th>STUDENTNAME</th> <th>SUBJECT NAME</th> <th>MARKS</th> </tr> </thead> <tbody> <tr> <td>Amit</td> <td>DBMS</td> <td>80</td> </tr> <tr> <td>Amit</td> <td>OS</td> <td>70</td> </tr> <tr> <td>Bimal</td> <td>DBMS</td> <td>70</td> </tr> <tr> <td>Bimal</td> <td>OS</td> <td>70</td> </tr> </tbody> </table> <p><b>b)</b> Retrieve the name of the students who are getting marks in DBMS</p>	ACCOUNTNO	BRANCHNAME	AMOUNT	A1	Kolkata	50000	A2	Howrah	40000	A3	Howrah	40000	A4	Kolkata	20000	A5	Durgapur	30000	STUDENTNAME	SUBJECT NAME	MARKS	Amit	DBMS	80	Amit	OS	70	Bimal	DBMS	70	Bimal	OS	70	5 HRS	3
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Bimal	DBMS	70																																		
Bimal	OS	70																																		



	<p>above 75 but who are getting marks in OS less than 75.</p> <p><b>c)</b> Write a query to retrieve student names from the marks table and output will look like:-</p> <p style="padding-left: 40px;">Mr. A</p> <p style="padding-left: 40px;">Mr. A</p> <p style="padding-left: 40px;">Mr. B</p> <p style="padding-left: 40px;">Mr. B</p>		
P10	<p>6.Create a unique index on ENO column of the table EMP.</p> <p>7.The table Sales_Order_Detail(Product_No, Suppliers_No, Order_ID) has more 50,000 records for 500 distinct Product. Create an index on the Product_No column, which is the best suited according to the above stated scenario.</p> <p>8.Create the following object type rectangle with the attributes length, width and a method area (), which computes the area of the rectangle; as follows.</p> <p>CREATE TYPE rectangle AS OBJECT</p> <p>( length NUMBER,</p> <p>width NUMBER,</p> <p>MEMBER FUNCTION area RETURN NUMBER DETERMINISTIC</p> <p>);</p> <p>/</p> <p>CREATE OR REPLACE TYPE BODY rectangle AS</p> <p>MEMBER FUNCTION area RETURN NUMBER IS</p> <p>BEGIN</p> <p>RETURN (length*width);</p> <p>END;</p>	6 HRS	3

	<p>/</p> <p>Now, create a table rect_tab of type rectangle and create a function-based index on the method area().</p> <p>9. Make a group of 5 students. Open two terminals. From one terminal Login into the Oracle server with the user name FACULTY and password FACULTY. (This user has the <b>CREATE USER</b> system privilege. From the other terminal do the experiments with the newly created user.</p> <ol style="list-style-type: none"> <li>a. Create a user <b>STUDENT</b> with following characteristics <ol style="list-style-type: none"> <li>1. The password student123</li> <li>2. Default tablespace <b>SYSTEM</b>, with a quota of 10 megabytes</li> <li>3. Temporary tablespace <b>TEMP</b></li> <li>4. Access to the tablespace <b>SYSTEM</b>, with a quota of 5MB.</li> <li>5. Limits on database resources defined by the profile <b>DEFAULT</b></li> </ol> </li> <li>b. After successfully creating this user, try to connect using this username and password. Note the error message and state the reason.</li> <li>c. Grant the role Connect to the user with admin option.</li> <li>d. Grant Resource and other necessary system privileges to this user. (e.g. Alter, Create, Insert, Delete, Grant etc.)</li> <li>e. Now Create the Table Employee(Eno Number(2), EName Varchar2(15)).</li> <li>f. Insert 3 records. Try different DML operations.</li> </ol> <p>10.a. Log in as CSEA (User ID: CSEA, Password: CSEA). Display all records from the Employee table of the user Student. Try to insert or update any record. Note down the error.</p> <p>b. Grant the object privileges on the table STUDENT.EMPLOYEE to CSEA with without Grant option.</p> <p>c. Now do the experiments given in 2a.</p> <p>d. Log in as CSEA. Try to grant the object Privilege on STUDENT.EMPLOYEE to the user CSEB. Note down the error. How this can possible.</p>		
P11	<p>Write a PL/SQL program to check the given number is even or odd.</p> <p>Write a program to check whether a given number is prime or not.</p> <p>Write a PL/SQL program to check whether a number is Armstrong number or not.</p>	7 HRS	3
P12	a) Write a procedure to calculate sum of two numbers.	8 HRS	3

	<p>b) Write a PL/SQL function, which returns maximum of the three numbers.</p> <p>c) Write a function, which returns true if employee exist in employee table, otherwise it returns false.</p> <p>The Table is as follows:</p> <p>EMPLOYEE (ENO, ENAME, SALARY, MGRNO)</p>		
P13	<p>a) Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated areas in table.</p> <p>b) Add an extra column diameter to the table circle and update the diameter column for each entry diameter=2* radius.</p> <p>c) Print the number of records in the circle table with the help of an explicit cursor.</p> <p>a)A HRD manager has decided to raise the salary for all the employees in department number 20 by 0.05. Whenever any such raise is given to employees an audit trail of the same is maintained in the <b>EMP_RAISE</b> table. The <b>EMP_RAISE</b> table holds the employee number, the date when the raise was given and the raise amount.</p> <p>b) Write a PL/SQL block to update the salary of each employee of dept-no 20 appropriately and insert a record in the <b>EMP_RAISE</b> table as well.</p> <p>Tables are as follows:</p> <p>EMPLOYEE (EMP_CODE, ENAME, JOB, SALARY, DEPTNO)</p> <p>EMP_RAISE(EMP_CODE, RAISE_AMOUNT, RAISE_DATE)</p>	9 HRS	3
P14	<p>Create a transparent audit system for a table CLIENT_MASTER. The system must keep track of the records that are being deleted or updated. The functionality being when a record is deleted or modified the original record details and the date of operations is stored in the audit-client table, the delete or update is allowed to go through.</p> <p>Write a trigger for the above problem.</p>	10 HRS	3

The Tables are as follows:-  CLIENT_MASTER(CLIENT_NO, NAME, ADDRESS, CITY, BAL-DUE)  AUDIT_CLIENT(CLIENT_NO, NAME,BAL_DUE,OPERATION, USER_ID, OP_DATE)		
<b>Total</b>		<b>40</b>
<b>University Exams</b>		<b>60</b>

**\* Internal Lab Marks calculated based on Best of 2 from 3 assignments.**

**Overall Course attainment target levels:**

<b>As per NBA SAR Example 3.2.2 : Attainment Levels</b>			
<b>Attainment Level</b>	<b>Inference</b>	<b>Marks</b>	<b>Co-relation</b>
Attainment Level 1	40% of the students have attained more than the target level of that CO	1	L
Attainment Level 2	50% of the students have attained more than the target level of that CO	2	M
Attainment Level 3	60% of the students have attained more than the target level of that CO	3	H

**Overall Course Attainment Target** (70% of university and 30% of the internal exam) will be = Attainment Level 3

**University Grading System:**

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

**(vi) Mapping of Course Outcomes and Program Outcomes:**

Course Outcomes	Program Outcomes (POs)												(PSOs)	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	1.	2.
IT601.1	1	1	1	--	--	--	--	--	--	--	--	--	1	--
IT601.2	2	2	1	1	--	--	--	--	--	--	--	--	1	--

IT601.3	2	2	2	1	1	--	--	--	1	--	--	1	1	2
IT601.4	2	2	2	--	--	--	--	--	--	--	--	--	1	--
IT601.5	2	2	1	1	--	--	--	--	--	--	--	--	1	--
IT601	2	2	1	1	1	--	--	--	1	--	--	1	1	2

**Justification :**

- C01 to C05 satisfies knowledge of mathematics and science in solving engineering problems and development / design solution of complex engineering problem. (PO1, PO2, PO3).
- C02, C03, C05 knowledge help to do investigation of complex problems in research based work.(PO4)
- C03, C05 minimally satisfies modern engineering and IT tools. (PO5).
- C03 minimally satisfies the individual and team work. (PO9).
- C01 to C05 minimally satisfies the lifelong learning. (PO12).

**FOR PSO**

- C01 to C05 satisfies application of knowledge of mathematical foundations, programming skills and algorithm etc. (PSO1).
- C03 minimally satisfies. (PSO2).

**(vii) Delivery Methodology**

Outcome	Method	Supporting Tools	Demonstration
IT601.1	Structured (partially supervised)	Blackboard	Fundamentals of DBMS and design of logical databases using design principles of ERD and implement the logic in Relational Data Model.
IT601.2	Structured (partially supervised)	Blackboard	Query processing methodologies of Relational Algebra and Calculus and query optimization techniques.
IT601.3	Semi-Structured	Blackboard + SQL	Simple and moderately advanced database queries using SQL and

	(Independent work)		PL/SQL blocks for ensuring data integrity and security.
IT601.4	Structured (partially supervised)	Blackboard	Normalization techniques.
IT601.5	Structured (partially supervised)	Blackboard	The basic issues of transaction processing, concurrency control and recovery mechanisms in applications.

**(viii) Assessment Methodology**

Assessment Tool	Outcomes					Specific Question/activity aligned to the Outcome
	CS501.1	CS501.2	CS501.3	CS501.4	CS501.5	
FIRST INTERNAL	√	√	√	√	√	Internal Question Paper
SECOND INTERNAL	--	--	--	--	--	--
QUIZ	√	√	√	√	√	Quiz
LABORATORY	--	--	√	--	--	LAB Assignments

**(ix) A. Weekly Lesson Plan**

Week	Lectures	Quiz
1	Introduction : Concept & Overview of DBMS	Domain can be defined as: a. The value of a field    b. Value of a tuple c. Value of a table        d. None of these
2	Entity-Relationship Model	Cardinality ratio means a. Number of attributes associated with an entity b. Number of entities related with other entities via a relationship c. Number of entities in an entity set d. Ratio of number of columns and rows in a table
3	Relational Model : Relational Algebra, Relational Calculus	When we are interested in only certain columns of a table, which of the following operation is used? a. <b>Projection</b> b. <b>Selection</b> b. <b>c. Union</b> d. <b>Join</b>
4	SQL and Integrity Constraints	
5	Relational Database Design, Normalization using	A normal form in which every determinant is a key, is:

	functional dependencies	a.2NF   b. 3NF   c. BCNF   d. 4NF
6	Normalization using multi-valued dependencies	Given the relation schema Bank (BankID, AccountNo, Balance, Customer) with FDs : { BankID, AccountNo → Balance, BankID, AccountNo → Customer, Customer → BankID } What is the highest normal form for the relation schema Bank ? a. First   b. Second   c. Third   d. Boyce Codde
7	Internals of RDBMS, Physical data structures, Query optimization	The employee salary should not be greater than Rs. 20,000. This is a. Integrity constraint   b. referential constraint C. Over-defined constraint   d. feasible constraint
8	Concurrency control and Recovery Management, File & Record Concept	What type of lock forbids any other user to access the data in any way? a. Shared   b. Exclusive   c. Limited d. Concurrent
9	File Organization & Index Structures , B tree and B+ tree	Which of the following is the way to undo the effects of an aborted transaction? a. Compensation transaction   b. Roll back d. Recovery   d. Error Control

Week	Laboratory
1, 2	Creating Database , Creating a Table, Record Handling , Retrieving Data from a Database <b>(LAB_A1)</b>
3, 4	Creating Views , Column Aliases, Using GRANT and REVOKE , Cursors, Trigger in Oracle PL / SQL <b>(LAB_A2)</b>
5,6	Writing Oracle PL / SQL Stored Procedures <b>(LAB_A3)</b>

**B. Daily Lesson Plan (Repeat format for each chapter)**

CHAPTER: 1 Title: <b>Introduction to DBMS</b> Dayb1 & 2
CONTENTS Introduction : Concepts & Overview of DBMS, Data Models
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are:

1. To gather the knowledge of File management system, Different data models.
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):
<ol style="list-style-type: none"> <li>1. What do you mean by a Database Management System? [ BT - Level - 1]</li> <li>2. Compare file processing system over DBMS? [ BT - Level - 2]</li> <li>3. Describe main categories of data models. [ BT - Level - 1]</li> </ol>

CHAPTER: 1 Title: <b>Introduction to DBMS</b> Day 3 & 4
CONTENTS 3-Schema architecture, Database Users, Database Administrator
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. To recognize Database User.</li> <li>2. To understand the level of 3-Schema architecture.</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):
<ol style="list-style-type: none"> <li>1. Describe 3-tire Architecture of DBMS [ BT - Level - 1]</li> <li>2. Explain Data Independence. [ BT - Level - 1]</li> <li>3. What is the Role of a DBA. [ BT - Level - 1]</li> </ol>

CHAPTER: 2 Title: <b>Entity-Relationship Model</b> Day 5 & 6
CONTENTS Basic Concepts, design Issues, Mapping Constraints, Keys, E-R Diagram
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. To understand basic feature of an ERD.</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):
<ol style="list-style-type: none"> <li>1. Define the term Entity, Attribute and Relationship? [L1]</li> <li>2. what is an E-R model ?</li> <li>3s. What do you mean by cardinality of a relationship? Explain.</li> </ol>

CHAPTER: 2 Title: <b>Entity-Relationship Model</b> Day 7
CONTENTS Weak Entity Sets, Integrity constraints, Extended E-R features; Example
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. To understand extended feature of an ERD</li> </ol>



Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Define the concept of generalization and specialization with suitable example. [L3]
2. Draw the ER Diagram for the system given as follows: An Organization has number of faculties who are expert in one or more subjects, for each subject, number of such expert are there, system will store faculty and subject information and must support query on finding expertise on subjects. Students get enrolled to have training on one or more subjects. System will keep student information also one faculty is allotted to teach one or more subjects for one subject only one faculty is assigned. System must keep the information regarding such assignment.

CHAPTER: 3

Title: **Relational Model**

Day 8 & 9

CONTENTS

Structure of relational Databases, Relational Algebra

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. To understand the operation of Relational Algebra.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What is a relational database? [L1]
2. Define PROJECTION operation. [L2, L3]
3. What are the various set operations? Explain with Examples.

CHAPTER: 3

Title: **Relational Model**

Day 10

CONTENTS

Extended Relational Algebra Operations

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. To understand the operation of Relational Algebra

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What is the role of Join operations? Differentiate between equijoin and natural join ?
2. Employee: { eno, ename, city, salary, mgr\_id, dno } , Department: { dno, dname, mgr\_id }

Project: { pno, pname, dno } , Works\_on: { eno, pno, p\_Loc, hours }

Dependent: { eno, name, relation, DOB }

write down the **Relational Algebra** expressions for the following:

Get the name of employees who work on all projects controlled by department 2. [L2, L3]

CHAPTER: 3

Title: **Relational Model**

Day 11 & 12
CONTENTS Relational Calculus
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. To understand the Relational Calculus Operations
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. What is relational calculus ? what are its two forms ? 2. Employee: { <u>eno</u> , ename, city, salary, mgr_id, dno }, Department: { <u>dno</u> , dname, mgr_id } Project: { <u>pno</u> , pname, dno} , Works_on: { <u>eno</u> , <u>pno</u> , p_Loc, hours } Dependent: { <u>eno</u> , <u>name</u> , relation, DOB} Write down the <b>Relational Calculus</b> expressions for the following: Use Domain relational calculus to get the name of the employees who do not have any dependent. [L2]

CHAPTER: 3 Title: <b>Relational Model</b> Day 13 & 14
CONTENTS Views, Modifications Of the Database.
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: Solve Problem
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Employee: { <u>eno</u> , ename, city, salary, mgr_id, dno } , Department: { <u>dno</u> , dname, mgr_id } Project: { <u>pno</u> , pname, dno} , Works_on: { <u>eno</u> , <u>pno</u> , p_Loc, hours } Dependent: { <u>eno</u> , <u>name</u> , relation, DOB} <b>Write down the Relational Calculus and Algebra for the following:</b> i. Show the department name and total salary of the employees in each department. ii. Get the employee who works on the same project and hour combination as that of employee number '26'.

CHAPTER: 4 Title: <b>SQL and Integrity Constraints</b> Day 15 & 16
CONTENTS Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. To understand the various operation of SQL.
Once the student has completed this topic/ chapter he/she will be able to answer following

questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What is SQL? What is data type? [L2]
2. What are the major categories of SQL command? [L1]

CHAPTER: 4

Title: **SQL and Integrity Constraints**

Day 17 & 18

CONTENTS

Null Values, Domain Constraints, Referential Integrity Constraints, assertions, Nested Subqueries,

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. To recognize different type of constraint.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What are the different types of constraints that can be specified? Explain with examples. [L2]
2. Explain the concept of aliasing in SQL. [L2]
3. Define aggregate function in SQL.

CHAPTER: 4

Title: **SQL and Integrity Constraints**

Day 19 & 20

CONTENTS

Views, Database security application development using SQL

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. Understand views, DB security.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Explain the purpose of View in SQL. [L3]
2. What is the difference between Where and Having clause. [L1]

CHAPTER: 4

Title: **SQL and Integrity Constraints**

Day 21 & 22

CONTENTS

Stored procedures, Cursor and triggers.

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. Understand the use of trigger, Cursor.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Describe Triggers. How are they created? [L2]
2. What are store procedures? [L2]
3. How is an implicit and explicit cursor? [L2]

CHAPTER: 5 Title: <b>Relational Database Design</b> Day 23 & 24
CONTENTS Functional Dependency
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Understand Functional Dependencies
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. What is Functional Dependencies? Give examples. [L2] 2. What are the features of a good relational database design ? [L2]

CHAPTER: 5 Title: <b>Relational Database Design</b> Day 25 & 26
CONTENTS Different anomalies in designing a Database, Normalization using functional dependencies, 1NF
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Understand Different anomalies and Normalization
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Explain various update anomalies. [L2] 2. What is normalization? Define Normal forms.[L2]

CHAPTER: 5 Title: <b>Relational Database Design</b> Day 27 & 28
CONTENTS Normalization using functional dependencies, 2NF, Decomposition
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Understand Normalization
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Define 2NF.[L2] 2. What do you mean by decomposition of a relation? [L2]

CHAPTER: 5 Title: <b>Relational Database Design</b> Day 29 & 30
CONTENTS

Boyce-Codd Normal Form, 3NF
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Understand Normalization BCNF.
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. What is transitive dependency? [L2] 2. Define BCNF. Give example. [L2]

CHAPTER: 5 Title: <b>Relational Database Design</b> Day 31 & 32
CONTENTS Normalization using multi-valued dependencies, 4NF, 5NF
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Understand multi-valued dependencies, 4NF, 5NF.
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. What is a multi-valued dependency? [L2] 2. Discuss 4NF, 5NF. [L2]

CHAPTER: 5 Title: <b>Relational Database Design</b> Day 33 & 34
CONTENTS Solve Normalization examples
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Apply the concepts of Normalized.
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Given a relational schema Supplier (sno, sname, city, status, pno, qty) with FD set $F = \{ sno \rightarrow sname, sno \rightarrow city, city \rightarrow status, \{sno, pno\} \rightarrow qty \}$ . Assume, sno is the key of the schema Supplier. Normalized up to 3NF.[L3]

CHAPTER: 6 Title: <b>Internals of RDBMS</b> Day 35 & 36
CONTENTS Query optimization: join algorithm Statistics and cost base optimization.
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Understand Query optimization.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What do you mean by query processing ?[L2]
2. What is a query tree? [L2]

CHAPTER: 6

Title: **Internals of RDBMS**

Day 37 & 38

CONTENTS

Transaction processing: Concurrency control

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. Understand the Transaction processing.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Define transaction.[L1]
2. Explain state transition diagram. [L2]

CHAPTER: 6

Title: **Internals of RDBMS**

Day 39 & 40

CONTENTS

Recovery Management : transaction model properties

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. Understand the Recovery Management techniques.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. What is concurrency control? [L2]
2. Explain wait-die and wound-wait protocols for deadlock prevention
3. Define recovery manager. What are log-based recovery techniques?

CHAPTER: 6

Title: **Internals of RDBMS**

Day 41 & 42

CONTENTS

state serializability, lock base protocols, two phase locking

Topic/Unit/Chapter Objectives:

Broad Objectives of the chapter/topic are:

1. Understand lock base protocols.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy):

1. Explain serializable schedule by giving an example. [L3]
2. Define lock. What are the two modes of locking?

CHAPTER: 6 Title: <b>File Organization &amp; Index Structures</b> Day 43
CONTENTS File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Understand the File & Record Concept.
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Discuss the importance of file organization in database. [L3]

CHAPTER: 6 Title: <b>File Organization &amp; Index Structures</b> Day 44
CONTENTS Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Knowledge on Indexing
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. What is the difference between Primary Index, Secondary Index and Clustering Index? [L3]

CHAPTER: 7 Title: <b>File Organization &amp; Index Structures</b> Day 45
CONTENTS Dynamic Multilevel Indexes using B tree and B+ tree
Topic/Unit/Chapter Objectives: Broad Objectives of the chapter/topic are: 1. Simplification of designing B tree and B+ tree
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy): 1. Create a B+ tree with the following key : ORDER- 3, KEY = 8, 5, 1, 7, 3, 12, 9, 6. [L3]

**(x) Teaching Strategy/Method**

- Learning by memorizing and understanding
- Solving problem
- Interactive sessions

**(xa) Strategy to support weak students**

- Reviewing student attendance and counseling students about attending classes

- Providing extra assignments to students with poor attendance.
- Taking more care of those who understand poorly
- In brainstorming small group (week student + bright student).

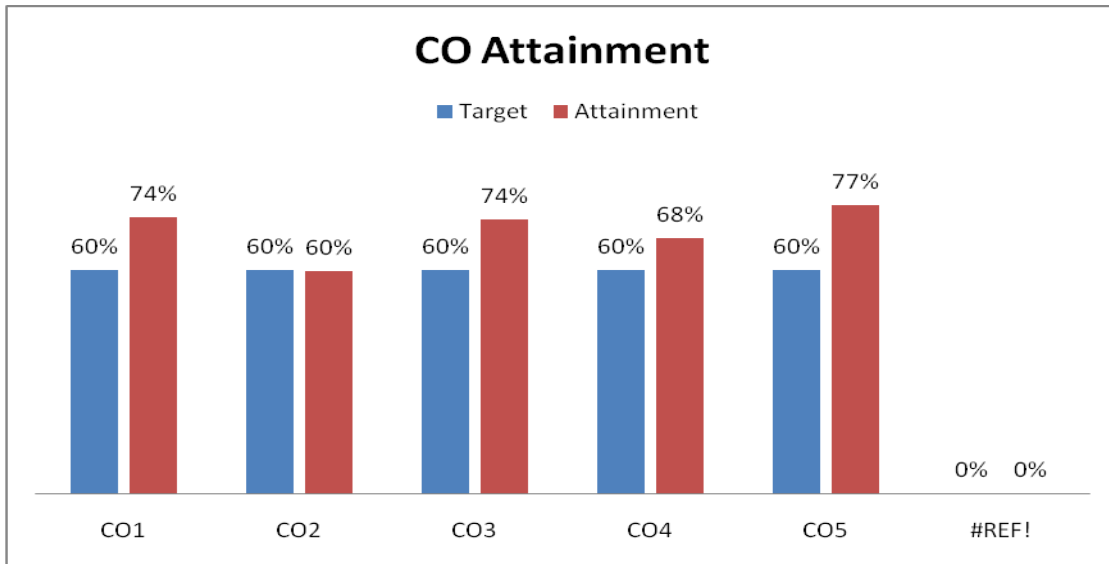
**(xb) Strategy to encourage bright students**

- Instruct them to work ahead to problems of skills that they do not know.
- Teaching research skills for accessing information; higher level thinking skills for processing it; creative thinking and problem-solving skills for flexibility in approach and generation of information; and communication skills for sharing it.

**(xc) Efforts to keep students engaged**

- Asking students to write what they have learned, questions they may have, or by discussing the content with a fellow student.
- Allow students 5-7 seconds of ‘think time’ when asking a question. At the end of the time draw a random name to answer the question.
- At the end of a lesson allow students time to share their findings with a peer.

**(xi) Analysis of Students performance in the course (internal) (labs, tests, assignments, quiz, exam)**



- 74% students have attained the set target of 60% marks for CO1
- 60% students have attained the set target of 60% marks for CO2
- 74% students have attained the set target of 60% marks for CO3
- 68% students have attained the set target of 60% marks for CO4
- 77% students have attained the set target of 60% marks for CO5



(xii) Analysis of Students performance in the course (university results)

	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME
University	60%	16	16	100%

Overall Course Attainment Target = 70% of university and 30% of the internal exam is **Attainment Level 3**

(xiii) Teacher Self-Assessment (at the completion of course)

The graphical analysis of the results show that all of the course outcome have been achieved successfully by the students.

(xiv) Recommendations/Suggestions for improvement by faculty

Tutorials must be incorporated in the syllabus.

## INTERNAL ASSESMENT RECORD

Subject with code: Database Management Systems (IT 601) Semester : 6<sup>th</sup> sem, 2017  
Discipline: INFORMATION TECHNOLOGY

SL	Name	Roll No.	Attendance		Marks in Internal Test		Quiz (20*5/10=10)	Attendance + Internal +Quiz =	Total (30)
			Total (%)	Marks (5)	INT I (30)	Marks (15)			
1.	ARABINDA ROY	11900214001	75	5	18	9	6.9	20.9	21
2.	ARPAN PAUL	11900214002	62.5	5	18	9	5.2	19.2	19
3.	BINEETA MAJUMDER	11900214003	50	4	20	10	7.3	21.3	21
4.	BIPUL SARKAR	11900214004	0	2	25	12.5	8.4	22.9	23
5.	DEEPAK SINGH	11900214005	62.5	5	18	9	6.6	20.6	21
6.	JYOTI KUMARI GUPTA	11900214006	0	2	21	10.5	7.8	20.3	20
7.	NAIRITH DAS	11900214007	50	4	16	8	6.7	18.7	19
8.	NAYAN KUMAR	11900214008	75	5	16	8	4.5	17.5	18
9.	PRABHAT PUSHKAR	11900214009	0	2	17	8.5	6.9	17.4	17
10.	PUJA KUMARI	11900214010	37.5	3	21	10.5	7.8	21.3	21
11.	SAHELI PYNE	11900214011	62.5	5	18	9	6.6	20.6	21
12.	SOUBHIK DAS	11900214012	87.5	5	20	10	7.8	22.8	23
13.	SUSHRI PAUL	11900214013	37.5	3	20	10	7.2	20.2	20
14.	VINEET KUMAR	11900214015	75	5	20	10	5.2	20.2	20
15.	YEAKUTUN NESSA	11900214016	50	4	15	7.5	6.2	17.7	18
16.	DEBOJIT PAUL	11900215045	65	2	18	9	6.6	17.6	18

## Sessional/Practical Performance Record

Subject with code: Database Management Systems Lab(IT 691)

Semester : 6<sup>th</sup> sem, 2017

Discipline: INFORMATION TECHNOLOGY

SL	Name	Roll No.	Marks in experimentation			Total (40)
			LAB_A1	LAB_A2	LAB_A3	
1.	ARABINDA ROY	11900214001	14	16	14	30
2.	ARPAN PAUL	11900214002	10	11	15	26
3.	BINEETA MAJUMDER	11900214003	13	17	17	34
4.	BIPUL SARKAR	11900214004	17	15	18	35
5.	DEEPAK SINGH	11900214005	15	16	16	32
6.	JYOTI KUMARI GUPTA	11900214006	14	17	17	34
7.	NAIRITH DAS	11900214007	13	13	12	26
8.	NAYAN KUMAR	11900214008	8	12	17	29
9.	PRABHAT PUSHKAR	11900214009	14	17	16	33
10.	PUJA KUMARI	11900214010	14	15	16	31
11.	SAHELI PYNE	11900214011	15	16	18	34
12.	SOUBHIK DAS	11900214012	13	16	17	33
13.	SUSHRI PAUL	11900214013	14	15	18	33
14.	VINEET KUMAR	11900214015	12	14	15	29
15.	YEAKUTUN NESSA	11900214016	12	16	17	33
16.	DEBOJIT PAUL	11900215045	15	16	17	33

# CERTIFICATE

I, the undersigned, have completed the course allotted to me as shown below

Sl. No.	Semester	Subject with Code	Total Chapter	Remarks
1.	7 <sup>th</sup>	Database Management Systems (IT601) & Database Management Systems Lab (IT 691)	07	

Date :

**Signature of Faculty**

## Submitted to HOD

Certificate by HOD

I, the undersigned, certify that **Prof. Sathi Ball** has completed the course work allotted to him satisfactorily / not satisfactorily.

Date :

**Signature of HOD**

## Submitted to Director

Date :

**Signature of Director**

# Sample Internal Question Paper

SILIGURI INSTITUTE OF TECHNOLOGY  
DEPARTMENT OF INFORMATION TECHNOLOGY  
1<sup>ST</sup> INETRNL EXAM- 2017

PAPER NAME: DATABASE MANAGEMENT SYSTEM

PAPER CODE: IT

601

FULL MARKS: 30

TIME: 1HR 30

MINS

**Answer all questions (each question carries 10 marks)**

**Q1.** Construct an E-R diagram for a company database that has to be designed to keep track of employees, departments and projects. The database should also be able to keep track of dependents of each employee for medical purpose. You can make appropriate assumptions to make the specification complete.

Convert E-R schema into relational schemas.

**7 + 3**

**OR**

Describe the three-schema architecture. Why do we need mappings between schema levels?

What is the difference between logical data independence and physical data independence? Which one is harder to achieve? Why?

**4+1+3+2**

**OR**

What do you mean by degree and cardinality of a relationship? Explain with suitable example specialization and generalization. Explain the terms super key and candidate key with example.

**2+(2+2)+(2+2)**

**Q2.** Compare **left outer join**, **right outer join** and **full outer join** with example.

**( 2 + 2 + 2 ) + 2+**

**2**

Consider following schemas –

Sailor (sid, sname, rating, age)

Reserve (sid, bid, day)

Give an expression in **Relational Algebra** for each of the following queries :

- Find names of the sailors who have reserved boat number 203.
- Find names and ages of the sailors who have reserved a boat.

**OR**

A. Consider the following schemas:

Employee (employee\_no, employee\_name, salary)

Project (project\_no, project\_name, project\_manager)

Works\_for (project\_no, employee\_no)

Write the following queries in **Relational Algebra**:

**3+3**

- List the name of employees working on project 'P2' but not on project 'P1'.
- List the name of employees who are working on a project for which 'E2' is the project manager.

B. Which one is advantageous to use between Cartesian product and Join operation and why?

**2**

Consider the following tables:

Employee (eno, fname, lname, dob, address, salary, dno)

Department (dnumber, dname)

Write the following queries in **Relational Algebra**:

**2**

- i. Find the name and address of all employees who work for the 'Sales' department.

**Q3.** Consider the following schemas:

Employee (employee\_name, street, city)

Works (employee\_name, company\_name, salary)

Company (company\_name, city)

Formulate the following queries in **SQL**

**2+2+3+3**

- a. Find the names and cities of residence of all employees who work for 'FBC'.
- b. Find all employees who live in the same cities as the companies for which they work.
- c. Assume that the companies may be located in several cities. Find all companies located in every city in which 'SBC' is located.
- d. Find the company that has most employees.

**SILIGURI INSTITUTE OF TECHNOLOGY  
DEPARTMENT OF INFORMATION TECHNOLOGY**

**2<sup>nd</sup> INTERNAL EXAM- 2017**

**PAPER NAME: DATABASE MANAGEMENT SYSTEM**

**PAPER CODE: IT 601**

**FULL MARKS: 30**

**TIME: 1HR 30 MINS**

**Answer any one question from each group, each question carries 10marks**

**Group-A ( CO 4)**

- a) Defined multi-valued dependency with suitable example.
- b) Compute the closure of the following set F of functional dependencies for the relation schema R.  
 $R=(A, B, C, D,E); F=\{ A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A\}$
- c) Consider the relation schema  $R(A, B, C)$  with a set of functional dependencies  
 $F=\{A \rightarrow BC, B \rightarrow C, A \rightarrow B, AB \rightarrow C\}$ . Compute the irreducible set for F. 3+3+4

OR

- a) Consider a relation schema  $R(A, B,C, D, E, F)$  with set of functional dependencies  $F = \{A \rightarrow BCDEF, BC \rightarrow ADEF, B \rightarrow F, D \rightarrow E \}$ .
  - i) Find the candidate keys for R.
  - ii) Decompose R to 3NF.
  - iii) If another functional dependency  $D \rightarrow B$  is introduced, what will be the resulting decomposed relation schema?
  - iv) Is the decomposition lossless ? 2+4+2+2

OR

- a) Consider an ordered file with  $r=30000$  records (fixed length) of size  $R = 100$  bytes stored on a disk with block size  $B = 1024$  bytes. Suppose each index entry in index file takes 15 bytes (9 bytes for index value, 6 bytes for pointer). What is the number of accessing blocks for Primary index?
- b) Construct a B tree for the following set of key values: [3,4,6,8,12,17,19,23,29,31,10,11] when the number of pointers that will fit in one node is: 3

5+5

**Group-B (C05)**

- a) Explain 2PL Protocol with example.
- b) Prove 2PL protocol ensures serializability.
- c) What do you mean by deadlock in a multi-user environment?
- d) When a schedule is called recoverable schedule? Explain with a suitable example. 3+3+2+2

OR

- a) Discuss the ACID properties of transaction.
- b) Describe one non-log based recovery technique. What is the limitation of this technique? 4+(4+2)

OR

- a) Explain: 'Deadlock cannot occur in timestamp based protocol'.
- b) Find out whether the following schedule S is conflict serializable or not?  
S: [R3(y); R3(z); R1(x); W1(x); W3(z); W3(y); R2(z); R1(y); W1(y); R2(y); W2(y); R2(x); W2(x)]  
If conflict serializable then specify the equivalent serial schedule.
- c) What do you mean by shared & exclusive lock. 4+(3+1)+2

**Group-C (C03)**

Consider the following relations and write the SQL queries: 5X2=10

Book: {isbn, title, subject, pb\_yr, price, aid, pid}

Author :{ aid, name, city}

Publisher:{pid, name, city}

Book\_Order:{orderNo, isbn, quantity, date }

- i. Display the title, new\_price of all books published after year 2004. (new\_price= price\*0.15)
- ii. Get the average price as AVG\_PR of each subject books.
- iii. Get the title, subject and price of all books written by Navathe, published by PHI.
- iv. Retrieve the name of publishers who publishes more than 5 books.
- v. Get the id and name of the publishers who have not published any books.

OR

- a) Consider the following tables and write the SQL queries : 2+3+2+3  
employee (employee name, street, city)  
works (employee name, company name, salary)  
company (company name, city)  
manages (employee name, manager name)
  - i. Find the names, street address, and cities of residence of all employees who work for First Bank Corporation and earn more than \$10,000.
  - ii. Find all employee in the database who live in the same cities as the companies for which they are work.

- iii. Find all employees in the database who earn more than each employee of Small Bank corporation.
- iv. Find the names of all employees who work for PQR.

1

## Sample Quiz Paper

1. Goals for the design of Logical Schema includes
  - i) Avoiding data inconsistency easily
  - ii) Being able to access data efficiently
  - iii) Being able to construct queries
  - iv) All the above
2. Which of the following is not an Aggregate function?
  - i) Min
  - ii) Max
  - iii) Select
  - iv) Avg
3. The project operation:
  - i) Combines relational tables to provide the user with more information than is otherwise available.
  - ii) Creates a subset consisting of columns in a table.
  - iii) Organizes elements into segments.
  - iv) Identifies the table from which the columns will be selected.
4. Cardinality ratio means
  - i) Number of attributes associated with an entity
  - ii) Number of entities related with other entities via a relationship
  - iii) Number of entities in an entity set
  - iv) Ratio of number of columns and rows in a table
5. In order to permanently remove all the data from the STUDENT table without changing its structure, you need to execute which of the following queries?
  - i) DROP TABLE STUDENT
  - ii) DELETE ALL FROM STUDENT
  - iii) DROP ALL FROM STUDENT
  - iv) DELETE FROM STUDENT
6. Which of the following is the way to undo the effects of an aborted transaction?
  - i) Compensation transaction
  - ii) Roll back
  - iii) Recovery
  - iv) Error Control
7. Relational Calculus is a
  - i) Procedural Language
  - ii) Non- Procedural Language
  - iii) Query Language
  - iv) Normalize techniques
8. Domain can be defined as
  - i) the value of a field
  - ii) value of a tuple
  - iii) value of a table
  - iv) none of these





<u>Col. Name</u>	<u>Type</u>	<u>Width</u>
<b>ROLL</b>	<b>NUMBER</b>	<b>2</b>
<b>MATH</b>	<b>NUMBER</b>	<b>2</b>
<b>ENG</b>	<b>NUMBER</b>	<b>3</b>

**b)** Add a foreign key constraint on column 'ROLL' in 'MARKS' table referencing column 'ROLL' in table 'STUDENT' and name the constraint as FK\_ROLL.

**c)** Try to insert following data:-  
<16,90,80>

**d)** Change width of 'MATH' column to 3.

**e)** Add a check constraint on 'ENG' column so that permissible value for 'ENG' attribute lies between 0 and 50 and name the constraint as CHK\_ENG.

**f)** Try to insert following data:-  
<11,90,80>

**g)** Now insert following data:

<u>ROLL</u>	<u>MATH</u>	<u>ENG</u>
<b>11</b>	<b>90</b>	<b>45</b>
<b>12</b>	<b>45</b>	<b>46</b>
<b>13</b>	<b>70</b>	<b>30</b>
<b>14</b>	<b>90</b>	<b>20</b>
<b>15</b>	<b>45</b>	<b>46</b>

**h)** Add a new column 'TOTAL' in table 'MARKS'. The data type is number and width is 3.

**i)** Update column 'TOTAL' in 'MARKS' table with proper data.

### **Q3. Write queries using SQL.**

- i)** Display data from table 'STUDENT' with column heading ROLL\_NO, STD\_NAME.
- j)** List students having name starting with letter 'S'.
- k)** List students where second character of name is 'a'.
- l)** Display EXAMDATE in 'DD/MM/YYYY' format.
- m)** Display NAME, MATH, ENG and PER of all students. Assume, total marks of math are 100 and eng is 50.
- n)** Display names of all students who are getting above 65 of math.
- o)** Display names of students getting marks in eng between 20 and 40.
- p)** Display name of the student, who get the same marks (math) as that of 'Shyamal'.

### **Q4 Create following tables:-**

**HOTEL (HOTEL\_NO, NAME, ADDRESS )**  
**ROOM( ROOM\_NO, HOTEL\_NO, TYPE, PRICE)**

**BOOKING(HOTEL\_NO, GUEST\_NO, DATE\_FROM, DATE\_TO, ROOM\_NO)**

**GUEST(GUEST\_NO, NAME, ADDRESS)**

Where **HOTEL** contains hotel details and HOTEL\_NO is the Primary Key.

**ROOM** contains room details for each hotel and (**HOTEL\_NO,ROOM\_NO**) forms the Primary key. **BOOKING** contains details of the bookings and the Primary Key comprises (**HOTEL\_NO, GUEST\_NO, DATE\_FORM**) and **GUEST** contains guest details and **GUEST\_NO** is the Primary key and mention the Foreign Key constraints.

**Q5. Write queries using SQL.**

- i.** List full details of hotels in Mumbai
- ii.** List the name and addresses of all guests in New Delhi, alphabetically ordered by the name.
- iii.** List all double or family rooms with a price below Rs. 800 per day, in ascending ordered.
- iv.** List the bookings for which no date\_to has been specified.
- v.** What is the total daily revenue from all the double room?
- vi.** How many different guests have made booking for august, 2015
- vii.** List the price and type of all rooms at the hotel Land Mark.
- viii.** What is the total income from booking for the hotel Manor today.

## Assignment-II

<b>Subject</b>	<b>Database Management System</b>
<b>Course Title</b>	<b>Introduction to DBMS</b>
<b>Name of the Paper</b>	<b>Database Management System Lab</b>
<b>Paper Code</b>	<b>IT-691</b>

There are five questions in this Assignment. Answer all the questions. You may use illustrations and diagrams to enhance explanations.

**Q1. a)** Create tables for following functional Dependencies –

$eno \rightarrow \{ename, address\}$

$pno \rightarrow \{pname, plocation\}$

$\{eno, pno\} \rightarrow hours$

plocation must be among MUMBAI, KOLKATA, CHENNAI, and DELHI.

**b)** Mention primary key, foreign key and CHECK constraints.

**c)** i. Insert following data for EMP:-

ENO	ENAME	ADDRESS
1	Swarnali	MUMBAI
2	Deboshree	MUMBAI
3	Moumita	KOLKATA
4	Piyali	CHENNAI
5	Surupa	DELHI

ii. Insert following data for Proj:-

PNO	PNAME	PLOCATION
101	BANKING	DELHI
102	LIBRARY	MUMBAI
103	RAILWAY_BOOKING	KOLKATA
104	PF_AUTOMATION	CHENNAI
105	SHARE_ANALYZER	DELHI

iii. Insert following data for EmpProj:-

ENO	PNO	HOURS
1	101	10
2	103	12
3	104	19
3	105	29
5	102	6

d) List the name of employees who are working on more than one project.

**Q2. a)** Create a table PHONE\_BOOK. The fields of the table are NAME, ADDRESS, PHONE\_NO.

b) Insert at least 6 entries into the table of which there are two pairs of duplicate entries.

c) Delete duplicate rows from the table.

d) Write a query to select first two rows from the table.

e) Write a query to select last two rows from the table.

**Q3. a)** Create a table employee and insert following data into the table.

EMPNO	EMPNAME	MANAGER NO.	SALARY(RS).
E1	Amal	--	30000
E2	Bimal	E1	25000
E3	Kamal	E1	20000
E4	Nirmal	E2	15000
E5	Shymal	E2	21000
E6	Parimal	E3	10000

b) Retrieve the names of the employees and the names of their respective managers from the employee table.

c) Retrieve the name of the employee who is earning second maximum salary.

d) Retrieve the name of the employee who is earning nth highest salary.

e) Retrieve the names of employees whose salary is greater than the salary of all the employees whose manager no. is E1.

f) Get the details of all employees whose salary is lesser than the average salary of the employee.

**Q4. a)** Create a table account and insert following data into the table Account.

ACCOUNT NO.	BRANCH NAME	AMOUNT (RS)
A1	Kolkata	50000
A2	Howrah	40000
A3	Howrah	40000
A4	Kolkata	20000
A5	Durgapur	30000

b) Create a view that will show branch name and total amount of that branch. The name of view will be acc\_view.

c) Select the branch names having total amount greater than 50000

i) Using account1 view

ii) Without using view.

**Q5. a)** Create a table Marks and insert following data into the table.

STUDENT NAME	SUBJECT NAME	MARKS
Amit	DBMS	80

Amit	OS	70
Bimal	DBMS	70
Bimal	OS	70

**b)** Retrieve the name of the students who are getting marks in DBMS above 75 but who are getting marks in OS less than 75.

**c)** Write a query to retrieve student names from the marks table and output will look

like:-

Mr. A  
Mr. A  
Mr. B  
Mr. B

# Assignment-III

<b>Subject</b>	<b>Database Management System</b>
<b>Course Title</b>	<b>Introduction to DBMS</b>
<b>Name of the Paper</b>	<b>Database Management System Lab</b>
<b>Paper Code</b>	<b>IT-691</b>

There are seven questions in this Assignment. Answer all the questions. You may use illustrations and diagrams to enhance explanations.

- Q1.** Write a PL/SQL program to check the given number is even or odd.
- Q2.** Write a program to check whether a given number is prime or not.
- Q3.** a) Write a PL/SQL program to check whether a number is Armstrong number or not.  
b) Write a PL/SQL function, which returns maximum of the three numbers.
- Q4.** a) Write a procedure to calculate sum of two numbers.  
b) Write a function, which returns true if employee exist in employee table otherwise it returns false. The Table is as follows: **EMPLOYEE (ENO, ENAME, SALARY, MGRNO)**
- Q5.** a) Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated areas in table.  
b) Add an extra column diameter to the table circle and update the diameter column for each entry  $diameter=2*radius$ .  
c) Print the number of records in the circle table with the help of an explicit cursor.
- Q6.** A HRD manager has decided to raise the salary for all the employees in department number 20 by 0.05. Whenever any such raise is given to employees an audit trail of the same is maintained in the **EMP\_RAISE** table. The **EMP\_RAISE** table holds the employee number, the date when the raise was given and the raise amount.  
Write a PL/SQL block to update the salary of each employee of dept-no 20 appropriately and insert a record in the **EMP\_RAISE** table as well.  
Tables are as follows:  
**EMPLOYEE (EMP\_CODE, ENAME, JOB, SALARY, DEPTNO)**  
**EMP\_RAISE(EMP\_CODE, RAISE\_AMOUNT, RAISE\_DATE)**
- Q7.** Create a transparent audit system for a table **CLIENT\_MASTER**. The system must keep track of the records that are being deleted or updated. The functionality being when a record is deleted or modified the original record details and the date of operations is stored in the audit-client table, the delete or update is allowed to go through. Write a trigger for the above problem.

The Tables are as follows:-

**CLIENT\_MASTER (CLIENT\_NO, NAME, ADDRESS, CITY, BAL-DUE)**

**AUDIT\_CLIENT (CLIENT\_NO, NAME, BAL\_DUE, OPERATION, USER\_ID, OP\_DATE)**

OPERATION : Operation performed on the client-master table  
OP\_DATE : The date when the operation was performed.  
USER\_ID : The name of the user performing the operation.



**SILIGURI INSTITUTE OF TECHNOLOGY**  
**COMPUTER SCIENCE & ENGINEERING**



**COURSE FILE**  
**1<sup>ST</sup> SEM, 2<sup>ND</sup> YEAR, 2015**

**PAPER NAME: DATA STRUCTURE AND ALGORITHM**

**PAPER CODE : CS 302 & CS 392**



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Course Title/Code: Data Structure and Algorithm/CS302 & CS392

Semester:-1<sup>st</sup>Year:- 2<sup>nd</sup> Group:- B

Name of the Faculty: Prof. Sutapa Bhattacharya

E-mail : [sutapa2007@gmail.com](mailto:sutapa2007@gmail.com)

**Class Schedule:**

Day	Monday	Tuesday [ 2L ]	Wednesday[ L ]	Thursday	Friday [ T ]
Timing(B)	---	11:40 am – 1:20pm	11:40 am – 12:30pm	---	2:10 pm – 3:00 pm

**Laboratory Schedule:**

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Group B1	---	---	---	2:10 pm – 4:40 pm	---
Group B2	---	2:10 pm – 4:40 pm	---	---	---

**Hours of Meeting Students:**

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Timing(B)	3.50pm--4.50pm	3.50pm--4.50pm	3.50pm--4.50pm	3.50pm--4.50pm	3.50pm--4.50pm

- OR Byappointment.

**i) Course Objective:**

Students will be capable to demonstrate the basic concept of data structures and implement it through C programming language and compute asymptotic notations of an algorithm to analyze the consumption of resources (time/space).

**ii) Course Outcomes:**

After completion of this course the students are expected to be able to demonstrate following Knowledge, skills and attitudes.

- a) **The Students will be able to:**

COs	Outcomes	Targets
CS302.1	1. <b>Describe</b> ideas about Algorithm and basic data structures. (BT-LEVEL 2)	60% marks
CS302.2	2. <b>Implement</b> linear data Structure like array, linked list and its operations. (BT- LEVEL 3)	60% marks
CS302.3	3. <b>Solve</b> the different problems on stack, queue and recursive techniques.(BT-LEVEL 3)	60% marks
CS302.4	4. <b>Utilize</b> the knowledge about the basic data structure and algorithm in non- linear data structures.(BT-LEVEL 3)	60% marks
CS302.5	5. <b>Verify</b> the complexity of standard algorithms for Sorting, Searching and Hashing. (BT-LEVEL 5)	60% marks

- b) Once the student has successfully complete this course, he/she must be able to answer the following questions or perform/demonstrate the following:

SN	QUESTION	BT- LEVEL
1.	<b>Define</b> linear and non-linear data structure.	2
2.	<b>Describe</b> briefly about asymptotic notations.	2
3.	How do you <b>implement</b> the linked list data structure?	3
4.	How to <b>solve</b> the problem of singly linked list?	3
5.	How do you <b>implement</b> stack using array and linked list?	3
6.	How do you <b>implement</b> linear queue using array and linked list?	3
7.	How do you <b>implement</b> linear queue using array and linked list?	3
8.	How to <b>calculate</b> Balance factor in AVL tree?	3
9.	How can implement a non-linear data structure?	3
10.	What is the technique to <b>detect</b> worst time complexity in quick sort?	5
11.	How to <b>verify</b> complexity of sorting algorithm?	5

### Data Structure and Algorithm Syllabus [in Units]

**Paper Code: CS302**

**Contracts: 3L + 1 T**

**Credits- 4**

#### Unit -1: Introduction (2L)

Why we need data structure?

Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type. Algorithms and programs, basic idea of pseudo-code.

3

Algorithm efficiency and analysis, time and space analysis of algorithms – order notations.

#### Unit-2: Array (2L)

Different representations – row major, column major.

Sparse matrix - its implementation and usage. Array representation of polynomials.

**Unit-3: Linked List (4L)**

Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.

**Unit-4: Stack and Queue (5L)**

Stack and its implementations (using array, using linked list), applications.

Queues, circular queue, dequeue. Implementation of queue- both linear and circular (using array, using linked list), applications.

**Unit-5: Recursion (2L)**

Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle.

**Unit-6: Nonlinear Data structures Trees (9L)**

Basic terminologies, forest, tree representation (using array, using linked list).

Binary trees-binary tree traversal (pre-, in-, post-order), threaded binary tree (left, right, full)-non-recursive traversal algorithms using threaded binary tree, expression tree.

Binary search tree- operations (creation, insertion, deletion, searching).

Height balanced binary tree – AVL tree (insertion, deletion with examples only). B-Trees – operations (insertion, deletion with examples only).

**Unit-7: Nonlinear Data structures Trees Graphs (6L):**

Graph definitions and concepts (directed/undirected graph, weighted/un-weighted edges, sub-graph, degree, cut- vertex/articulation point, pendant node, clique, complete graph, connected components – strongly connected component, weakly connected component, path, shortest path, isomorphism).

Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list.

Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, and forward-edge), applications.

Minimal spanning tree – Prim’s algorithm (basic idea of greedy methods).

**Unit -8: Sorting (5L)**

Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quicksort, heap sort (concept of max heap, application – priority queue), radix sort.

**Unit -9: Searching (2L)**

Sequential search, binary search, interpolation search.

**Unit -10: Hashing (3L)**

Hashing functions, collision resolution techniques.

**c) Unit Layout**

Unit No.	Unit	Lecture Hours	Tutorials	Laboratory Hours
1	Introduction	2HRS		
2	Array	2 HRS	1	3 HRS
3	Linked List	4 HRS	1	12 HRS
4	Stack and Queue	5 HRS	2	6 HRS
5	Recursion	2 HRS	1	3 HRS
6	Trees	9 HRS	2	3 HRS
7	Graphs	6 HRS	2	

8	Sorting	5 HRS	1	6 HRS
9	Searching	2 HRS	1	3 HRS
10	Hashing	3 HRS	1	
	<b>Total</b>	<b>40</b>	<b>12</b>	<b>36HRS</b>

**Text Books:**

- 1) Data Structure and Algorithms, Seymour Lipschutz, TMH Publications
- 2) Data Structures using C and C++ by Langsam, Tenenbaum, PHI publications

**Reference Books:**

- 1) "Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed
- 2) Data structures through C language by Samiran Chattopadhyay

**d) Evaluation Scheme:**

**1) Theory:**

Evaluation Criteria	Marks
First & Second Internal Exam*	15
Assignments/Quiz	10
Attendance	5
University Exam	70
Total	100

\* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

**University Grading System:**

Grade	Marks
O	90% and above
E	80– 89.9%
A	70– 79.9%
B	60– 69.9%
C	50– 59.9%
D	40– 49.9%
F	Below 40%

**2) Practical:**

Evaluation Criteria	Marks
Internal Exam*	40
University Exam	60
Total	100

\*Internal Evaluation will be based on daily lab performance as per the following schedule:

**e) Laboratory Evaluation:**

Experiment No.	Experiment Name	Schedule	Marks
P1	Implement the following Operation of Array data structure: 1) InsertanddeleteanelementintoanArray. 2) Traverse thearray.	3 HRS	3
P2	Implement the following Operation of Single linked list : 1) Create and Traverse a single linked list. 2) Insertanddeleteanelementfromalist 3) Reverse a single list. 4) Searching the element from the list 5)Sorting the node values in ascending order	3 HRS	4
P3	1) Implement The following Stack Operation using Array and Linked List : a)PUSH() b)POP() c) Traversal 2)WriteaprogramtoimplementTowerofHanoi and8queen puzzleproblemusingrecursion	3 HRS	4
P4	1)Implement The following linear Queue Operationusing Array andLinkedlist: a)Enqueue() b)Dequeue() c)Traversal 2)Implement The following Circular Queue Operation using Array : a)Enqueue() b)Dequeue() c) Traversal	3 HRS	4

P5	Implement The following Double ended Queue Operation using Array : a)Insert left() b)Insert right() c) Delete left() d) Delete right() e)Traversal()	3 HRS	4
P6	Implement the following Operation of Double linked list : 1) CreateandTraverseadoublelinkedlist. 2) Insertanddeleteanelementfromalist.	3 HRS	3
P7	Implement the following Operation of Circular linked list : 1) CreateandTraverseadoublelinkedlist. 2) Insertanddeleteanelementfromalist.	3 HRS	3
P8	Write a program to implement polynomial additionand multiplicationusinglinkedlist.	3 HRS	3
P9	Implement The following Binary search Tree operation : a) Insert an element b) Delete an element c) Search an element	3 HRS	3
P10	Develop the following sorting algorithm: a)Bubblesort b)Selectionsort c)InsertionSort d)Merge sort	3 HRS	3
P11	Develop the following sorting algorithm: a)Quick sort b)Heap sort c)Shell sort	3 HRS	3
P12	Develop the following searching algorithm: Linear Search, Binary Search and Interpolation search	3 HRS	3
Total			40
University Exams			60

#### f) Overall Course Attainment Target

Attainment Level	Inference	Marks
Attainment Level 1	40%ofthestudentshaveattainedmorethanthetargetlevelofthatCO	1
Attainment Level 2	50%ofthestudentshaveattainedmorethanthetargetlevelofthatCO	2
Attainment Level 3	60%ofthestudentshaveattainedmorethanthetargetlevelofthatCO	3

## Overall Course Attainment Target

(70% of university and 30% of the internal exam) will be = **Attainment Level 3**

**Target has been set on the basis of last year's performance / result by the students, student quality this year and difficulty level of the course.**

### g) Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes												PSOs	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	1.	2.
CS302.1	1	1	--	--	--	--	--	--	--	--	--	--	1	1
CS302.2	2	2	--	--	1	--	--	--	2	--	--	--	1	1
CS302.3	2	2	--	--	2	--	--	--	2	--	--	1	1	--
CS302.4	2	2	--	--	2	--	--	--	2	--	--	1	1	--
CS302.5	2	3	--	--	2	--	--	--	2	--	--	1	1	--
CS302	<b>2</b>	<b>2</b>	--	--	<b>2</b>	--	--	--	<b>2</b>	--	--	<b>1</b>	<b>1</b>	<b>1</b>

- CO1 to CO5 satisfies application of knowledge of mathematics and science in solving engineering problems and problem analysis. (PO1, PO2).
- CO2 to CO5 partially satisfies modern engineering and IT tools. (PO5).
- CO2 to CO5 minimally satisfies the individual and team work. (PO9).
- CO3 to CO5 minimally satisfies the lifelong learning. (PO12).
- CO1 to CO5 satisfies application of knowledge of mathematical foundations, programming skills and algorithm etc. (PSO1).
- CO1 and CO2 minimally satisfies PSO2

### h) Delivery Methodology:

Outcome	Method	Supporting Tools	Demonstration
CS 302.1	Structured, Partially Supervised	Black Board ,NPTEL videos	Describe the basic algorithm and asymptotic notations.
CS 302.2	Structured, Partially Supervised	Black Board, C programming	Describe the different types of linked list and their implementations.
CS 302.3	Structured, Partial Supervised	Black Board, C programming	Demonstrate applications of stack and queue.

CS 302.4	Structured, Partial Supervised	Black Board, C programming, Power point slides	Implement Non-linear data structures using linear data structures.
CS 302.5	Structured, Partial Supervised	Black Board, C programming, Power point slides	Implement different types of sorting, searching problems.

**i) Assessment Methodology:**

Assessment Tool	Outcomes					Specific Question aligned to the Outcome
	CS302.1	CS02.2	CS302.3	CS302.4	CS302.5	
FIRST INTERNAL	√	√	√	√	--	Write an algorithm to reverse a linked list in reverse order.
SECOND INTERNAL	--	--	--	√	√	Draw a max heap from the below list: 12, 11, 7, 3, 5, 9, 2, 10
ASSIGNMENT	√	--	√	√	√	Translating the following infix expression into postfix expression using algorithm: A+(B*C-(D/(E+F))*G)*H
QUIZ	√	√	√	√	√	..... function of C is used to allocate a block of memory. a) malloc()                      b) calloc() c) free()                              d) realloc()
LABORATORY	---	√	√	√	√	Write a program to implement singly linked list.





## A. Weekly Lesson Plan

Week	Lectures	Tutorial	Laboratory	Assignment/Quiz
1	<p>Discussion on course outcome and program outcome</p> <p><b>Introduction:</b> Remembering C programming language. Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type. Algorithms and programs, basic idea of pseudo-code.</p> <p><b>Linear Data Structure: Array-</b> Insertion, Deletion, Traversing, row major, column major, Sparse matrix - its implementation and usage</p> <p><b>Linear Data Structure: Singly Linked List-</b> Definitions, Operations- Create, Traverse, Insertion</p>	Review of C Language	Implement C programming using function and structure technique.	<b>Quiz1</b>
2	<p><b>Linear Data Structure: Singly Linked List-</b> Deletion, Reverse, Traverse (in reverse order), Sorting, Searching</p> <p><b>Linear Data Structure: Stack-</b> Definitions, operations (push, pop, traverse). Implementations stack using array and linked list, Polish notations</p>	Array	Array (P1)	<b>Assignment1</b>
3	<p>Conversion -infix to postfix, Evaluation of postfix</p> <p><b>Principles of recursion</b> – use of stack, differences between recursion and iteration, tail recursion, Applications - The Tower of Hanoi, Eight Queen puzzle problem</p> <p><b>Linear queue</b> -(Definition, implementation using array and Linked List)</p>	Single Linked List	Singly Linked list (P2)	<b>Assignment1</b>

4	<p><b>Circular queue</b>-(Definition, implementation using array and Linked List)</p> <p><b>Double Ended queue</b>-(Definition, implementation using array)</p>	Stack & Recursion	Stack & Recursion (P3)	<b>Assignment1</b>
5	<p>Doubly Linked List –Definitions and operations(create, traverse, insertion, deletion)</p> <p>Circular Linked List –Definitions and operations(create, traverse, insertion, deletion)</p>	Queue	Queue (P4 & P5)	
6	<p>Polynomial and Applications using array and linked list</p> <p><b>Nonlinear Data structures- Trees</b> :Basic terminologies, forest, tree representation (using array and linked list), Binary trees - binary tree traversal (pre-, in-, post-order)</p> <p>Binary search tree-Definition and operations (create, insert, traverse, search), BST deletion</p>	Double and Circular Linked List	Double and Circular Linked List(P6&P7)	<b>Assignment1</b>
7	<p>Expression tree, Threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree</p> <p>Height balanced binary tree – AVL tree (insertion, deletion with examples only).</p> <p>B- Trees – operations (insertion, deletion with examples only).</p> <p>Basic idea of pseudo-code, Algorithm efficiency and analysis, time and space analysis of algorithms – order notations</p>	Binary search tree	Polynomial addition and multiplication using linked list(P8)	<b>Assignment2</b>

8	<p><b>Sorting Algorithms</b> : Bubble sort and its optimizations, Insertion sort and analysis of time complexity</p> <p>Selection sort, Merge sort and analysis of time complexity</p> <p>Quick sort, Shell sort and analysis of time complexity</p> <p>Heap sort (concept of max heap), Radix sort and analysis of time complexity</p>	B-Tree & AVL Tree	Binary search tree (P9)	<b>Assignment2</b>
9	<p><b>Searching</b> : Sequential , Binary search, Interpolation search and its time complexity</p> <p><b>Non-linear Data structure: Graphs-</b> definitions and concepts (directed/undirected graph, weighted/un-weighted edges, sub-graph, degree, cut-vertex/articulation point, pendant node, clique, and complete graph)</p>	Asymptotic notations and Sorting Algorithms	Sorting(P10)	<b>Assignment2</b>
10	<p><b>Graphs:</b> Definitions (connected components – strongly connected component, weakly connected component, path, shortest path, isomorphism)</p> <p>Graph representations storage implementations – adjacency matrix, adjacency list, adjacency multi-list., connectivity – Depth-first search (DFS),</p>	Searching	Sorting(P11)	<b>Assignment2</b>
11	<p>Breadth-first search (BFS) – concepts of edges used in DFS and BFS, applications.</p> <p>Minimal spanning tree – Prim’s algorithm (basic idea of greedy methods).</p> <p><b>Hashing</b> : Hashing functions, collision resolution techniques</p>	Graphs	Searching(P12)	
12	<p>Discussion on Previous Question Paper on WBUT</p> <p>Revision Lesson</p>	Hashing		

**B. Daily Lesson Plan (Repeat format for each unit)**

**UNIT: 1**

**Title : Introduction**

**Date: 14/07/15 Day: Tuesday(11.40 a.m—13.20 p.m)**

**CONTENTS**

1) Discussion on program outcome, Introduction to C programming language with example 2) Define the Data structure

3) Classify Data Structure

4) Explain Algorithm with example

Unit Objectives: Student can able to recall C programming. Broad

Objectives of the unit are:

1. Concepts of using pointer function and structure.
2. Data structure definition and classifications.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Describe** function, structure? (Level 2)
2. What do you **understand** by Data Structure? (Level 2)
3. **Classify** data structure with examples. (Level 5)
4. **Describe** characteristics of algorithms. (Level 2)
5. **Compare** between linear and non linear data structure. (Level 4)

HOMEWORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. What is the utilization of the following program? main()

```
{
    int a[]={0,1,2,3,4};
    int k, *p;
    for(p=a, k=0; p+k<=a+4; p++, k++) printf(" %d ",
        *(p+k));
}
```

QUIZ: related to Topic objective and outcome (new quiz with real world examples) 1)..... function of C is

used to allocate a block of memory.

- a) malloc()                      b) calloc()

c)free()                      d)realloc()

UNIT: 2

Title :Array and Its Operation

Date: 15/07/15 Day: Wednesday(11.40a.m---12.30 p.m)

CONTENTS

- 1) Define Array data structure.
- 2) Insert an element in to Array.
- 3) Delete an element from Array.
- 4) Memory representation: row major and column major

Topic/Unit/Chapter Objectives: Student can able to understand about linear data structure. Broad Objectives of the chapter/topic are:

1. Concepts of linear data structure.
2. Implement the algorithm to insert and delete an element from array.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Describe** array? (Level1)
2. **Explain** the algorithm for insert and delete operation on array data structure. (Level4)
3. **Explain** with example on row major and column major. (Level4)

HOMEWORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

- 1) Let A be a two dimensional array declared as  $A[1 \dots 10][1 \dots 15]$  of integer. Assuming that each integer takes one memory locations the array is stored in row major order and the first element of the array is stored at location 100, what is the address of the element  $A[i][j]$ ?

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

- 1) The number of elements n is called the length ----- of the array.
  - a) Upper Bound                                      c) Lower Bound
  - b) Size    d) Variable
- 2) Arrays are best data structures
  - a) for relatively permanent collections of data                      b) for the size of the structure and the data in the

c) for both of above situation

structure are constantly changing

d) for none of above situation

LABORATORY EXPERIMENT: related to the Topic objective and outcome

1) Insert one element into array and delete one element from array.

#### UNIT: 2

Title :Tutorial I

Date: 17/07/15 Day: Friday(02.10 p.m---03.00p.m)

#### CONTENTS

- 1) Write a C program to merge two arrays.
- 2) What is the difference between linear and non-linear data structure?

#### UNIT: 3

Title:**SingleLinked List**

Date: 21/07/15 Day: Tuesday(11.40 a.m—13.20 p.m)

- 1) Definition of Linked list and its types.
- 2) Representation of linked list.
- 3) Operations of Single Linked list( Create, Traverse, Insertion)

Unit Objectives: Student can able to understand about single linked list. Broad Objectives of the chapter/topic are:

1. Student can able to **understand** linked list. (Level 2)
2. How to **create** a single linked list? (Level 6)
3. **Compare** between array and linked list. (Level 4)

Once the student has completed this topic/ chapter he/she will be able to answer following questions/performance the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Explain** an algorithm for Creation of single linked list. (Level 4)
2. **Explain** the algorithm of Traversal of single linked list. (Level 4)

HOMEWORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Draw a single link list which has 5 nodes.

LABORATORY EXPERIMENT: related to the Topic objective and outcome

- 1) Implement the following operation of linked list
  - a) Create list
  - b) Traversal
  - c) Insert first
  - d) insert last
  - e) Insert Anywhere

UNIT: 3

Title: **Single Linked List**

Date: 22/07/15 Day: Wednesday (11.40 a.m—12.30 p.m)

CONTENTS

Operations of Single Linked list. (Deletion, Searching, Sorting, Reversing)

Unit Objectives: Student can able to **understand** about operation of single linked list Broad Objectives of the chapter/topic are:

1. Student can able to **understand** single linked list. (Level 2)
2. How to **explain** the algorithm to Insert and Delete an element from a single linked list? (Level 4)

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Explain** an algorithm for Insertion and deletion of single linked list. (Level 4)
2. **Explain** the algorithm of searching the element from single linked list. (Level 4)
3. **Explain** an algorithm for Sorting of single linked list. (Level 4)
4. **Explain** to Reverse single linked list. (Level 4)
5. **Explain** to traverse linked list in reverse order. (Level 4)

HOMEWORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Write an algorithm of finding the middle node from a single linked list.
2. Binary search is possible or not to find a node from a linked list.

LABORATORY EXPERIMENT: related to the Topic objective and outcome.

- 1) Implement the following operation of single linked list
  - a) Delete first
  - b) delete last
  - c) Delete anywhere
  - d) Sorting
  - e) Reversing
  - f) Traverse (in reverse order)
  - g) Search the element from list

UNIT: 3

Title: Tutorial-II

Date: 24/07/15 Day: Friday (02.10 a.m—03.00 p.m)

CONTENTS

- 1) What is the difference between array and linked list?
- 2) Find the middle element from a single link list without counting the number of node?  
(If number of node is ODD then one middle element, if EVEN then two middle element)
- 3) Is it possible to find (searching) a node from a single link list using BINARY search (consider all the element in sorted order)

UNIT:3

Title: Linear Data Structure (Stack) Date:

28/07/15 Day: Tuesday

CONTENTS

- 1) STACK-Definitions, operations
- 3) Implementations using array
- 4) Implementations using linked list
- 5) Application of Stack
- 6) Arithmetic notation (prefix, postfix, infix)

Unit Objectives: Student can able to **understand** about operation of stack Broad

Objectives of the chapter/topic are:



1. Able to **understand** about Stack Data Structure
2. Student can able to **understand** stack operation ( PUSH and POP)
3. Able to understand about how to represent prefix, postfix, and infix notation

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom’s Taxonomy):

1. What do you **understand** by push and pop operation in Stack? (Level 2)
2. **Finding** the over flow and under flow condition for Stack? (Level 4)
3. **Explaining** the real life example of stack? (Level 4)

HOMEWORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. A single array  $A[1 \dots \text{MAXSIZE}]$  is used to implement stacks. Two stacks grow from opposite ends of the array. Variable  $\text{Top1}$  and  $\text{Top2}$  ( $\text{Top1} < \text{Top2}$ ) point to the location of the top most element in each stacks. if the space is to be used efficiently. so what is the STACKFULL condition?

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

1. Stack is also called as
 

a) Last in first out	b) First in last out
c) Last in last out	d) First in first out
2. Inserting an item into the stack when stack is not full is called ..... Operation and deletion of item from the stack, when stack is not empty is called ..... operation.
 

a) push, pop	b) pop, push
c) insert, delete	d) delete, insert

LABORATORY EXPERIMENT: related to the Topic objective and outcome.

1. Implement Stack Operation in C programming language using array and linked list.

UNIT: 4

Title: Linear Data Structure (STACK) Date:

29/07/15 Day: Wednesday

CONTENTS

- 3) Convert infix to post fix expression (with examples)

#### 4)Evaluation of post fix expression

Topic/Unit/Chapter Objectives: Student can able to understand stack data structure Broad Objectives of the chapter/topic are:

1. Student can able to understand how to convert infix to post fix expression
2. Student can able to understand how to evaluate post fix expression

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Describe** polish notation? (Level 2)
2. What do you **understand** by reverse polish notation? (Level 2)

HOMEWORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Translating the following infix expression into post fix expression  $A+(B*C-(D/(E+F))*G)*H$
2. Evaluate the following Post fix expression (with single digit operand).  $8\ 2\ 3\ ^\wedge\ /2\ 3\ *\ +5$   
 $1\ *\ -$   
Identify the Top two elements of the stack after the first \* (operator) is evaluated.

#### UNIT: 4

Title :Tutorial-III

Date: 31/07/15 Day: Friday

#### CONTENTS

1. Convert the following arithmetic expression infix to post fix expression i)  $A+B*D+(G-H)$   
ii)  $F/G*(M*N+A)$
2. Evaluate the following post fix expression. i)  $*+7\ 9-4$   
 $6$   
ii)  $/+24*-6\ 3\ 1$
3. The following sequence of operation is perform on a stack :  
 $\text{push}(1),\text{push}(2),\text{pop}(),\text{push}(5),\text{pop}(),\text{pop}(),\text{push}(4),\text{pop}()$ . What are sequence of popped out values?

UNIT: 5

Title : Recursion

Date: 04/08/15 Day: Tuesday

CONTENTS

- 1) Recursion.
- 2) Types of Recursion.
- 3) Tower of Hanoi.
- 4) Eight Queen Puzzle Problem.

Unit Objectives: Student can able to **understand** about recursion and its classification. Broad Objectives of the chapter/topic are:

1. Student can able to understand how to apply recursion technique in real life application.
2. Student can able to understand how to draw recursive tree.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Compare** between Recursion Vs Iteration. (Level 4)
2. **Describe** Tail recursion? (Level 2)
1. **Explain** the algorithm of Tower of Hanoi. (Level 4) 2. **Outline** a recursive Tree for Tower of Hanoi for n=3. (Level 4)
3. **Explain** the algorithm of 8 queen puzzle problem. (Level 4)

HOMEWORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

```
1) int ABC( int n , int m )
   {
       if(n==0) return(m+1);
       else if(m==0&& n>0)
```

```

return ABC(n-1,1);

else return ABC(n-1,ABC(n,m-1));

}

```

2) Draw a recursive Tree for Tower of Hanoi for  $n = 4$

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

NA

LABORATORY EXPERIMENT: related to the Topic objective and outcome

1. Construct C programming language for GCD of two number recursive techniques.
2. Construct C programming language for Fibonacci series of two number using recursion.
3. Construct C programming language for tower of Hanoi in recursive technique.
4. Construct C programming language for eight queen puzzle problem in recursive technique.

#### UNIT: 4

Title: Linear Data Structure (Linear QUEUE) Date:

05/08/15 Day: Wednesday

#### CONTENTS

- 1) Linear Queue-Definitions
- 2) Operation of Queue (insert at front, delete at rear)
- 3) Implementation using array and linked list

Topic/Unit/Chapter Objectives: Student can able to understand queue data structure Broad Objectives of the chapter/topic are:

1. Able to understand about linear queue Data Structure
2. Student can able to understand linear queue operation (insert at front, delete at rear)

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Discuss** the operation in queue? (Level 2)
2. **Explain** the overflow and underflow condition for Queue data structure? (Level 4)
3. **What do you understand by** the real life example of queue? (Level 2)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. What is the difficulties of linear queue and how overcome it?

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

1. Which data structure allows deleting data elements from and inserting at rear?

A.Stack

B. Queues

C.Tree

D. LinkedList

2. A .....is a data structure that organizes data similar to a line in the supermarket, where the first one in line is the first one out.

A. Queue

B. Stacks

C. Both of them

D. Neither of them

LABORATORY EXPERIMENT: related to the Topic objective and outcome

1. Implement Linear Queue Operation in C programming language using array and linked list.

UNIT: 4&5

Title : Tutorial-IV Date:

07/08/15 Day: Friday

UNIT:4

Title Linear Data Structure (Circular QUEUE) Date:

11/08/15 Day: Tuesday

CONTENTS

- 1) CIRCULAR Queue
- 2) Operation of CURCULAR Queue (insert at front, delete at rear, traverse)
- 3) Implementation using array
- 4) DEQUEUE-Definitions

5) Operation of DE QUEUE (Insert left, Delete left)

Unit Objectives: Student can able to understand Circular queue data structure Broad Objectives of the chapter/topic are:

1. Able to understand about circular queue Data Structure
2. Student can able to understand circular queue operation (insert at front, delete at rear)
3. Student can able to know how it use full in real life.
4. Able to understand about Double ended queue Data Structure
5. Student can able to understand Double ended queue operation (insert at left, delete at left)

Once the student has completed this topic/ chapter he/she will be able to answer following questions/performance the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Discuss** the operation in Circular queue? (Level 2)
2. **Describe** the overflow and underflow condition for Circular Queue data structure? (Level 2)
3. **Outline** the real life example of queue. (Level 4)
4. **Describe** the Over flow and Under flow condition of Deque. (Level 2)
5. **Explain** the algorithm for traversal of deque. (Level 4)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Take a circular queue **CQ** which is allocated 5 memory cells starting from **CQ[0] to CQ[4]**. Perform the following operations one by one on it and write down **front** and **rear** value in each and every step.

- (i) Insert 23, 12, 45, 33      (ii) Delete two elements      (iii) Insert 43, 56      (iv) Delete one element      (v) Insert 10

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

1. Let queue be a circular array having size 5. Now  $front = 5$  and  $rear = 5$  indicates that the queue -----  
(a) is empty      (b) is full      (c) contains only one element      (d) none of these
2. A linear list in which elements can be added or removed at either end but not in the middle, is known as  
(a) Queue      (b) Deque      (c) Stack      (d) Tree
3. Identify the data structure which allows deletions at both ends of the list but insertion at only one end.  
A. Input restricted deque      B. Output restricted queue

C.Priorityqueues

D. Stack

LABORATORY EXPERIMENT: related to the Topic objective and outcome

1. Implement Circular Queue Operation in C programming language using array.
2. Implement DOUBLE ENDED Queue Operation in C programming language using array ( insert left and delete left)

TOPIC/UNIT/CHAPTER: 3

Title Linear Data Structure (DE-QUEUE) Date:

12/08/15 Day: Wednesday

CONTENTS

- 1) DE-QUEUE OPERATION (Insert right, Delete right)
- 2) Traverse
- 3) Priority Queue

Topic/Unit/Chapter Objectives: Student can able to understand De Queue data structure Broad Objectives of the chapter/topic are:

1. Able to understand about Operation of Double ended queue Data Structure
2. Student can able to understand Double ended queue operation (insert at right, delete at right)

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Produce** the algorithm for insert right? (Level 3)
2. **Outline** the over flow and under flow condition for insert right and delete right? (Level 4)
3. What do you **understand** by Priority Queue? (Level 2)

LABORATORY EXPERIMENT: related to the Topic objective and outcome

1. Implement DOUBLE ENDED Queue Operation in C programming language using Array ( insert left and delete left)

Title :Tutorial-IV

Date: 14/08/15 Day: Friday

1. **Describe** the Over flow and Under flow condition of Deque.
2. **Propose** an algorithm for traversal of deque.

UNIT: 3

Title :Linear Data Structure(Circular Linked List) Date:

19/08/15 Day: Tuesday

CONTENTS

- 1) Circular Linked list. (Definition)
- 2) Operation of circular linked list.
- 3) Double Linked list. (Definition)
- 4) Operation of Double linked list (Create, Traverse)

Topic/Unit/Chapter Objectives: Student can able to understand Operation of De Queue data structure **Broad Objectives of the chapter/topic are:**

1. Student can able to **understand** Circular linked list.
2. How to create, traverse a circular linked list.
3. How to Insert and Delete an element from a circular linked list?
4. Student can able to **understand** double linked list.
5. **How** to Create and traverse the double linked list?
6. Write down the advantages of doubly linked list over singly linked list.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Explain** an algorithm for Creation and traversal of Circular linked list. (Level 4)
2. **Explain** the algorithm for insertion and deletion of Circular linked list. (Level 4)
3. **Explain** an algorithm for Creation and traversal (forward and backward direction) of Double linked list. (Level 4)
4. **Compare** between singly linked list and doubly linked list. (Level 4)



HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

- 1) Draw circular linked lists which have 5 nodes.
- 2) Draw a double linked list which has 5 nodes.

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

1. The disadvantage in using a circular linked list is.....
  - A. It is possible to get into infinite loop
  - B. Last node points to first node.
  - C. Time consuming
  - D. Requires more memory space

LABORATORY EXPERIMENT: related to the Topic objective and outcome

1. Implement the following operation of circular linked list
  - a) Create
  - b) Traverse
  - c) Insert first
  - d) Insert last
  - e) Delete first
  - f) Delete last

TOPIC/UNIT/CHAPTER: 3

Title: Doubly linked list Date:

20/08/15 Day: Wednesday

#### CONTENTS

Operations of Doubly linked list (Insert, Delete)

Topic/Unit/Chapter Objectives: Student can able to **understand** about Circular linked list and its operation.

Broad Objectives of the chapter/topic are:

1. How to Insert and Delete an element from a double linked list.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/performance the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Explain** an algorithm for insertion of Double linked list. (Level 4)
2. **Explain** an algorithm for deletion of Double linked list. (Level 4)

LABORATORY EXPERIMENT: related to the Topic objective and outcome

- 1) Implement the following operation of double linked list
  - a) Create
  - b) Traverse
  - c) Insert first
  - d) insert last
  - e) Insert at specified position
  - f) Delete first
  - g) Delete at specified position
  - h) delete last

TOPIC/UNIT/CHAPTER: 3

Title: Tutorial-VI

Date: 22/08/15 Day: Friday

1. How to delete node at beginning, ending and at specific position?

UNIT: 3

Title: Linear Data Structure (Application of linked list) Date:

25/08/15 Day: Tuesday

CONTENTS

1. Representation of Polynomial expression using array
2. Representation of Polynomial expression using linked list
3. Polynomial addition using linked list
4. Polynomial multiplication using linked list

Topic/Unit/Chapter Objectives: Student can able to **understand** about double linked list and its operation.

Broad Objectives of the chapter/topic are:

1. Student can able to **understand** polynomial addition.
2. Student can able to **understand** polynomial multiplication.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/performance the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Explain** an algorithm for Polynomial addition. (Level 4)
2. **Explain** an algorithm for Polynomial multiplication. (Level 4)

LABORATORY EXPERIMENT: related to the Topic objective and outcome

1. Implement the following operation of linked list
  - a. Polynomial addition.
  - b. Polynomial multiplication

### UNIT: 6

Title : NON -Linear Data Structure( Tree) Date:

26/08/15 Day: Wednesday

### CONTENTS

1. Define Tree and its terminology
2. Definition of binary tree with examples
3. Types of Tree( complete , strictly , extended )
4. Expression Tree

Topic/Unit/Chapter Objectives: Student can able to **understand** about operation of double linked list Broad Objectives of the chapter/topic are:

1. Student can able to **understand** Tree.
2. Concepts of binary tree

Once the student has completed this topic/ chapter he/she will be able to answer following questions/performance the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. What do you **understand** by complete binary tree? (Level 2)
2. **Describe** the following terms : Degree , terminal , root node , height , child (Level 2)

HOMEWORK: related to Topic objective and outcome as expressed in terms of indicators/criteria NA

1) Prove that  $n_0 = n_2 + 1$  where  $n_0$  is the terminal and  $n_2$  is non terminal node degree 2.

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

1. In array representation of binary tree, if the index number of a child node is 6 then the index number of its parent node is

- (a) 2                      (b) 3                      (c) 4                      (d) 5

UNIT: 3

Title : Tutorial-VII Date:

28/08/15 Day: Friday

1. Construct an Expression tree for this following expression:  $(A + (B - C)) * ((D - E) / (F + G - H))$

2. Consider the following Preorder and In order traversals of a binary tree.

Preorder :        A B D G H E I C F J K

Inorder :        G D H B E I A C J F K

5

UNIT: 6

Title: NON-Linear Data Structure (BST) Date:

01/09/15 Day: Tuesday

CONTENTS

1. Definitions of BST
2. Construct BST from in order, pre order and post order traversal.
3. BST operations using algorithms [Create, Traverse (Recursive and non-recursive)]

Topic/Unit/Chapter Objectives: Student can able to **understand** about application of link list Broad Objectives of the chapter/topic are:

1. Student can able to know the operation of binary search tree.

2. Student can able to know how to construct BST from pre order, post order and in order.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Explain** the Algorithm for finding number of node from a BST.(Level 4)
2. **Explain** an algorithm for finding inorder predecessor of root node from non-empty BST.(Level 4)
3. **Describe** BST. (Level 2)
4. **Write** an algorithm for create and traverse BST. (Level 1)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Write an algorithm in order traversal of BST in non-recursive way.

LABORATORY EXPERIMENT: related to the Topic objective and outcome

1. Implement the following BST Operation
  - a) Create
  - b) Traverse (preorder, in order, post order in recursive way)
  - c) Traverse (preorder, in order in non-recursive way)

#### UNIT: 6

Title: NON-Linear Data Structure (BST) Date:

02/09/15 Day: Wednesday

#### CONTENTS

BST operations using algorithms (Insertion)

Topic/Unit/Chapter Objectives: Student can able to **understand** about non-linear data structure like Tree and its terminology.

Broad Objectives of the chapter/topic are:

1. How to insert a node in recursive as well as non-recursive way in a BST?

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Explain** the Algorithm to insert a node in a BST. (Level 4)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria 1.Insert following elements in BST:44,12,34,78,90,6,22,87

1. Implement the following BST Operation
  - a) Insert the node using recursive and non-recursive way

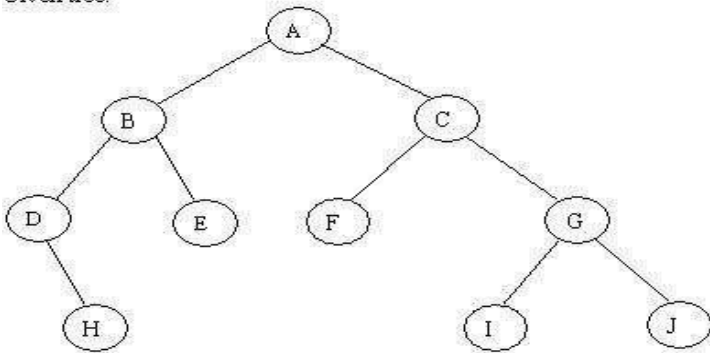
UNIT:

Title : Tutorial-VIII Date:

04/09/15 Day:Friday

- 1) Write an Algorithm for finding in order successor of root node.
- 2) Traverse the given tree using Inorder, Preorder and Postorder traversals.

Given tree:



UNIT: 6

Title: NON-Linear Data Structure(BST) Date:

08/09/15 Day:Tuesday

CONTENTS

BST operations using algorithms(Deletion)

Topic/Unit/Chapter Objectives: Explanation of operation of binary search tree. Broad Objectives

of the chapter/topic are:

1. **Able to understand** the Algorithm for deleting node from a BST.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Explain** the Algorithm for deleting node from a BST.(Level 4)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Write an Algorithm for finding in order successor of root node.

LABORATORY EXPERIMENT: related to the Topic objective and outcome

1. Implement the following BST Operation Delete the node

#### UNIT: 6

Title : NON -Linear Data Structure(Threaded Binary Tree) Date:

09/09/15 Day: Wednesday

#### CONTENTS

1. Threaded Binary Tree

2. Classification of Threaded Binary Tree.

3. Traversal of Threaded Binary tree.

Topic/Unit/Chapter Objectives: Explanation of operation of threaded binary tree. Broad Objectives

of the chapter/topic are:.

1. Student can able to **understand** about threaded binary tree.

2. Student can able to know the classification of Threaded Binary tree

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. Whatdo you **understand** by Threaded Binary tree?(Level 2)

2. **Implement**an algorithm for In order Traverse of Threaded Binary Tree?(Level 3)

3. **Compare** the efficiency between threaded binary tree and BST? (Level 4)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Draw a Full Threaded Binary Tree which has seven nodes.

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

1. If a binary tree is threaded for in-order traversal, a right NULL link of any node is replaced by the address of its

- (a) successor                      (b) predecessor                      (c) root                      (d) own

UNIT: 6

Title :Tutorial-IX

Date: 11/09/15 Day: Friday

1. Construct the Binary Search Tree by using the following traversals: Inorder:

DCKEAHBQJI

Postorder: DKECHQJIBA

2. Draw the expression tree for the following expressions-

i)  $A * B + C / D - E * F + G * H$

ii)  $a * b + c - (d + e) / f * g + h$

UNIT: 6

Title:NON-Linear Data Structure (AVL tree) Date:

15/09/15 Day:Tuesday

CONTENTS

1. AVL Tree-Definitions
2. Balance Factor
3. Operation of AVL Tree(Single rotations, Double rotations)



Topic/Unit/Chapter Objectives: Explanation of more efficient Data structure than binary search tree. Broad Objectives of the chapter/topic are:

1. Student can able to **understand** about AVL tree.
2. Student can able to know the Operation of AVL tree.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. What do you **understand** by AVL tree?(Level 2)
2. **Complete** the full form of AVL?(Level 3)
3. **Compare** BST and AVL tree.(Level 4)
4. What do you **understand** by pivot node in AVL tree?(Level 2)
5. What do you **understand** by Balance factor?(Level 2)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Draw all the general form of rotation for insert in an AVL tree.
2. Insert the following keys in AVL tree and show the rotations.

8, 12, 9, 11, 7, 6,66,2,1,44

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

12. A binary search tree whose left subtree and right subtree differ in height by at most 1 unit is called .....  
A. AVL tree  
B. Red-black tree  
C. Lemmatree  
D. None of the above

### TOPIC/UNIT/CHAPTER: 6

Title: NON-Linear Data Structure(AVL Tree) Date:

16/09/15 Day: Wednesday

### CONTENTS

Explain R<sub>0</sub> R<sub>1</sub> R<sub>-1</sub> rotation for delete an element

Topic/Unit/Chapter Objectives: Explanation of more efficient Data structure than binary search tree. Broad Objectives of the chapter/topic are:

1. Student can able to **understand** about rotation for delete a node from AVL tree

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Evaluate** the time complexity of AVL Tree? (Level 5)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria 1. Draw all the general form of rotation for delete an element from an AVL tree

TOPIC/UNIT/CHAPTER: 6

Title: NON-Linear Data Structure (B Tree) Date:

30/09/15 Day: Tuesday

CONTENTS

1. Explain B Tree.
2. Operation of B tree with example

Topic/Unit/Chapter Objectives: Explanation of deletion of element from B tree. Broad Objectives of the chapter/topic are:

1. Student can able to **understand** about B Tree.
2. Student can able to **know** the Operation of B tree.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Describe** B Tree tree? (Level 2)
2. **Discuss** the element is to be insert into B- Tree? (Level 2)
3. **Describe** an element is to be Deleted from B- Tree? (Level 2)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Insert The following element in to B Tree of order 4 : 4,7,1,4,22,9,11,55,33,88,77
2. Delete The following element in to B Tree of order 4 : 4,7,1,4,22,9,11,55,33,88,77

Title : **Algorithm efficiency and analysis and Sorting**

Date: 01/10/15 Day: Wednesday

CONTENTS

- 1) Define asymptotic notation.
- 2) Demonstrate the classification of asymptotic notation.

Topic/Unit/Chapter Objectives: Explanation of more efficient Data structure Broad

Objectives of the chapter/topic are:

1. Student can able to relate about Big O, Theta and Omeganotation.
2. Student can able to find complexity of an algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Explain** Big O , Theta, Omega notation.(Level 4)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Prove that  $3n^2 + 7n = O(n^2)$
2. Prove that  $3n^2 + 7n = \Omega(n^2)$
3. Prove that  $3n^2 + 7n = \Theta(n^2)$
4. Short notes on asymptotic notations.

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

1. Which of the following shows the correct relationship among some of the more common computing times for algorithm?

- (a)  $O(\log n) < O(n) < O(n \cdot \log n) < O(2^n) < O(n^2)$
- (b)  $O(n) < O(\log n) < O(n \cdot \log n) < O(2^n) < O(n^2)$
- (c)  $O(n) < O(\log n) < O(n \cdot \log n) < O(n^2) < O(2^n)$
- (d)  $O(\log n) < O(n) < O(n \cdot \log n) < O(n^2) < O(2^n)$

Date: 06/10/15 Day: Tuesday

CONTENTS

- 1) Searching- Linear Search, Binary search, Interpolation search
- 2) Time complexity of Linear Search, Binary search, Interpolation search

Topic/Unit/Chapter Objectives: Explanation of Sorting Broad Objectives

of the chapter/topic are:

1. Student can able to understand about linear searching and its time complexity
2. Student can able to understand about binary searching and its time complexity
3. Student can able to understand about interpolation searching and its time complexity

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Describe** searching? (Level2)
2. **Compare** Best, average and worst case time complexity of linear search. (Level4) 3. **Compare** Best, average and worst case time complexity of binary search. (Level4)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

- 1) Search an smallest element from a matrix

QUIZ: related to Topic objective and outcome (new quiz with real world examples) 1. The worst case time complexity of binary search is

- (a)  $O(n^2)$       (b)  $O(n)$       (c)  $O(\log n)$       (d)  $O(n * \log n)$

LABORATORY EXPERIMENT: related to the Topic objective and outcome

- 1) Implement linear search, binary search and interpolation search in C programming language

UNIT: 9

Title :Sorting

Date: 07/10/15 Day: Wednesday

CONTENTS

1. Bubble, Insertionsort
2. Time Complexity Analysis

Topic/Unit/Chapter Objectives: Student can able to understand about algorithm and how analyze time complexity of an algorithm.

Broad Objectives of the chapter/topic are:

1. **Explain** Bubble, Insertion sort algorithm. (Level 4)
2. **Explain** the time complexity analysis. (Level 4)

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Classify** the best, worst and average case time complexity of bubble sort. (Level 2)
2. **Classify** the best, worst and average case time complexity of insertion sort? (Level 2)
3. **Describe** modified bubble sort? (Level 2)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria 1. Draw the step of

Bubble sort for the following data element : 5,1,7,2,4,8

2. Draw the step of Insertion sort for the following data element : 5,1,7,2,4,8

QUIZ: related to Topic objective and outcome (new quiz with real world examples) 1. The best case time

complexity of the bubble sort technique is

- (a)  $O(n)$                       (b)  $O(n^2)$                       (c)  $O(n \log n)$                       (d)  $O(\log n)$

2. The worst case time complexity of the insertion sort technique is

- (a)  $O(n)$                       (b)  $O(n^2)$                       (c)  $O(n \log n)$                       (d)  $O(\log n)$

LABORATORY EXPERIMENT: related to the Topic objective and outcome

1. Implement program for following sorting algorithm  
a) Bubble sort  
b) Insertion sort

UNIT: 1 & 6

Title : Tutorial-X

Date: 09/10/15 Day: Friday

1. Find time complexity of the following algorithm: for( $i=0; i < n; i++$ )

for( $j=i; j < n; j++$ )

```
for(k=j;k<n;k++)
```

```
s++;
```

2. Insert the following keys in the order given below to build them into an AVL tree:

9, 14, 32, 20, 5, 25, 46, 68.

3. Insert the following keys into a B-tree of order 3: p, q, r, d, h, m, l, s, k, n

### UNIT: 8

Title: Sorting

Date: 14/10/15 Day: Tuesday

### CONTENTS

1. Selection Sort, Merge sort
2. Time Complexity Analysis

Topic/Unit/Chapter Objectives: Student can able to understand about searching algorithm. Broad Objectives of the chapter/topic are:

1. **Explain** selection and merge sort algorithm. (Level 4)
2. **Explain** the time complexity analysis. (Level 4)

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Classify** the best, worst and average case time complexity of selection sort? (Level 2)
2. **Classify** the best, worst and average case time complexity of selection sort? (Level 2)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria 1. Draw the step of

Selection sort for the following data element: 15, 1, 70, 2, 41, 87

2. Draw the step of Insertion sort for the following data element: 5, 11, 7, 12, 47, 8

QUIZ: related to Topic objective and outcome (new quiz with real world examples) 1. The best case time

complexity of the merge sort technique is

(a)  $O(n)$

(b)  $O(n^2)$

(c)  $O(n \log n)$

(d)  $O(\log n)$

LABORATORY EXPERIMENT: related to the Topic objective and outcome

2. Implement program for following sorting algorithm
- Selection sort
  - Merge sort

UNIT: 8

Title :Sorting

Date: 15/10/15 Day: Wednesday

CONTENTS

1. Quick sort algorithm and time complexity analysis

Topic/Unit/Chapter Objectives: student can able to understand about sorting and its time complexity Broad Objectives of the chapter/topic are:

1. Student can able to **understand** the algorithm of Quick sort
2. student can able to **understand** Time complexity of Quick sort

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Compare** the best, worst and average case time complexity of Quick Sort?(Level 4)
2. **Find** the strategy which is used to implement Quick sort?(Level 4)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Draw the step of Quick sort for the following data element : 5,1,7,2,4,8,9,11,6

QUIZ: related to Topic objective and outcome (new quiz with real world examples) 1. The best case time complexity of the quick sort technique is

- (a)  $O(n)$                       (b)  $O(n^2)$                       (c)  $O(n \log n)$                       (d)  $O(\log n)$

LABORATORY EXPERIMENT: related to the Topic objective and outcome 1. Implement program for following sorting algorithm

- Quick sort

UNIT: 8 & 9

Title :Tutorial-XI

Date: 16/10/15 Day: Friday

1. Give a comparative study among bubble, insertion and selection sort with examples.
2. Write the linear search algorithm. What is the best time and worst time complexity of this algorithm.
3. Write the binary search algorithm. What is the best time and worst time complexity of this algorithm.

UNIT:8

Title: Sorting

Date: 28/10/15 Day: Wednesday

CONTENTS

1. Shell sort and Radix sort
2. Time complexity analysis

Topic/Unit/Chapter Objectives: student can able to understand about more efficient sorting Algorithm and its time complexity.

Broad Objectives of the chapter/topic are:

1. Student can able to **understand** Shell sort.
2. Student can able to **understand** Radix sort.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Implement** the algorithm of Shell Sort.
2. **Implement** the algorithm of Radix Sort?

HOMEWORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Draw the step of Shell sort for the following data element :  
511,100,79,24,402,801,319,101,604.666,222,873,471,902,184

2. Draw the step of Radix sort for the following data element :  
511,100,79,24,402,801,319,101,604.666,222,873,471,902,184

LABORATORY EXPERIMENT: related to the Topic objective and outcome 1. Implement program for

following sorting algorithm

- a) Shell sort                      b) Radix sort



UNIT:8

Title: Tutorial -XII Date:

30/10/15 Day: Friday

1. Sort the given values using Quick Sort.

65	70	75	80	85	60	55	50	45
----	----	----	----	----	----	----	----	----

2. Sort the given values using Merge Sort.

65	70	75	80	85	60	55	50	45
----	----	----	----	----	----	----	----	----

UNIT: 8

Title Sorting

Date: 03/11/15 Day: Tuesday

CONTENTS

- 1) Algorithm for Heap sort
- 2) Construction of Heap tree
- 3) Time complexity analysis

Topic/Unit/Chapter Objectives: student can know the algorithm and complexity analysis of merge sort. Broad Objectives of the chapter/topic are:

3. Student can able to **understand** the algorithm of heap sort

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Compare** the best ,worst and average case time complexity of Heap Sort ?(Level 4)

2. **Explain** the Heap sort algorithm? (Level 4)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria 1. Draw the step of Heap sort for the following data element: 5, 1, 7, 2, 4, 8, 9, 11, 6

LABORATORY EXPERIMENT: related to the Topic objective and outcome 1. Implement program for following sorting algorithm  
a) Heap sort

UNIT: 5

Title: NON-Linear Data Structure (Graph) Date:

04/11/15 Day: Wednesday

CONTENTS

1) Graph definition

2) Types of Graph: Directed, undirected, complete graph

3) Definitions- weighted/un-weighted edges, sub-graph, degree, cut-vertex/articulation point, pendant node, clique, complete graph, connected components – strongly connected component, weakly connected component, path, shortest path, isomorphism

Topic/Unit/Chapter Objectives: student can know the algorithm and complexity analysis of Heap sort. Broad Objectives of the chapter/topic are:

1. Able to understand definition of graph. 2. Able to

learn different terminology of graph

3. Able to understand different types of graph?

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Describe** the definition of graph? (Level 2)

2. **Identify** directed or undirected graph? (Level 4)

3. **Describe** the definition of different types of graphs? (Level 2)

4. **Identify** isomorphism of graph? (Level 4)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Drawan un directed graph which have 8 vertex and represent it using array.

QUIZ: related to Topic objective and outcome (new quiz with real world examples) 1. The vertex, removal of which makes a graph disconnected, is called

(a) pendant vertex      (b) bridge      (c) articulation point      (d) none of these

UNIT: 8 & 5

Title : Tutorial XII Date:

06/11/15 Day: Friday

1. Create a heap (max/min) with the following data 33, 25, 67, 89, 12, 55, 3, 67. And sort the data in ascending and descending order.
2. Short notes on heap sort.
3. Draw a directed graph which have 8 vertex and represent it using array.

UNIT: 4

Title: NON-Linear Data Structure (Graph) Date:

17/11/15 Day: Tuesday

CONTENTS

- 1) Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi- list.
- 2) Graph Traversal-BFS and DFS (algorithms with examples)

Topic/Unit/Chapter Objectives: student can know the algorithm and complexity analysis of Radix sort. Broad Objectives of the chapter/topic are:

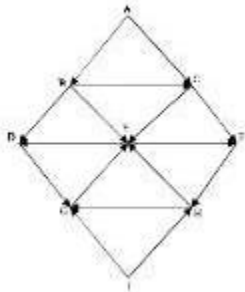
1. Able to understand adjacency matrix and list.
2. Able to understand BFS and DFS traversal of graphs
3. Comparison study about BFS and DFS

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. How to **construct** adjacency matrix of a graph? (Level 6)
2. How to **construct** a graph using linked list? (Level 6)
3. **Explain** DFS with example. (Level 4)
4. **Describe** the data structure need to develop DFS? (Level 2)
5. **Explain** BFS with example. (Level 4)
6. **Describe** the data structure need to develop BFS? (Level 2)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Traverse the following Graph using DFS and BFS



TOPIC/UNIT/CHAPTER: 5

Title: NON-Linear Data Structure (Graph) Date:

18/11/15 Day: Wednesday

#### CONTENTS

- 1) Spanning Tree
- 2) Minimum Spanning Tree
- 3) Prim's algorithm.

Topic/Unit/Chapter Objectives: how to define graph and how to represent graph Broad Objectives

of the chapter/topic are:

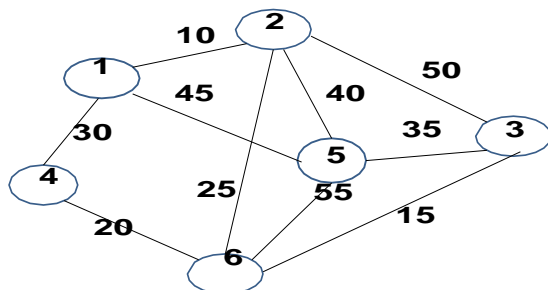
1. Able to know about spanning tree.
2. Able to understand minimum spanning tree.
3. Able to know about Prim's algorithm with example.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Describe** minimum spanning tree? (Level 2)
2. **Explain** prim's algorithm with example. (Level 4)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Using Prim's Algorithm to find the minimum spanning tree (MST) of the given graph.

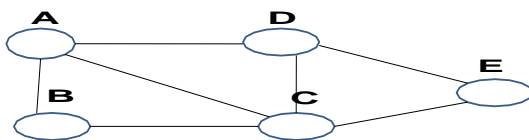


TOPIC/UNIT/CHAPTER: 5

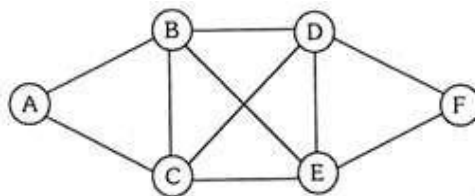
Title :Tutorial-XIV Date:

20/11/15 Day: Friday

1. Starting from the vertex A show BFS and DFS traversal of the following graph.

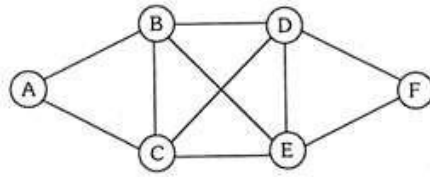


2. Find out the BFS tree for the given graph.



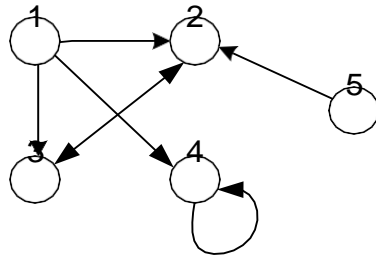
1.

3. Find out the DFS tree for the given graph.



1.

4. Find out the DFS tree and classified the edges for the following Graph where start vertex is '1'.



UNIT: 10

Title : **Hashing**

Date: 24/11/15 Day: Tuesday

CONTENTS

- 1) Definition of Hashing
- 2) Different types of Hashing
- 3) Collision Resolution techniques

Topic/Unit/Chapter Objectives: student can able to relate how sparse matrix can utilize for space optimization in memory

Broad Objectives of the chapter/topic are:

1. Student can able to understand hashing.
2. Student can able to understand how many types of hashing techniques are there?
3. Student can able to understand about collision resolution techniques.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

1. **Describe** Hashing .(Level2)
2. **Describe** the utilization of different types of hashing?(Level2)
3. **Describe** different types of collision resolution techniques. (Level 2)

HOMEWORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1. Calculate load factor.

TOPIC/UNIT/ CHAPTER:

Title : **WBUT QUESTION ANSWER SESSION**

Date: 25/11/15 Day:33

CONTENTS

Last 5 years university question paper.

Topic/Unit/Chapter Objectives: student can able to relate how sparse matrix can utilize for space optimization in memory

Broad Objectives of the chapter/topic are:

1. They are able to explain to analyze, investigate and evaluate.
2. They are able to judge how to apply theory.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities (Performance Criteria/Indicators with Levels of Bloom's Taxonomy):

**Discussion most of the university questions in last 5 years.**

a) **Teaching Strategy/Method (describe instructional methods, usage of ICT, efficient and engaging instructions and display the best practices on institutional website)**

- 1) To give Assignments
- 2) By giving more interesting examples
- 3) Giving lectures in power point presentation

**b) Strategy to support weak students**

- 1) To engage the weak students in habit of studying, I give him some easy questions in regular basis.
- 2) Some weak students also have a problem that they forget what they learn. In my class I always give some tips on how to recall and how to write systematically.
- 3) Weak students need special attention even after college hours. I always give some extra hours to a weak student.

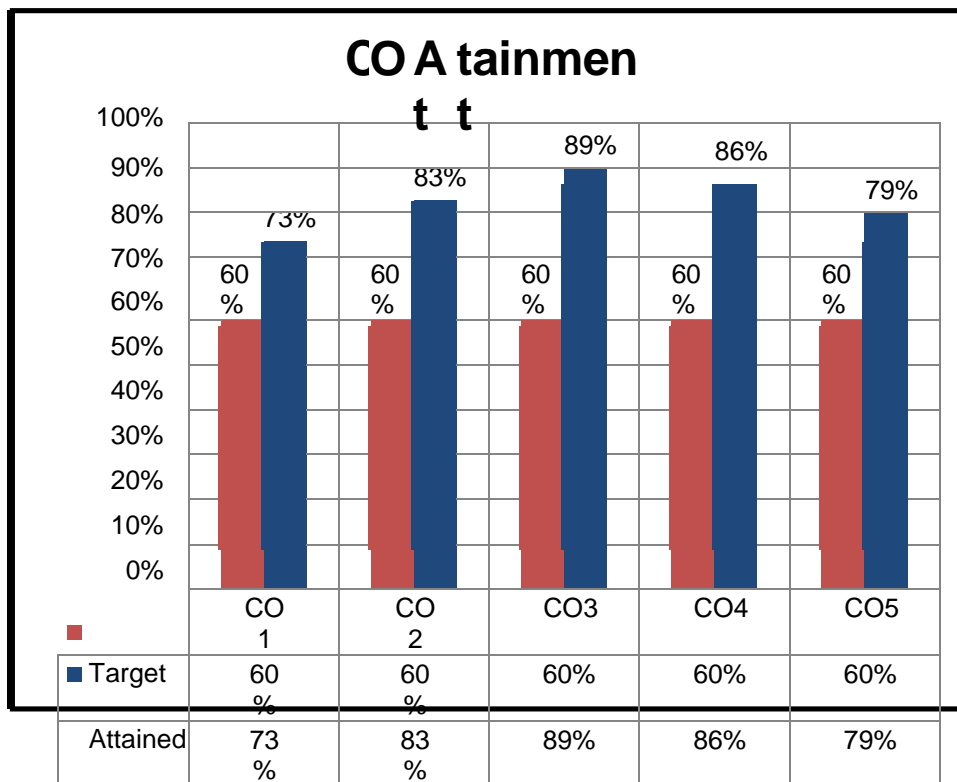
**c) Strategy to encourage bright students**

- 1) Have an extra challenge ready that allows the student to go deeper into the subject, learn a little more, or apply a skill he has just learned in a new way.
- 2) Some students are engaged with the final year students for their final project.

**d) Efforts to keep students engaged**

- 1) Regular basis Home Work.
- 2) 5-10 minutes spend in an every class for question answer session.
- 3) Quiz in regular basis.
- 4) Some technical assignments in group wise.

**e) Analysis of Students performance in the course (internal) (labs, seminars, tests, assignments, quiz, exam etc)**





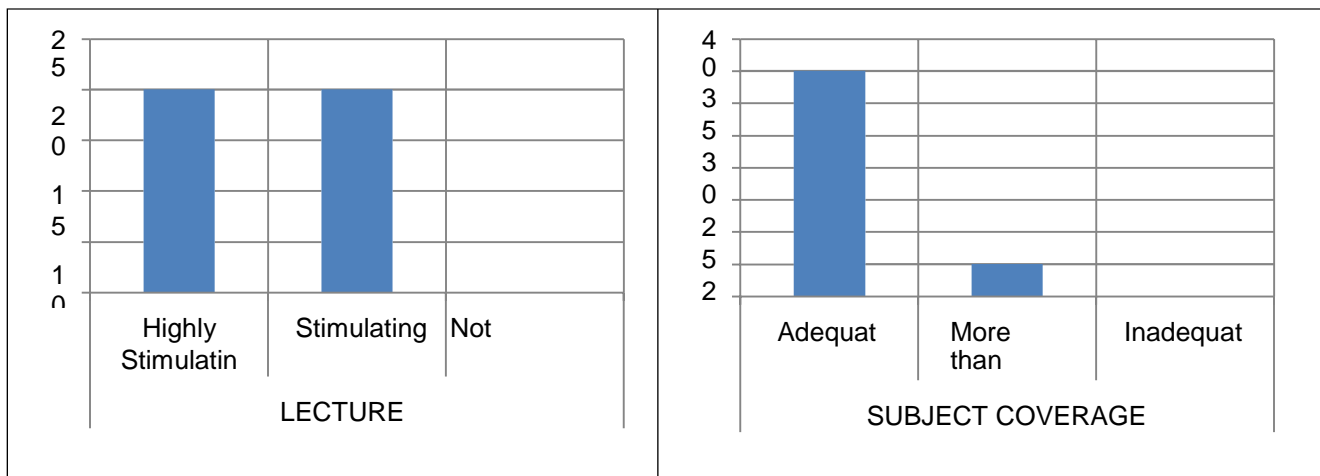
**Comments:**

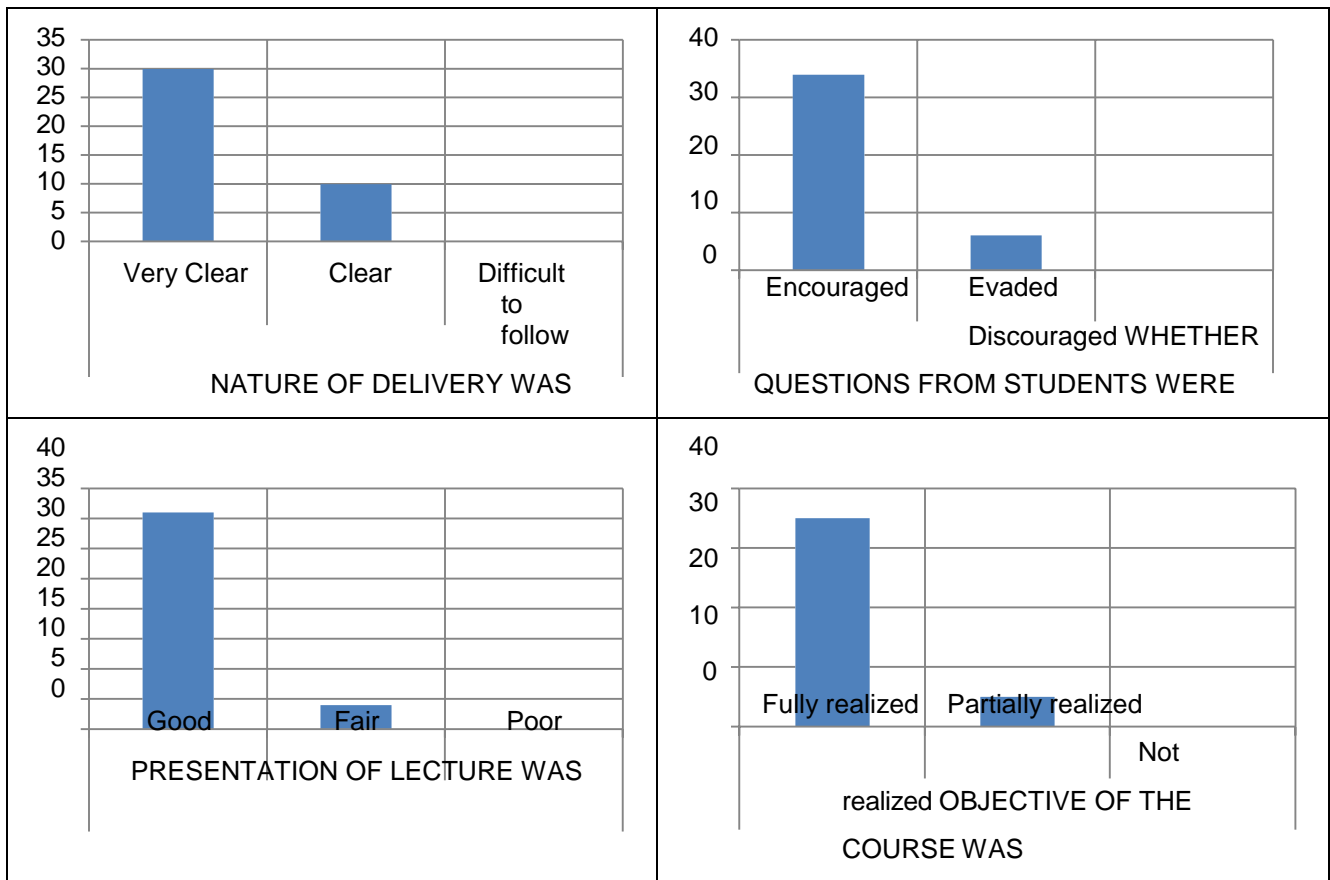
- 73% students have attained the set target of 60% marks for CO1
- 83% students have attained the set target of 60% marks for CO2
- 89% students have attained the set target of 60% marks for CO3
- 86% students have attained the set target of 60% marks for CO4
- 79% students have attained the set target of 60% marks for CO5

**f) Analysis of Students performance in the course (university results)**

	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME
University Result	60%	40	36	90%

**g) Student Feedback**





**h) Teacher Self-Assessment (at the completion of course)**

At the completion of course I have understood that CO1 and CO5 has reached the attainment levels but not satisfactorily.. That's why more assignments and quiz questions should be provided.

**i) Recommendations/Suggestions for improvement by faculty**

Text books are available in the library but in previous edition. That's why books should be updated.

**Siliguri Institute of Technology  
INTERNAL ASSESSMENT  
REPORT  
Paper Name: Data Structure & Algorithm  
Paper Code: CS 302**



S N	NAME	ROLL NO.	ATTENDANCE [5 MARKS]		MARKS IN INTERNAL EXAM[15 MARKS]			QUIZ [10 MARKS] MARKS=[((I+II)/30)*100]/10			TOTAL [30 MARKS]
			TOTAL %	MARKS	I	II	AVG	Q-I [15]	Q-II [15]	MARKS	
1	RAKESH KUMAR	11900114049	80.77	5	25	28	14	8	11	7	26
2	RISAB BISWAS	11900114050	75	4	25	28	14	12	15	9	27
3	RISHITA CHOWDHURY	11900114051	88.46	5	25	27	14	9	10	7	26
4	RIYA MITRA	11900114052	80.77	5	29	27	15	9	12	7	27
5	RUPAM MITRA	11900114053	46.15	3	16	AB	8	13	9	8	19
6	SACHIN KUMAR SAHA	11900114054	61.54	4	23	22	12	11	13	8	24
7	SAGAR BHATTARAI	11900114055	92.31	5	23	18	11	9	9	6	22
8	SAGARIKA MITRA	11900114056	92.31	5	22	29	14	10	11	7	26
9	SAHITYA KAUSHIK	11900114057	92.31	5	24	29	14	9	11	7	26
10	SAMIK ANWAR	11900114058	88.46	5	29	28	15	13	13	9	29
11	SAMRAT BHATTACHARJEE	11900114059	38.46	3	A B	03	2	8	9	6	11
12	SANDIPAN CHAKRABORTY	11900114060	67.31	4	A B	22	6	13	13	9	19
13	SANGAM GURUNG	11900114061	86.54	5	27	26	14	12	12	8	27
14	SANTANU RAKSHIT	11900114062	67.31	4	23	24	12	8	9	6	22
15	SAPTARSHI GHOSH	11900114063	100	5	10	03	4	10	11	8	17
16	SAYAN CHAKRABORTY	11900114064	48.08	3	08	04	4	7	7	5	12
17	SHALINI PRADHAN	11900114065	94.23	5	24	27	13	15	15	10	28
18	SHALINI ROY CHOWDHURY	11900114066	57.69	3	25	26	14	12	12	8	25
19	SHASHI KANT PATEL	11900114067	90.38	5	24	24	12	12	12	8	25
20	SHIRSANA GHATAK	11900114068	48.08	3	15	14	8	11	11	8	22
21	SNEHA PARIJAAT	11900114069	76.92	4	22	15	10	12	13	9	23

22	SOHAM SARKAR	11900114070	86.54	5	29	18	13	10	11	7	25
23	SOURAVENDU NANDY	11900114071	71.15	4	27	23	13	12	12	8	25
24	SOUVIK BISWAS	11900114072	80.77	5	29	28	15	10	10	7	27
25	SRIJA GHOSH	11900114073	76.92	4	20	22	11	12	12	8	23
26	SUBHAM GUHA	11900114074	36.54	3	AB	09	3	10	10	7	13
27	SUBHOJIT KUNDU	11900114075	71.15	4	AB	25	7	12	12	8	19
28	SUDIPTA SAHA	11900114076	67.31	3	29	17	13	7	10	6	22
29	SURAJ SHARMA	11900114077	73.08	4	20	17	10	12	14	9	23
30	SURAJIT KUMAR DAS	11900114078	76.92	4	28	24	13	12	14	9	26
31	SWARNAVA MUKHERJEE	11900114079	92.31	5	28	29	15	12	12	8	28
32	SWEETY	11900114080	71.15	4	19	24	11	9	11	7	22
33	UJJAL DAS	11900114081	76.92	4	23	18	11	8	8	6	21
34	VINITA KUMARI	11900114082	86.54	5	14	10	7	12	12	8	20
35	ANIRBAN HALDAR	11900114086	57.69	3	17	20	10	10	8	6	19
36	ADRIJA PAUL(L)	11900115095	62.06	4	13	13	8	9	12	7	20
37	BINDHYA MANGAN(L)	11900115096	62.06	4	18	17	10	10	10	7	21
38	POOJA UPADHYAY(L)	11900115097	65.50	4	20	17	10	13	12	9	23
39	RAJAT MUKHIA(L)	11900115098	82.75	5	22	24	12	14	14	10	27
40	SHRADHANJALI PRADHAN(L)	11900115099	86.20	5	22	11	14	11	8	7	26

**Siliguri Institute of Technology**  
**ATTENDANCE SHEET (LECTURE)**  
**Paper Name: Data Structure and Algorithm**  
**Paper Code: CS302**

ROLL NO.	21/7(2)	22/7	23/7	28/7(2)	30/7	4/8(2)	5/8	6/8	11/8(2)	12/8	19/8(2)	25/8(2)	26/8	1/9(2)	8/9(2)	9/9	12/9(2)	15/9(2)	16/9	30/9	1/10(2)	5/10	6/10(2)	2/11(2)	3/11(2)	4/11(3)	6/11(2)						
11900114049	0	0	0	2	1	2	1	0	2	1	2	0	0	2	2	1	2	2	1	1	2	1	2	2	2	2	3	0					
11900114050	2	0	1	2	1	2	1	1	2	1	0	2	1	0	2	0	0	2	1	0	2	1	2	2	2	3	0						
11900114051	2	1	1	2	1	2	1	0	2	1	2	2	1	2	2	0	2	2	1	0	2	1	2	2	2	3	0						



11900115098	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	0	1	1	1	1									
11900115099	0	0	1	1	0	0	0	1	1	1	1	0	1	1	0	1	1	0	1	1	1	0	0	0	0	1										

**Siliguri Institute of Technology**  
**ATTENDANCE SHEET (TUTORIAL**  
**CLASS)**  
**Paper Name: Data Structure & Algorithm**  
**Paper Code: CS 302**

FACULTY NAME: **Ms. SUTAPA BHATTACHARYA**

**YEAR: 2015**

STREAM: **B.TECH [ CSE ]**

YEAR: **3<sup>RD</sup>**

SEMESTER: **I<sup>ST</sup>**

SECTION: **B**

NO. OF CLASS HELD: 12

SN	NAME	ROLL NO.	24/7	31/7	7/8	14/8	21/8	28/8	4/9	11/9	21/9	9/10	2/11	Total
1	RAKESH KUMAR	11900114049	1	1	1	0	1	0	1	1	1	0	0	7
2	RISAB BISWAS	11900114050	1	1	0	1	1	0	0	1	1	0	0	6
3	RISHITA CHOWDHURY	11900114051	1	0	0	1	0	0	0	1	1	0	0	4
4	RIYA MITRA	11900114052	1	1	0	1	0	0	1	1	0	0	1	6
5	RUPAM MITRA	11900114053	1	0	1	0	1	0	1	0	1	1	1	7
6	SACHIN KUMAR SAHA	11900114054	0	0	0	0	0	1	0	0	0	0	0	1
7	SAGAR BHATTARAI	11900114055	1	1	1	0	1	0	1	0	1	0	0	6
8	SAGARIKA MITRA	11900114056	0	0	1	0	0	0	0	0	1	0	1	3
9	SAHITYA KAUSHIK	11900114057	0	0	0	0	0	1	1	1	1	1	1	6
10	SAMIK ANWAR	11900114058	1	0	1	0	0	1	0	1	1	0	1	6
11	SAMRAT BHATTACHARJEE	11900114059	0	1	1	0	1	0	1	1	1	1	1	8
12	SANDIPAN CHAKRABORTY	11900114060	0	1	1	1	0	1	0	0	1	1	0	6
13	SANGAM GURUNG	11900114061	0	1	0	0	1	0	1	1	0	0	1	5
14	SANTANU RAKSHIT	11900114062	0	1	1	0	1	1	0	0	0	1	1	6
15	SAPTARSHI GHOSH	11900114063	0	1	0	0	1	0	1	1	0	0	0	4
16	SAYAN CHAKRABORTY	11900114064	1	0	0	1	1	0	0	0	0	0	1	4
17	SHALINI PRADHAN	11900114065	1	1	0	1	1	0	0	1	0	1	0	6

18	SHALINI CHOWDHURY	ROY	11900114066	0	0	1	0	1	0	0	1	1	0	0	4
19	SHASHI KANT PATEL		11900114067	1	1	0	0	0	1	0	0	1	1	0	5
20	SHIRSANA GHATAK		11900114068	1	0	0	1	1	0	0	0	1	0	1	5
21	SNEHA PARIJAAT		11900114069	1	0	1	0	0	0	0	0	0	0	0	2
22	SOHAM SARKAR		11900114070	1	1	0	0	1	1	1	1	1	0	0	7
23	SOURAVENDU NANDY		11900114071	1	0	1	1	0	0	0	1	1	1	0	6
24	SOUVIK BISWAS		11900114072	0	1	1	0	0	0	1	0	0	0	1	4
25	SRIJA GHOSH		11900114073	1	1	1	1	1	1	1	0	0	1	0	8
26	SUBHAM GUHA		11900114074	1	0	1	1	1	1	1	1	0	0	0	7
27	SUBHOJIT KUNDU		11900114075	0	1	1	0	0	1	1	0	1	0	0	5
28	SUDIPTA SAHA		11900114076	1	0	1	1	1	0	0	0	0	1	0	5
29	SURAJ SHARMA		11900114077	0	1	0	0	0	0	0	1	1	0	0	3
30	SURAJIT KUMAR DAS		11900114078	1	0	1	0	1	0	1	0	1	0	0	5
31	SWARNAVA MUKHERJEE		11900114079	1	0	1	1	1	1	0	0	0	0	1	6
32	SWEETY		11900114080	0	0	1	1	1	0	1	1	1	0	0	6
33	UJJAL DAS		11900114081	0	0	1	1	1	1	0	0	1	1	0	6
34	VINITA KUMARI		11900114082	1	1	1	0	1	0	1	1	0	1	1	8
35	ANIRBAN HALDAR		11900114086	0	0	0	0	1	1	0	0	1	0	0	3
36	ADRIJA PAUL(L)		11900115095	0	0	0	0	1	0	1	1	1	1	1	6
37	BINDHYA MANGAN(L)		11900115096	0	0	1	1	1	0	0	0	1	0	1	5
38	POOJA UPADHYAY(L)		11900115097	0	0	1	0	0	0	1	1	0	0	0	3
39	RAJAT MUKHIA(L)		11900115098	0	0	1	1	1	0	0	0	1	0	1	5
40	SHRADHANJALI PRADHAN(L)		11900115099	0	0	1	0	0	0	1	1	0	0	0	3



**Siliguri Institute of Technology**  
**LABORATORY ATTENDANCE**  
**SHEET**

Paper Name:  
Paper Code: CS 392

FACULTY NAME: Ms. SUTAPA BHATTACHARYA

YEAR: 2015

STREAM: B.TECH[CSE]

YEAR: 3<sup>RD</sup>

SEMESTER: 1<sup>ST</sup>

GROUP: B1

No. of  
Practical: 1 2

SN	NAME	DAY	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL MARKS
		DATE	23/7	30/7	6/8	13/8	20/8	27/8	3/9	10/9	17/9	1/10	8/10	5/11	
		ROLL NO													
1	RAKESH KUMAR	11900114049	0	1	1	1	1	1	1	1	1	1	1	1	11
2	RISAB BISWAS	11900114050	1	1	1	1	1	1	0	1	1	1	1	1	11
3	RISHITA CHOWDHURY	11900114051	1	1	0	1	1	1	1	1	1	1	1	1	11
4	RIYA MITRA	11900114052	1	1	0	1	0	0	1	1	0	0	1	1	7
5	RUPAM MITRA	11900114053	0	1	1	1	0	1	0	0	1	1	1	0	7
6	SACHIN KUMAR SAHA	11900114054	0	1	1	1	1	1	1	0	0	0	1	0	7
7	SAGAR BHATTARAI	11900114055	0	1	1	0	1	1	1	1	0	1	1	1	9
8	SAGARIKA MITRA	11900114056	1	1	0	1	1	1	1	1	1	0	1	1	10
9	SAHITYA KAUSHIK	11900114057	1	1	0	1	1	1	1	1	1	0	1	1	10
10	SAMIK ANWAR	11900114058	0	1	1	1	0	1	0	1	1	0	1	1	9
11	SAMRAT BHATTACHARJEE	11900114059	0	0	0	1	1	0	0	0	0	0	0	0	2
12	SANDIPAN CHAKRABORTY	11900114060	1	1	0	1	1	1	0	1	1	0	0	1	8
13	SANGAM	11900114061	1	1	1	1	1	1	1	1	0	1	1	1	11

	GURUNG														
14	SANTANU RAKSHIT	11900114062	0	1	1	1	1	1	0	0	1	1	0	1	8
15	SAPTARSHI GHOSH	11900114063	1	1	1	1	1	1	1	1	1	1	1	1	12
16	SAYAN CHAKRABORTY	11900114064	0	0	0	0	0	1	1	1	0	1	1	1	6
17	SHALINI PRADHAN	11900114065	1	1	1	1	1	1	1	1	1	1	1	1	12
18	SHALINI ROY CHOWDHURY	11900114066	0	1	1	1	0	1	1	1	0	1	1	1	9
19	SHASHI KANT PATEL	11900114067	1	1	1	1	1	1	1	0	0	1	1	1	10
20	SHIRSANA GHATAK	11900114068	0	1	1	1	1	1	1	1	0	0	1	0	8

**Siliguri Institute of Technology**  
**LABORATORY ATTENDANCE**  
**SHEET**  
**Paper Name: Paper Code: CS 392**

**FACULTY NAME: Ms. SUTAPA BHATTACHARYA**

**YEA  
R:  
2015**

**STREAM: B.TECH [CSE]**

**YEAR: 3<sup>RD</sup>**

**SEMESTER: 1<sup>ST</sup>**

**GROUP: B2**

**NO. OF PRACTICAL HELD: 11&7(Lateral)**

SN	NAME	DAY	1	2	3	4	5	6	7	8	9	10	11	TOTAL MARKS
			DATE	21/7	28/7	04/8	11/8	25/8	1/9	8/9	15/9	29/9	6/10	
		ROLL NO.												
1	SNEHA PARIJAAT	11900114069	0	1	1	1	0	1	0	1	1	1	0	7
2	SOHAM SARKAR	11900114070	1	1	1	1	1	1	1	1	1	1	0	10
3	SOURAVENDU NANDY	11900114071	1	0	1	1	1	1	1	1	1	1	0	9
4	SOUVIK BISWAS	11900114072	1	1	1	1	1	1	1	0	1	1	0	10
5	SRIJA GHOSH	11900114073	1	1	1	1	1	1	1	1	1	1	1	11
6	SUBHAM GUHA	11900114074	0	1	0	0	0	1	1	1	0	0	0	5
7	SUBHOJIT KUNDU	11900114075	1	1	1	1	1	1	1	1	0	0	1	9

8	SUDIPTA SAHA	11900114076	1	1	1	1	1	1	1	1	1	1	1	0	10
9	SURAJ SHARMA	11900114077	1	1	1	1	1	1	1	1	0	1	0	0	9
10	SURAJIT KUMAR DAS	11900114078	0	1	1	1	1	1	1	1	1	1	1	1	10
11	SWARNAVA MUKHERJEE	11900114079	1	1	1	1	1	1	1	1	1	1	1	1	11
12	SWEETY	11900114080	0	1	1	1	0	1	0	1	1	1	1	0	8
13	UJJAL DAS	11900114081	1	1	1	1	0	1	0	1	1	1	1	0	8
14	VINITA KUMARI	11900114082	1	1	1	0	0	1	1	0	1	1	1	1	8
15	ANIRBAN HALDAR	11900114086	0	1	1	0	0	1	1	1	1	0	1	1	7
16	ADRIJA PAUL(L)	11900115095					0	0	1	1	1	0	1	1	4
17	BINDHYA MANGAN(L)	11900115096					0	1	1	1	1	0	1	1	5
18	POOJA UPADHYAY(L)	11900115097					1	1	1	1	1	0	1	1	6
19	RAJAT MUKHIA(L)	11900115098					0	1	1	1	1	1	1	1	6
20	SHRADHANJALI PRADHAN(L)	11900115099					0	0	1	1	1	1	1	1	5

Siliguri Institute of Technology

**RECORDS OF ASSIGNMENTS/QUIZ**  
**Paper Name: Data Structure & Algorithm**  
**Paper Code: CS 302**

SN	NAME	ROLL NO.	Assign - I	Assign - II	SN	NAME	ROLL NO.	Assign - I	Assign - II
1	RAKESH KUMAR	11900114049	1	1	21	SNEHA PARIJAAT	11900114069	1	1
2	RISAB BISWAS	11900114050	1	1	22	SOHAM SARKAR	11900114070	1	1
3	RISHITA CHOWDHURY	11900114051	1	1	23	SOURAVENDU NANDY	11900114071	1	1
4	RIYA MITRA	11900114052	1	1	24	SOUVIK BISWAS	11900114072	1	1
5	RUPAM MITRA	11900114053	1	1	25	SRIJA GHOSH	11900114073	1	1
6	SACHIN KUMAR SAHA	11900114054	1	1	26	SUBHAM GUHA	11900114074	1	1

7	SAGAR BHATTARAI	11900114055	1	1	27	SUBHOJIT KUNDU	11900114075	1	1
8	SAGARIKA MITRA	11900114056	1	1	28	SUDIPTA SAHA	11900114076	1	1
9	SAHITYA KAUSHIK	11900114057	1	1	29	SURAJ SHARMA	11900114077	1	1
10	SAMIK ANWAR	11900114058	1	1	30	SURAJIT KUMAR DAS	11900114078	1	1
11	SAMRAT BHATTACHARJEE	11900114059	1	1	31	SWARNAVA MUKHERJEE	11900114079	1	1
12	SANDIPAN CHAKRABORTY	11900114060	1	1	32	SWEETY	11900114080	1	1
13	SANGAM GURUNG	11900114061	1	1	33	UJJAL DAS	11900114081	1	1
14	SANTANU RAKSHIT	11900114062	1	1	34	VINITA KUMARI	11900114082	1	1
15	SAPTARSHI GHOSH	11900114063	1	1	35	ANIRBAN HALDAR	11900114086	1	1
16	SAYAN CHAKRABORTY	11900114064	1	1	36	ADRIJA PAUL(L)	11900115095	1	1
17	SHALINI PRADHAN	11900114065	1	1	37	BINDHYA MANGAN(L)	11900115096	1	1
18	SHALINI ROY CHOWDHURY	11900114066	1	1	38	POOJA UPADHYAY(L)	11900115097	1	1
19	SHASHI KANT PATEL	11900114067	1	1	39	RAJAT MUKHIA(L)	11900115098	1	1
20	SHIRSANA GHATAK	11900114068	1	1	40	SHRADHANJALI PRADHAN(L)	11900115099	1	1

**Siliguri Institute of Technology**  
**LIST OF PRACTICAL'S**  
**Paper Name: Data Structure & Algorithm**  
**Paper Code: CS 392**

SN	Details of Experiment(s)	Hours Allotted
1	Implement the following Operation of Array data structure : 1) Insert and delete an element in to an Array. 2) Traverse the array.	3 HRS
2	Implement the following Operation of Single linked list : 1) Create and Traverse a single linked list. 2) Insert and delete an element from a list	3 HRS

	<p>3) Reverse a single list.</p> <p>4) Searching the element from the list</p> <p>5) Sorting the node values in ascending order</p>	
3	<p>1) Implement The following Stack Operation using Array and Linked List : a)PUSH() b)POP() c) Traversal</p> <p>2) Write a program to implement Tower of Hanoi and 8 queen puzzle problem using recursion</p>	3 HRS
4	<p>1) Implement The following linear Queue Operation using Array and Linked list : a)Enqueue() b)Dequeue() c) Traversal</p> <p>2) Implement The following Circular Queue Operation using Array : a)Enqueue() b)Dequeue() c) Traversal</p>	3 HRS
5	<p>Implement The following Double ended Queue Operation using Array: a)Insert left() b)Insert right() c)Delete left() d)Delete right() e) Traversal()</p>	3 HRS
6	<p>Implement the following Operation of Double linked list :</p> <p>1) Create and Traverse a double linked list.</p> <p>2) Insert and delete an element from a list.</p>	3 HRS
7	<p>Implement the following Operation of Circular linked list :</p> <p>1) Create and Traverse a double linked list.</p> <p>2) Insert and delete an element from a list.</p>	3 HRS
8	<p>Write a program to implement polynomial addition and multiplication using linked list.</p>	3 HRS
9	<p>Implement The following Binary search Tree operation :</p> <p>a) Insert an element b) Delete an element</p> <p>c) Search an element</p>	3 HRS
10	<p>Develop the following sorting algorithm:</p> <p>a)Bubble sort b)Selection sort c) Insertion Sort d)Merge sort</p>	3 HRS

11	Develop the following sorting algorithm: a)Quick sort b)Heap sort c)Shell sort	3 HRS
12	Develop the following searching algorithm: Linear Search, Binary Search and Interpolation search	3 HRS

**Siliguri Institute of Technology**  
**SESSIONAL/PRACTICAL PERFORMANCE**  
**RECORD**  
**Paper Name: Data Structure and Algorithm Lab**  
**Paper Code: CS 392**

FACULTYNAME: Ms SUTAPA BHATTACHARYA  
**YEA**  
**R:**  
**2015**

STREAM: B.TECH[ CSE ]    YEAR: 3<sup>RD</sup>    SEMESTER: 1<sup>ST</sup>    SECTION: B

SN	NAME	ROLL NO	Lab_A1(P1,P2,P6, P7,P8)Marks:16	Lab_A2(P3,P4 ,P5)Marks:9	Lab_A3(P 9) Marks:4	Lab_A4(P10, P11,P12) Marks:11	TOTAL[40]
1	RAKESH KUMAR	11900114049	15	8	4	9	36
2	RISAB BISWAS	11900114050	14	9	4	11	38
3	RISHITA CHOWDHURY	11900114051	14	9	4	11	38
4	RIYA MITRA	11900114052	13	9	4	11	37
5	RUPAM MITRA	11900114053	7	5	4	8	24
6	SACHINKUMARSAHA	11900114054	10	6	4	9	29
7	SAGAR BHATTARAI	11900114055	9	6	4	9	28
8	SAGARIKA MITRA	11900114056	14	9	4	11	38
9	SAHITYA KAUSHIK	11900114057	12	9	4	11	36
10	SAMIK ANWAR	11900114058	14	9	4	11	38
11	SAMRAT BHATTACHARJEE	11900114059	7	7	2	4	21

12	SANDIPAN CHAKRABORTY	11900114060	13	8	4	10	35
13	SANGAM GURUNG	11900114061	14	9	4	11	38
14	SANTANU RAKSHIT	11900114062	13	9	4	11	37
15	SAPTARSHI GHOSH	11900114063	13	8	4	11	36
16	SAYAN CHAKRABORTY	11900114064	11	8	4	9	32
17	SHALINI PRADHAN	11900114065	14	9	4	11	38
18	SHALINI ROY CHOWDHURY	11900114066	13	8	4	11	36
19	SHASHI KANT PATEL	11900114067	13	9	4	9	35
20	SHIRSANA GHATAK	11900114068	11	8	4	9	32
21	SNEHA PARIJAAT	11900114069	11	9	4	11	35
22	SOHAM SARKAR	11900114070	12	8	4	11	36
23	SOURAVENDU NANDY	11900114071	11	8	3	8	30
24	SOUVIK BISWAS	11900114072	14	9	4	11	38
25	SRIJA GHOSH	11900114073	14	7	4	10	35
26	SUBHAM GUHA	11900114074	8	6	3	7	24
27	SUBHOJIT KUNDU	11900114075	14	8	4	10	36
28	SUDIPTA SAHA	11900114076	11	7	4	10	32
29	SURAJ SHARMA	11900114077	13	9	4	9	35
30	SURAJIT KUMAR DAS	11900114078	13	9	4	11	37
31	SWARNAVA MUKHERJEE	11900114079	14	9	4	11	38
32	SWEETY	11900114080	13	8	4	10	35
33	UJJAL DAS	11900114081	11	9	4	9	33
34	VINITA KUMARI	11900114082	8	6	2	8	24
35	ANIRBAN HALDAR	11900114086	8	6	2	6	22
36	ADRIJA PAUL(L)	11900115095	11	6	3	9	29
37	BINDHYA MANGAN(L)	11900115096	11	6	3	9	29
38	POOJA UPADHYAY(L)	11900115097	13	9	4	11	37

39	RAJAT MUKHIA(L)	11900115098	13	9	4	10	36
40	SHRADHANJALI PRADHAN(L)	11900115099	12	9	4	11	35

<b>NAME WITH ROLL NUMBERS OF STUDENT WHOSE ACADEMIC PERFORMANCE IS NOT SATISFACTORY</b>			
<b>Sl.</b>	<b>Name of Student</b>	<b>Roll No.</b>	<b>Remedial measures taken by teacher</b>
1	RUPAM MITRA	11900114053	<ul style="list-style-type: none"> <li>• Additionaldoubtclearingsessions</li> <li>• Providing extra assignments to students with poor attendance.</li> <li>• Guiding them through previous question papers</li> <li>• Highlighting important and frequently asked questions</li> </ul>
2	SACHIN KUMAR SAHA	11900114054	
3	SAMRAT BHATTACHARJEE	11900114059	
4	SANDIPAN CHAKRABORTY	11900114060	
5	SAYAN CHAKRABORTYTY	11900114064	

## CERTIFICATE

I, the undersigned, have completed the course allotted to me as shown below

<b>Sl. No.</b>	<b>Semester</b>	<b>Subject with Code</b>	<b>Total Chapters</b>	<b>Remarks</b>
1.	3 <sup>rd</sup>	Data Structure & Algorithm (CS302) Data Structure & Algorithm Lab (CS 392)	10	

Date :

**Signature of Faculty**

**Submitted to HOD**



## **Certificate by HOD**

I, the undersigned, certify that **Prof. Sutapa Bhattacharya** has completed the course work allotted to him satisfactorily / not satisfactorily.

Date :

**Signature of HOD**

## **Submitted to Director**

Date :

**Signature of Director**



**SILIGURI INSTITUTE OF TECHNOLOGY**  
**COMPUTER SCIENCE & ENGINEERING**



**COURSE FILE**  
**1<sup>ST</sup> SEM, 3<sup>RD</sup> YEAR, 2016**

**PAPER NAME : Design & Analysis of Algorithm**

**PAPER CODE : CS 501 & CS 591**



**Course File**

**Course Title/Code: Design and Analysis of Algorithm/CS501 & CS591**

**Semester:- 1<sup>st</sup> Year:- 3<sup>rd</sup> Group:- B**

Name of the Faculty: **Sucharita Das**

E-mail : [sucharita.das007@gmail.com](mailto:sucharita.das007@gmail.com)

**Class Schedule:**

Day	Monday	Wednesday		Thursday	Friday	Saturday
<b>Timing(B)</b>	10:00 AM - 10:50 AM	12:30 PM -1:20 PM	2:10 PM-3:00 PM (Tutorial)	2:10 PM-3:00 PM (Tutorial)	10:00 AM-10:50 AM	12:30 PM -1:20 PM

**Laboratory Schedule:**

Day	Monday	Tuesday	Wednesday	Thursday	Friday
<b>Group B1</b>	---	---	---	---	2:10 pm - 4:40 pm
<b>Group B2</b>	---	2:10 pm - 4:40 pm	---	---	---

**Hours of Meeting Students:** Monday (11:00 AM – 5:00PM ) and Wednesday(10:00AM-12:15 PM)/By an Appointment

**i) Course Objective:**

Students will be able to apply different programming design paradigm to develop new algorithms and also analyze the efficiency of its algorithm.

**ii) Course Outcomes:**

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

**a) The Students will be able to:**

Course Outcomes		Targets
CS501.1	<b>Memorize</b> the fundamental principles of basic algorithms. (BT-Level 1)	60% marks
CS501.2	<b>Describe</b> the notion of NP-completeness. (BT-Level 2)	60% marks
CS501.3	<b>Use</b> the Asymptotic notations as well as Recurrences on simple algorithms, including those algorithms that are using complex loops and recursions. (BT-Level 3)	60% marks
CS501.4	<b>Estimate</b> the time and space complexity of a given algorithm. (BT-Level 4)	60% marks
CS501.5	<b>Experiment</b> and analysis on various algorithms on graph data structures as well as basic graph algorithms. (BT-Level 5)	60% marks
CS501.6	<b>Implement</b> different known algorithms with the help of different programming design paradigm like divide & conquer, greedy method, dynamic programming , backtracking etc. (BT-Level 6)	60% marks

b) Once the student has successfully complete this course, he/she must be able to answer the following questions or perform/demonstrate the following:

SN	QUESTION	BT-LEVEL
1.	<b>What</b> do you understand by an algorithm?	1
2.	<b>What</b> are the analytic issues of an algorithm?	1
3.	<b>Write</b> an algorithm to find the <b>maximum number among three numbers</b> and also calculate the running time complexity.	1
4.	<b>Write</b> an algorithm to calculate the <b>sum of two matrices</b> and also calculate the running time complexity.	1
5.	<b>Define Cook's</b> theorem. Prove that <b>3-SAT</b> is NP- Complete.	2
6.	<b>Find</b> out the Recurrence relation of recursive <b>Tower of Hanoi</b> problem and solve it for the input size n.	3
7.	<b>Solve</b> the following recurrence using iteration method. 1. $T(n)=2T(n/2) + O(n)$	3
8.	<b>Solve</b> the following recurrence using master method. 1. $T(n)=2T(n/2) + O(n)$ 2. $T(n)=4T(n/2) + O(n)$ 3. $T(n)=T(n/2) + O(n)$	3
9.	<b>Show</b> that the following equation is correct: $33n^2 + 4n = \Omega(n^2)$	3
10.	<b>Solve</b> $T(n) = aT(n/b) + O(n^k)$ where $a > 1$ and $b \geq 1$ .	3
11.	<b>Find</b> out the running time complexity of the <b>Quick sort</b> algorithm in Best, Worst and Average cases.	4
12.	<b>Find</b> out the running time complexity of the <b>N-Queen</b> problem.	4
13.	<b>Implement</b> adjacent matrix and adjacent list of a given graph and also conclude which representation is better.	5
14.	<b>Implement</b> graph traversal techniques like <b>BFS</b> and <b>DFS</b> .	5
15.	<b>Implement Binary Search</b> with the help of <b>Divide &amp; Conquer</b> strategy.	6
16.	<b>Implement</b> shortest path using <b>Dijkstra's</b> algorithm with the help of dynamic programming strategy.	6

## Design & Analysis of Algorithm syllabus [in Chapters]

Code: CS501

Contact: 3L + 1T

### CHAPTER-1

#### Complexity Analysis: [4L]

Time and Space Complexity, Different Asymptotic notations – their mathematical significance

## CHAPTER-2

### Heap Sort and its complexity [2L]

## CHAPTER-3

### Divide and Conquer: [3L]

Basic method, use, following case studies with proper analysis.

- 1) Binary Search.
- 2) Merge Sort.
- 3) Quick Sort and their complexity.

## CHAPTER-4

### Dynamic Programming: [4L]

Basic method, use, following case studies with proper analysis.

- 1) Matrix Chain Multiplication.
- 2) All pair shortest paths
  - a. Floyd-Warshall Algorithm.
- 3) Single source shortest path.
  - a. Dijkstra's Algorithm.
  - b. Bellmanford Algorithm.

## CHAPTER-5

### Backtracking: [2L]

Basic method, use, following case studies with proper analysis.

- 1) n queens problem.
- 2) Graph coloring problem.

## CHAPTER-6

### Greedy Method: [4L]

Basic method, use, following case studies with proper analysis.

- 1) Knapsack problem.
- 2) Job sequencing with deadlines.
- 3) Minimum cost spanning tree
  - a. Prim's Algorithm.
  - b. Kruskal's Algorithm.

## CHAPTER-7

### Lower Bound Theory: [1L]

Prove  $O(n \lg(n))$  bound for comparison sort .

## CHAPTER-8

### Disjoint set manipulation: [1L]

Set manipulation algorithm like UNION-FIND, union by rank.

## CHAPTER-9

### Graph traversal algorithm: [3L]

- 1) Breadth First Search(BFS)
- 2) Depth First Search(DFS)
- 3) Classification of edges - tree, forward, back and cross edges – complexity and comparison

## CHAPTER-10

### String matching problem: [2L]

Different techniques Naive algorithm, string matching using finite automata, and Knuth, Morris, Pratt (KMP) algorithm with their complexities.

**CHAPTER-11****Amortized Analysis: [2L]**

Aggregate, Accounting, and Potential Method.

**CHAPTER-12****Network Flow: [3L]**

Ford Fulkerson algorithm, Max-Flow Min-Cut theorem (Statement and Illustration)

**CHAPTER-13****Matrix Manipulation Algorithm: [3L]**

Strassen's matrix manipulation algorithm; application of matrix multiplication to solution of simultaneous linear equations using LUP decomposition, Inversion of matrix and Boolean matrix multiplication.

**CHAPTER-14****Notion of NP-completeness: [4L]**

P class, NP class, NP hard class, NP complete class – their interrelationship, Satisfiability problem, Cook's theorem (Statement only), and Clique decision problem.

**CHAPTER-15****Approximation Algorithms:[1L]**

Necessity of approximation scheme, performance guarantee, polynomial time approximation schemes, vertex cover problem, travelling salesman problem.

**c) Chapter Layout**

Chapter No.	Chapter	Lecture Hours	Tutorials	Laboratory hours
Chapter - 1	Complexity Analysis	4 HRS	1	6 HRS
Chapter – 2	Heap Sort and its complexity	2 HRS	1	3 HRS
Chapter – 3	Divide and Conquer	3 HRS	1	3 HRS
Chapter – 4	Dynamic Programming	4 HRS	1	6 HRS
Chapter – 5	Backtracking	2 HRS		3 HRS
Chapter – 6	Greedy Method	4 HRS	1	3 HRS
Chapter – 7	Lower Bound Theory	1 HRS		

Chapter – 8	Disjoint set manipulation	1 HRS	1	
Chapter – 9	Graph traversal algorithm	3 HRS	1	3 HRS
Chapter – 10	String matching problem	2 HRS	1	3 HRS
Chapter – 11	Amortized Analysis	2 HRS		
Chapter – 12	Network Flow:	3 HRS	1	
Chapter – 13	Matrix Manipulation Algorithm	3 HRS	1	
Chapter – 14	Notion of NP-completeness	4 HRS	1	
Chapter - 15	Approximation Algorithms	1 HRS		
Total		39 HRS	11	30 HRS

**d) Textbooks:**

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein , “Introduction to Algorithms”
2. Aho, J. Hopcroft and J. Ullman “The Design and Analysis of Algorithms” D. E. Knuth “The Art of Computer Programming”, Vol. 3
3. Jon Kleiberg and Eva Tardos, "Algorithm Design"

**e) Reference Books:**

1. K. Mehlhorn , “Data Structures and Algorithms” - Vol. I & Vol. 2.
2. S. Baase “Computer Algorithms”
3. E. Horowitz and Shani “Fundamentals of Computer Algorithms”

**f) Evaluation Scheme:**

**1) THEORY**

Evaluation Criteria	Marks
First & Second Internal Exam*	15
Quiz/ Assignments	10
Attendance	5
University Exam	70
Total	100

\*Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

**University Grading System:**

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

## 2) LABORATORY

Evaluation Criteria	Marks
Internal Exam*	40
University Exam	60
Total	100

\* Internal Evaluation will be based on daily lab performance as per the following schedule:

### g) Laboratory Evaluation:

Expt. No.	Experiment Name	Schedule	Marks
P1	Experiment on different <b>Searching</b> Techniques and also judge the running time complexity. List of Experiments --- <b>1) Linear Search</b> <b>2) Binary Search</b>	3 HRS	2 + 2
P2	Experiment on different <b>Sorting</b> techniques and also judge the running time complexity. List of Experiments --- <b>3) Merge Sort</b> <b>4) Quick Sort</b>	3 HRS	2 + 2
P3	Experiment on different <b>Sorting</b> techniques and also judge the running time complexity. List of Experiments --- <b>5) Heap Sort</b> <b>6) Counting Sort</b>	3 HRS	2 + 2
P4	Experiment on some <b>recursion</b> problems also judge the running time complexity as well as plot the graph. List of Experiments --- <b>7) Calculate <math>x^y</math></b> <b>8) N<sup>th</sup> Fibonacci Number</b> <b>9) Tower of Hanoi etc and</b>	3 HRS	1+1+2
P5	Experiment on <b>Dynamic Programming</b> algorithm strategy and also judge the running time complexity. <b>10) Matrix Chain Multiplication.</b>	3 HRS	4
P6	Experiment on <b>Dynamic Programming</b> algorithm strategy and also judge the running time complexity. <b>11) Floyd's Algorithm</b>	3 HRS	4
P7	Experiment on <b>Backtracking</b> algorithm strategy and also judge the running time complexity. List of Experiments --- <b>12) 4 Queen</b> <b>13) Graph Coloring</b>	3 HRS	2+2



P8	Experiment on <b>Minimum Spanning Tree</b> and also judge the running time complexity. (Any one) List of Experiments --- <b>14) Prim's Algorithm</b> <b>15) Kruskal's Algorithm</b>	3 HRS	4
P9	Experiment on <b>Graph Traversal Techniques</b> and also judge the running time complexity. List of Experiments --- <b>16) BFS</b> <b>17) DFS</b>	3 HRS	2 + 2
P10	Experiment on <b>String Matching</b> Algorithm and also judge the running time complexity. <b>18) KMP</b>	3 HRS	4

### Overall Course Attainment Target

Attainment Level	Inference	Marks
Attainment Level 1	50% of the students have attained more than the target level of that CO	1
Attainment Level 2	60% of the students have attained more than the target level of that CO	2
Attainment Level 3	70% of the students have attained more than the target level of that CO	3

(70% of university and 30% of the internal exam) will be = **Attainment Level 3**

Target has been set on the basis of last year's performance / result by the students, student quality this year and difficulty level of the course.

### h) Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes (PO's)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CS501.1	1	1	1	-	-	-	-	-	-	-	-	-	1	1
CS501.2	1	2	2	-	-	--	-	-	-	-	-	-	2	-
CS501.3	1	1	2	-	-	-	-	-	-	-	-	-	2	-
CS501.4	2	2	2	-	-	--	-	-	-	-	-	-	2	1
CS501.5	1	2	2	-	-	-	-	-	1	-	-	-	-	2
CS501.6	1	3	2	-	-	-	-	-	1	-	-	-	-	2
CS501	1	2	2	-	-	-	-	-	1	-	-	-	2	2

**i) Delivery Methodology:**

Outcome	Method	Supporting Tools	Demonstration
CS 501.1	Structured (partially supervised)	Blackboard	Describe the basic algorithm.
CS 501.2	Structured (partially supervised)	Blackboard , PPT , NPTEL	Describe the basic concept of NP Completeness.
CS 501.3	Structured (partially supervised)	Blackboard + C Programming	Calculate Asymptotic notations & Recurrences
CS 501.4	Structured (partially supervised)	Blackboard , NPTEL	Judge the efficiency of a given algorithm.
CS 501.5	Structured (partially supervised)	Blackboard + C Programming	Implement different graph traversal algorithms.
CS 501.6	Structured (partially supervised)	Blackboard + C Programming	Implement basic algorithm with the help of different programming design paradigm.

**j) Assessment Methodology:**

Assessment Tool	Outcomes						Specific Question/activity aligned to the Outcome
	CS501.1	CS501.2	CS501.3	CS501.4	CS501.5	CS501.6	
FIRST INTERNAL	√	--	√	√	√	√	<u>First Internal Question Paper</u>
SECOND INTERNAL	√	--		√	√	√	<u>Second Internal Question Paper</u>
ASSIGNMENT	√	--	√	√	√	√	<u>First, Second, Third Assignment</u>
QUIZ	√	√	√	√	√	√	Quiz -(Q1, Q2, Q3)
LABORATORY	--	--	√	√	√	√	<u>LAB Assignments</u>

### k) A. Weekly Lesson Plan

Week	Lecture	Tutorial	Laboratory	Assignment/Quiz
1	Complexity Analysis.	Tutorial on Linear/Non Linear Data Structures. <a href="#">(TS1)</a>	Review on basic algorithms.	---
2	Heap Sort.	Tutorial on Asymptotic Notations & Recurrences <a href="#">(TS2)</a>	Recursion <a href="#">(P4)</a>	Assignment - I <a href="#">(A1)</a>
3	Binary Search, Merge Sort, Quick Sort.	Tutorial on Heap Sort & Binary Search. <a href="#">(TS3)</a>	Linear & Binary Search <a href="#">(P1)</a>	---
4	Matrix Chain Multiplication. Single Source Shortest Path. (Dijkstra's & Bellman Ford)	Tutorial on Binary Search, Merge Sort & Quick Sort. <a href="#">(TS4)</a>	Sorting <a href="#">(P2)</a>	Assignment - II <a href="#">(A2)</a>
5	All Pair Shortest Path (Floyd's Algorithm). N-Queen, Graph Coloring.	Tutorial on Matrix Chain Multiplication & Shortest Path Problem. <a href="#">(TS5)</a>	Sorting <a href="#">(P3)</a>	Quiz - I (Q1)
6	Knapsack problem. Kruskal's Algorithm. Prim's Algorithm.	Tutorial on Floyd's algorithm. <a href="#">(TS6)</a>	Matrix Chain <a href="#">(P5)</a>	---
7	Job Sequencing with deadline. Lower Bound Theory. Disjoint set manipulation.	Tutorial on Knapsack Problem & Job Sequencing. <a href="#">(TS7)</a>	Floyd's <a href="#">(P6)</a>	Assignment - III <a href="#">(A3)</a>
8	Graph traversal algorithm (BFS & DFS)	Tutorial on MST. <a href="#">(TS8)</a>	N-Queen & Graph Coloring <a href="#">(P7)</a>	Quiz - II (Q2)
9	String Matching.	Tutorial on BFS & DFS. <a href="#">(TS9)</a>	Prim's & Kruskal's <a href="#">(P8)</a>	---
10	Amortized Analysis Approximation Algorithms.	-----	BFS & DFS <a href="#">(P9)</a>	---
11	Network Flow, Ford- Fulkerson algorithm.	-----		---
12	System of Linear Equations Solve by LUP. Strassen's Matrix Multiplication. Matrix Inversion & Boolean Matrix Multiplication.	Tutorial on Network Flow. <a href="#">(TS12)</a>	KMP <a href="#">(P10)</a>	---
13	Notion of NP-completeness.	Tutorial on LUP. <a href="#">(TS10)</a> Tutorial on Matrix Inversion. <a href="#">(TS11)</a>	---	Quiz - III (Q3)

**B. Daily Lesson Plan (Repeat format for each chapter)**

<b>CHAPTER: 1</b> Title: <b><u>Time &amp; space complexity</u></b> Date: <b><u>15<sup>th</sup> July,2016</u></b> , Day: <b><u>Friday</u></b>
<b><u>CONTENTS</u></b> Asymptotic notations & other mathematical preliminaries with examples.
<b>Chapter Objectives:</b> They are capable to make a decision what are the actual ways to judge the efficiency of an algorithm.  <b>Broad Objectives of the chapter are:</b>  <ol style="list-style-type: none"><li>1. To able how to judge the efficiency of an algorithm in <b>worst</b> case.</li><li>2. To able how to judge the efficiency of an algorithm in <b>best</b> case.</li><li>3. To able how to judge the efficiency of an algorithm in <b>average</b> case.</li></ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:  <ol style="list-style-type: none"><li>1. <b>What</b> is asymptotic notation? (Level 1)</li><li>2. <b>Different</b> types of asymptotic notations. (Level 2)</li><li>3. <b>Explain</b> Big 'O' notation with example. (Level 4)</li><li>4. <b>Explain</b> Big 'Ω' notation with example. (Level 4)</li><li>5. <b>Explain</b> Big 'Θ' notation with example. (Level 4)</li><li>6. <b>Prove</b> that <math>2n^2 + 5n + 4 = O(n^2) / \Omega(n^2) / \Theta(n^2)</math> (Level 5)</li></ol>
<b>HOME WORK:</b>  <ol style="list-style-type: none"><li>1. Prove that <math>3n^2 + 7n = O(n^2)</math> (Like Question No. 6)</li><li>2. Prove that <math>3n^2 + 7n = \Omega(n^2)</math> (Like Question No. 6)</li><li>3. Prove that <math>3n^2 + 7n = \Theta(n^2)</math> (Like Question No. 6)</li><li>4. Short notes on asymptotic notations. (Like Question No. 1-5)</li></ol>



## CHAPTER: 1

Title: **Time & space complexity**

Date: **16<sup>th</sup> July,2016** Day: **Saturday**

### **CONTENTS**

Recursion & iteration, design of recursive algorithms, tower of Hanoi, tail recursion

**Chapter Objectives:** They are capable to make a decision what are the actual ways to judge the efficiency of an algorithm.

**Broad Objectives of the chapter are:**

1. To able to write an iterative algorithm.
2. To able to write a recursive algorithm.
3. To able how to judge the efficiency of an iterative algorithm.
4. To able how to judge the efficiency of a recursive algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. How to write an iterative algorithm. (Level 2)
2. How to write recursion algorithm. (Level 2)
3. How to judge the efficiency of an iterative algorithm. (Level 2)
4. How to judge the efficiency of a recursive algorithm. (Level 2)
5. Write an algorithm on Tower of Hanoi problem. (Level 1)
6. What is tail recursion with example? (Level 1)

### **HOME WORK:**

1. Write an iterative algorithm on  $n^{\text{th}}$  Fibonacci number & calculate the running time complexity. (Like Question No. 1&3)
2. Write a recursive algorithm on  $n^{\text{th}}$  Fibonacci number & calculate the running time complexity. (Like Question No. 2 & 4)
3. Short notes on Tower of Hanoi problem. (Like Question No. 5,6)

## CHAPTER: 1

Title: **Time & space complexity**

Date: **18<sup>th</sup> July,2016**, Day: **Monday**

### **CONTENTS**

Substitution Method with examples, Iteration Method with examples Master Method with examples.

**Chapter Objectives:** They are capable to make a decision what are the actual ways to judge the efficiency of an algorithm.

**Broad Objectives of the chapter are:**

1. They are able, how to judge efficiency of an algorithm using substitution method.
2. They are able, how to judge efficiency of an algorithm using iteration method.
3. They are able, how to judge efficiency of an algorithm using master method.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. How to solve substitution method with example. (Level 6)
2. How to solve iteration method with example. (Level 6)
3. How to solve master method with example. (Level 6)

### **HOME WORK:**

1. Solve the following recurrence using substitution method (Like Question No. 1)
  - a.  $T(n)=2T(n/2) + O(n)$
2. Solve the following recurrence using iteration method (Like Question No. 2)
  - a.  $T(n)=2T(n/2) + O(n)$
3. Solve the following recurrence using master method (Like Question No. 3)
  - a.  $T(n)=2T(n/2) + O(n)$
  - b.  $T(n)=4T(n/2) + O(n)$
  - c.  $T(n)=T(n/2) + O(n)$
4. Short notes on Recurrences. (Like Question No. 1-3)

## CHAPTER: 1

Title: **Time & space complexity**

Date: **20<sup>th</sup> July,2016**, Day: **Wednesday**

### **CONTENTS**

Different algorithms for a problem, example study – Fibonacci numbers using recursion & iteration with complexity

**Chapter Objectives:** They are capable to make a decision what are the actual ways to judge the efficiency of an algorithm.

**Broad Objectives of the chapter are:**

1. They are able to judge the efficiency of an algorithm in **worst** case with case study.
2. They are able to judge the efficiency of an algorithm in **best** case with case study.
3. They are able to judge the efficiency of an algorithm in **average** case with case study.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. How to judge the efficiency of an algorithm in **worst** case with case study. (Level 5)
2. How to judge the efficiency of an algorithm in **best** case with case study. (Level 5)
3. How to judge the efficiency of an algorithm in **average** case with case study. (Level 5)

### **HOME WORK:**

1. Write an iterative algorithm on sum of n numbers & calculate the running time complexity. (Like Question No. 1, 2 & 3)
2. Write a recursive algorithm on sum of n numbers & calculate the running time complexity. (Like Question No. 1, 2 & 3)

### **LABORATORY EXPERIMENT: (P4)**

1. WAP to find out nth Fibonacci number using recursion as well as tail recursion and calculate the running time complexity also plot the curve between certain ranges.
2. WAP to solve Tower of Hanoi problem using recursion.
3. WAP to compute  $x^y$ .

### **Tutorial 1**

Title: **Tutorial on Linear / Non Linear Data Structures**

Date: **20<sup>th</sup> and 21<sup>st</sup> July,2016**, Day: **Wednesday and Thursday**

### **CHAPTER: 2**

Title: **Heap Sort and its complexity**

Date: **22<sup>th</sup> July,2016**, Day: **Friday**

#### **CONTENTS**

Discuss on Heap, Types of heap, how to create heap with examples.

**Chapter Objectives:** They are capable to make a heap as well as heap sort and judge the efficiency of this algorithm.

**Broad Objectives of the chapter are:**

1. They are able to describe what is heap.
2. They are able to know types of heap.
3. They are able to create a heap.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. **What** is heap? (Level 1)
2. **Different** types of heap. (Level 2)
3. **Create** a heap for some certain data. (Level 6)

#### **HOME WORK:**

1. Create a heap (max/min) with the following data 33, 25, 67, 89, 12, 55, 3, 67.  
(Like Question No. 3)
2. Short notes on heap. (Like Question No. 1-3)



**CHAPTER: 2**

Title: **Heap Sort and its complexity**

Date: **25<sup>th</sup> July,2016**, Day: **Monday**

**CONTENTS**

Heap sort with example. Analysis of heap as well as heap sort.

**Chapter Objectives:** They are capable to make a heap as well as heap sort and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to explain heap sort algorithm with some example.
2. They are able to solve the efficiency of heap sort algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the heap sort algorithm with example? (Level 1)
2. Short notes on heap sort. (Level 2)
3. What is the time complexity of a heap? (Level 1)
4. Establish the time complexity of a heap sort. (Level 4)

**HOME WORK:**

1. Create a heap (max/min) with the following data 33, 25, 67, 89, 12, 55, 3, 67. And sort the data in ascending and descending order. (Like Question No. 1)
2. Short notes on heap sort. (Like Question No. 1-4)

**LABORATORY EXPERIMENT:**

1. WAP to implement Heap sort. Estimate the running time complexity.



**CHAPTER: 3**

Title: **Divide & Conquer**

Date: **27<sup>th</sup> July,2016**, Day: **Wednesday**

**CONTENTS**

Basic idea on divide & conquer (D&C) method: case study - Binary Search

**Chapter Objectives:** They are capable to make an algorithm on the basis of D&C strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to explain D&C algorithm strategy with some example.
2. They are able to explain binary search algorithm with some example.
3. They are able to solve the efficiency of binary search algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the binary search algorithm with example? (Level 1)
2. What is BST? (Level 1)
3. What is the time complexity of binary search algorithm? (Level 4)
4. Establish the time complexity of a binary search algorithm. (Level 4)

**HOME WORK:**

1. Create a binary search tree (BST) with the following data 33, 25, 67, 89, 12, 55, 3, 67. (like question no. 2)
2. Short notes on binary search technique. (like question no. 1,3,4)
3. Explain binary search algorithm with an example. (like question no. 1)

**LABORATORY EXPERIMENT:**

1. WAP to implement binary search iterative as well as recursive method. Establish the running time complexity for both the cases.



## Tutorial 2

Title: Asymptotic Notations & Recurrences

Date: 27<sup>th</sup> and 28<sup>th</sup> July, 2016, Day: Wednesday and Thursday

1. Prove that  $3n^2 + 7n = O(n^2)$
2. Prove that  $3n^2 + 7n = \Omega(n^2)$
3. Prove that  $3n^2 + 7n = \Theta(n^2)$
4. Solve the following recurrence using substitution method.
  - a.  $T(n) = 2T(n/2) + O(n)$
5. Solve the following recurrence using iteration method.
  - a.  $T(n) = 2T(n/2) + O(n)$
6. Solve the following recurrence using master method.
  - a.  $T(n) = 2T(n/2) + O(n)$
  - b.  $T(n) = 4T(n/2) + O(n)$
  - c.  $T(n) = T(n/2) + O(n)$

**CHAPTER: 3**

Title: **Divide & Conquer**

Date: **29<sup>th</sup> July,2016**, Day: **Friday**

**CONTENTS**

Divide & conquer method: (contd.) case study - Merge Sort .

**Chapter Objectives:** They are capable to make an algorithm on the basis of D&C strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to explain merge sort algorithm with some example.
2. They are able to solve the efficiency of merge sort algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the merge sort algorithm with example? (Level 1)
2. What is the time complexity of merge sort algorithm? (Level 4)
3. Establish the time complexity of a merge sort algorithm. (Level 4)

**HOME WORK:**

1. Short notes on merge sort. (like question no 1-3)
2. Explain merge sort algorithm with an example. (like question no. 1)

**LABORATORY EXPERIMENT:**

1. WAP to implement merge sort using divide & conquer strategy. Establish the running time complexity.



**CHAPTER: 3**

Title: **Divide & Conquer**

Date: **30<sup>th</sup> July,2016** Day: **Saturday**

**CONTENTS**

Divide & conquer method: (contd.) case study - Quick Sort .

**Chapter Objectives:** They are capable to make an algorithm on the basis of D&C strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to explain quick sort algorithm with some example.
2. They are able to solve the efficiency of quick sort algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the quick sort algorithm with example? (Level 1)
2. What is the time complexity of quick sort algorithm? (Level 4)
3. Establish the time complexity of a quick sort algorithm. (Level 4)

**HOME WORK:**

1. Short notes on quick sort. (like question no 1-3)
2. Explain quick sort algorithm with an example. (like question no. 1)

**LABORATORY EXPERIMENT:**

1. WAP to implement quick sort using divide & conquer strategy. Establish the running time complexity.



**CHAPTER: 4**

Title: **Dynamic Programming**

Date: **1<sup>st</sup> August, 2016**, Day: **Monday**

**CONTENTS**

Dynamic programming: case study –Matrix Chain Multiplication with example

**Chapter Objectives:** They are capable to make an algorithm on the basis of Dynamic Programming strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to explain matrix chain multiplication algorithm with some example.
2. They are able to solve the efficiency of matrix chain multiplication algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the matrix chain multiplication algorithm with example? (Level 1)
2. Write the optimal parenthesis algorithm with example? (Level 1)
3. What is the time complexity of matrix chain multiplication algorithm? (Level 1)
4. Establish the time complexity of a matrix chain multiplication algorithm. (Level 4)

**HOME WORK:**

1. Short notes on matrix chain multiplication. (like question no 1,3,4)
2. Find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is(5,10,3,12,5). (like question no. 1)

**LABORATORY EXPERIMENT:**

1. WAP to multiply a chain of matrices optimally whose sequence of dimensions is <10, 20, 50, 1, 100>.



## CHAPTER: 4

Title: **Dynamic Programming**

Date: **3<sup>rd</sup> August, 2016**, Day: **Wednesday**

### CONTENTS

Dynamic programming: case study – Single Source shortest paths with example.  
(Dijkstra's Algorithm)

**Chapter Objectives:** They are capable to make an algorithm on the basis of Dynamic Programming strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

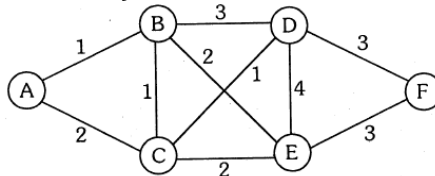
1. They are able to clarify the actual need of single source shortest path problem with an example.
2. They are able to explain Dijkstra's algorithm with some example.
3. They are able to solve the efficiency of Dijkstra's algorithm with different data structure.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the Dijkstra's algorithm of single source shortest path problem with an example? (Level 1)
2. Establish the time complexity of a Dijkstra's algorithm of single source shortest path algorithm. (Level 4)

### **HOME WORK:**

1. Short notes on single source shortest path problem. (like question no 1,2)
2. Find out the shortest path between Vertex 'A' to Vertex 'F' using Dijkstra's algorithm where Vertex 'A' is the start Vertex. (like question no. 1)



### **LABORATORY EXPERIMENT:**

1. WAP to implement Dijkstra's algorithm for single source shortest path. **(if required)**

**Tutorial: 3**

Title: **Heap Sort**

Date: **3<sup>rd</sup> and 4<sup>th</sup> August, 2016**, Day: **Wednesday and Thursday**

- 1)** Create a binary heap (max/min) with the following data 33, 25, 67, 89, 12, 55, 3, 67.  
And sort the data in ascending and descending order.
- 2)** Create a Fibonacci heap with the following data 33, 25, 67, 89, 12, 55, 3, 67.



**CHAPTER: 4**

Title: **Dynamic Programming**

Date: **5<sup>th</sup> August, 2016**, Day: **Friday**

**CONTENTS**

Dynamic programming: case study – Single Source shortest paths with example.  
(Bellman ford Algorithm)

**Chapter Objectives:** They are capable to make an algorithm on the basis of Dynamic Programming strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

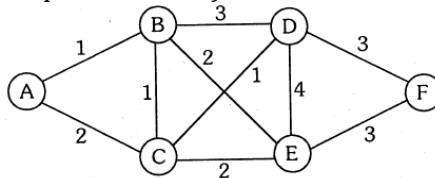
1. They are able to clarify the actual need of single source shortest path problem with an example.
2. They are able to explain Bellman ford algorithm with some example.
3. They are able to solve the efficiency of Bellman ford algorithm with different data structure.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom’s Taxonomy:

1. Write the Bellman ford algorithm of single source shortest path problem with an example? (Level 1)
2. Establish the time complexity of a Bellman ford algorithm of single source shortest path algorithm. (Level 4)
3. Compare between Dijkstra’s and Bellman ford algorithm.(Level 4)

**HOME WORK:**

1. Short notes on single source shortest path problem. (like question no 1,2)
2. Find out the shortest path between Vertex ‘A’ to Vertex ‘F’ using Bellman ford algorithm where Vertex ‘A’ is the start Vertex. (like question no. 1)



3. Write some difference between Dijkstra’s and Bellman ford algorithm.

**LABORATORY EXPERIMENT:**

2. WAP to implement Dijkstra’s algorithm for single source shortest path. **(if required)**

**CHAPTER: 4**

Title: **Dynamic Programming**

Date: **6<sup>th</sup> August, 2016**, Day: **Saturday**

**CONTENTS**

Dynamic programming: case study – All pair shortest paths with example. (Floyd’s Algorithm)

**Chapter Objectives:** They are capable to make an algorithm on the basis of Dynamic Programming strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to clarify the actual need of all pair shortest path problem with an example.
2. They are able to explain Floyd’s algorithm with some example.
3. They are able to solve the efficiency of Floyd’s algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom’s Taxonomy:

1. Write the Floyd’s algorithm for all pair shortest path problem with an example? (Level 1)
2. Establish the time complexity of a Floyd’s algorithm of single source shortest path algorithm. (Level 4)

**HOME WORK:**

1. Short notes on all pair shortest path problem. (like question no 1,2)
2. Find out the shortest path between all pair using Floyd’s algorithm. (like question no. 1)

0	7	5	$\infty$
$\infty$	0	7	6
$\infty$	$\infty$	0	$\infty$
4	1	11	0

3. Write some difference between single source and all pair shortest path..

**LABORATORY EXPERIMENT:**

1. WAP to find the shortest path between all pairs of vertices of a given graph using Floyd’s algorithm.

0	7	5	$\infty$
$\infty$	0	7	6
$\infty$	$\infty$	0	$\infty$
4	1	11	0

**CHAPTER: 5**

Title: **Backtracking**

Date: **8<sup>th</sup> August, 2016**, Day: **Monday**

**CONTENTS**

Basic idea on backtracking strategy. Case study – n queen problem

**Chapter Objectives:** They are capable to make an algorithm on the basis of Backtracking strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to clarify the actual need of backtracking strategy.
2. They are able to explain ‘n’ queen problem with an example.
3. They are able to solve the efficiency of ‘n’ queen problem.
4. They are able to know the actual need of state space tree of n queen problem.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom’s Taxonomy:

1. Write the short notes on ‘n’ queen problem. (level 1)
2. Write the ‘n’ queen algorithm with an example? (Level 1)
3. Establish the time complexity of ‘n’ queen algorithm. (Level 4)
4. How to draw the state space tree? (Level 2)

**HOME WORK:**

1. Short notes on n queen problem. (like question no 1,2,3)
2. Find out the one solution for the given 4 queen problem. (like question no. 2)

-	Q	-	-
-	-	-	-
-	-	-	-
-	-	-	-

3. Draw the state space tree for 4 queen problem. (like question no. 4)

**LABORATORY EXPERIMENT:**

1. WAP to implement 4-Queen problem using backtracking strategy.

**CHAPTER: 5**

Title: **Backtracking**

Date: **10<sup>th</sup> August, 2016**, Day: **Wednesday**

**CONTENTS**

Basic idea on backtracking strategy. Case study – graph coloring problem

**Chapter Objectives:** They are capable to make an algorithm on the basis of Backtracking strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

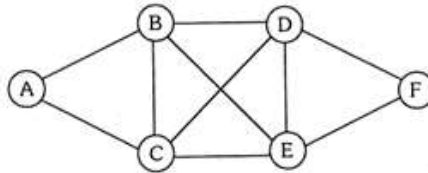
1. They are able to explain graph coloring problem with an example.
2. They are able to solve the efficiency of graph coloring algorithm.
3. They are able to know the actual need of state space tree of graph coloring problem.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the short notes on graph coloring problem. (level 1)
2. Write the 'graph coloring algorithm with an example? (Level 1)
3. Establish the time complexity of graph coloring algorithm. (Level 4)
4. How to draw the state space tree? (Level 2)

**HOME WORK:**

1. Short notes on graph coloring problem. (like question no 1,2,3)
2. Find how many distinct colors are required for the given graph.(like question no. 2)



3. Draw the state space tree for 3-coloring problem. (like question no. 4)

**LABORATORY EXPERIMENT:**

1. WAP to implement graph coloring problem using backtracking strategy.

**Tutorial: 4**

Title: **Binary Search, Merge Sort & Quick Sort**

Date: **10<sup>th</sup> and 11<sup>th</sup> August, 2016**, Day: **Wednesday and Thursday**

- 1) Create a binary search tree (BST) with the following data 33, 25, 67, 89, 12, 55, 3, 67 and also find out the results in different traversal techniques
- 2) Illustrate the operation of PARTITION on the following sequence of keys.
  - a. 2, 3, 18, 17, 5, 1
- 3) Show how Quick sort works for the following sequence of keys.
  - a. 2, 3, 18, 17, 5, 1
- 4) Use Merge sort algorithm to sort the following elements.
  - a. 15, 10, 5, 20, 25, 30, 40, 35
- 5) Show that merging two sorted sequences  $S_1$  and  $S_2$  takes  $O(n_1 + n_2)$  time, where  $n_1$  is the size of  $S_1$  and  $n_2$  is the size of  $S_2$ .

**CHAPTER: 6**

Title: **Greedy Method**

Date: **12<sup>th</sup> August, 2016**, Day: **Friday**

**CONTENTS**

Basic idea on Greedy Method: case study - Knapsack Problem with example.

**Chapter Objectives:** They are capable to make an algorithm on the basis of Greedy strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to clarify the actual need of greedy strategy with an example.
2. They are able to explain greedy knapsack problem with an example.
3. They are able to solve the efficiency of greedy knapsack algorithm with different data structure.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the greedy knapsack algorithm with an example? (Level 1)
2. Establish the time complexity of a greedy knapsack algorithm. (Level 4)

**HOME WORK:**

1. Short notes on greedy knapsack problem. (like question no 1,2)
2. Find an optimal solution to the knapsack instance  $n=7, m=15, (v_1, v_2, v_3, \dots, v_7) = (10, 5, 15, 7, 6, 18, 3)$ , and  $(w_1, w_2, w_3, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$ . (like question no 1)



**CHAPTER: 6**

Title: **Greedy Method**

Date: **17<sup>th</sup> August, 2016**, Day: **Wednesday**

**CONTENTS**

Greedy Method: Minimum spanning trees(MST): Kruskal's algorithm with example.

**Topic/Unit/Chapter Objectives:** They are capable to make an algorithm on the basis of Greedy strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter/topic are:**

1. They are able to explain Kruskal's algorithm with an example.
2. They are able to solve the efficiency of Kruskal's algorithm with set data structures.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the Kruskal's algorithm with an example? (Level 1)
2. Establish the time complexity of Kruskal's algorithm. (Level 4)

**HOME WORK:**

1. Short notes on Kruskal's algorithm. (like question no 1,2)
2. Find out the minimum spanning tree for the following graph (adjacent matrix with weight) using Kruskal's algorithm.(like question no 1)

-	1	$\infty$	4	$\infty$	$\infty$	$\infty$
1	-	2	6	4	$\infty$	$\infty$
$\infty$	2	-	$\infty$	5	6	$\infty$
4	6	$\infty$	-	3	$\infty$	4
$\infty$	4	5	3	-	8	7
$\infty$	$\infty$	6	$\infty$	8	-	3
$\infty$	$\infty$	$\infty$	4	7	3	-

**LABORATORY EXPERIMENT:**

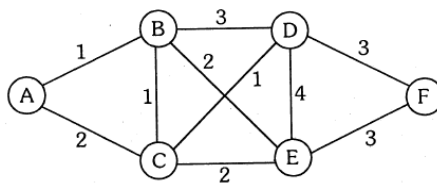
1. WAP to implement MST of a given graph using Kruskal's algorithm. Check your program on a graph whose length matrix is given in (Home Work Question no 2)

### Tutorial: 5

Title: **Matrix Chain Multiplication & Shortest Path Problem**

Date: **17<sup>th</sup> and 18<sup>th</sup> August, 2016**, Day: **Wednesday and Thursday**

- 1) Find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is  $\langle 5, 10, 3, 12, 5 \rangle$ .
- 2) Find out the shortest path between Vertex 'A' to Vertex 'F' using Dijkstra's / Bellman Ford algorithm where Vertex 'A' is the start Vertex.





**CHAPTER: 6**

Title: **Greedy Method**

Date: **19<sup>th</sup> August.2016** Day: **Friday**

**CONTENTS**

Greedy Method: Minimum spanning trees(MST): Prim's algorithm with example.

**Chapter Objectives:** They are capable to make an algorithm on the basis of Greedy strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to clarify minimum spanning tree with an example.
2. They are able to explain Prim's algorithm with an example.
3. They are able to solve the efficiency of Prim's algorithm with different data structures.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the Prim's algorithm with an example? (Level 1)
2. Establish the time complexity of Prim's algorithm. (Level 4)
3. What is minimum spanning tree with an example.(Level 2)

**HOME WORK:**

1. Short notes on minimum spanning tree. (like question no 1,2)
2. Find out the minimum spanning tree for the following graph (adjacent matrix with weight) using Prim's algorithm. (like question no 1)

-	1	$\infty$	4	$\infty$	$\infty$	$\infty$
1	-	2	6	4	$\infty$	$\infty$
$\infty$	2	-	$\infty$	5	6	$\infty$
4	6	$\infty$	-	3	$\infty$	4
$\infty$	4	5	3	-	8	7
$\infty$	$\infty$	6	$\infty$	8	-	3
$\infty$	$\infty$	$\infty$	4	7	3	-

**LABORATORY EXPERIMENT:**

2. WAP to implement MST of a given graph using Prim's algorithm. Check your program on a graph whose length matrix is given in (Home Work Question no 2)

**CHAPTER: 6**

Title: **Greedy Method**

Date: **20<sup>th</sup> August, 2016**, Day: **Saturday**

**CONTENTS**

Greedy Method: case study - Job Sequencing with Deadline with example.

**Chapter Objectives:** They are capable to make an algorithm on the basis of Greedy strategy and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to clarify the actual need of job sequencing with deadline with an example.
2. They are able to explain job sequencing problem with an example.
3. They are able to solve the efficiency of job sequencing with deadline.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the job sequencing with deadline algorithm with an example? (Level 1)
2. Establish the time complexity of job sequencing with deadline algorithm. (Level 4)

**HOME WORK:**

1. Short notes on job sequencing with deadline problem. (like question no 1,2)
2. Using greedy strategy, schedule the following jobs within deadline so as to maximize the profit. Deadline and profits are mentioned as follows. (like question no 1)

Job i	1	2	3	4
Deadline $d_i$	3	2	3	1
Profit $g_i$	9	7	7	2



**CHAPTER: 7**

Title: **Lower Bound Theory**

Date: **22<sup>nd</sup> August,2016**, Day: **Monday**

**CONTENTS**

Lower bound theory, necessity of lower bounds. Lower bound theory: lower bound of the sorting problem with example.

**Topic/Unit/Chapter Objectives:** They are capable to judge the lower bound of an algorithm.

**Broad Objectives of the chapter/topic are:**

1. They are able to explain Lower bound theory.
2. They are able to clarify the lower bound of the sorting problem.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Justify what is the lower bound of an algorithm? (Level 5)
2. How to design decision trees for sorting algorithms. (Level 6)
3. Establish the lower bound for worst case of comparison based sorting technique. (Level 5)

**HOME WORK:**

1. Short notes lower bound theory. (like question no 1,2,3)
2. Draw the decision tree for a sorting algorithm where number of element is 4.  
(like question no 2)



**CHAPTER: 8**

Title: **Disjoint set manipulation**

Date: **24<sup>th</sup> August, 2016**, Day: **Wednesday**

**CONTENTS**

Disjoint set manipulation: UNION-FIND, Union by Rank, Path Compression with example.

**Topic/Unit/Chapter Objectives:** They are competent how to manipulate disjoint sets data structure.

**Broad Objectives of the chapter/topic are:**

1. They are able to explain disjoint set data structure.
2. They are able to explain Union, Find algorithms.
3. They are able to know path compression with example.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write Union, Find algorithm with an example? (Level 2)
2. What is path compression, explain with an example. (Level 1)
3. Establish the running time complexity for Union, Find algorithms. (Level 5)
4. Prove the theorem every node has rank at most  $\lfloor \lg(n) \rfloor$ . (Level 5)
5. Prove the lemma for all tree roots  $x$ ,  $\text{size}(x) \geq 2^{\text{rank}[x]}$ . (level 5)

**HOME WORK:**

1. Short notes on disjoint set manipulation. (like question no 1,2,3)



**Tutorial: 6**

Title: **All pair Shortest Path Problem**

Date: **24<sup>th</sup> August and 1<sup>st</sup> September, 2016**, Day: **Wednesday and Thursday**

1) Find out the shortest path between all pair using Floyd's algorithm. (like question no. 1)

0	7	5	$\infty$
$\infty$	0	7	6
$\infty$	$\infty$	0	$\infty$
4	1	11	0

2) Find out the total number of operations for the above problem.

**CHAPTER: 9**

Title: **Graph traversal algorithm**

Date: **26<sup>th</sup> August, 2016**, Day: **Friday**

**CONTENTS**

Graphs, properties of graphs, representation of graphs with examples.

**Chapter Objectives:** They are capable to make an algorithm and also explain properties of a graph on the basis of graph traversal techniques and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

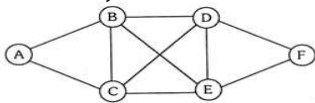
1. They are able to clarify the actual need of graph and also explain graph properties.
2. They are able how to represent a graph in computer memory.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the graph representation algorithm with an example? (Level 1)
2. Establish the time complexity of graph representation. (Level 4)

**HOME WORK:**

1. Short notes on graph. (like question no 1,2)
2. Write the adjacent matrix and adjacent list for the given graph.



3. Prove that a complete graph has at least  $n(n-1)/2$  number of edges.

**CHAPTER: 9**

Title: **Graph traversal algorithm**

Date: **29th August,2016**, Day: **Monday**

**CONTENTS**

Graph traversal algorithms: BFS with example.

**Chapter Objectives:** They are capable to make an algorithm and also explain properties of a graph on the basis of graph traversal techniques and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

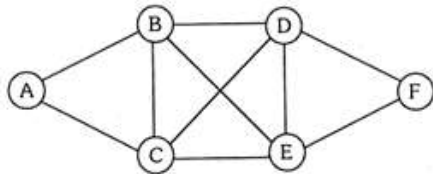
1. They are able to clarify the BFS algorithm with an example.
2. They are able to solve the efficiency of BFS algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the BFS algorithm with an example? (Level 1)
2. Establish the time complexity of BFS algorithm. (Level 4)

**HOME WORK:**

1. Short notes on BFS. (like question no 1,2)
2. Find out the BFS tree for the given graph. (like question no. 1)



3. Establish the running time for the BFS algorithm.(like question no. 2)

**LABORATORY EXPERIMENT:**

1. WAP to implement BFS on a given graph(in Home Work Question no 2) where the graph is represented as a adjacent list.

**CHAPTER: 9**

Title: **Graph Traversal Algorithm**

Date: **31<sup>st</sup> August, 2016**, Day: **Wednesday**

**CONTENTS**

Graph traversal algorithms: DFS with example.

**Chapter Objectives:** They are capable to make an algorithm and also explain properties of a graph on the basis of graph traversal techniques and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

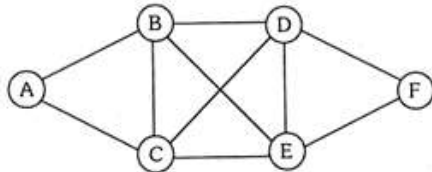
1. They are able to clarify the DFS algorithm with an example.
2. They are able to solve the efficiency of DFS algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the DFS algorithm with an example? (Level 1)
2. Establish the time complexity of DFS algorithm. (Level 4)
3. Comparative study between DFS and BFS.

**HOME WORK:**

1. Short notes on DFS. (like question no 1,2)
2. Find out the DFS tree for the given graph. (like question no. 1)



3. Establish the running time for the DFS algorithm.(like question no. 2)
4. Difference between DFS and BFS.(like question no. 3).
5. Short notes on Graph traversal techniques. (like question 1,2,3)

**LABORATORY EXPERIMENT:**

1. WAP to implement DFS on a given graph (in Home Work Question no 2) where the graph is represented as a adjacent list.

**Tutorial: 7**

Title: Knapsack Problem

Date: **31<sup>st</sup> August and 8<sup>th</sup> September, 2016**, Day: **Wednesday and Thursday**

- 1) Find an optimal solution to the knapsack instance  $n=7$ ,  $m=15$ ,  $(v_1, v_2, v_3, \dots, v_7) = (10, 5, 15, 7, 6, 18, 3)$ , and  $(w_1, w_2, w_3, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$ .

**CHAPTER: 9**

Title: **Graph traversal algorithm**

Date: **2<sup>nd</sup> September, 2016**, Day: **Friday**

**CONTENTS**

Graph traversal algorithms: Classification of edges with example.

**Chapter Objectives:** They are capable to make an algorithm and also explain properties of a graph on the basis of graph traversal techniques and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

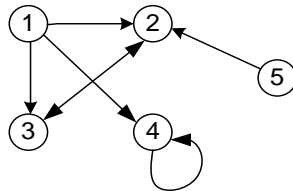
1. They are able to classify the edges in DFS tree.
2. They are able to know different types of edges.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write the definition of different types of edges with examples. (Level 1)
2. How to classify the edges give an example. (Level 3)

**HOME WORK:**

1. Find out the DFS tree and classified the edges for the following Graph where start vertex is '1'.





<p><b>CHAPTER: 10</b>  Title: <b><u>String Matching</u></b>  Date: <b><u>3<sup>rd</sup> September, 2016</u></b>, Day: <b><u>Saturday</u></b></p>
<p><b><u>CONTENTS</u></b></p>
<p>Basic idea on String Matching algorithm: naïve string matching algorithm</p>
<p><b>Topic/Unit/Chapter Objectives:</b> They are capable to make an algorithm on the basis of string matching and judge the efficiency of the algorithm.</p>
<p><b>Broad Objectives of the chapter/topic are:</b></p> <ol style="list-style-type: none"> <li>1. They are able to explain what is string algorithm matching with an example.</li> <li>2. They are able to explain naïve string matching algorithm with example.</li> <li>3. They are able to find out the running time complexity of naïve string matching algorithm.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:</p> <ol style="list-style-type: none"> <li>1. Write the naïve string matching algorithm with an example. (Level 2)</li> <li>2. Establish the running time complexity of naïve string matching algorithm. (Level 4)</li> </ol>

<p><b>CHAPTER: 10</b>  Title: <b><u>String Matching</u></b>  Date: <b><u>5<sup>th</sup> September, 2016</u></b>, Day: <b><u>Monday</u></b></p>
<p><b><u>CONTENTS</u></b></p>
<p>Basic idea on String Matching algorithm: Knuth-Moris-Prat [KMP] string matching algorithm with example.</p>
<p><b>Topic/Unit/Chapter Objectives:</b> They are capable to make an algorithm on the basis of string matching and judge the efficiency of the algorithm.</p>
<p><b>Broad Objectives of the chapter/topic are:</b></p> <ol style="list-style-type: none"> <li>1. They are able to explain KMP algorithm with example.</li> <li>2. They are able to find out the running time complexity of KMP algorithm.</li> <li>3. They are able to know what is suffix and prefix with example.</li> <li>4. They are able to know how to calculate the prefix function.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:</p> <ol style="list-style-type: none"> <li>1. Write the KMP algorithm with an example. (Level 2)</li> <li>2. Establish the running time complexity of KMP algorithm. (Level 4)</li> <li>3. Give an example on prefix calculation.(Level 3)</li> </ol>
<p><b>HOME WORK:</b></p> <ol style="list-style-type: none"> <li>1. Write the KMP algorithm with an example.(like question no. 1)</li> </ol>

2. Compute the prefix function  $\pi$  for the pattern ababbabbabbababbabb where the alphabet is  $\Sigma = \{a,b\}$ . (like question no. 3)

**LABORATORY EXPERIMENT:**

1. WAP to implement KMP algorithm for pattern matching.

**CHAPTER: 11**

Title: **Amortized Analysis**

Date: **7<sup>th</sup> September, 2016**, Day: **Wednesday**

**CONTENTS**

Discuss short notes on Amortized Analysis.

**Chapter Objectives:** They are capable to judge the efficiency of the algorithm on average running time over per operation cost.

**Broad Objectives of the chapter are:**

1. They are able to explain average running time per operation cost.
2. They are able to know the actual meaning of amortized analysis.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. What is the actual meaning of amortized analysis? (Level 2)

### Tutorial: 8

Title: Minimum Spanning Tree

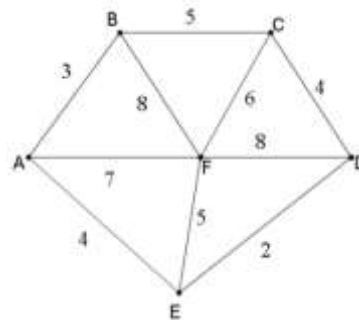
Date: 7<sup>th</sup> and 15<sup>th</sup> September, 2016, Day: Wednesday and Thursday

1) Find out the minimum spanning tree for the following graphs (adjacent matrix with weight) using Prim's / Kruskal's algorithm.

i)

-	1	$\infty$	4	$\infty$	$\infty$	$\infty$
1	-	2	6	4	$\infty$	$\infty$
$\infty$	2	-	$\infty$	5	6	$\infty$
4	6	$\infty$	-	3	$\infty$	4
$\infty$	4	5	3	-	8	7
$\infty$	$\infty$	6	$\infty$	8	-	3
$\infty$	$\infty$	$\infty$	4	7	3	-

ii)



**CHAPTER: 11**

Title: **Amortized Analysis**

Date: **9<sup>th</sup> September, 2016**, Day: **Friday**

**CONTENTS**

Different techniques used in Amortized Analysis.

**Chapter Objectives:** They are capable to judge the efficiency of the algorithm on average running time over per operation cost.

**Broad Objectives of the chapter are:**

1. They are able to classify different techniques used in amortized analysis.
2. They are able to explain different techniques with an example.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Describe aggregate analysis with an example? (Level 2)
2. Describe accounting method with an example? (Level 2)
3. Describe potential method with an example? (Level 2)

**HOME WORK:**

1. Write short notes on Amortized analysis.(like question no. 1,2,3)



**CHAPTER: 15**

Title: **Approximation Algorithm**

Date: **14<sup>th</sup> September, 2016**, Day: **Wednesday**

**CONTENTS**

Approximation algorithms: Only Short Notes.

**Chapter Objectives:** They are capable to understand the notion of Approximation algorithm.

**Broad Objectives of the chapter are:**

1. They are able to explain actual meaning of approximation algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Short notes on Approximation algorithm. (Level 4)

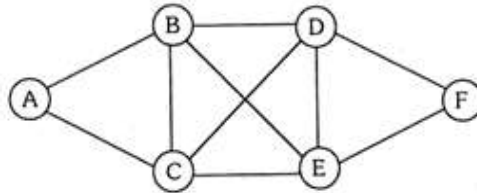


**Tutorial: 9**

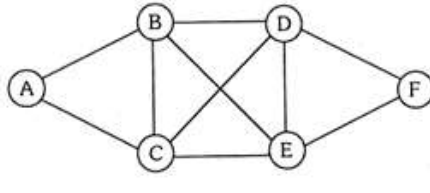
Title: **BFS & DFS**

Date: **14<sup>th</sup> and 22<sup>nd</sup> September, 2016**, Day: **Wednesday and Thursday**

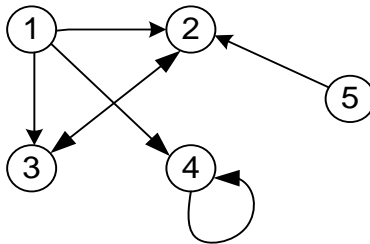
1) Find out the BFS tree for the given graph.



2) Find out the DFS tree for the given graph.



3) Find out the DFS tree and classified the edges for the following Graph where start vertex is '1'.



**CHAPTER: 12**

Title: **Network Flow**

Date: **16<sup>th</sup> September, 2016**, Day: **Friday**

**CONTENTS**

Basic idea on Network Flow with examples.

**Chapter Objectives:** They are capable to explain network flow and also measure the total flow of a network.

**Broad Objectives of the chapter are:**

1. They are able to explain about flow networks.
2. They are able to explain certain properties of a flow network.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. What is maximum flow network?
2. Describe three properties of a flow network with examples.

**HOME WORK:**

1. Write short notes on flow network.(like question no. 1,2)
2. What is the meaning of maximal flow problem?(like question no. 1)



**CHAPTER: 12**

Title: **Network Flow**

Date: **17<sup>th</sup> September, 2016**, Day: **Saturday**

**CONTENTS**

Ford Fulkerson Algorithm with example.

**Chapter Objectives:** They are capable to explain network flow and also measure the total flow of a network.

**Broad Objectives of the chapter are:**

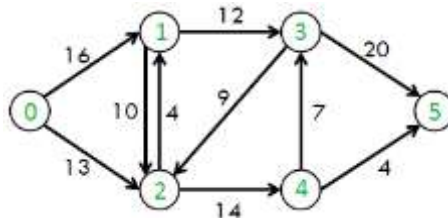
1. They are able to explain Residual network, Augmenting path, Cuts.
2. They are able to explain Ford Fulkerson algorithm of a flow network.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Explain Residual network, augmenting path and cuts with example.(Level 4)
2. Write Ford Fulkerson algorithm on network flow with example. (Level 2)

**HOME WORK:**

1. Short notes on Ford Fulkerson algorithm.
2. Find out the total flow for the given network using Ford Fulkerson.





**CHAPTER: 12**

Title: **Network Flow**

Date: **19<sup>th</sup> September, 2016**, Day: **Monday**

**CONTENTS**

Discuss on Max Flow Min cut Theorem and illustrate some examples.

**Chapter Objectives:** They are capable to explain network flow and also measure the total flow of a network.

**Broad Objectives of the chapter are:**

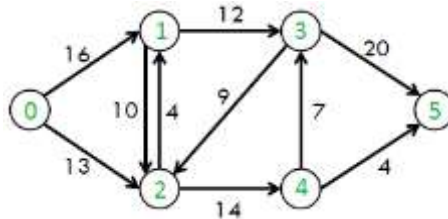
1. They are able to explain Residual network, Augmenting path, Cuts.
2. They are able to explain Max flow Min cut theorem with example.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Explain Residual network, augmenting path and cuts with example.(Level 4)
2. Write Max flow Min cut theorem with example. (Level 3)

**HOME WORK:**

1. State Max flow Min cut theorem with example.
2. Use the Ford-Fulkerson algorithm to find the maximum flow for the following network. ( Source : 0 & Sink: 5) and also find the cuts.



## CHAPTER: 13

Title: **Matrix Manipulation Algorithm**

Date: **21<sup>st</sup> September, 2016**, Day: **Wednesday**

### CONTENTS

Algorithms for solution of simultaneous equations using LUP decomposition.

**Chapter Objectives:** They are capable to make an algorithm on the basis of matrix manipulation and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to explain the computational procedure of LU decomposition.
2. They are able to explain LUP algorithm with examples.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Solve the equation by LUP decomposition. (Level 5)

$$\begin{bmatrix} 1 & 5 & 4 \\ 2 & 0 & 3 \\ 5 & 8 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 12 \\ 9 \\ 5 \end{bmatrix}$$

2. Write LUP algorithm with example. (Level 3)

### **HOME WORK:**

1. Solve the equation by LUP decomposition. (like question no. 1)

$$\begin{bmatrix} 1 & 5 & 4 \\ 2 & 0 & 3 \\ 5 & 8 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 12 \\ 9 \\ 5 \end{bmatrix}$$

2. Solve the equation by LUP decomposition. (like question no. 1)

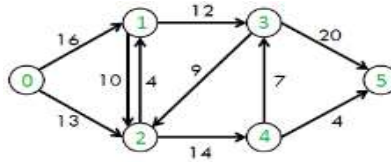
$$\begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ -7 & 6 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 3 \\ 14 \\ -7 \end{bmatrix}$$

**Tutorial: 10**

Title: **Network Flow**

Date: **21<sup>st</sup> and 29<sup>th</sup> September, 2016**, Day: **Wednesday and Thursday**

- 1) Use the Ford-Fulkerson algorithm to find the maximum flow for the following network. ( Source : 0 & Sink: 5) and also find the cuts.



**CHAPTER: 13**

Title: **Matrix Manipulation Algorithm**

Date: **23<sup>rd</sup> September, 2016**, Day: **Friday**

**CONTENTS**

Inversion of Matrix with example.

**Chapter Objectives:** They are capable to make an algorithm on the basis of matrix manipulation and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to find out the inverse of a matrix using Gauss-Jordan's rule.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Find out inverse of a matrix using Gauss-Jordan's rule. (Level 5)

$$\begin{bmatrix} 1 & 5 & 4 \\ 2 & 0 & 3 \\ 5 & 8 & 2 \end{bmatrix}$$

**HOME WORK:**

1. Find out inverse of a matrix using Gauss-Jordan's rule. (like question no. 1)

$$\begin{bmatrix} 1 & 5 & 4 \\ 2 & 0 & 3 \\ 5 & 8 & 2 \end{bmatrix}$$

2. Find out inverse of a matrix using Gauss-Jordan's rule. (like question no. 1)

$$\begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ -7 & 6 & 1 \end{bmatrix}$$

**CHAPTER: 13**

Title: **Matrix Manipulation Algorithm**

Date: **26<sup>th</sup> September, 2016**, Day: **Monday**

**CONTENTS**

Strassen's Matrix Multiplication algorithm with example and analysis.

**Chapter Objectives:** They are capable to make an algorithm on the basis of matrix manipulation and judge the efficiency of the algorithm.

**Broad Objectives of the chapter are:**

1. They are able to explain the computational procedure of Strassen's Matrix Multiplication algorithm with an example.
2. They are able to explain the running time complexity of Strassen's Matrix Multiplication algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Find  $C=AB$ . (Level 5)

$$A = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 5 & 6 & 7 \\ 2 & 1 & 4 & 1 \\ 5 & 1 & 1 & 1 \end{pmatrix} \text{ and } B = \begin{pmatrix} 3 & 1 & 2 & 1 \\ 3 & 1 & 1 & 2 \\ 4 & 1 & 2 & 2 \\ 1 & 1 & 1 & 3 \end{pmatrix}$$

2. Write short notes on Strassen's Matrix Multiplication algorithm. (Level 2)

**HOME WORK:**

1. Find  $C=AB$ . (like question no. 1)

$$A = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 5 & 6 & 7 \\ 2 & 1 & 4 & 1 \\ 5 & 1 & 1 & 1 \end{pmatrix} \text{ and } B = \begin{pmatrix} 3 & 1 & 2 & 1 \\ 3 & 1 & 1 & 2 \\ 4 & 1 & 2 & 2 \\ 1 & 1 & 1 & 3 \end{pmatrix}$$

2. Calculate the running time complexity of Strassen's Matrix Multiplication algorithm. (like question no. 2)



**CHAPTER: 14**

Title: **Notion of NP Completeness**

Date: **28<sup>th</sup> September, 2016**, Day: **Wednesday**

**CONTENTS**

Complexity theory : P, NP, NP-hard class, NP-complete class

**Chapter Objectives:** They are capable to understand the notion of NP Completeness.

**Broad Objectives of the chapter are:**

1. They are able to explain P, NP, NP hard, NP Complete class.
2. They are able to explain relation between P, NP, NP hard class, NP Complete class.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Explain P, NP, NP hard, NP Complete class.(Level 4)
2. Write deterministic algorithm (like linear search) with example. (Level 5)
3. Write non deterministic algorithm (like linear search) with example. (Level 5)

**HOME WORK:**

1. Write non deterministic algorithm on sorting technique with an example.  
(like question no. 3)
2. Draw a ven diagram on P, NP, NP hard, NP Complete class. (like question no 1)



### Tutorial: 11

Title: LUP & Matrix Inversion

Date: **28<sup>th</sup> and 20<sup>th</sup> October, 2016**, Day: **Wednesday and Thursday**

- 1) Solve the equation by LUP decomposition.

$$\begin{bmatrix} 1 & 5 & 4 \\ 2 & 0 & 3 \\ 5 & 8 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 12 \\ 9 \\ 5 \end{bmatrix}$$

- 2) Solve the equation by LUP decomposition.

$$\begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ -7 & 6 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 3 \\ 14 \\ -7 \end{bmatrix}$$

- 3) Find out the  $A^{-1}$  for the given A.

$$A = \begin{bmatrix} 1 & 5 & 4 \\ 2 & 0 & 3 \\ 5 & 8 & 2 \end{bmatrix}$$

- 4) Show that  $AA^{-1} = I$ . (relative to Q3)

**CHAPTER: 14**

Title: **Notion of NP Completeness**

Date: **1st October, 2016**, Day: **Saturday**

**CONTENTS**

Discuss on optimization problems and Decision problems and relation between them.

**Chapter Objectives:** They are capable to understand the notion of NP Completeness.

**Broad Objectives of the chapter are:**

1. They are able to explain verification algorithm.
2. They are able to explain polynomial-time verification algorithm.
3. They are able to explain polynomial time reduction.
4. They are able to clarify optimization versus decision algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. What is polynomial-time verification algorithm? (Level 1)
2. What polynomial time reduction? (Level 1)
3. Convert graph coloring decision problem to optimization problem and vice versa. (Level 4)

**HOME WORK:**

1. Convert K-clique decision problem to optimization problem and vice versa.





**CHAPTER: 14**

Title: **Notion of NP Completeness**

Date: **3<sup>rd</sup> October, 2016**, Day: **Monday**

**CONTENTS**

SAT, 3-SAT problems

**Chapter Objectives:** They are capable to understand the notion of NP Completeness.

**Broad Objectives of the chapter are:**

1. They are able to explain Cook's Theorem.
2. They are able to explain SAT problem.
3. They are able to proof 3-SAT is NP complete.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Explain Cook's theorem? (Level 2)
2. Describe SAT problem? (Level 2)
3. Prove that 3-SAT is NP complete. (Level 5)

**CHAPTER: 14**

Title: **Notion of NP Completeness**

Date: **5<sup>th</sup> October, 2016**, Day: **Wednesday**

**CONTENTS**

Clique decision problem

**Chapter Objectives:** They are capable to understand the notion of NP Completeness.

**Broad Objectives of the chapter are:**

1. They are able to explain Cook's Theorem.
2. They are able to explain K-Clique problem.
3. They are able to proof Clique decision problem is NP complete.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

4. Explain Cook's theorem? (Level 2)
5. Describe K-Clique problem? (Level 2)
6. Prove that Clique decision problem is NP complete. (Level 5)

**QUIZ:** Not Required.

<p>Title: <b><u>Discussion on University QP(Last 5 Years)</u></b>  Date: <b><u>17<sup>th</sup> &amp; 19<sup>th</sup> October,2016.</u></b> Day: <b><u>Monday and Wednesday</u></b></p>
<p><b><u>CONTENTS</u></b></p>
<p>Last 5 years university question paper.</p>
<p><b>Topic/Unit/Chapter Objectives:</b> we provide discussion on university question paper so that our students can clear their concept and their answers can be to the point.</p> <p><b>Broad Objectives of the chapter/topic are:</b></p> <ol style="list-style-type: none"> <li>1. They are able to explain to analyze, investigate and evaluate.</li> <li>2. They are able to judge how to apply theory.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:</p> <p style="text-align: center;"><b>Discussion most of the university questions in last 5 years.</b></p>

<p>Title: <b><u>Discussion on University QP(Last 5 Years)</u></b>  Date: <b><u>21<sup>st</sup> &amp; 22<sup>nd</sup> October,2016.</u></b> Day: <b><u>Friday and Saturday</u></b></p>
<p><b><u>CONTENTS</u></b></p>
<p>Last 5 years university question paper.</p>
<p><b>Topic/Unit/Chapter Objectives:</b> we provide discussion on university question paper so that our students can clear their concept and their answers can be to the point.</p> <p><b>Broad Objectives of the chapter/topic are:</b></p> <ol style="list-style-type: none"> <li>1. They are able to explain to analyze, investigate and evaluate.</li> <li>2. They are able to judge how to apply theory.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:</p> <p style="text-align: center;"><b>Discussion most of the university questions in last 5 years.</b></p>



**l) Teaching Strategy/Method (describe instructional methods, usage of ICT, efficient and engaging instructions and display the best practices on institutional website)**

- 1) Taking interactive classes through different examples.
- 2) Conducting Question – answer session at the end of the class.
- 3) Real life application for better understanding.

**m) Strategy to support weak students**

- 1) To engage the weak students in habit of studying, I give them some easy questions in regular basis.
- 2) Some weak students also have the problem of forgetting what they have learnt. In my class I always give some tips on how to recall and how to write systematically.
- 3) Weak students need special attention even after college hours. I always give some extra hours to weak students.

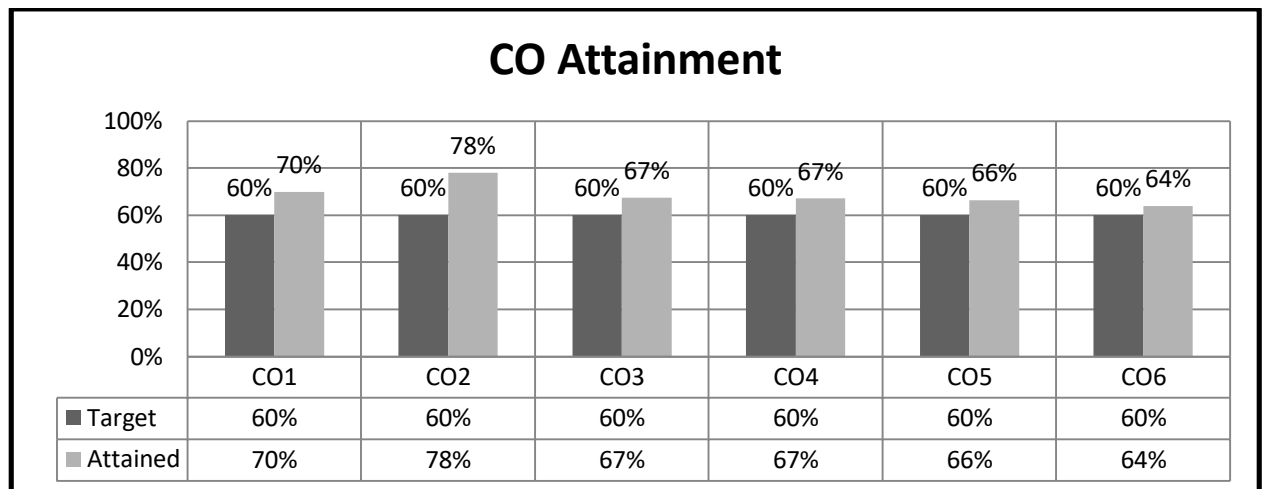
**n) Strategy to encourage bright students**

- 1) Have an extra challenge ready that allows the student to go deeper into the subject, learn a little more, or apply a skill he has just learned in a new way.
- 2) Some students are engaged with the final year students for their final projects.

**o) Efforts to keep students engaged**

- 1) Regular basis Home Work.
- 2) 5-10 minutes spent in an every class for question answer session.
- 3) Quiz on regular basis.
- 4) Some technical assignments are given group wise.

p) Analysis of Students performance in the course (internal) (labs, seminars, tests, assignments, quiz, exam etc)



**Comments:**

- 70% students have attained the set target of 60% marks for CO1
- 78% students have attained the set target of 60% marks for CO2
- 67% students have attained the set target of 60% marks for CO3
- 67% students have attained the set target of 60% marks for CO4
- 66% students have attained the set target of 60% marks for CO5
- 64% students have attained the set target of 60% marks for CO6

q) Analysis of Students performance in the course (university results)

	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME
University Result	60%	41	41	100%

- 100% students have attained the set target of 60% marks for University Exams.

**r) Analysis of Student Feed Back**

**s) Teacher Self Assessment (at the completion of course)**

From the analysis of the results obtained it can be seen that set targets for the course outcome have been achieved successfully by the students. Since this subject is a pre-requisite for Design & Analysis of Algorithm in 5<sup>th</sup> semester, more emphasis must be given for NP completeness.

**t) Recommendations/Suggestions for improvement by faculty**

- More emphasis should be given to clear the concepts of NP Completeness.
- Tutorials must be incorporated in the syllabus.
- Increase the total contact hours for theory to 40 hrs, with 4L per week.

**Siliguri Institute of Technology**  
**INTERNAL ASSESSMENT REPORT**  
**Paper Name: Design & Analysis of Algorithm**  
**Paper Code: CS 501**

FACULTY NAME : **Mr. MITHUN ROY**

**YEAR: 2015**

STREAM: **B.TECH[CSE]** YEAR: **3RD**

SEMESTER: **1ST**

SECTION: **A**

NO. OF CLASS HELD: **52**

S N	NAME	ROLL NO.	ATTENDANCE [5 MARKS]		MARKS IN INTERNAL EXAM			ASSIGNMENT [10 MARKS] MARKS=[((I+II +III)/55)*100]/10				TOTAL [30 MARKS]
			TOTAL %	MARKS	I	II	AVG	A-I [15]	A-II [20]	A-III [20]	MARKS	
1	ABHISHEK DEY	11900113001	53.85	3	21	14	9	14	19	14	9	21
2	ADITYA SAHA	11900113002	51.28	3	21	20	10	13	20	14	9	22

3	AKANKSHA KUMARI	11900113003	58.97	3	19	18	9	12	18	13	8	20
4	AKHILESH SINGH	11900113004	43.59	3	20	17	9	13	18	13	8	20
5	AMIT KUMAR	11900113005	79.49	4	22	20	11	15	19	15	9	24
6	AMRITA KUNDU	11900113007	46.15	3	14	21	9	14	17	15	8	20
7	ANGSHUMAN HALDER	11900113008	56.41	3	13	12	6	13	17	16	8	17
8	ANIRBAN DUTTA	11900113009	69.23	3	13	13	7	13	20	14	9	19
9	ANKITA GUPTA	11900113011	76.92	4	22	25	12	14	18	15	9	25
10	ANURAG SHARMA	11900113012	53.85	3	18	16	9	12	19	15	8	20
11	AYUSH AMAN	11900113013	74.36	4	19	13	8	14	20	15	9	21
12	BASANT RAJ	11900113014	64.1	3	13	17	8	15	20	16	9	20
13	BHAWESH PRASAD	11900113016	51.28	3	12	16	7	12	20	15	9	19
14	BINITA AGARWAL	11900113017	46.15	3	14	22	9	14	19	16	9	21
15	BISWAJIT DOLUI	11900113018	66.67	3	10	19	7	13	17	15	8	18
16	CHIRANJIB MUKHERJEE	11900113019	58.97	3	12	14	7	15	17	15	9	19
17	GANESH CHANDRA SAHA	11900113020	69.23	3	14	12	7	13	18	13	8	18
18	JAYDEET KARMAKAR	11900113021	48.72	3	20	10	8	13	18	13	8	19
19	JUHI RANI	11900113022	76.92	4	17	9	7	13	19	14	8	19
20	JYOTI SINHA	11900113023	82.05	5	16	13	7	13	18	14	8	20
21	KARISHMA KUMARI	11900113024	94.87	5	29	23	13	13	19	13	8	26
22	KRIKA BIBHU	11900113025	89.74	5	28	26	14	12	20	16	9	28
23	KUMAR NISHANT	11900113026	61.54	3	12	3	4	12	19	16	9	16
24	KUNAL KUMAR	11900113027	51.28	3	6	3	2	12	20	15	9	14
25	MILAN SHIT	11900113028	66.67	3	15	10	6	14	18	16	9	18
26	MOHAMMAD MAYAR ALAM	11900113030	64.1	3	22	8	8	12	17	15	8	19
27	MONALISA SINHA	11900113031	61.54	3	17	5	6	15	20	14	9	18
28	MRINAL BARMAN	11900113032	46.15	3	ABS	10	3	12	18	16	8	14
29	NEHA GOYAL	11900113033	56.41	3	22	16	10	15	17	14	8	21
30	NEHA SINGH	11900113034	53.85	3	28	15	11	15	17	14	8	22
31	NIRAJ SONAR	11900113035	64.1	3	16	15	8	12	18	13	8	19
32	PRABHAKAR PAUL	11900113036	64.1	3	21	12	8	13	18	13	8	19
33	PRAGYA KUMARI	11900113037	46.15	3	17	9	7	13	18	14	8	18
34	PRASANJIT BANIK	11900113038	82.05	5	17	16	8	12	20	15	9	22
35	PRITAM KUMAR GHOSH	11900113039	66.67	3	21	15	9	13	19	15	9	21
36	PRITI KUMARI	11900113040	87.18	5	26	16	11	15	17	16	9	25
37	PRIYANKA KUMARI	11900113041	71.79	4	21	14	9	13	17	13	8	21
38	PRONIL CHAKRABORTY	11900113042	58.97	3	21	16	9	13	18	13	8	20

**Siliguri Institute of Technology**  
**ATTENDANCE SHEET (LECTURE)**  
**Paper Name: Design & Analysis of Algorithm**  
**Paper Code: CS 501**

ROLL NO.	20/7	21/7	23/7	27/7	28/7	3/8	4/8	6/8	10/8	11/8	11/9	13/8	17/8	24/8	25/8	25/8	27/8	27/8	31/8	1/9	1/9	3/9	7/9	8/9	8/9	10/9	14/9	15/9	15/9	28/9	29/9	1/10	5/10	6/10	3/11	3/11	5/11	5/11		
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11900113002	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	1	0	0	0	1	1
11900113003	0	0	0	0	0	1	0	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	0	0	0	0	0	0	
11900113004	1	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	1	1	0	1	0	0	0	0	0	0	0	
11900113005	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	1	1	

**Siliguri Institute of Technology**  
**ATTENDANCE SHEET (TUTORIAL CLASS)**  
**Paper Name: Design & Analysis of Algorithm**  
**Paper Code: CS 501**

FACULTY NAME : **Mr. MITHUN ROY**

**YEAR: 2015**

STREAM: **B.TECH[CSE]**

YEAR: **3<sup>RD</sup>**

SEMESTER: **1<sup>ST</sup>**

SECTION: **A**

NO. OF CLASS HELD: **11**

SN	NAME	ROLL NO.	24/7	31/7	7/8	14/8	21/8	28/8	4/9	11/9	21/9	9/10	2/11	Total
1	ABHISHEK DEY	11900113001	1	1	1	0	1	0	1	1	1	0	0	7
2	ADITYA SAHA	11900113002	1	1	0	1	1	0	0	1	1	0	0	6
3	AKANKSHA KUMARI	11900113003	1	0	0	1	0	0	0	1	1	0	0	4
4	AKHILESH SINGH	11900113004	1	1	0	1	0	0	1	1	0	0	1	6
5	AMIT KUMAR	11900113005	1	0	1	0	1	0	1	0	1	1	1	7
6	AMRITA KUNDU	11900113007	0	0	0	0	0	1	0	0	0	0	0	1
7	ANGSHUMAN HALDER	11900113008	1	1	1	0	1	0	1	0	1	0	0	6
8	ANIRBAN DUTTA	11900113009	0	0	1	0	0	0	0	0	1	0	1	3
9	ANKITA GUPTA	11900113011	0	0	0	0	0	1	1	1	1	1	1	6
10	ANURAG SHARMA	11900113012	1	0	1	0	0	1	0	1	1	0	1	6
11	AYUSH AMAN	11900113013	0	1	1	0	1	0	1	1	1	1	1	8
12	BASANT RAJ	11900113014	0	1	1	1	0	1	0	0	1	1	0	6
13	BHAWESH PRASAD	11900113016	0	1	0	0	1	0	1	1	0	0	1	5
14	BINITA AGARWAL	11900113017	0	1	1	0	1	1	0	0	0	1	1	6
15	BISWAJIT DOLUI	11900113018	0	1	0	0	1	0	1	1	0	0	0	4
16	CHIRANJIB MUKHERJEE	11900113019	1	0	0	1	1	0	0	0	0	0	1	4
17	GANESH CHANDRA SAHA	11900113020	1	1	0	1	1	0	0	1	0	1	0	6
18	JAYDEET KARMAKAR	11900113021	0	0	1	0	1	0	0	1	1	0	0	4
19	JUHI RANI	11900113022	1	1	0	0	0	1	0	0	1	1	0	5
20	JYOTI SINHA	11900113023	1	0	0	1	1	0	0	0	1	0	1	5
21	KARISHMA KUMARI	11900113024	1	0	1	0	0	0	0	0	0	0	0	2
22	KRITIKA BIBHU	11900113025	1	1	0	0	1	1	1	1	1	0	0	7
23	KUMAR NISHANT	11900113026	1	0	1	1	0	0	0	1	1	1	0	6
24	KUNAL KUMAR	11900113027	0	1	1	0	0	0	1	0	0	0	1	4
25	MILAN SHIT	11900113028	1	1	1	1	1	1	1	0	0	1	0	8
26	MOHAMMAD MAYAR ALAM	11900113030	1	0	1	1	1	1	1	1	0	0	0	7
27	MONALISA SINHA	11900113031	0	1	1	0	0	1	1	0	1	0	0	5
28	MRINAL BARMAN	11900113032	1	0	1	1	1	0	0	0	0	1	0	5
29	NEHA GOYAL	11900113033	0	1	0	0	0	0	0	1	1	0	0	3



30	NEHA SINGH	11900113034	1	0	1	0	1	0	1	0	1	0	0	5
31	NIRAJ SONAR	11900113035	1	0	1	1	1	1	0	0	0	0	1	6
32	PRABHAKAR PAUL	11900113036	0	0	1	1	1	0	1	1	1	0	0	6
33	PRAGYA KUMARI	11900113037	0	0	1	1	1	1	0	0	1	1	0	6
34	PRASANJIT BANIK	11900113038	1	1	1	0	1	0	1	1	0	1	1	8
35	PRITAM KUMAR GHOSH	11900113039	0	0	0	0	1	1	0	0	1	0	0	3
36	PRITI KUMARI	11900113040	0	0	0	0	1	0	1	1	1	1	1	6
37	PRIYANKA KUMARI	11900113041	0	0	1	1	1	0	0	0	1	0	1	5
38	PRONIL CHAKRABORTY	11900113042	0	0	1	0	0	0	1	1	0	0	0	3

**Siliguri Institute of Technology**  
**LABORATORY ATTENDANCE SHEET**  
**Paper Name: Design & Analysis of Algorithm**  
**Paper Code: CS 591**

FACULTY NAME : **Mr. MITHUN ROY**

**YEAR: 2015**

STREAM: **B.TECH[CSE]**

YEAR: **3<sup>RD</sup>**

SEMESTER: **1<sup>ST</sup>**

GROUP: **A1**

NO. OF PRACTICAL HELD: **10**

SN	NAME	DAY	1	2	3	4	5	6	7	8	9	10	TOTAL MARKS	
			DATE	30/7	6/8	13/8	20/8	27/8	3/9	10/9	17/9	1/10		5/11
			ROLL NO											
1	ABHISHEK DEY	11900113001	0	1	1	1	0	1	1	1	1	0	7	
2	ADITYA SAHA	11900113002	1	1	1	1	0	0	1	0	1	0	6	
3	AKANKSHA KUMARI	11900113003	0	1	1	1	1	1	1	0	1	0	7	
4	AKHILESH SINGH	11900113004	0	1	1	1	0	0	1	1	0	0	5	
5	AMIT KUMAR	11900113005	0	1	1	1	1	1	1	1	1	0	8	
6	AMRITA KUNDU	11900113007	1	1	1	1	1	0	1	0	1	0	7	
7	ANGSHUMAN HALDER	11900113008	1	1	1	1	1	1	0	0	1	0	7	
8	ANIRBAN DUTTA	11900113009	1	1	0	1	1	1	1	1	1	0	8	
9	ANKITA GUPTA	11900113011	1	1	1	1	1	1	1	1	1	1	10	
10	ANURAG SHARMA	11900113012	1	1	1	1	1	1	0	1	1	0	8	
11	AYUSH AMAN	11900113013	0	1	1	1	0	0	1	1	1	0	6	
12	BASANT RAJ	11900113014	0	1	1	0	1	0	1	1	1	1	7	
13	BHAWESH PRASAD	11900113016	1	1	1	1	1	1	1	0	1	0	8	
14	BINITA AGARWAL	11900113017	1	1	1	1	1	1	1	1	1	0	9	
15	BISWAJIT DOLUI	11900113018	1	1	1	1	1	1	1	1	1	0	9	
16	CHIRANJIB MUKHERJEE	11900113019	1	1	1	1	0	0	0	1	1	0	6	

17	GANESH CHANDRA SAHA	11900113020	1	1	1	1	1	1	1	1	1	0	9
18	JAYDEET KARMAKAR	11900113021	1	1	1	1	1	0	1	0	1	0	7
19	JUHI RANI	11900113022	1	1	1	1	1	1	1	1	1	0	9

**Siliguri Institute of Technology**  
**LABORATORY ATTENDANCE SHEET**  
**Paper Name: Design & Analysis of Algorithm**  
**Paper Code: CS 591**

FACULTY NAME : **Mr. MITHUN ROY**

**YEAR: 2015**

STREAM: **B.TECH[CSE]**    YEAR: **3<sup>RD</sup>**    SEMESTER: **1<sup>ST</sup>**    GROUP: **A2**    NO. OF PRACTICAL HELD: **10**

SN	NAME	DAY	1	2	3	4	5	6	7	8	9	10	TOTAL MARKS	
			DATE	29/7	5/8	12/8	19/8	26/8	9/9	16/9	30/9	7/10		4/11
			ROLL NO											
1	JYOTI SINHA	11900113023	1	1	1	1	1	1	1	1	1	0	9	
2	KARISHMA KUMARI	11900113024	0	1	1	1	1	1	1	1	1	0	8	
3	KRITIKA BIBHU	11900113025	1	1	1	1	1	1	1	1	1	1	10	
4	KUMAR NISHANT	11900113026	1	0	1	1	1	1	1	0	1	1	8	
5	KUNAL KUMAR	11900113027	1	0	0	0	1	1	1	0	0	0	4	
6	MILAN SHIT	11900113028	1	0	1	1	0	1	1	1	1	1	8	
7	MOHAMMAD MAYAR ALAM	11900113030	1	1	0	1	0	1	1	0	1	1	7	
8	MONALISA SINHA	11900113031	1	0	1	1	1	1	0	1	1	0	7	
9	MRINAL BARMAN	11900113032	1	1	0	1	0	1	1	1	1	0	7	
10	NEHA GOYAL	11900113033	1	1	1	1	1	1	1	1	0	0	8	
11	NEHA SINGH	11900113034	1	0	1	1	1	0	1	1	1	1	8	
12	NIRAJ SONAR	11900113035	1	0	0	1	1	0	1	1	0	0	5	
13	PRABHAKAR PAUL	11900113036	1	1	1	1	1	1	1	1	0	1	9	
14	PRAGYA KUMARI	11900113037	1	1	0	1	1	1	0	1	0	0	6	
15	PRASANJIT BANIK	11900113038	1	0	1	0	1	1	0	1	1	0	6	
16	PRITAM KUMAR GHOSH	11900113039	1	0	1	0	1	1	1	0	1	0	6	
17	PRITI KUMARI	11900113040	1	1	1	1	1	1	1	1	1	0	9	
18	PRIYANKA KUMARI	11900113041	0	1	1	1	1	1	1	1	0	0	7	
19	PRONIL CHAKRABORTY	11900113042	1	0	1	0	1	1	1	1	0	0	6	

**Siliguri Institute of Technology**  
**RECORDS OF ASSIGNMENTS/QUIZ**  
**Paper Name: Design & Analysis of Algorithm**  
**Paper Code: CS 591**

SN	NAME	ROLL NO.	Assign - I	Assign - II	Assign - III	SN	NAME	ROLL NO.	Assign - I	Assign - II	Assign - III
1	ABHISHEK DEY	11900113001	1	1	1	20	JYOTI SINHA	11900113023	1	1	1
2	ADITYA SAHA	11900113002	1	1	1	21	KARISHMA KUMARI	11900113024	1	1	1
3	AKANKSHA KUMARI	11900113003	1	1	1	22	KRITIKA BIBHU	11900113025	1	1	1
4	AKHILESH SINGH	11900113004	1	1	1	23	KUMAR NISHANT	11900113026	1	1	1
5	AMIT KUMAR	11900113005	1	1	1	24	KUNAL KUMAR	11900113027	1	1	1
6	AMRITA KUNDU	11900113007	1	1	1	25	MILAN SHIT	11900113028	1	1	1
7	ANGSHUMAN HALDER	11900113008	1	1	1	26	MOHAMMAD MAYAR ALAM	11900113030	1	1	1
8	ANIRBAN DUTTA	11900113009	1	1	1	27	MONALISA SINHA	11900113031	1	1	1
9	ANKITA GUPTA	11900113011	1	1	1	28	MRINAL BARMAN	11900113032	1	1	1
10	ANURAG SHARMA	11900113012	1	1	1	29	NEHA GOYAL	11900113033	1	1	1
11	AYUSH AMAN	11900113013	1	1	1	30	NEHA SINGH	11900113034	1	1	1
12	BASANT RAJ	11900113014	1	1	1	31	NIRAJ SONAR	11900113035	1	1	1
13	BHAWESH PRASAD	11900113016	1	1	1	32	PRABHAKAR PAUL	11900113036	1	1	1
14	BINITA AGARWAL	11900113017	1	1	1	33	PRAGYA KUMARI	11900113037	1	1	1
15	BISWAJIT DOLUI	11900113018	1	1	1	34	PRASANJIT BANIK	11900113038	1	1	1
16	CHIRANJIB MUKHERJEE	11900113019	1	1	1	35	PRITAM KUMAR GHOSH	11900113039	1	1	1
17	GANESH CHANDRA SAHA	11900113020	1	1	1	36	PRITI KUMARI	11900113040	1	1	1
18	JAYDEET KARMAKAR	11900113021	1	1	1	37	PRIYANKA KUMARI	11900113041	1	1	1
19	JUHI RANI	11900113022	1	1	1	38	PRONIL CHAKRABORTY	11900113042	1	1	1

**Siliguri Institute of Technology**  
**LIST OF PRACTICAL'S**  
**Paper Name: Design & Analysis of Algorithm Lab**  
**Paper Code: CS 591**

SN	Details of Experiment(s)	Hours Allotted
1	Experiment on different <b>Searching</b> Techniques and also judge the running time complexity. <b>1) Linear Search</b> <b>2) Binary Search</b>	3 HRS
2	Experiment on different <b>Sorting</b> techniques and also judge the running time complexity. <b>3) Merge Sort</b> <b>4) Quick Sort</b>	3 HRS
3	Experiment on different <b>Sorting</b> techniques and also judge the running time complexity. <b>5) Heap Sort</b> <b>6) Counting Sort</b>	3 HRS
4	Experiment on some <b>recursion</b> problems also judge the running time complexity as well as plot the graph. <b>7) Calculate <math>x^y</math></b> <b>8) N<sup>th</sup> Fibonacci Number</b> <b>9) Tower of Hanoi etc and</b>	3 HRS
5	Experiment on <b>Dynamic Programming</b> algorithm strategy and also judge the running time complexity. <b>10) Matrix Chain Multiplication.</b>	3 HRS
6	Experiment on <b>Dynamic Programming</b> algorithm strategy and also judge the running time complexity. <b>11) Floyd's Algorithm</b>	3 HRS
7	Experiment on <b>Backtracking</b> algorithm strategy and also judge the running time complexity. <b>12) 4 Queen</b> <b>13) Graph Coloring</b>	3 HRS

8	Experiment on <b>Minimum Spanning Tree</b> and also judge the running time complexity. (Any one) <b>14) Prim's Algorithm</b> <b>15) Kruskal's Algorithm</b>	3 HRS
9	Experiment on <b>Graph Traversal Techniques</b> and also judge the running time complexity. <b>16) BFS</b> <b>17) DFS</b>	3 HRS
10	Experiment on <b>String Matching</b> Algorithm and also judge the running time complexity. <b>18) KMP</b>	3 HRS

**Siliguri Institute of Technology**  
**SESSIONAL/PRACTICAL PERFORMANCE RECORD**  
**Paper Name: Design & Analysis of Algorithm Lab**  
**Paper Code: CS 591**

FACULTY NAME : **Mr. MITHUN ROY**

**YEAR: 2015**

STREAM: **B.TECH[CSE]**

YEAR: **3<sup>RD</sup>**

SEMESTER: **1<sup>ST</sup>**

SECTION: **A**

SN	NAME	ROLL NO	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	TOTAL[40]
1	ABHISHEK DEY	11900113001	0	4	4	4	0	4	4	4	4	0	<b>28</b>
2	ADITYA SAHA	11900113002	4	4	4	4	0	0	4	0	4	0	<b>24</b>
3	AKANKSHA KUMARI	11900113003	0	4	4	4	4	4	4	0	4	0	<b>28</b>
4	AKHILESH SINGH	11900113004	0	4	4	4	0	0	4	4	0	0	<b>20</b>
5	AMIT KUMAR	11900113005	0	4	4	4	4	4	4	4	4	0	<b>32</b>
6	AMRITA KUNDU	11900113007	4	4	4	4	4	0	4	0	4	0	<b>28</b>
7	ANGSHUMAN HALDER	11900113008	4	4	4	4	4	4	0	0	4	0	<b>28</b>
8	ANIRBAN DUTTA	11900113009	4	4	0	4	4	4	4	4	4	0	<b>32</b>
9	ANKITA GUPTA	11900113011	4	4	4	4	4	4	4	4	4	4	<b>40</b>
10	ANURAG SHARMA	11900113012	4	4	4	4	4	4	0	4	4	0	<b>32</b>
11	AYUSH AMAN	11900113013	0	4	4	4	0	0	4	4	4	0	<b>24</b>
12	BASANT RAJ	11900113014	0	4	4	0	4	0	4	4	4	4	<b>28</b>
13	BHAWESH PRASAD	11900113016	4	4	4	4	4	4	4	0	4	0	<b>32</b>
14	BINITA AGARWAL	11900113017	4	4	4	4	4	4	4	4	4	0	<b>36</b>
15	BISWAJIT DOLUI	11900113018	4	4	4	4	4	4	4	4	4	0	<b>36</b>
16	CHIRANJIB MUKHERJEE	11900113019	4	4	4	4	0	0	0	4	4	0	<b>24</b>
17	GANESH CHANDRA SAHA	11900113020	4	4	4	4	4	4	4	4	4	0	<b>36</b>
18	JAYDEET KARMAKAR	11900113021	4	4	4	4	4	0	4	0	4	0	<b>28</b>

19	JUHI RANI	11900113022	4	4	4	4	4	4	4	4	4	4	0	36
20	JYOTI SINHA	11900113023	4	4	4	4	4	4	4	4	4	4	0	36
21	KARISHMA KUMARI	11900113024	0	4	4	4	4	4	4	4	4	4	0	32
22	KRITIKA BIBHU	11900113025	4	4	4	4	4	4	4	4	4	4	4	40
23	KUMAR NISHANT	11900113026	4	0	4	4	4	4	4	4	0	4	4	32
24	KUNAL KUMAR	11900113027	4	0	0	0	4	4	4	4	0	0	0	16
25	MILAN SHIT	11900113028	4	0	4	4	0	4	4	4	4	4	4	32
26	MOHAMMAD MAYAR ALAM	11900113030	4	4	0	4	0	4	4	0	4	4	4	28
27	MONALISA SINHA	11900113031	4	0	4	4	4	4	0	4	4	0	4	28
28	MRINAL BARMAN	11900113032	4	4	0	4	0	4	4	4	4	4	0	28
29	NEHA GOYAL	11900113033	4	4	4	4	4	4	4	4	4	0	0	32
30	NEHA SINGH	11900113034	4	0	4	4	4	0	4	4	4	4	4	32
31	NIRAJ SONAR	11900113035	4	0	0	4	4	0	4	4	0	0	0	20
32	PRABHAKAR PAUL	11900113036	4	4	4	4	4	4	4	4	4	0	4	36
33	PRAGYA KUMARI	11900113037	4	4	0	4	4	4	0	4	0	0	0	24
34	PRASANJIT BANIK	11900113038	4	0	4	0	4	4	0	4	4	0	0	24
35	PRITAM KUMAR GHOSH	11900113039	4	0	4	0	4	4	4	0	4	0	0	24
36	PRITI KUMARI	11900113040	4	4	4	4	4	4	4	4	4	4	0	36
37	PRIYANKA KUMARI	11900113041	0	4	4	4	4	4	4	4	4	0	0	28
38	PRONIL CHAKRABORTY	11900113042	4	0	4	0	4	4	4	4	4	0	0	24

NAME WITH ROLL NUMBERS OF STUDENT WHOSE ACADEMIC PERFORMANCE IS NOT SATISFACTORY			
Sl.	Name of Student	Roll No.	Remedial measures taken by teacher
1	ABHISHEK DEY	11900113001	<ul style="list-style-type: none"> <li>• Additional doubt clearing sessions</li> <li>• Providing extra assignments to students with poor attendance.</li> <li>• Guiding them through previous question papers</li> <li>• Highlighting important and frequently asked questions</li> </ul>
2	GANESH CHANDRA SAHA	11900113020	
3	KUNAL KUMAR	11900113027	
4	MILAN SHIT	11900113028	
5	MRINAL BARMAN	11900113032	
6	NIRAJ SONAR	11900113035	

## **CERTIFICATE**

I, the undersigned, have completed the course allotted to me as shown below

Sl. No.	Semester	Subject with Code	Total Chapters	Remarks
1.	5 <sup>th</sup>	Design & Analysis of Algorithm (CS501) Design & Analysis Laboratory (CS 591)	15	

Date :

**Signature of Faculty**

**Submitted to HOD**

**Certificate by HOD**

I, the undersigned, certify that **Prof. Mithun Roy** has completed the course work allotted to him satisfactorily / not satisfactorily.

Date :

Signature of HOD

**Submitted to Director**

Date :

Signature of Director



Director  
Siliguri Institute of Technology

**Siliguri Institute of Technology**  
**Department of Computer Sc. & Engineering**  
**1<sup>st</sup> Internal Exam-2015**  
**Design & Analysis of Algorithm, CS 501**  
**F.M-30, Time: 1h 30m**

**Group- A, Marks allotted: 10**

**Answer the following questions (2X5 = 10)**

1. a) Write the **Master Theorem**.  
b) **Solve** the following recurrence **using Master Theorem**. [CO3]

$$T(n) = 4T\left(\frac{n}{3}\right) + n^2 \lg(n)$$

OR

- a) **Prove that**  $\sum_{k=0}^n \log(k)$  is  $O(n \lg n)$ . [CO3]  
2. **Create a Max Heap** for the following key elements.  $A = \{5,3,17,10,84,19,6,22,9\}$  [CO5]

OR



Perform the **partition** operation once (one time) on the following array as per the requirement of the **quicksort algorithm**, assuming the last element is the pivot of the array. Clearly mention the steps.

$A[] = \{2,8,7,1,3,5,6,4\}$ . [C05]

**Group- B, Marks allotted: 10**

**Answer the following questions (2X5 = 10)**

- Find the recurrence relation of **Binary search** and derive the **time complexity** of **Binary search**. [C01]

OR

Derive the Time complexity of **Mergesort algorithm**. [C01]

- Analyze the **Best** case and **Worst** case time complexity of **Quicksort algorithm**. [C04]

**Group- C, Marks allotted: 10**

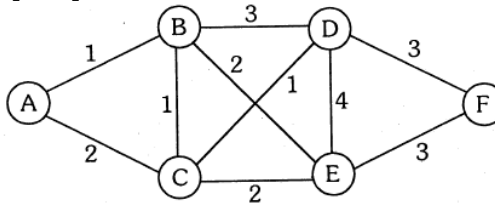
**Answer the following questions (2X5 = 10)**

- Write difference between **Divide & Conquer strategy** and **Dynamic Programming** with an example. [C06]

OR

Write short notes on **all pair shortest path** OR **Asymptotic Notation**. [C06]

- Find out the **shortest path** between Vertex 'A' to Vertex 'F' using **Dijkstra's algorithm** where Vertex 'A' is the start Vertex. [C06]



OR

Find an **optimal parenthesization** of a **matrix-chain product** whose sequence of dimensions is  $\langle 5,10,3,12,5 \rangle$ . [C06]

**Siliguri Institute of Technology**  
**Department of Computer Sc. & Engineering**  
**2<sup>nd</sup> Internal Exam-2015**  
**Design & Analysis of Algorithm, CS 501**  
**F.M-30, Time: 1h 30m**

**Group- A, Marks allotted: 10**

**Answer any two questions (2X5 = 10)**

- Find an **optimal solution** to the **knapsack** instance  $n=7, m=15, (v_1, v_2, v_3, \dots, v_7) = (10, 5, 15, 7, 6, 18, 3)$ , and  $(w_1, w_2, w_3, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$ . [CO 6]
- Design an algorithm that calculate the sum of  $n$  elements of an array and also calculate the

running time complexity. [CO 1]

OR

5. Compute the prefix function  $\Pi$  for the pattern ababbabbabbababbabb where the alphabet is  $\Sigma = \{a,b\}$ . [CO 1]

**Group- B. Marks allotted: 10**

**Answer any two questions (2X5 = 10)**

6. Solve the equation following linear equations using **LUP decomposition**. [CO 5]

$$x + 5y + 4z = 12$$

$$2x + 3z = 9$$

$$5x + 8y + 2z = 5$$

7. Discuss the procedure for **Strassen's matrix multiplication** to evaluate the product of 'n' matrices. [CO 4]

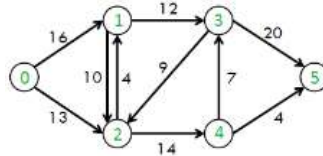
OR

8. Find the resulting recurrence relation for the same (**Strassen's matrix multiplication**) and analyze its time complexity. [CO 4]

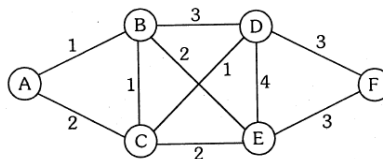
**Group- C, Marks allotted: 10**

**Answer any two questions (2X5 = 10)**

9. Write **Max-flow Min-cut** Theorem. Use the Ford-Fulkerson algorithm to find the maximum flow for the following network. ( Source : 0 & Sink: 5) [CO 5]

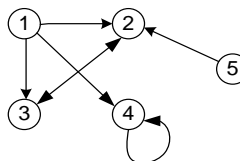


10. Find out the **Minimum Spanning Tree** for the following graph using **Prim's** or **Kruskal's** Algorithm. [CO 6]



OR

11. Find out the **DFS tree** and **classified the edges** for the following Graph where start vertex is '1'. [CO 6]



Year: 3<sup>RD</sup> Semester: 1<sup>ST</sup> Section: A  
Marks: 15

**Paper Name:** Design & Analysis of Algorithm

**Paper Code:** CS 501

**Submission Date:** 6<sup>th</sup> August, 2015

**Assignment policy:**

- Assignments must be submitted **in class** as hardcopy (A4 sheet) on the due date mentioned in the assignment
- Early submissions are allowed.
- All assignments must be done individually. Anyone cheating will receive a zero for that assignment.
- Late submission policy: **No late submissions will be allowed** on any assignment. However, earlier submissions are allowed at any time before due.

### Assignment - I

I. Given 2 arrays A and B, each of size N, 3 + 1 +  
2 = 6

- 1) Design an algorithm to test whether there is at least one common element between the 2 arrays,
- 2) Prove its correctness, and
- 3) Estimate its speed.

II. Solve the following recurrence by successive substitutions.  $F(1) = 1$ , and  
2

$$F(N) = 2F(N - 1) + N, \text{ for any } N > 1.$$

III. Which of the following equalities are true and why? 7  
X 1 = 7

- 1)  $3N^2 + 6N = O(N^2)$
- 2)  $3N^2 + 6N = O(N^2 \log N)$
- 3)  $N^2 \log N = O(N^2)$
- 4)  $3^N = O(2^N)$
- 5)  $\log N = O((\log \log N)^4)$
- 6)  $N = O((\log N)^{\log N})$

7)  $N^{100} = O(2^N)$

## Siliguri Institute of Technology

Computer Science & Engineering Department

Year: 3<sup>RD</sup> Semester: 1<sup>ST</sup> Section: A

Marks: 20

**Paper Name:** Design & Analysis of Algorithm

**Paper Code:** CS 501

**Submission Date:** 18<sup>th</sup> August, 2015

**Assignment policy:**

- Assignments must be submitted **in class** as hardcopy (A4 sheet) on the due date mentioned in the assignment
- Early submissions are allowed.
- All assignments must be done individually. Anyone cheating will receive a zero for that assignment.
- Late submission policy: **No late submissions will be allowed** on any assignment. However, earlier submissions are allowed at any time before due.

### Assignment - II

(4 X 5 = 20)

I. By applying the master theorem solve the following recurrences. For the base cases, assume that  $T(1) = O(1)$ .

1)  $T(N) = 25T(N/5) + N^{2.1}$

2)  $T(N) = 25T(N/5) + N^{1.5}$

3)  $T(N) = 25T(N/5) + N^2$

II. Solve the following recurrence by successive substitutions or by induction. For the base cases, assume that  $T(1) = O(1)$ .

$$T(N) \leq 25T(N/5) + N^2 \log N.$$

III. The ELEMENT DISTINCTNESS problem consists of testing whether a given set of  $N$  numbers have no duplicates. Design an  $O(N \log N)$  step comparison-based algorithm for this problem.

- IV. In the selection problem (finding the  $K^{\text{TH}}$  smallest element), if we group the  $N$  elements into  $N/3$  groups each of 3 elements and make appropriate changes to the algorithm, derive the speed of the resulting algorithm. Repeat it when each group consists of 7 elements.

## Siliguri Institute of Technology

Computer Science & Engineering Department

Year: 3<sup>RD</sup> Semester: 1<sup>ST</sup> Section: A

Marks: 20

**Paper Name:** Design & Analysis of Algorithm

**Paper Code:** CS 501

**Submission Date:** 25<sup>th</sup> November, 2015

**Assignment policy:**

- Assignments must be submitted **in class** as hardcopy (A4 sheet) on the due date mentioned in the assignment
- Early submissions are allowed.
- All assignments must be done individually. Anyone cheating will receive a zero for that assignment.
- Late submission policy: **No late submissions will be allowed** on any assignment. However, earlier submissions are allowed at any time before due.

### Assignment - III

(4 X 5 = 20)

I. Design a dynamic programming algorithm for the following problem:

Given a sequence  $A_1 * A_2 * \dots * A_{N-1} * A_N$ , in which each  $A_i$  is a positive integer and each  $*$  is '+' or '-', compute a parenthesization of the expression such that the resulting value is the maximum possible. It suffices to compute the resulting value instead of the parenthesization. Estimate its speed.

For example, if the given sequence is 3 - 4 -5,  $((3-4)-5)$  results in -6 while  $(3-(4-5))$  results in 4. The second parenthesization results in the maximum possible value, and the output is 4.

II. Let  $A$  be an  $M \times N$  array of numbers. In phase 1, we sort the rows and then in phase 2, we sort the columns. Prove that after both the phases are completed, the rows remain in sorted order.

III. Let  $S_1, S_2, \dots, S_M$  be nonempty subsets of  $\{1, 2, \dots, N\}$ , and let the total number of elements in all the  $S_i$ 's be  $N$ . Design an  $O(N)$  step algorithm for sorting the  $S_i$ 's.

IV. In the standard Heap Sort, given any  $N$  numbers  $A_1, A_2, \dots, A_N$ , we first arranged them into a complete binary tree and then satisfied the heap property in the order  $A_N, A_{N-1}, \dots, A_1$ . If we

want to heapify in the order  $A_1, A_2, \dots, A_N$ , describe an appropriate algorithm and estimate its speed. (In this algorithm, for any  $l \geq 1$ , after a heap is constructed for  $A_1, A_2, \dots, A_l$ , the next number  $A_{l+1}$  is brought into the heap in a bottom-up fashion.)



Director  
Siliguri Institute of Technology



**SILIGURI INSTITUTE OF TECHNOLOGY**  
**COMPUTER SCIENCE & ENGINEERING**



# **COURSE FILE**

**2<sup>ND</sup> SEM, 3<sup>RD</sup> YEAR, 2017**

**PAPER NAME : Database Management System**

**PAPER CODE : CS 601 & CS 691**

## **Vision of CSE dept.**

To be a nationwide recognized department that produces versatile computer engineers, capable of adapting to the changing needs of computer and related industry.

## **Mission of CSE dept.**

- To impart quality technical education with skills, knowledge and attitude to succeed in Computer Science & Engineering careers.
- To provide knowledge of emerging trends in computer and related industry and foster environment of lifelong learning.
- To develop graduate engineers who investigate research, design and find workable solutions to complex engineering problems with awareness and concern for society and environment.

## **PROGRAM EDUCATIONAL OBJECTIVES (PEOs) of CSE dept.**

### **The graduates will be:**

- Competent professionals with knowledge of Computer Science & Engineering to pursue variety of careers/higher education.
- Proficient in successfully designing innovative solutions to real life problems that are technically sound, economically viable and socially acceptable.
- Efficient team leaders, effective communicators and capable of working in multi-disciplinary environment following ethical values.
- Capable of adapting to new technologies and constantly upgrade their skills with an attitude towards lifelong learning.

## **PROGRAM OUTCOMES (PO)**

### **Engineering Graduates will be able to:**

- **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.



- **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### PSOs of CSE Dept

- **Apply probability, statistics, mathematics through differential and integral calculus, sciences including applications appropriate to the Computer Science & Engineering topics.**
- **Use algorithms, data structures/management, software design, concepts of programming languages and computer organization & architecture.**

# Course File

Course Title/Code: Database Management System/CS601 & CS691

Semester:- 2<sup>nd</sup> Year:- 3<sup>rd</sup> Group:- B

Name of the Faculty: **Prof. Dr. Bidyut Biman Sarkar, Prof. Jayashree Singha**

E-mail : [jaysin31m85@gmail.com](mailto:jaysin31m85@gmail.com)

## Class Schedule:

Day	Monday [ L ]	Tuesday [ L ]	Wednesday [ L ]	Thursday [ L ]	Friday [ L ]
<b>Timing(B)</b>	12.30 PM - 1.20 PM	11:40 AM- 12.30 PM	10.50 AM-11:40 AM	3.00 PM-3.50 PM	---

## Laboratory Schedule:

Day	Monday	Tuesday	Wednesday	Thursday	Friday
<b>Group B1</b>	2:10 PM -4.40 PM	---	---	---	---
<b>Group B2</b>	---	---	2:10 PM - 4:40 PM	---	---

**Hours of Meeting Students:-** Tuesday & Friday (3:00 PM – 4:30PM ) /By Appointment

### i) Course Objective:

Students will be able to design normalized database and apply it to build secure and efficient applications.

### ii) Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

#### a) The Students will be able to:

Course Outcomes	Targets
<b>Describe</b> the fundamental concepts of database system and <b>construct</b> Entity-Relationship (E-R) model from specifications and <b>convert</b> an E-R schema to relation schema using mapping algorithm. <b>[ BT - Level - 3 ]</b>	65% marks
<b>Identify</b> query processing methodologies of Relational Algebra, Relational Calculus and determine the query optimization techniques. <b>[ BT - Level - 4 ]</b>	65% marks
<b>Construct</b> simple and moderately advanced database queries using SQL and PL/SQL blocks for ensuring data integrity and security. <b>[ BT - Level - 6 ]</b>	65% marks
<b>Explain</b> the concepts of normalization and <b>apply</b> such knowledge to the normalization of a database; and be able to <b>identify</b> basic database storage structures and access	65% marks

techniques. [ BT - Level - 4]	
<b>Implement</b> the basic issues of transaction processing, concurrency control and recovery mechanisms in applications. [ BT - Level - 3]	65% marks

- b) Once the student has successfully complete this course, he/she must be able to answer the following questions or perform/demonstrate the following:

SN	QUESTION	BT-LEVEL
1.	What do you <b>understand</b> by database and database management system?	2
2.	<b>Explain</b> the 3-schema architecture of DBMS. How are these different schema layers related to the concepts of logical and physical data independence?	2
3.	What do you <b>understand</b> by physical and logical data independence and why are they important?	2
4.	<b>Describe</b> the role of DBA.	2
5.	<b>Explain</b> the following terms briefly: attribute, domain, entity, relationship, entity set, relationship set, one-to-many relationship, many-to-many relationship, participation constraint, overlap constraint, covering constraint, weak entity set, specialization, generalization, aggregation, and role indicator.	2
6.	<b>Describe</b> a banking system database with the help of suitable ERD.	2
7.	<p><b>Use</b> mathematical notations of relational algebra to express a database query. Consider the following tables:  SUPPLIER (SUPPLIER_ID, SUPPLIER_NAME, SUPPLIER_ADDRESS)  PARTS (PART_ID, PART_NAME, COLOR)  CATALOG (SUPPLIER_ID, PART_ID, COST)</p> <p>Write the following queries in Relational Algebra based on above mentioned tables:</p> <ol style="list-style-type: none"> <li>Find names of the suppliers who supply 'YELLOW' parts.</li> <li>Find names of the suppliers who supply both 'BLUE' and 'RED' parts.</li> <li>Find name of the supplier who supply all parts.</li> </ol>	3
8.	<p><b>Use</b> mathematical notations of relational calculus to express a database query. Consider the following tables:  EMPLOYEE (EMPLOYEE_NO, EMPLOYEE_NAME, CITY)  WORKS (EMPLOYEE_NO, COMPANY_NAME, SALARY)</p> <p>Write the following query in Tuple and Domain Relational Calculus: Find the name and city of residence of all employees who work for TCS</p>	3

	Company.	
9.	<p><b>Construct</b> simple and nested <b>queries</b> on a given database system using SQL. Consider the following tables:</p> <p style="padding-left: 40px;">EMPLOYEE (EMP_CODE, EMP_NAME, DESIGNATION, HEAD, DOJ, BASIC, DEPT_CODE)</p> <p style="padding-left: 40px;">DEPARTMANT (DEPT_CODE, DEPT_NAME, LOCATION)</p> <p><b>Write</b> the following queries in <b>SQL</b></p> <p>a. List the names of the employees who are earning more than the lowest salary of an employee in department 30.</p> <p>b. List of only those DEPT_CODE where the total salary is greater than 20000.</p> <p>c. List the names of those employees whose names either starts or ends with 'S'.</p> <p>d. List the names of the employees along with the name of the people under whom they are working.</p>	6
10.	<b>Explain</b> the concepts of functional dependency, multivalued dependency and join dependency.	2
11.	<b>Find</b> the closure of the following set F of functional dependencies for the relation schema R. R=(A, B, C, D,E); F={ A→BC, CD→E, B→D, E→A}	4
12.	Consider the relation schema R(A, B, C) with a set of functional dependencies F={A→BC, B→C, A→B, AB→C}. <b>Find</b> the irreducible set for F.	4
13.	<p>Consider a relation schema R(A, B,C, D, E, F) with set of functional dependencies F = {A→BCDEF, BC→ADEF, B→F, D→E }.</p> <p>i) <b>Find</b> the candidate keys for R.</p> <p>ii) Decompose R to 3NF.</p> <p>iii) If another functional dependency D→B is introduced, what will be the resulting decomposed relation schema?</p> <p>iv) Is the decomposition lossless ?</p>	4
14.	<b>Describe</b> each of the following indexing techniques with suitable example: primary, secondary and clustered indexing.	2
15.	<b>Compare</b> and contrast between: i) B-tree and B+ tree organization	4
16.	<p><b>Construct</b> a B+ tree for the following set of key values: [5, 10, 15, 20, 25, 30, 35, 40, 50, 55, 65,70, 75, 80, 90, 95] when the number of pointers that will fit in one node is: 5</p> <p>i. Insert 60</p> <p>ii. Delete 15, 75</p>	6
17.	<b>Discuss</b> the ACID properties of database.	2
18.	<b>Write</b> the differences among 2PL and Strict 2PL? Which one is	1

	advantageous and why?	
19.	<b>Determine</b> whether the following schedule S is conflict or serial? S: [R3(y); R3(z); R1(x); W1(x); W3(z); W3(y); R2(z); R1(y); W1(y); R2(y); W2(y); R2(x); W2(x)] If conflict then, find the equivalent serial schedule.	2
20.	<b>Describe</b> log-based and non-log based recovery techniques.	2

## Database Management System Syllabus [in Chapters]

**Code: CS601**

Contact: 3L

### CHAPTER 1: [4L]

#### Introduction

Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

### CHAPTER 2: [6L]

#### Entity-Relationship Model

Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

### CHAPTER 3: [5L]

#### Relational Model

Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.

### CHAPTER 4: [8L]

#### SQL and Integrity Constraints

Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Sub-queries, Database security application development using SQL, Stored procedures and triggers.

### CHAPTER 5: [9L]

#### Relational Database Design

Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF

7

### CHAPTER 6: [7L]

#### Internals of RDBMS

Physical data structures, Query optimization: join algorithm, statistics and cost based optimization. Transaction processing, Concurrency control and Recovery Management: transaction model properties, state serializability, lock base protocols, two phase locking.

## CHAPTER 7: [6L]

### File Organization & Index Structures

File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree .

#### c) Chapter Layout

Chapter No.	Chapter	Lecture Hours	Tutorials	Laboratory hours
Chapter - 1	Introduction	4 HRS	NOT APPLICABLE	
Chapter - 2	Entity-Relationship Model	6 HRS		
Chapter - 3	Relational Model	5 HRS		
Chapter - 4	SQL and Integrity Constraints	8 HRS		26 HRS
Chapter - 5	Relational Database Design	9 HRS		2 HRS
Chapter - 6	Internals of RDBMS	7 HRS		
Chapter - 7	File Organization & Index Structures	6 HRS		2HRS
Total		45 HRS	30 HRS	

#### d) Text Books:

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing Company.

#### e) Reference:

1. James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of India, New Delhi
2. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
3. "Database Management Systems", Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

#### f) Evaluation Scheme:

##### 1) THEORY

Evaluation Criteria	Marks
First & Second Internal Exam*	15
Quiz/ Assignments	10
Attendance	5
University Exam	70
Total	100

\*Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

### University Grading System:

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

## 2) LABORATORY

Evaluation Criteria	Marks
Internal Exam*	40
University Exam	60
Total	100

\* Internal Evaluation will be based on daily lab performance as per the following schedule:

### g) Laboratory Evaluation:

Experiment No.	Experiment Name	Schedule	Marks																														
P1	<p>Q1. a) Create a table 'STUDENT' with following structures:-</p> <table border="1"> <thead> <tr> <th>Col. Name</th> <th>Type</th> <th>Width</th> </tr> </thead> <tbody> <tr> <td>ROLL</td> <td>NUMBER</td> <td>2</td> </tr> <tr> <td>NAME</td> <td>VARCHAR2</td> <td>15</td> </tr> <tr> <td>EXAMDATE</td> <td>DATE</td> <td></td> </tr> </tbody> </table> <p>b) Add a primary key constraint on column 'NAME'.            c) Drop the primary key of the table 'STUDENT'.            d) Add a primary key on col. 'ROLL' in table 'STUDENT'.            e) Insert following data:-</p> <table border="1"> <thead> <tr> <th>ROLL</th> <th>NAME</th> <th>EXAMDATE</th> </tr> </thead> <tbody> <tr> <td>11</td> <td>Sourav</td> <td>01-JUN-10</td> </tr> <tr> <td>12</td> <td>Kamal</td> <td>01-JUN-10</td> </tr> <tr> <td>13</td> <td>Rahul</td> <td>01-JUN-10</td> </tr> <tr> <td>14</td> <td>Sovan</td> <td>01-DEC-10</td> </tr> <tr> <td>15</td> <td>Shyamal</td> <td>01-DEC-10</td> </tr> </tbody> </table>	Col. Name	Type	Width	ROLL	NUMBER	2	NAME	VARCHAR2	15	EXAMDATE	DATE		ROLL	NAME	EXAMDATE	11	Sourav	01-JUN-10	12	Kamal	01-JUN-10	13	Rahul	01-JUN-10	14	Sovan	01-DEC-10	15	Shyamal	01-DEC-10	1	3
Col. Name	Type	Width																															
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13	Rahul	01-JUN-10																															
14	Sovan	01-DEC-10																															
15	Shyamal	01-DEC-10																															

P2	<p>Q2. a) Create a table 'MARKS' with following structures:-</p> <table border="1"> <thead> <tr> <th>Col. Name</th> <th>Type</th> <th>Width</th> </tr> </thead> <tbody> <tr> <td>ROLL</td> <td>NUMBER</td> <td>2</td> </tr> <tr> <td>MATH</td> <td>NUMBER</td> <td>2</td> </tr> <tr> <td>ENG</td> <td>NUMBER</td> <td>3</td> </tr> </tbody> </table> <p>b) Add a foreign key constraint on column 'ROLL' in 'MARKS' table referencing column 'ROLL' in table 'STUDENT' and name the constraint as FK_ROLL.</p> <p>c) Change width of 'MATH' column to 3.</p> <p>d) Add a check constraint on 'ENG' column so that permissible value for 'ENG' attribute lies between 0 and 50 and name the constraint as CHK_ENG.</p> <p>e) Try to insert following data:- &lt;11,90,80&gt;</p> <p>f) Now insert following data:</p> <table border="1"> <thead> <tr> <th>ROLL</th> <th>MATH</th> <th>ENG</th> </tr> </thead> <tbody> <tr> <td>11</td> <td>90</td> <td>45</td> </tr> <tr> <td>12</td> <td>45</td> <td>46</td> </tr> <tr> <td>13</td> <td>70</td> <td>30</td> </tr> <tr> <td>14</td> <td>90</td> <td>20</td> </tr> <tr> <td>15</td> <td>45</td> <td>46</td> </tr> </tbody> </table> <p>g) Add a new column 'TOTAL' in table 'MARKS'. The data type is number and width is 3.</p> <p>h) Update column 'TOTAL' in 'MARKS' table with proper data.</p>	Col. Name	Type	Width	ROLL	NUMBER	2	MATH	NUMBER	2	ENG	NUMBER	3	ROLL	MATH	ENG	11	90	45	12	45	46	13	70	30	14	90	20	15	45	46	1	3
Col. Name	Type	Width																															
ROLL	NUMBER	2																															
MATH	NUMBER	2																															
ENG	NUMBER	3																															
ROLL	MATH	ENG																															
11	90	45																															
12	45	46																															
13	70	30																															
14	90	20																															
15	45	46																															
P3	<p>a) Display data from table 'STUDENT' with column heading ROLL_NO, STD_NAME.</p> <p>b) List students having name starting with letter 'S'.</p> <p>c) List students where second character of name is 'a'.</p> <p>d) Display EXAMDATE in 'DD/MM/YYYY' format.</p> <p>e) Display NAME, MATH, ENG and PER of all students. Assume, total marks of math are 100 and eng is 50.</p> <p>f) Display names of all students who are getting above 65 of math.</p> <p>g) Display names of students getting marks in eng between 20 and 40.</p> <p>h) Display name of the student, who get the same marks (math) as that of 'Shyamal'.</p>	1	3																														
P4	<p>HOTEL (HOTEL_NO, NAME, ADDRESS )</p> <p>ROOM( ROOM_NO, HOTEL_NO, TYPE, PRICE)</p> <p>BOOKING(HOTEL_NO, GUEST_NO, DATE_FROM, DATE_TO, ROOM_NO)</p> <p>GUEST(GUEST_NO, NAME, ADDRESS)</p> <p>Where HOTEL contains hotel details and HOTEL_NO is the Primary Key. ROOM contains room details for each hotel and (HOTEL_NO,ROOM_NO) forms the Primary key. BOOKING contains details of the bookings and the Primary Key comprises (HOTEL_NO, GUEST_NO, DATE_FORM) and GUEST contains guest details and</p>	2	3																														



	GUEST_NO is the Primary key and mention the Foreign Key constraints.																																																								
P5	<ul style="list-style-type: none"> <li>i. List full details of hotels in Mumbai</li> <li>ii. List the name and addresses of all guests in New Delhi, alphabetically ordered by the name.</li> <li>iii. List all double or family rooms with a price below Rs. 800 per day, in ascending ordered.</li> <li>iv. List the bookings for which no date_to has been specified.</li> <li>v. What is the total daily revenue from all the double room?</li> <li>vi. How many different guests have made booking for august, 2015</li> <li>vii. List the price and type of all rooms at the hotel Land Mark.</li> <li>viii. What is the total income from booking for the hotel Manor today.</li> </ul>	2	3																																																						
P6	<p><b>1.a)</b> Create tables for following functional Dependencies  -  <math>eno \rightarrow \{ename, address\}</math>  <math>pno \rightarrow \{pname, plocation\}</math>  <math>\{eno, pno\} \rightarrow hours</math>  plocation must be among MUMBAI, KOLKATA, CHENNAI, and DELHI.</p> <p><b>b)</b> Mention primary key, foreign key and CHECK constraints.</p> <p><b>c)</b> i. Insert following data for EMP:-  <table border="1"> <thead> <tr> <th>ENO</th> <th>ENAME</th> <th>ADDRESS</th> </tr> </thead> <tbody> <tr><td>1</td><td>Swarnali</td><td>MUMBAI</td></tr> <tr><td>2</td><td>Deboshree</td><td>MUMBAI</td></tr> <tr><td>3</td><td>Moumita</td><td>KOLKATA</td></tr> <tr><td>4</td><td>Piyali</td><td>CHENNAI</td></tr> <tr><td>5</td><td>Surupa</td><td>DELHI</td></tr> </tbody> </table> </p> <p>ii. Insert following data for Proj:-  <table border="1"> <thead> <tr> <th>PNO</th> <th>PNAME</th> <th>PLOCATION</th> </tr> </thead> <tbody> <tr><td>101</td><td>BANKING</td><td>DELHI</td></tr> <tr><td>102</td><td>LIBRARY</td><td>MUMBAI</td></tr> <tr><td>103</td><td>RAILWAY</td><td>KOLKATA</td></tr> <tr><td>104</td><td>FINANCE</td><td>CHENNAI</td></tr> <tr><td>105</td><td>ANALYZER</td><td>DELHI</td></tr> </tbody> </table> </p> <p>iii. Insert following data for EmpProj:-  <table border="1"> <thead> <tr> <th>ENO</th> <th>PNNO</th> <th>HOURS</th> </tr> </thead> <tbody> <tr><td>1</td><td>101</td><td>10</td></tr> <tr><td>2</td><td>103</td><td>12</td></tr> <tr><td>3</td><td>104</td><td>19</td></tr> <tr><td>3</td><td>105</td><td>29</td></tr> <tr><td>5</td><td>102</td><td>6</td></tr> </tbody> </table> </p> <p><b>d)</b> List the name of employees who are working on more than one project</p>	ENO	ENAME	ADDRESS	1	Swarnali	MUMBAI	2	Deboshree	MUMBAI	3	Moumita	KOLKATA	4	Piyali	CHENNAI	5	Surupa	DELHI	PNO	PNAME	PLOCATION	101	BANKING	DELHI	102	LIBRARY	MUMBAI	103	RAILWAY	KOLKATA	104	FINANCE	CHENNAI	105	ANALYZER	DELHI	ENO	PNNO	HOURS	1	101	10	2	103	12	3	104	19	3	105	29	5	102	6	3	3
ENO	ENAME	ADDRESS																																																							
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3	104	19																																																							
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5	102	6																																																							
P7	<p><b>2.a)</b> Create a table PHONE_BOOK. The fields of the table are NAME, ADDRESS, PHONE_NO.</p> <p><b>b)</b> Insert at least 6 entries into the table of which there are two pairs of duplicate entries.</p>	3	3																																																						

	<p><b>c)</b> Delete duplicate rows from the table.  <b>d)</b> Write a query to select first two rows from the table.  <b>e)</b> Write a query to select last two rows from the table.</p>																																			
P8	<p><b>3.a)</b> Create a table employee and insert following data into the table.</p> <table border="1"> <thead> <tr> <th>EMPNO</th> <th>EMPNAME</th> <th>MANAGERNO</th> <th>SALARY</th> </tr> </thead> <tbody> <tr> <td>E1</td> <td>Amal</td> <td>--</td> <td>30,000</td> </tr> <tr> <td>E2</td> <td>Bimal</td> <td>E1</td> <td>25,000</td> </tr> <tr> <td>E3</td> <td>Kamal</td> <td>E1</td> <td>20,000</td> </tr> <tr> <td>E4</td> <td>Nirmal</td> <td>E2</td> <td>15,000</td> </tr> <tr> <td>E5</td> <td>Shymal</td> <td>E2</td> <td>21,000</td> </tr> <tr> <td>E6</td> <td>Parimal</td> <td>E3</td> <td>10,000</td> </tr> </tbody> </table> <p><b>b)</b> Retrieve the names of the employees and the names of their respective managers from the employee table.  <b>c)</b> Retrieve the name of the employee who is earning second maximum salary.  <b>d)</b> Retrieve the name of the employee who is earning nth highest salary.  <b>e)</b> Retrieve the names of employees whose salary is greater than the salary of all the employees whose manager no. is E1.  <b>f)</b> Get the details of all employees whose salary is lesser than the average salary of the employee.</p>	EMPNO	EMPNAME	MANAGERNO	SALARY	E1	Amal	--	30,000	E2	Bimal	E1	25,000	E3	Kamal	E1	20,000	E4	Nirmal	E2	15,000	E5	Shymal	E2	21,000	E6	Parimal	E3	10,000	4	3					
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E6	Parimal	E3	10,000																																	
P9	<p><b>4.a)</b> Create a table account and insert following data into the table Account.</p> <table border="1"> <thead> <tr> <th>ACCOUNTNO</th> <th>BRANCHNAME</th> <th>AMOUNT</th> </tr> </thead> <tbody> <tr> <td>A1</td> <td>Kolkata</td> <td>50000</td> </tr> <tr> <td>A2</td> <td>Howrah</td> <td>40000</td> </tr> <tr> <td>A3</td> <td>Howrah</td> <td>40000</td> </tr> <tr> <td>A4</td> <td>Kolkata</td> <td>20000</td> </tr> <tr> <td>A5</td> <td>Durgapur</td> <td>30000</td> </tr> </tbody> </table> <p><b>b)</b> Create a view that will show branch name and total amount of that branch. The name of view will be acc_view.  <b>c)</b> Select the branch names having total amount greater than 50,000  i) Using account1 view  ii) Without using view.</p> <p><b>5.a)</b> Create a table Marks and insert following data into the table.</p> <table border="1"> <thead> <tr> <th>STUDENTNAME</th> <th>SUBJECT NAME</th> <th>MARKS</th> </tr> </thead> <tbody> <tr> <td>Amit</td> <td>DBMS</td> <td>80</td> </tr> <tr> <td>Amit</td> <td>OS</td> <td>70</td> </tr> <tr> <td>Bimal</td> <td>DBMS</td> <td>70</td> </tr> <tr> <td>Bimal</td> <td>OS</td> <td>70</td> </tr> </tbody> </table> <p><b>b)</b> Retrieve the name of the students who are getting marks in DBMS above 75 but who are getting marks in OS less than 75.  <b>c)</b> Write a query to retrieve student names from the marks table and output will look like:-  Mr. A  Mr. A  Mr. B</p>	ACCOUNTNO	BRANCHNAME	AMOUNT	A1	Kolkata	50000	A2	Howrah	40000	A3	Howrah	40000	A4	Kolkata	20000	A5	Durgapur	30000	STUDENTNAME	SUBJECT NAME	MARKS	Amit	DBMS	80	Amit	OS	70	Bimal	DBMS	70	Bimal	OS	70	5	3
ACCOUNTNO	BRANCHNAME	AMOUNT																																		
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Amit	DBMS	80																																		
Amit	OS	70																																		
Bimal	DBMS	70																																		
Bimal	OS	70																																		

	Mr. B		
P10	<p>6.Create a unique index on ENO column of the table EMP.</p> <p>7.The table Sales_Order_Detail(Product_No, Suppliers_No, Order_ID) has more 50,000 records for 500 distinct Product. Create an index on the Product_No column, which is the best suited according to the above stated scenario.</p> <p>8.Create the following object type rectangle with the attributes length, width and a method area (), which computes the area of the rectangle; as follows.  CREATE TYPE rectangle AS OBJECT  (length NUMBER,  width NUMBER,  MEMBER FUNCTION area RETURN NUMBER  DETERMINISTIC  );  /  CREATE OR REPLACE TYPE BODY rectangle AS  MEMBER FUNCTION area RETURN NUMBER IS  BEGIN  RETURN (length*width);  END;  /  Now, create a table rect_tab of type rectangle and create a function-based index on the method area().</p> <p>9.Make a group of 5 students. Open two terminals. From one terminal Login into the Oracle server with the user name FACULTY and password FACULTY. (This user has the <b><u>CREATE USER</u></b> system privilege. From the other terminal do the experiments with the newly created user.</p> <ol style="list-style-type: none"> <li>a. Create a user <b>STUDENT</b> with following characteristics <ol style="list-style-type: none"> <li>1. The password student123</li> <li>2. Default tablespace <b>SYSTEM</b>, with a quota of 10 megabytes</li> <li>3. Temporary tablespace <b>TEMP</b></li> <li>4. Access to the tablespace <b>SYSTEM</b>, with a quota of 5MB.</li> <li>5. Limits on database resources defined by the profile <b>DEFAULT</b></li> </ol> </li> <li>b. After successfully creating this user, try to connect using this username and password. Note the error message and state the reason.</li> </ol>	6	3

	<p>c. Grant the role Connect to the user with admin option.</p> <p>d. Grant Resource and other necessary system privileges to this user. (e.g. Alter, Create, Insert, Delete, Grant etc.)</p> <p>e. Now Create the Table Employee(Eno Number(2), EName Varchar2(15)).</p> <p>f. Insert 3 records. Try different DML operations.</p> <p>10.a. Log in as CSEA (User ID: CSEA, Password: CSEA). Display all records from the Employee table of the user Student. Try to insert or update any record. Note down the error.</p> <p>b. Grant the object privileges on the table STUDENT.EMPLOYEE to CSEA with without Grant option.</p> <p>c. Now do the experiments given in 2a.</p> <p>d. Log in as CSEA. Try to grant the object Privilege on STUDENT.EMPLOYEE to the user CSEB. Note down the error. How this can possible.</p>		
P11	<p>Write a PL/SQL program to check the given number is even or odd.</p> <p>Write a program to check whether a given number is prime or not.</p> <p>Write a PL/SQL program to check whether a number is Armstrong number or not.</p>	7	3
P12	<p>a) Write a procedure to calculate sum of two numbers.</p> <p>b) Write a PL/SQL function, which returns maximum of the three numbers.</p> <p>c) Write a function, which returns true if employee exist in employee table, otherwise it returns false.</p> <p>The Table is as follows: EMPLOYEE (ENO, ENAME, SALARY, MGRNO)</p>	8	3
P13	<p>a) Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated areas in table.</p> <p>b) Add an extra column diameter to the table circle and update the diameter column for each entry diameter=2* radius.</p> <p>c) Print the number of records in the circle table with the help of an explicit cursor.</p> <p>a)A HRD manager has decided to raise the salary for all the employees in department number 20 by 0.05. Whenever any such raise is given to employees an audit trail of the same is maintained in the <b>EMP_RAISE</b> table. The <b>EMP_RAISE</b> table holds the employee number, the date when the raise was given and the raise amount.</p> <p>b) Write a PL/SQL block to update the salary of each employee of dept-no 20 appropriately and insert a</p>	9	3

	<p>record in the <b>EMP_RAISE</b> table as well.</p> <p>Tables are as follows:  EMPLOYEE (EMP_CODE, ENAME, JOB, SALARY, DEPTNO)  EMP_RAISE(EMP_CODE, RAISE_AMOUNT, RAISE_DATE)</p>		
P14	<p>Create a transparent audit system for a table CLIENT_MASTER. The system must keep track of the records that are being deleted or updated. The functionality being when a record is deleted or modified the original record details and the date of operations is stored in the audit-client table, the delete or update is allowed to go through.</p> <p>Write a trigger for the above problem.</p> <p>The Tables are as follows:-  CLIENT_MASTER(CLIENT_NO, NAME, ADDRESS, CITY, BAL-DUE)  AUDIT_CLIENT(CLIENT_NO, NAME, BAL_DUE, OPERATION, USER_ID, OP_DATE)</p>	10	3

#### h) Overall Course Attainment Target

Attainment Level	Inference	Marks
Attainment Level 1	40% of the students have attained more than the target level of that CO	1
Attainment Level 2	50% of the students have attained more than the target level of that CO	2
Attainment Level 3	60% of the students have attained more than the target level of that CO	3

(70% of university and 30% of the internal exam) will be = **Attainment Level 2**

Target has been set on the basis of last year's performance / result by the students, student quality this year and difficulty level of the course.

## h) Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes (PO's)												PSOs	
	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CS601.1	2	2	2	--	--	--	--	--	--	--	--	--	1	2
CS601.2	2	3	1	1	--	--	--	--	--	--	--	--	3	2
CS601.3	2	2	2	--	1	--	--	--	1	--	--	1	2	3
CS601.4	2	2	2	--	--	--	--	--	--	--	--	--	--	3
CS601.5	2	2	2	--	--	--	--	--	--	--	--	--	--	3
CS601	2	2	2	1	1	--	--	--	1	--	--	1	2	3

### Justification for CO-PO Mapping

Mapping	Low(1) /Medium(2) /High(3)	Justification
CS601.1 - PO1	2	Use the <b>knowledge of the fundamental concepts</b> e.g. entity, attribute, relationship etc. to create conceptual schema.
CS601.1 - PO2	2	<b>Analyze</b> the requirements to decide entities, attributes, relationships among entities, relationship degree etc. using the first principles of <i>engineering sciences</i> .
CS601.1 - PO3	2	<b>Develop</b> relational database schema from ER schema in providing solutions to the real life data handling problems.
CS601.1 - PSO1	1	Apply mathematics (e.g. concepts of set theory in determining cardinality of a relationship) to create conceptual schema.
CS601.1 - PSO2	2	Use algorithms and data management schemes of various data models.
CS601.2 -PO1	2	Use the knowledge of <b>Mathematics</b> e.g. set theory, predicate calculus to express <b>queries</b> in <b>Relational Algebra</b> and <b>Relational Calculus</b> .
CS601.2 - PO2	3	<b>Identify</b> different techniques of procedural and non-procedural languages <b>to formulate</b> database queries for accessing the database.
CS601.2 - PO3	1	<b>Develop</b> optimum <b>queries</b> in procedural and non-procedural

		language constructs to <b>ease data access</b> from underlying database.
CS601.2 - P04	1	<b>Optimize</b> the queries using query processing algorithms and catalog information to provide <b>least costly solutions to data access</b> .
CS601.2 - PS01	3	Apply mathematics (e.g. concepts of set theory, predicate calculus) to formulate database queries in Relational algebra and relational calculus.
CS601.2 - PS02	2	Use algorithms for query optimization and formulate optimized database queries for efficient data management.
CS601.3 - P01	2	<b>Use the knowledge</b> of procedural and non-procedural languages to write database queries and programs.
CS601.3 - P02	2	<b>Analyze and identify</b> specific database requirement that can be solved using PL/SQL.
CS601.3 - P03	2	<b>Design</b> database queries using SQL to access data easily. Also acquire skills to develop solutions for complex problems using PL/SQL.
CS601.3 - P05	1	Learning the basics of SQL helps in using modern tools available for database designing.
CS601.3 - P09	1	Create and access database as an individual or as a member/leader in diverse teams.
CS601.3 - P012	1	Gain the capability to <b>construct</b> database queries to create, access and maintain the database and to <b>adapt the technological changes</b> .
CS601.3 - PS01	2	Apply concepts of set theory to formulate database queries and PL/SQL blocks to retrieve data with efficiency.
CS601.3 - PS02	3	Acquire skills to design and manipulate database using SQL and/or PL/SQL.
CS601.4 - P01	2	<b>Apply</b> the basic knowledge of normalization to design efficient database systems.
CS601.4 - P02	2	<b>Identify</b> the issues relating to database insert, update, delete operations and <b>analyze</b> such issues to minimize them.
CS601.4 - P03	2	<b>Develop</b> efficient database systems by applying normalization techniques.
CS601.4 - PS02	3	Use algorithms and normalization techniques to normalize database ensuring no loss of information.
CS601.5 - P01	2	<b>Use</b> concepts related to a transaction, concurrent schedules, and concurrency control techniques in order to ensure serializability of concurrent transactions.
CS601.5 - P02	2	<b>Identify</b> different techniques of deadlock handling and <b>analyze</b> them to find out the situation when one technique is more practical than others in dealing with deadlock.

<b>CS601.5 - P03</b>	<b>2</b>	<b>Design effective solution</b> to the issues of transaction processing and database failure to <b>provide data security</b> and also provide solution for concurrent transactions.
<b>CS601.5 - PS02</b>	<b>3</b>	Use algorithms for data recovery and develop solutions for efficient transaction processing and data management.

**i) Delivery Methodology:**

<b>Outcome</b>	<b>Method</b>	<b>Supporting Tools</b>	<b>Demonstration</b>
CS 601.1	Structured (partially supervised Whole Class- grouping)	Blackboard & Chalk, Lecture Notes	Representation of any database system with ERD design.
CS 601.2	Structured (partially supervised Whole Class- grouping)	Blackboard & Chalk, Lecture Notes	Express a database query using mathematical notations of relational algebra and relational calculus.
CS 601.3	Structured (partially supervised Whole Class- grouping and independent work)	Blackboard & Chalk, Lecture Notes, SQL coding	Construct simple and nested queries on a given database system using SQL, and write PL/SQL programs.
CS 601.4	Structured (partially supervised Whole Class- grouping)	Blackboard & Chalk, Lecture Notes, SQL coding	Design normalized database and demonstrate data retrieval techniques.
CS 601.5	Structured (partially supervised Whole Class- grouping)	Blackboard & Chalk, Lecture Notes,	Demonstrate database transaction processing and recovery techniques.



**j) Assessment Methodology:**

Assessment Tool	Outcomes					Specific Question/activity aligned to the Outcome
	CS601.1	CS601.2	CS601.3	CS601.4	CS601.5	
FIRST INTERNAL	√	√	√	--	--	<u>First Internal Question Paper</u>
SECOND INTERNAL	--	--	√	√	√	<u>Second Internal Question Paper</u>
ASSIGNMENT	√	√	√	√	--	<u>First, Second, Third, Fourth Assignment</u>
QUIZ	√	√	√	√	√	Quiz -(Q1, Q2)
LABORATORY	--	--	√	√	--	<u>LAB Assignments</u>



**k) A. Weekly Lesson Plan**

Week	Lecture	Laboratory	Assignment/Quiz
1	Overview of DBMS, File & Database Concepts; 3 Schema architecture, Data Independence, Database Users, Database Administrator; Data Models, Introduction to E-R features e.g. entities, attributes, keys, cardinality	Introduction to SQL commands (P1, P2)	---
2	Extended E-R features e.g. Specialization, Generalization, Aggregation, ERD design for a database system, Integrity constraints, Introduction to RDBMS	Simple SQL queries (P3)	Assignment - I <a href="#">(A1)</a>
3	Basic Relational Algebra operations	Table construction with integrity constraints (P4)	---
4	Extended Relational Algebra operations and Relational Calculus	Complex SQL queries (P5)	Assignment - II <a href="#">(A2)</a>
5	Introduction to SQL queries: simple and nested queries	Design of normalized database (P6)	Assignment - III <a href="#">(A3)</a>
6	SQL Query practice session, Views, Stored Procedures; Cursors, Triggers	Queries on normalized databases (P7)	Quiz – I (Q1)
7	Functional Dependency, closure of F , Cover of F	Nested SQL queries & Views (P8)	
8	Database normalization techniques: 1NF, 2NF, 3NF, BCNF	Complex SQL queries (P9, P10)	Assignment - IV <a href="#">(A4)</a>
9	MVD & 4NF; JD & 5NF, Algorithm for Lossless join decomposition	Introduction to PL/SQL programming (P11)	---
10	Indexing techniques, B-tree & B+ tree, Hashing Techniques	PL/SQL stored procedures & functions (P12)	---
11	Transaction Concepts, Serializability, Concurrency control techniques, 2PL, time stamp protocol, deadlock	PL/SQL cursors (P13)	---
12	Recovery techniques: log based, non-log	PL/SQL triggers (P14)	Quiz – II (Q2)

	based, Query optimization techniques		
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## B. Daily Lesson Plan

<p><b>CHAPTER: 1</b>  Title: Introduction: Concepts and overview of DBMS  Date: <u>2.2.17</u>, Day: <u>1</u></p>
<p><b><u>CONTENTS</u></b></p> <p>Overview of DBMS, File &amp; Database Concepts;</p>
<p><b>Chapter Objectives:</b> They are capable to demonstrate relation between database and DBMS, differentiate between DBMS and file processing system</p> <p><b>Broad Objectives of the chapter are:</b></p> <ol style="list-style-type: none"> <li>1. To able to relate database and DBMS.</li> <li>2. To able to differentiate between DBMS and file processing system</li> <li>3.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:</p> <ol style="list-style-type: none"> <li>1. Define database and DBMS. (Level 1)</li> <li>2. Compare DBMS and traditional file processing system. (Level 4)</li> <li>3. Write some of the areas of applications of DBMS. (Level 2)</li> <li>4.</li> </ol>

<p><b>CHAPTER: 1</b>  Title: Introduction: Concepts and overview of DBMS  Date: <u>6.2.17</u>, Day: <u>2</u></p>
<p><b><u>CONTENTS</u></b></p> <p>3 Schema architecture, Data Independence, Database Users, Database Administrator;</p>
<p><b>Chapter Objectives:</b> They are capable to demonstrate 3 Schema architecture of DBMS, Data Independence, Differentiate among different database users</p>

**Broad Objectives of the chapter are:**

1. To able to explain 3 Schema architecture of DBMS.
2. To able to differentiate among different database users.
3. To able to explain physical and logical data independence.
4. To able to explain the role of DBA.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Explain the 3-schema architecture of DBMS. (Level 2)
2. Explain data abstraction in DBMS.
3. Write the roles and responsibilities of DBA.
4. What do you mean by data independence?

**CHAPTER: 2**

Title: Entity-Relationship Model

Date: 7.2.17, Day: 3

**CONTENTS**

Data Models Basic Concepts, Cardinality Ratios;

**Chapter Objectives:** They are capable to demonstrate different data models, attributes, entities, keys

**Broad Objectives of the chapter are:**

1. They are able to explain different data models.
2. They are able to explain different types of attributes, entities, relationships.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Define: simple & composite attribute, single valued & multi-valued attribute, derived attribute. (Level 1)
2. Briefly explain different data models in DBMS. (Level 1)
3. Define: cardinality and degree of a relation. (Level 1)
- 4.

**CHAPTER: 2**

Title: Entity-Relationship Model

Date: 8.2.17, Day: 4

**CONTENTS**

Integrity Constraints, Keys;

**Chapter Objectives:** They are capable to demonstrate different data models.

**Broad Objectives of the chapter are:**

1. They are able to explain different types of keys.
2. They are able to explain different types of integrity constraints.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Define: super key, candidate key, primary key, alternate key, foreign key (Level 1)
2. Explain with suitable example: entity integrity constraint and referential constraint. (Level 2)
- 3.

## CHAPTER: 2

Title: Entity-Relationship Model

Date: 9.2.17, Day: 5

### CONTENTS

Strong Entity & Weak Entity Sets; ERD

**Chapter Objectives:** They are capable to explain Strong Entity & Weak Entity Sets and draw ERD for any database system.

**Broad Objectives of the chapter are:**

1. They are able to explain Strong Entity & Weak Entity Sets.
2. They are able to construct ERDs for a database system.
- 3.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Explain with suitable example the concept of weak entity set. (Level 2)
2. Define: Identifying relationship, discriminator. (Level 1)
3. Construct an ERD for a university database system. (Level 4)

### **HOME WORK:**

1. Draw an ERD for a banking management system.
2. Draw an ERD for a car insurance company.
- 3.

## CHAPTER: 2

Title: Entity-Relationship Model

Date: 13.2.17, Day: 6

### CONTENTS

Specialization, Generalization, Aggregation

**Chapter Objectives:** They are capable to demonstrate the extended ER features,

**Broad Objectives of the chapter are:**

1. They are able to explain the concepts of Specialization, Generalization on ERD
2. They are able to explain the concepts of Aggregation
- 3.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Explain with suitable example the concepts of Specialization & Generalization on ERD. (Level 2)
2. What do you understand by the disjoint and overlapping constraint on specialization and generalization? (Level 2)
3. **Explain** aggregation with a suitable example. (Level 6)

## CHAPTER: 2

Title: Entity-Relationship Model

Date: 14.2.17, Day: 7

Design of RDBMS from ERD

**Chapter Objectives:** They are capable to design relation schemas in RDBMS.

**Broad Objectives of the chapter are:**

1. They are able to convert ER features in RDBMS.
- 2.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. How are multi-valued and composite attributes represented in RDBMS? (Level 2)
2. Represent weak entity set in RDBMS. (Level 2)
3. How are relationships in ER notations represented in RDBMS? (Level 2)

## CHAPTER: 4

Title: SQL

Date: 15.2.17, Day: 8

### CONTENTS

SQL: Basic Concepts, Set Operations; Query Practice

**Chapter Objectives:** They are capable to create and access a database

**Broad Objectives of the chapter are:**

1. They are able to create a database.
2. They are able to insert and update a database.
3. They are able to retrieve data from a database with help of SQL queries.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write SQL queries to create and populates the following tables. (Level 1)

SUPPLIER (SUPPLIER\_ID, SUPPLIER\_NAME, SUPPLIER\_ADDRESS)

PARTS (PART\_ID, PART\_NAME, COLOR)

CATALOG (SUPPLIER\_ID, PART\_ID, COST)

2. Write the following SQL queries based on the above mentioned tables: (Level 1)

- Find names of the suppliers who supply both 'BLUE' and 'RED' parts.
- Find names of the suppliers who supply either 'BLUE' or 'RED' parts.
- Find names of the suppliers who supply 'BLUE' parts but not 'RED' parts.
- Get the supplier who supply part id 'P2'.
- Get name, color and cost of the parts supplied by supplier 'S4'.
- Get the supplier name who supplies part 'P1' or 'P3'.
- Get the supplier name who does not supply any part.
- Get the supplier name who does not supply part 'P5'.
- 

**HOME WORK:**

- 1.

**LABORATORY EXPERIMENT:**

- 1.

**CHAPTER: 4**

Title: SQL

**Date: 16.2.17, Day: 9**

**CONTENTS**

SQL: Aggregate Functions, aliasing , self-join, Query Practice

**Chapter Objectives:** They are capable to access a database using SQL queries.

**Broad Objectives of the chapter are:**

1. They are able to retrieve data from a database with help of SQL queries.

Once the student has completed this topic/ chapter he/she will be able to answer following

questions/perform the following activities with Levels of Bloom's Taxonomy:

EMPLOYEE (EMP\_CODE, EMP\_NAME, DESIGNATION, HEAD, DOJ, BASIC, DEPT\_CODE)  
DEPARTMENT (DEPT\_CODE, DEPT\_NAME, LOCATION)

1. Write the following queries in SQL based on the above mentioned tables: (Level 1)
  - List the names of the employees who are earning more than the lowest salary of an employee in department 30.
  - List of only those DEPT\_CODE where the total salary is greater than 20000.
  - List the names of those employees whose names either starts or ends with 'S'.
  - List the names of the employees along with the name of the people under whom they are working.
  - Get the maximum, minimum, average and total salary for each department.
  - Count the number of employees in each department with salary more than rupees 20000/-.
  - List the DOJ of the employees in 'DD/MM/YYYY' format.

**HOME WORK:**

2.

**LABORATORY EXPERIMENT:**

2.

**CHAPTER: 4**

Title: SQL

**Date: 20.2.17, Day: 10**

**CONTENTS**

SQL: Null Values; Nested Sub-Queries; Query Practice,

**Chapter Objectives:** They are capable to write nested queries in SQL.

**Broad Objectives of the chapter are:**

1. They are able to write nested queries in SQL.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Consider the following tables:  
SALES\_ORDER\_DETAILS (ORDER\_NO, PRODUCT\_NO, QTY\_ORDERED, QTY\_DISPATCHED)  
SALES\_ORDER (ORDER\_NO, CLIENT\_NO, ORDER\_DATE)  
CLIENT\_MASTER (CLIENT\_NO, NAME, BALANCE\_DUE)



**PRODUCT\_MASTER (PRODUCT\_NO, DESCRIPTION)**

Write the following queries in SQL (Level 1)

- a. Retrieve the PRODUCT\_NO and the total QTY\_ORDERED for products 'P001' and 'P004'.
- b. Retrieve all orders placed by a client named 'RAHUL DESAI'.
- c. Find out all products that are not being sold/ ordered.
- d. Retrieve the ORDER\_NO, client NAME, their ORDER\_DATE in 'DD/MM/YY' format and sorted in ascending order of ORDER\_DATE.

2. employee (employee name, street, city)  
works (employee name, company name, salary)  
company (company name, city)  
manages (employee name, manager name)

Write the following queries in SQL (Level 1)

- a. Find the names and cities of residence of all employees who work for First Bank Corporation.
- b. Find the names, street addresses, and cities of residence of all employees who work for First Bank Corporation and earn more than \$10,000.
- c. Find all employees in the database who do not work for First Bank Corporation.
- d. Find all employees in the database who earn more than each employee of Small Bank Corporation.
- e. Find the company that has the most employees.
- f. Find those companies whose employees earn a higher salary, on average, than the average salary at First Bank Corporation.

**HOME WORK:**

3.

**LABORATORY EXPERIMENT:**

3.

**CHAPTER: 4**

Title: **SQL**

Date: **21.2.17, Day: 11**

**CONTENTS**

Assertions, Views

**Chapter Objectives:** They are capable to create assertions and views on database.

**Broad Objectives of the chapter are:**

1. They are able to write assertions.
2. They are able to create and update views.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. What is view? (Level 1)
2. What are the advantages of creating a view? (Level 1)
3. Explain assertion with suitable example. (Level 2)
4. Create a table account and insert following data into the table Account.
- 5.

ACCOUNT NO.	BRANCH NAME	AMOUNT(RS)
A1	Kolkata	50,000
A2	Howrah	40,000
A3	Howrah	40,000
A4	Kolkata	20,000
A5	Durgapur	30,000

a) Create a view that will show branch name and total amount of that branch. The name of view will be acc\_view.

b) Select the branch names having total amount greater than 50,000

- i) Using account1 view
- ii) Without using view.

#### LABORATORY EXPERIMENT:

1. Create a table account and insert following data into the table Account

ACCOUNT NO.	BRANCH NAME	AMOUNT(RS)
A1	Kolkata	50,000
A2	Howrah	40,000
A3	Howrah	40,000
A4	Kolkata	20,000
A5	Durgapur	30,000

a) Create a view that will show branch name and total amount of that branch. The name of view will be acc\_view.

b) Select the branch names having total amount greater than 50,000

- i) Using account1 view
- ii) Without using view.

#### CHAPTER: 4

Title: SQL

Date: 22.2.17, Day: 12

#### CONTENTS

Stored Procedures;

**Chapter Objectives:** They are capable to create and execute stored procedures and function using PL/SQL.

**Broad Objectives of the chapter are:**

1. They are able to create and execute stored procedures.
2. They are able to create and execute stored functions.

Once the student has completed this topic/ chapter he/she will be able to answer following

questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write a PL/SQL function, which returns maximum of the three numbers. (Level 1)
2. Write a procedure to calculate sum of two numbers. (Level 1)
3. What are the differences between stored procedure and functions? (Level 1)
- 4.

**LABORATORY EXPERIMENT:**

Write a function, which returns true if employee non-exist in employee table otherwise it returns false. The Table is as follows: **EMPLOYEE (ENO, ENAME, SALARY, MGRNO)**

**CHAPTER: 4**

Title: **SQL**

Date: **23.2.17, Day: 13**

**CONTENTS**

Cursors

**Chapter Objectives:** They are capable to create and execute stored explicit cursors using PL/SQL .

**Broad Objectives of the chapter are:**

1. They are able to create and execute cursors.
- 2.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. What is cursor? (Level 1)

**LABORATORY EXPERIMENT:**

1. A HRD manager has decided to raise the salary for all the employees in department number 20 by 0.05. Whenever any such raise is given to employees an audit trail of the same is maintained in the **EMP\_RAISE** table. The **EMP\_RAISE** table holds the employee number, the date when the raise was given and the raise amount.

Write a PL/SQL block to update the salary of each employee of dept-no 20 appropriately and insert a record in the **EMP\_RAISE** table as well. (Level 1)

Tables are as follows:

**EMPLOYEE (EMP\_CODE, ENAME, JOB, SALARY, DEPTNO)**

**EMP\_RAISE(EMP\_CODE, RAISE\_AMOUNT, RAISE\_DATE)**

**CHAPTER: 4**  
Title: **SQL**  
Date: **27.2.17, Day: 14**

**CONTENTS**

Triggers

**Chapter Objectives:** They are capable to create and execute stored explicit cursors using PL/SQL .

**Broad Objectives of the chapter are:**

1. They are able to create and execute database triggers.
- 2.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. What is trigger? (Level 1)
2. The price of a product changes constantly. It is important to maintain the history of the prices of the products. Create a row trigger to insert the existing values of the 'PRODUCT' table into the 'PRODUCT\_PRICE\_HISTORY' table when the price of the product is updated in the 'PRODUCT' table.  
PRODUCT(product\_id, product\_name , supplier\_name, unit\_price)

**LABORATORY EXPERIMENT:**

Create a transparent audit system for a table **CLIENT\_MASTER**. The system must keep track of the records that are being deleted or updated. The functionality being when a record is deleted or modified the original record details and the date of operations is stored in the audit-client table, the delete or update is allowed to go through.

Write a trigger for the above problem.

The Tables are as follows:-

**CLIENT\_MASTER (CLIENT\_NO, NAME, ADDRESS, CITY, BAL-DUE)**

**AUDIT\_CLIENT (CLIENT\_NO, NAME, BAL\_DUE, OPERATION,USER\_ID,OP\_DATE)**

**CHAPTER: 3**  
Title: Relational Model  
Date: **1.3.17, Day: 15**

**CONTENTS**

Basic Relational Algebra operations: selection, projection, rename, Cartesian product

**Chapter Objectives:** They are capable to explain basic mathematical operations for retrieving data from underlying database.

**Broad Objectives of the chapter are:**

1. They are able to explain different unary and binary mathematical operations required to retrieve data from database.
- 2.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

SUPPLIER (SUPPLIER\_ID, SUPPLIER\_NAME, SUPPLIER\_ADDRESS)

PARTS (PART\_ID, PART\_NAME, COLOR)

CATALOG (SUPPLIER\_ID, PART\_ID, COST)

Write the following queries in Relational Algebra based on above mentioned tables: (Level 1)

1. Get the supplier who supply part id 'P2'.
2. Get the suppliers who supply at least all those part supplied by supplier 'S2'.
3. Get the color of parts supplied by supplier 'S1'.
4. Find the parts that are supplied by at least two different suppliers.
5. Find names of the suppliers who supply 'YELLOW' parts.
- 6.

### CHAPTER: 3

Title: Relational Model

Date: 2.3.17, Day: 16

#### CONTENTS

Relational Algebra operations: set operations, join

**Chapter Objectives:** They are capable to explain basic mathematical operations for retrieving data from underlying database.

**Broad Objectives of the chapter are:**

1. They are able to explain different set operations required to retrieve data from database.
2. They are able to join multiple tables and retrieve data in an efficient way
- 3.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

SUPPLIER (SUPPLIER\_ID, SUPPLIER\_NAME, SUPPLIER\_ADDRESS)

PARTS (PART\_ID, PART\_NAME, COLOR)

CATALOG (SUPPLIER\_ID, PART\_ID, COST)

1. Write the following queries in Relational Algebra based on above mentioned tables: (Level 1)
  - Get the name of the suppliers who supply at least one 'RED' part.
  - Find name of the supplier who supply all parts.
  - Get the supplier who do not supply part id 'P2'.
  - Find names of the suppliers who supply both 'BLUE' and 'RED' parts.
  - Find names of the suppliers who supply only 'RED' parts.
  - Find names of the suppliers who supply 'YELLOW' parts.
  - Get the supplier name who supplies part 'P1' or 'P3'.
  - Get the supplier name who does not supply any part.
  - Find names of the suppliers who supply 'BLUE' parts but not 'RED' parts.
2. Explain the difference between Cartesian product and natural join operation. (Level 2)
3. Compare between inner join and outer join. (Level 4)
4. Explain theta-join and equi-join. (Level 2)

### **CHAPTER: 3**

Title: Relational Model

Date: 6.3.17, Day: 17

#### **CONTENTS**

Extended Relational Algebra Operations: division, generalized projection, aggregate functions

**Chapter Objectives:** They are capable to explain the extended relational algebra operations to retrieve data from a database.

**Broad Objectives of the chapter are:**

1. They are able to explain the use of division relational algebra operations.
2. They are able to use the aggregate functions to retrieve data
- 3.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

SUPPLIER (SUPPLIER\_ID, SUPPLIER\_NAME, SUPPLIER\_ADDRESS)

PARTS (PART\_ID, PART\_NAME, COLOR)

CATALOG (SUPPLIER\_ID, PART\_ID, COST)

1. Write the following queries in Relational Algebra based on above mentioned tables: (Level 1)
  - Find name of the supplier who supply all parts.
  - Find names of the suppliers who supply only 'RED' parts.
  - List the parts with maximum and minimum cost.
  - Get the average cost of each 'RED' part.
  - Get the number of distinct colored parts.
  - Get the total cost of the parts supplied by each supplier.
  - Retrieve the details of part id 'P2' having cost increased by 5%.



<b>CHAPTER: 3</b> Title: Relational Model <b>Date: 7.3.17, Day: 18</b>
<b><u>CONTENTS</u></b>
Relational Algebra Operations: Query practice
<b>Chapter Objectives:</b> They are capable to write queries using relational algebra operations.  <b>Broad Objectives of the chapter are:</b>  1. They are able to write queries methodically. 2.
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:  Consider the following tables: PROJECT (PROJECT_NO, PROJECT_NAME, PROJECT_MANAGER) EMPLOYEE (EMPLOYEE_NO, EMPLOYEE_NAME, SALARY) ASSIGNED_TO (PROJECT_NO, EMPLOYEE_NO) Write the following queries in <b>Relational Algebra</b> :  i. List the name of employees working on project 'P1' but not on project 'P2'. ii. List the name of employees who are working on a project for which 'E1' is the project manager.

<b>CHAPTER: 3</b> Title: Relational Model <b>Date: 8.3.17, Day: 19</b>
<b><u>CONTENTS</u></b>
Relational Calculus
<b>Chapter Objectives:</b> They are capable to write queries using notations of relational calculus.

**Broad Objectives of the chapter are:**

1. They are able to write queries in tuple and domain relational calculus.
- 2.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

EMPLOYEE (EMPLOYEE\_NO, EMPLOYEE\_NAME, CITY)

WORKS (EMPLOYEE\_NO, COMPANY\_NAME, SALARY)

1. Write the following query in both Tuple and Domain Relational Calculus. (Level 1)
  - Find the name and city of residence of all employees who work for TCS Company.
  - Find the name of all employees who earn more than rupees 20000/- per month.
  - Find the name of the company for the employees of Bangalore city.
  - Find the name of the employees who do not belong to Bangalore city.
  -

**CHAPTER: 3**

Title: Relational Model

Date: 9.3.17, Day: 20

**CONTENTS**

Views , Modifications of the Database

**Chapter Objectives:** They are capable to explain the modification to database in a mathematical way.

**Broad Objectives of the chapter are:**

1. They are able to write views in relational algebra.
2. They are able to explain the insertion, deletion and updating of database using relational algebra operations.
- 3.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Write queries in relational algebra to insert update and delete records from the employee database. (Level 1)

EMPLOYEE (SSN, EMP\_NAME, ADDRESS, DATE\_OF\_JOIN, SALARY, DEPT)

- 2.





<b>CHAPTER: 5</b> Title: Relational Database Design <b>Date: 13.3.17, Day: 21</b>
<b><u>CONTENTS</u></b>
Functional Dependency, Armstrong's Axioms;
<b>Chapter Objectives:</b> They are capable to explain the concept of functional dependency among different attributes of a relation schema. <b>Broad Objectives of the chapter are:</b> <ol style="list-style-type: none"><li>1. They are able to explain the concept of functional dependency</li><li>2. They are able to demonstrate the Armstrong's Axioms</li></ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy: <ol style="list-style-type: none"><li>1. What do you understand by functional dependency? (level 2)</li><li>2. Write the Armstrong's Axioms.(Level 1)</li><li>3.</li></ol>

<b>CHAPTER: 5</b> Title: Relational Database Design <b>Date: 14.3.17, Day: 22</b>
<b><u>CONTENTS</u></b>
Closure of F, cover of F
<b>Chapter Objectives:</b> They are capable to find the closure and cover of a set of functional dependencies. <b>Broad Objectives of the chapter are:</b> <ol style="list-style-type: none"><li>1. They are able to find closure of a set of functional dependencies</li><li>2. They are able to find cover of a set of functional dependencies</li><li>3.</li></ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy: <ol style="list-style-type: none"><li>1. Find the closure of the set of functional dependencies F. (Level 4)<ol style="list-style-type: none"><li>a. <math>F = \{A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A\}</math></li></ol></li></ol>

b.  $F = \{ AB \rightarrow C, A \rightarrow DE, B \rightarrow F, F \rightarrow GH, D \rightarrow IJ \}$

2.  $R = [A, B, C, D, E]$

$F = \{ A \rightarrow B, AB \rightarrow C, D \rightarrow AC, D \rightarrow E \}$

$E = \{ A \rightarrow BC, D \rightarrow AE \}$

Are F and E equivalent?

#### LABORATORY EXPERIMENT:

1. Create tables for following functional Dependencies –  
 $eno \rightarrow \{ ename, address \}$   
 $pno \rightarrow \{ pname, plocation \}$   
 $\{ eno, pno \} \rightarrow hours$   
plocation must be among MUMBAI, KOLKATA, CHENNAI, and DELHI.
2. Mention primary key, foreign key and CHECK constraints.

### CHAPTER: 5

Title: Relational Database Design

Date: 15.3.17, Day: 23

#### CONTENTS

Minimal cover / Canonical cover

**Chapter Objectives:** They are capable to find the minimal cover of a set of functional dependencies.

**Broad Objectives of the chapter are:**

1. They are able to find the minimal cover or the irreducible set of a set of functional dependencies.
- 2.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1.  $R = [A, B, C, D]$

$F = \{ A \rightarrow BC, B \rightarrow C, A \rightarrow B, AB \rightarrow C, AC \rightarrow D \}$

Find whether F is irreducible. (Level 4)

2.  $R = [A, B, C]$

$F = \{ A \rightarrow BC, B \rightarrow C, A \rightarrow B, AB \rightarrow C \}$

Find the minimal cover of F. (Level 4)

## CHAPTER: 5

Title: Relational Database Design

Date: 16.3.17, Day: 24

### CONTENTS

Attribute closure , Normalization

**Chapter Objectives:** They are capable to design normalized database.

**Broad Objectives of the chapter are:**

1. They are able to find the key of a relation R with help of given FDs on R.
2. They are able to explain the insert update and delete anomalies on a database.
3. They are able to explain the need for database normalization.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Explain the need for database normalization. (Level 2)
2. Patient{patient\_id, patient\_name, appointment\_no, time, doctor}  
F= {patient\_id→patient\_name, {patient\_id, appointment\_no} →time, doctor, time→appointment\_no}
  - a. Find the key of the relation Patient. (Level 4)

## CHAPTER: 5

Title: Relational Database Design

Date: 20.3.17, Day: 25

### CONTENTS

1NF, 2NF, 3NF

**Chapter Objectives:** They are capable to design normalized database.

**Broad Objectives of the chapter are:**

4. They are able to normalize a relation in 1NF, 2NF, 3NF.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Define: full functional dependency, transitive dependency (Level 1)
2. Patient{patient\_id, patient\_name, appointment\_no, time, doctor}  
F= {patient\_id→patient\_name, {patient\_id, appointment\_no} →time, doctor, time→appointment\_no}
  - a. Find the key of the relation Patient.
  - b. Normalize the relation Patient unto third normal form.
3. What do understand by repeating groups? How are they represented in a good database design? (Level 2)

**CHAPTER: 5**

Title: Relational Database Design

**Date: 21.3.17, Day: 26**

**CONTENTS**

BCNF; Problem discussion

**Chapter Objectives:** They are capable to design normalized database using the concepts of 1NF, 2NF, 3NF, BCNF;

**Broad Objectives of the chapter are:**

1. They are able to normalize a relation into BCNF.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Salesman\_Order{order\_id, order\_date, customer\_name, customer\_address, salesman\_name, salesman\_address, item\_code, item\_name, quantity, rate}  
F= {salesman\_name → salesman\_address,  
customer\_name→customer\_address,  
order\_id→ order\_date, customer\_name, salesman\_name,  
order\_id, , item\_code → quantity  
item\_code→item\_name, rate}
  - a. Find the key of the relation Salesman\_Order. (Level 4)
  - b. Normalize the relation Salesman\_Order to its highest achievable normal form.

**CHAPTER: 5**

Title: Relational Database Design

**Date: 22.3.17, Day: 27**

**CONTENTS**

MVD & 4NF;

**Chapter Objectives:** They are capable to explain the concept of MVD and 4NF.

**Broad Objectives of the chapter are:**

1. They are able to demonstrate MVD and 4NF.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. What do you understand by multivalued dependency? (Level 2)

2. Explain the concept of 4NF with example. (Level 2)

<b>CHAPTER: 5</b> Title: Relational Database Design <b>Date: 23.3.17, Day: 28</b>
<b><u>CONTENTS</u></b>
JD & 5NF, DKNF,
<b>Chapter Objectives:</b> They are capable to explain the concept of JD and 5NF and DKNF
<b>Broad Objectives of the chapter are:</b>
1. They are able to demonstrate JD and 5NF.
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:
<ol style="list-style-type: none"> <li>1. What do you understand by join dependency? (Level 2)</li> <li>2. Explain the concept of 5NF with example. (Level 2)</li> <li>3. Explain domain key normal form. (Level 2)</li> </ol>

<b>CHAPTER: 5</b> Title: Relational Database Design <b>Date: 27.3.17, Day: 29</b>
<b><u>CONTENTS</u></b>
Dependency preserving and Lossless join decomposition
<b>Chapter Objectives:</b> They are capable to demonstrate the dependency preserving and lossless join decomposition of a relation.
<b>Broad Objectives of the chapter are:</b>
<ol style="list-style-type: none"> <li>1. They are able to demonstrate dependency preserving decomposition.</li> <li>2. They are able to demonstrate lossless join decomposition.</li> </ol>
Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:
<ol style="list-style-type: none"> <li>1. What do you understand by the dependency preserving decomposition? (Level 2)</li> <li>2. Explain the concept of lossless join decomposition with suitable example. (Level 2)</li> <li>a) Consider a relation schema R(A, B,C, D, E, F) with set of functional dependencies F = {A→BCDEF, BC→ADEF,</li> </ol>

B→F, D→E }.

v) Find the candidate keys for R. (Level 4)

vi) Decompose R to 3NF.

vii) If another functional dependency D→B is introduced, what will be the resulting decomposed relation schema?

3. Is the decomposition lossless ?

### CHAPTER: 7

Title: File Organization & Index Structures

Date: 28.3.17, Day: 30

#### CONTENTS

Single Level Index( Primary, Clustered)

**Topic/Unit/Chapter Objectives:** They are capable to demonstrate the indexing techniques on RDBMS.

**Broad Objectives of the chapter/topic are:**

1. They are able to explain the concepts of sparse and dense indexing.
2. They are able to explain the concepts of primary and clustered indexing techniques.
- 3.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Compare between sparse and dense indexing techniques. (Level 4)
2. Explain with proper diagram: primary and clustered indexing techniques. (Level 2)

### CHAPTER: 7

Title: File Organization & Index Structures

Date: 29.3.17, Day: 31

#### CONTENTS

Single Level Index( secondary index), Multi-level Indexes;

**Topic/Unit/Chapter Objectives:** They are capable to demonstrate the indexing techniques on RDBMS.

**Broad Objectives of the chapter/topic are:**

1. They are able to explain the concept of multi-level indexing.
2. They are able to explain the concepts of secondary indexing techniques.
- 3.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Compare between primary and secondary indexing techniques. (Level 4)
2. Explain with proper diagram: secondary indexing technique. (Level 2)
3. Explain the concept of multi-level indexing with suitable example. (Level 2)

<p><b>CHAPTER: 7</b>          Title: File Organization &amp; Index Structures          Date: 30.3.17, Day: 32</p>
<p><b><u>CONTENTS</u></b></p>
<p>B-tree</p>
<p><b>Topic/Unit/Chapter Objectives:</b> They are capable to construct a B-tree for a set of database records.</p> <p><b>Broad Objectives of the chapter/topic are:</b></p> <ol style="list-style-type: none"> <li>1. They are able to construct B-tree on set of records.</li> <li>2.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:</p> <ol style="list-style-type: none"> <li>1. What is B-tree? (Level 1)</li> <li>2. Construct a B tree of order 3 for the following set of key values: (Level 4)</li> <li>3. [5, 10, 15, 20, 35, 40, 50, 65, 70, 75, 90, 95]             <ol style="list-style-type: none"> <li>i. Insert 60</li> <li>ii. Delete 15, 75</li> </ol> </li> <li>4.</li> </ol>

<p><b>CHAPTER: 7</b>          Title: File Organization &amp; Index Structures          Date: 3.4.17, Day: 33</p>
<p><b><u>CONTENTS</u></b></p>
<p>B<sup>+</sup> tree</p>
<p><b>Topic/Unit/Chapter Objectives:</b> They are capable to construct a B<sup>+</sup> tree for a set of database records.</p> <p><b>Broad Objectives of the chapter/topic are:</b></p> <ol style="list-style-type: none"> <li>1. They are able to construct B<sup>+</sup> tree on set of records.</li> <li>2.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:</p>

1. What is B+ tree? (Level 1)
2. Construct a B tree of order 3 for the following set of key values: (Level 4)
3. [5, 10, 15, 20, 35, 40, 50, 65, 70, 75, 90, 95]
  - i. Insert 60
  - ii. Delete 15, 75
4. Compare between B tree and B+ tree. (Level 4)

**CHAPTER: 6**

Title: Internals of RDBMS

**Date: 4.4.17, Day: 34**

**CONTENTS**

Transaction Concept, ACID Properties; Schedule

**Topic/Unit/Chapter Objectives:** They are capable to explain the concepts of database transaction

**Broad Objectives of the chapter/topic are:**

1. They are able to explain ACID properties of database transaction.
2. They are able to explain schedule of transactions.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Explain the ACID properties of transaction. (Level 2)
2. What do you understand by schedule of a set of transactions? (Level 2)
3. What is serial schedule? (Level 1)

**CHAPTER: 6**

Title: Internals of RDBMS

**Date: 5.4.17, Day: 35**

**CONTENTS**

Conflict & View Serializability,

**Topic/Unit/Chapter Objectives:** They are capable to explain the concepts of serializability among transactions.

**Broad Objectives of the chapter/topic are:**

1. They are able to explain concept of conflict serializability
2. They are able to explain concept of view serializability
- 3.

Once the student has completed this topic/ chapter he/she will be able to answer following



questions/perform the following activities with Levels of Bloom's Taxonomy:

4. When are two operations said to be conflicting? (Level 2)
5. Explain with example the concept of conflict serializability. (Level 2)
6. Explain with example the concept of view serializability. (Level 2)

**CHAPTER: 6**

Title: Internals of RDBMS

Date: 6.4.17, Day: 36

**CONTENTS**

Test for Conflict Serializability;

**Topic/Unit/Chapter Objectives:** They are capable to test the conflict serializability of a schedule.

**Broad Objectives of the chapter/topic are:**

1. They are able to test the conflict serializability of a schedule.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. How do you test a schedule is conflict serializable or not?? (Level 2)
2. Find out whether the following schedule S is conflict or serial?  
S: [R3(y); R3(z); R1(x); W1(x); W3(z); W3(y); R2(z); R1(y); W1(y); R2(y); W2(y); R2(x); W2(x)]  
If conflict then, find the equivalent serial schedule. (Level 4)

**CHAPTER: 6**

Title: Internals of RDBMS

Date: 10.4.17, Day: 37

**CONTENTS**

Concurrency Control , Lock Base Protocols;

**Topic/Unit/Chapter Objectives:** They are capable to explain the need of concurrency control in a multi-user system

**Broad Objectives of the chapter/topic are:**

1. They are able to explain the need of concurrency control
2. They are able to demonstrate different lock based concurrency control protocols.

Once the student has completed this topic/ chapter he/she will be able to answer following

questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Explain the need of concurrency control. (Level 2)
2. What is binary lock? What is the drawback of binary lock? (Level 1)
3. Explain shared and exclusive lock. (Level 2)
- 4.

### CHAPTER: 6

Title: Internals of RDBMS

Date: 11.4.17, Day: 38

#### CONTENTS

Two Phase Locking, Deadlock,

**Topic/Unit/Chapter Objectives:** They are capable to demonstrate the concepts of 2PL and deadlock in a multi-user database system

**Broad Objectives of the chapter/topic are:**

1. They are able to explain the importance of 2PL.
2. They are able to explain deadlock in database system.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Describe two phase locking protocol. What are its limitations? (Level 2)
2. Explain strict 2PL and rigorous 2PL. (Level 2)
3. Explain with example: cascaded rollback. (Level 2)
4. What is a recoverable schedule? (Level 1)
5. What do you understand by deadlock in a database system? (Level 2)

### CHAPTER: 6

Title: Internals of RDBMS

Date: 12.4.17, Day: 39

#### CONTENTS

Time stamp protocol

**Topic/Unit/Chapter Objectives:** They are capable to demonstrate the concepts of time stamp protocol for deadlock

**Broad Objectives of the chapter/topic are:**

1. They are able to explain the time stamp protocol

2.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Explain: 'deadlock cannot occur in time stamp base protocol'. (Level 2)
2. Explain the concept of wait-die and wound-wait protocol. (Level 2)
3. What is wait-for graph? (Level 1)
- 4.

### CHAPTER: 6

Title: Internals of RDBMS

Date: 13.4.17, Day: 40

#### CONTENTS

Causes of Failure; Recovery Techniques: log based

**Topic/Unit/Chapter Objectives:** They are capable to explain the causes of database failure and recovery techniques.

**Broad Objectives of the chapter/topic are:**

1. They are able to explain the different causes of database failure.
2. They are able to demonstrate the log-based recovery technique
- 3.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. What are the possible causes of database failure? (Level 1)
2. Explain the log-based recovery technique. (Level 2)
3. What are immediate update and deferred update? (Level 1)
4. What is log? (Level 1)

### CHAPTER: 6

Title: Internals of RDBMS

Date: 17.4.17, Day: 41

#### CONTENTS

Recovery Techniques: checkpoints, shadow paging

**Topic/Unit/Chapter Objectives:** They are capable to explain the non-log-based recovery techniques

**Broad Objectives of the chapter/topic are:**

1. They are able to explain the concept of shadow paging.

2. They are able to describe the importance of checkpoints.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Explain the shadow paging technique of database recovery. What is its limitation? (Level 2)
2. Explain the importance of checkpoints in a database log. (Level 2)
- 3.

**CHAPTER: 6**

Title: Internals of RDBMS

**Date: 18.4.17, Day: 42**

**CONTENTS**

ARIES algorithm

**Topic/Unit/Chapter Objectives:** They are capable to explain the ARIES algorithm for database recovery

**Broad Objectives of the chapter/topic are:**

1. They are able to explain the ARIES algorithm.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Describe briefly the ARIES algorithm for database recovery. (Level 2)
- 2.

**CHAPTER: 6**

Title: Internals of RDBMS

**Date: 19.4.17, Day: 43**

**CONTENTS**

Query optimization: cost based optimization.

**Topic/Unit/Chapter Objectives:** They are capable to determine and write optimal queries

**Broad Objectives of the chapter/topic are:**

1. They are able to evaluate a query.
2. They are able to write optimal queries.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

1. Describe the steps of query processing with the help of flow chart diagram. (Level 2)
2. What is operator tree? (Level 1)
3. Write the optimal query for the following: (Level 1)  
BOOK: { ISBN, BK\_TITLE, A\_ID, P\_ID, PG\_COUNT, CATEGORY, PRICE}  
PUBLISHER: { P\_ID, P\_NAME, ADDRESS, PH\_NO, EMAIL, BOOKS\_PUBLISHED}  
AUTHOR: { A\_ID, A\_NAME, ADDRESS, PH\_NO, EMAIL, BOOKS\_WRITTEN}  
REVIEW: { REVIEWER\_ID, ISBN, RATING }

$\Pi_{BK\_TITLE, A\_NAME, RATING} ( \sigma_{CATEGORY = 'NOVEL' \wedge RATING > 7} ( BOOK \bowtie (REVIEW \bowtie AUTHOR) ) )$

Title: **Discussion on University OP (Last 5 Years)**

Date: **24.4.17, 25.04.17** Day: **44 & 45**

### **CONTENTS**

Last 5 years university question paper.

**Topic/Unit/Chapter Objectives:** we provide discussion on university question paper so that our students can clear their concept and their answers can be to the point.

**Broad Objectives of the chapter/topic are:**

1. They are able to explain to analyze, investigate and evaluate.
2. They are able to judge how to apply theory.

Once the student has completed this topic/ chapter he/she will be able to answer following questions/perform the following activities with Levels of Bloom's Taxonomy:

**Discussion most of the university questions in last 5 years.**

### **l) Teaching Strategy/Method (describe instructional methods, usage of ICT, efficient and engaging instructions and display the best practices on institutional website)**

- 1) Taking interactive classes through different examples.
- 2) Conducting Question – answer session at the end of the class.
- 3) Real life application for better understanding.

### **m) Strategy to support weak students**

- 1) To engage the weak students in habit of studying, I give them some easy questions in regular basis.

- 2) Some weak students also have the problem of forgetting what they have learnt. In my class I always give some tips on how to recall and how to write systematically.
- 3) Weak students need special attention even after college hours. I always give some extra hours to weak students.

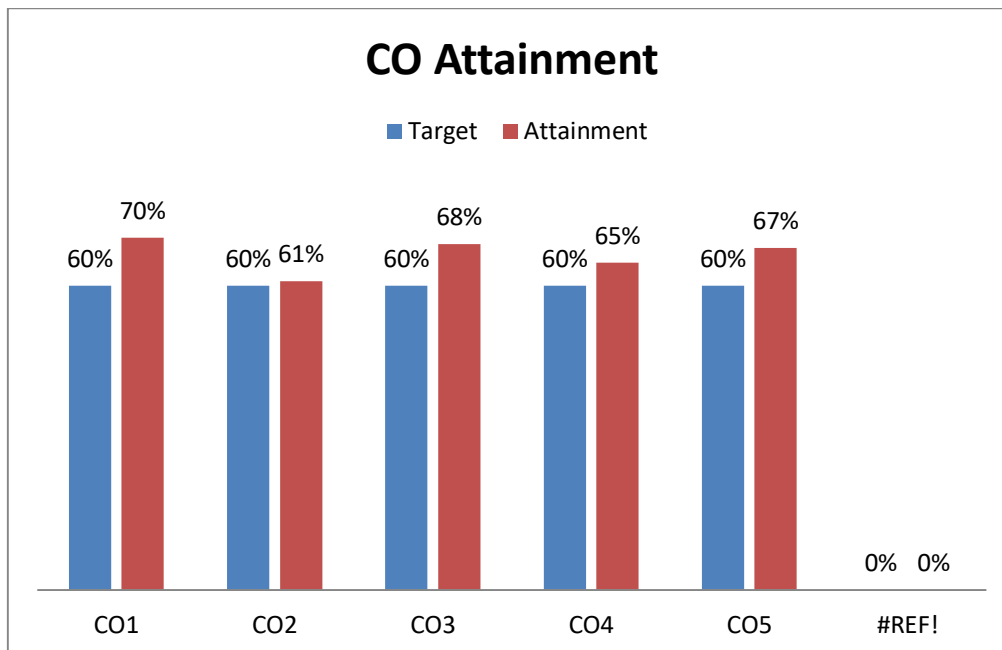
**n) Strategy to encourage bright students**

- 1) Have an extra challenge ready that allows the student to go deeper into the subject, learn a little more, or apply a skill he has just learned in a new way.
- 2) Some students are engaged with the final year students for their final projects.

**o) Efforts to keep students engaged**

- 1) Regular basis Home Work.
- 2) 5-10 minutes spent in an every class for question answer session.
- 3) Quiz on regular basis.
- 4) Some technical assignments are given group wise.

**p) Analysis of Students performance in the course (internal) (labs, seminars, tests, assignments, quiz, exam etc)**



**Comments:**

- 70% students have attained the set target of 60% marks for CO1
- 61% students have attained the set target of 60% marks for CO2
- 68% students have attained the set target of 60% marks for CO3
- 65% students have attained the set target of 60% marks for CO4
- 67% students have attained the set target of 60% marks for CO5

**q) Analysis of Students performance in the course (university results)**

	Target Course Outcome%	TOTAL STUDENTS	TOTAL STUDENT WHO ATTAINED OUTCOME	% STUDENTS WHO ATTAINED THE OUTCOME
University Result	60%	41	35	85%

➤ 85% students have attained the set target of 60% marks for University Exams.

**r) Analysis of Student Feed Back**

**s) Teacher Self Assessment (at the completion of course)**

From the analysis of the results obtained it can be seen that set targets for the course outcome have been achieved partially by the students. More emphasis should be given for Data Models, Relational Algebra and Calculus and Query Optimization Techniques.

**t) Recommendations/Suggestions for improvement by faculty**

- More emphasis should be given to clear the concepts of ERD concepts and Relational Algebra and Calculus.
- Tutorials must be incorporated in the syllabus.
- Increase the total contact hours for theory to 40 hrs, with 4L per week.

**Siliguri Institute of Technology**  
**INTERNAL ASSESSMENT REPORT**  
**Paper Name: Database Management System**  
**Paper Code: CS 601**

FACULTY NAME : **Mrs. JAYASHREE SINGHA**

**YEAR: 2017**

STREAM: **B.TECH[CSE]**

YEAR: **3RD**

SEMESTER:  
**2<sup>ND</sup>**

SECTION: **B**

NO. OF CLASS HELD: 43

S N	NAME	ROLL NO.	ATTENDANCE [5 MARKS]		MARKS IN INTERNAL EXAM			ASSIGNMENT/QUIZ [10 MARKS] MARKS=[((I+II)/30)*100]/1 0				TOTAL [30 MARKS]
			TOTAL %	MARKS	I	II	AVG	Q-I [15]	Q-II [15]	AVG	MAR KS	
1	RAKESH KUMAR	11900114049	93	5	25	19	22	14	13	13.5	9	25
2	RISAB BISWAS	11900114050	91	5	27	25	26	12	11	11.5	7.7	26
3	RISHITA CHOWDHURY	11900114051	88	4	22	13	17.5	10	9	9.5	6.3	19
4	RIYA MITRA	11900114052	84	4	20	17	18.5	13	11	12	8	21
5	RUPAM MITRA	11900114053	79	3	8	10	9	10	6	8	5.3	13
6	SACHIN KUMAR SAHA	11900114054	79	3	11	9	10	9	13	11	7.3	15
7	SAGAR BHATTARAI	11900114055	86	4	13	10	11.5	9	8	8.5	5.7	15
8	SAGARIKA MITRA	11900114056	93	5	20	16	18	6	14	10	6.7	21
9	SAHITYA KAUSHIK	11900114057	91	5	24	17	20.5	13	11	12	8	23
10	SAMIK ANWAR	11900114058	91	5	23	11	17	13	12	12.5	8.3	22
11	SAMRAT BHATTACHARJEE	11900114059	76	3	4	10	7	8	10	9	6	13
12	SANDIPAN CHAKRABORTY	11900114060	76	3	10	10	10	10	11	10.5	7	15
13	SANGAM GURUNG	11900114061	86	4	13	11	12	14	8	11	7.3	17
14	SANTANU RAKSHIT	11900114062	79	3	14	10	12	11	9	10	6.7	16
15	SAPTARSHI GHOSH	11900114063	98	5	16	11	13.5	12	13	12.5	8.3	20



16	SAYAN CHAKRABORTY	11900114064	95	5	15	9	12	10	10	10	6.7	18
17	SHALINI PRADHAN	11900114065	91	5	16	17	16.5	12	9	10.5	7	20
18	SHALINI ROY CHOWDHURY	11900114066	79	3	13	12	12.5	10	8	9	6	15
19	SHASHI KANT PATEL	11900114067	84	4	16	17	16.5	11	12	11.5	7.7	20
20	SHIRSANA GHATAK	11900114068	81	4	14	19	16.5	9	11	10	6.7	19
21	SNEHA PARIJAAT	11900114069	93	5	16	26	21	11	12	11.5	7.7	23
22	SOHAM SARKAR	11900114070	84	4	16	23	19.5	7	9	8	5.3	19
23	SOURAVENDU NANDY	11900114071	79	3	8	14	11	10	9	9.5	6.3	15
24	SOUVIK BISWAS	11900114072	93	5	21	21	21	12	12	12	8	24
25	SRIJA GHOSH	11900114073	91	5	10	12	11	8	14	11	7.3	18
26	SUBHAM GUHA	11900114074	76	3	6	7	6.5	6	9	7.5	5	11
27	SUBHOJIT KUNDU	11900114075	84	4	18	16	17	10	9	9.5	6.3	19
28	SUDIPTA SAHA	11900114076	81	4	18	16	17	10	12	11	7.3	20
29	SURAJ SHARMA	11900114077	93	5	15	19	17	14	10	12	8	22
30	SURAJIT KUMAR DAS	11900114078	91	5	18	19	18.5	14	11	12.5	8.3	23
31	SWARNAVA MUKHERJEE	11900114079	98	5	16	18	17	14	10	12	8	22
32	SWEETY	11900114080	86	4	13	12	12.5	9	8	8.5	5.7	16
33	UJJAL DAS	11900114081	91	5	18	18	18	11	12	11.5	7.7	22
34	VINITA KUMARI	11900114082	84	4	12	7	9.5	12	6	9	6	15
35	ANIRBAN HALDAR	11900114086	81	4	3	11	7	8	5	6.5	4.3	12
36	ADRIJA PAUL	11900115095	84	4	19	25	22	10	8	9	6	21
37	BINDHYA MANGAR	11900115096	81	4	8	11	9.5	7	12	9.5	6.3	15
38	POOJA UPADHYAY	11900115097	88	4	15	18	16.5	14	8	11	7.3	20

39	RAJAT MUKHIA	11900115098	86	4	18	16	17	11	9	10	6.7	19
40	SHRADHANJALI PRADHAN	11900115099	81	4	8	8	8	7	9	8	5.3	13
41	RATNADEEP BHATTACHARYA	11900114048	79	3	11	11	11	8	7	7.5	5	14

**SILIGURI INSTITUTE OF TECHNOLOGY**  
**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**  
**1<sup>ST</sup> INTERNAL EXAM- 2017**

**PAPER NAME: DATABASE MANAGEMENT SYSTEM**

**PAPER CODE: CS 601**

FULL MARKS: 30

TIME: 1HR 30 MINS

**Answer all questions (each question carries 10 marks)**

**Q1.** Construct an E-R diagram for a company database that has to be designed to keep track of employees, departments and projects. The database should also be able to keep track of dependents of each employee for medical purpose. You can make appropriate assumptions to make the specification complete.

Convert E-R schema into relational schemas.

**7 + 3**

**OR**

Describe the three-schema architecture. Why do we need mappings between schema levels?

What is the difference between logical data independence and physical data independence? Which one is harder to achieve? Why?

**4+1+3+2**

**OR**

What do you mean by degree and cardinality of a relationship? Explain with suitable example specialization and generalization. Explain the terms super key and candidate key with example.

**2+(2+2)+(2+2)**

**Q2.** Compare **left outer join**, **right outer join** and **full outer join** with example.

**( 2 + 2 + 2 ) + 2 + 2**

Consider following schemas –

Sailor (sid, sname, rating, age)

Reserve (sid, bid, day)

Give an expression in **Relational Algebra** for each of the following queries :

a. Find names of the sailors who have reserved boat number 203.

b. Find names and ages of the sailors who have reserved a boat.

**OR**

A. Consider the following schemas:

Employee (employee\_no, employee\_name, salary)

Project (project\_no, project\_name, project\_manager)

Works\_for (project\_no, employee\_no)

Write the following queries in **Relational Algebra**:

**3+3**

i. List the name of employees working on project 'P2' but not on project 'P1'.

ii. List the name of employees who are working on a project for which 'E2' is the project manager.

B. Consider the following tables:

Employee (eno, fname, lname, dob, address, salary, dno)

Department (dnumber, dname)

Write the following query in both **Tuple and Domain Relational Calculus:** **2+2**

- i. Find the name and address of all employees who work for the 'Sales' department.

**Q3.** Consider the following schemas:

Employee (employee\_name, street, city)

Works (employee\_name, company\_name, salary)

Company (company\_name, city)

Formulate the following queries in **SQL**

**2+2+3+3**

- a. Find the names and cities of residence of all employees who work for 'FBC'.
- b. Find all employees who live in the same cities as the companies for which they work.
- c. Assume that the companies may be located in several cities. Find all companies located in every city in which 'SBC' is located.
- d. Find the company that has most employees.



**Assignment -1 for 3<sup>rd</sup> year CSE 2017**

Year: 3<sup>RD</sup> Semester: 2<sup>nd</sup> Section: A

**Paper Name:** Database Management System

**FM:** 60

**Paper Code:** CS 601

**Submission Date:** 18/03/2016

1. Construct an E-R diagram for a Car-insurance company that has a set of customers, each of whom owns one or more cars. Each car has associated with it zero to any number of recorded accidents. Convert the E-R schema into Relational schema. (5)
2. Consider following relation schemas (7+7+7)  
Sailors(sid, sname, rating, age)  
Boats(bid, bname, color)  
Reserves(sid, bid, day)  
Write down following queries in RA, TRC and SQL expressions
  - a) Find all sailors with rating above 7
  - b) Find names and ages of sailors with rating above 7
  - c) Find the sailor name, boat id and reservation date for each reservation
  - d) Find the names of the sailors who have reserved boat number 103.
  - e) Find the names of the sailors who have reserved a red boat.
  - f) Find the names of the sailors who have reserved at least two boats.
  - g) Find the names of the sailors who have reserved all boats.
3. Consider following two relation schemas:  
Employee (eno, ename, job, hiredate, managerno, salary, comm., dno)  
Dept (dno, dname, location)  
**Solve the following queries using SQL:** (5)
  - i) List the name of the employees with their immediate higher authority.
  - ii) List the name of the employee whose name either starts or ends with "S".
  - iii) List the department name and the total salary payable in each department.
  - iv) List out the employees who earn more than the average salary of their department.
  - v) List the names of the employees who are working more than thirty years in the company.
4. Consider a relation schema R(A, B, C, D). For each of the following sets of FDs, assuming those are the only dependencies that hold on R, do the following: 5x3
  - i) Identify the candidate key(s) for R.
  - ii) Identify the best normal form that R satisfies (1NF, 2NF, 3NF, or BCNF).
  - iii) If R is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.
    1.  $C \rightarrow D, C \rightarrow A, B \rightarrow C$
    2.  $B \rightarrow C, D \rightarrow A$
    3.  $ABC \rightarrow D, D \rightarrow A$
    4.  $A \rightarrow B, BC \rightarrow D, A \rightarrow C$
    5.  $AB \rightarrow C, AB \rightarrow D, C \rightarrow A, D \rightarrow B$
5. Prove that any relation schema with two attributes is in BCNF. (4)
6. Prove that every 3NF schema is in 2NF. (4)
7. Prove that a relation with primary key of single attribute is always in 2NF. (3)
8. Suppose schema R = (A,B,C,D,E) with F = { A → BC, CD → E, B → D, E → A } is decomposed into (A, B, C) and (A,D,E). Show that this decomposition is lossless-join decomposition. (3)

**Siliguri Institute of Technology**  
**LABORATORY ATTENDANCE SHEET**  
**Paper Name: Database Management System**  
**Paper Code: CS 691**

FACULTY NAME : Mrs. JAYASHREE SINGHA

YEAR: 2017

NO. OF PRACTICAL HELD: 10

STREAM: B.TECH [ CSE ]

YEAR: 3<sup>RD</sup>

SEMESTER: 2<sup>ND</sup>

GROUP: B1

SN	NAME	DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	TOTAL MARKS
		DATE	6/2/17	13/2/17	20/2/17	27/2/17	6/3/17	27/3/17	10/4/17	17/4/17	8/5/17	15/5/17					
		ROLL NO															
1	RAKESH KUMAR	11900114049	0	1	1	1	1	0	1	1	1	1					8
2	RISAB BISWAS	11900114050	0	1	1	1	1	0	1	1	1	1					8
3	RISHITA CHOWDHURY	11900114051	1	1	1	1	1	0	1	1	1	1					9
4	RIYA MITRA	11900114052	0	1	1	1	1	1	1	0	1	1					8
5	RUPAM MITRA	11900114053	1	1	1	1	0	1	1	1	0	0					7
6	SACHIN KUMAR SAHA	11900114054	1	0	1	1	1	1	1	0	0	0					6
7	SAGAR BHATTARAI	11900114055	1	1	1	1	1	0	1	0	0	1					7
8	SAGARIKA MITRA	11900114056	1	1	1	1	1	0	1	0	1	1					8
9	SAHITYA KAUSHIK	11900114057	1	1	1	1	1	1	0	0	1	1					8
10	SAMIK ANWAR	11900114058	0	1	1	1	1	1	1	1	1	1					9
11	SAMRAT BHATTACHARJEE	11900114059	1	1	1	0	1	1	0	0	0	0					5
12	SANDIPAN CHAKRABORTY	11900114060	0	1	0	0	1	1	1	1	0	0					5
13	SANGAM GURUNG	11900114061	0	1	1	1	1	1	1	0	1	1					8
14	SANTANU RAKSHIT	11900114062	1	1	1	1	1	1	1	1	1	1					10

15	SAPTARSHI GHOSH	11900114063	1	1	1	1	1	1	1	1	1	1	1					10
16	SAYAN CHAKRABORTY	11900114064	1	1	1	1	1	1	0	0	1	1						8
17	SHALINI PRADHAN	11900114065	0	1	1	1	1	1	1	0	1	1						8
18	SHALINI ROY CHOWDHURY	11900114066	1	1	0	1	1	1	1	0	1	1						8
19	SHASHI KANT PATEL	11900114067	1	1	1	1	1	0	1	0	1	1						8
20	SHIRSANA GHATAK	11900114068	1	1	0	1	1	1	1	0	0	1						7

**Siliguri Institute of Technology**  
**LABORATORY ATTENDANCE SHEET**  
**Paper Name: Database Management System**  
**Paper Code: CS 691**

FACULTY NAME : Mrs. JAYASHREE SINGHA

YEAR: 2017

NO. OF PRACTICAL HELD: 10

STREAM: B.TECH| CSE I

YEAR: 3<sup>RD</sup>

SEMESTER: 2<sup>ND</sup>

GROUP: B2

SN	NAME	DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	TOTAL MARKS	
			DATE	8/2/17	15/2/17	22/2/17	1/3/17	8/3/17	29/3/17	12/4/17	19/4/17	28/4/17	12/5/17					
			ROLL NO															
1	SNEHA PARIJAAT	11900114069	0	1	1	1	1	1	1	1	0	1					8	
2	SOHAM SARKAR	11900114070	0	1	1	1	1	1	0	1	1	1					8	
3	SOURAVENDU NANDY	11900114071	1	0	1	1	1	1	0	1	1	1					8	
4	SOUVIK BISWAS	11900114072	0	1	1	1	1	0	1	1	1	1					8	
5	SRIJA GHOSH	11900114073	1	1	1	1	0	1	1	1	0	1					8	
6	SUBHAM GUHA	11900114074	1	1	1	1	1	1	1	0	0	0					7	

7	SUBHOJIT KUNDU	11900114075	1	0	1	1	1	1	0	1	1	0					7
8	SUDIPTA SAHA	11900114076	1	1	0	1	1	1	1	1	0	1					8
9	SURAJ SHARMA	11900114077	1	1	1	1	1	0	1	1	1	1					9
10	SURAJIT KUMAR DAS	11900114078	0	1	1	1	1	1	1	1	1	1					9
11	SWARNAVA MUKHERJEE	11900114079	0	1	1	1	1	1	1	1	0	1					8
12	SWEETY	11900114080	0	1	1	1	1	1	1	1	0	1					8
13	UJJAL DAS	11900114081	1	1	1	1	1	1	1	1	0	1					9
14	VINITA KUMARI	11900114082	1	1	1	1	1	0	0	1	1	0					7
15	ANIRBAN HALDAR	11900114086	1	0	1	0	1	1	0	0	1	1					6
16	ADRIJA PAUL	11900115095	1	1	1	1	1	1	0	1	0	1					8
17	BINDHYA MANGAR	11900115096	1	1	1	1	0	1	1	1	0	0					7
18	POOJA UPADHYAY	11900115097	1	1	1	1	1	1	0	0	1	1					8
19	RAJAT MUKHIA	11900115098	1	1	1	1	0	1	1	1	0	1					8
20	SHRADHANJALI PRADHAN	11900115099	1	1	1	1	1	1	0	1	0	1					8
21	RATNADEEP BHATTACHARYA	11900114048	0	1	1	1	1	1	0	1	1	1					8

**Siliguri Institute of Technology**  
**RECORDS OF ASSIGNMENTS/QUIZ**  
**Paper Name: Database Management System**  
**Paper Code: CS 601**

SN	NAME	ROLL NO.	Assign - I	Assign - II	Assign - III	SN	NAME	ROLL NO.	Assign - I	Assign - II	Assign - III
1	RAKESH KUMAR	11900114049	1			21	SNEHA PARIJAAT	11900114069	1		
2	RISAB BISWAS	11900114050	1			22	SOHAM SARKAR	11900114070	1		
3	RISHITA CHOWDHURY	11900114051	1			23	SOURAVENDU NANDY	11900114071	1		
4	RIYA MITRA	11900114052	1			24	SOUVIK BISWAS	11900114072	1		
5	RUPAM MITRA	11900114053	1			25	SRIJA GHOSH	11900114073	1		
6	SACHIN KUMAR SAHA	11900114054	1			26	SUBHAM GUHA	11900114074	1		
7	SAGAR BHATTARAI	11900114055	1			27	SUBHOJIT KUNDU	11900114075	1		
8	SAGARIKA MITRA	11900114056	1			28	SUDIPTA SAHA	11900114076	1		
9	SAHITYA KAUSHIK	11900114057	1			29	SURAJ SHARMA	11900114077	1		
10	SAMIK ANWAR	11900114058	1			30	SURAJIT KUMAR DAS	11900114078	1		
11	SAMRAT BHATTACHARJEE	11900114059	1			31	SWARNAVA MUKHERJEE	11900114079	1		
12	SANDIPAN CHAKRABORTY	11900114060	1			32	SWEETY	11900114080	1		
13	SANGAM GURUNG	11900114061	1			33	UJJAL DAS	11900114081	1		
14	SANTANU RAKSHIT	11900114062	1			34	VINITA KUMARI	11900114082	1		
15	SAPTARSHI GHOSH	11900114063	1			35	ANIRBAN HALDAR	11900114086	1		
16	SAYAN CHAKRABORTY	11900114064	1			36	ADRIJA PAUL	11900115095	1		
17	SHALINI PRADHAN	11900114065	1			37	BINDHYA MANGAR	11900115096	1		
18	SHALINI ROY CHOWDHURY	11900114066	1			38	POOJA UPADHYAY	11900115097	1		



19	SHASHI PATEL	KANT	11900114067	1		39	RAJAT MUKHIA	11900115098	1		
20	SHIRSANA GHATAK		11900114068	1		40	SHRADHANJALI PRADHAN	11900115099	1		
						41	RATNADEEP BHATTACHARYA	11900114048	1		

**Siliguri Institute of Technology**  
**LIST OF PRACTICAL'S**  
**Paper Name: Database Management System Lab**  
**Paper Code: CS 691**

SI No.	Details of Experiments	Hours Allotted																														
P1	<p>Q1. a) Create a table 'STUDENT' with following structures:-</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Col. Name</th> <th style="text-align: left;">Type</th> <th style="text-align: left;">Width</th> </tr> </thead> <tbody> <tr> <td>ROLL</td> <td>NUMBER</td> <td>2</td> </tr> <tr> <td>NAME</td> <td>VARCHAR2</td> <td>15</td> </tr> <tr> <td>EXAMDATE</td> <td>DATE</td> <td></td> </tr> </tbody> </table> <p>f) Add a primary key constraint on column 'NAME'.  g) Drop the primary key of the table 'STUDENT'.  h) Add a primary key on col. 'ROLL' in table 'STUDENT'.  i) Insert following data:-</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">ROLL</th> <th style="text-align: left;">NAME</th> <th style="text-align: left;">EXAMDATE</th> </tr> </thead> <tbody> <tr> <td>11</td> <td>Sourav</td> <td>01-JUN-10</td> </tr> <tr> <td>12</td> <td>Kamal</td> <td>01-JUN-10</td> </tr> <tr> <td>13</td> <td>Rahul</td> <td>01-JUN-10</td> </tr> <tr> <td>14</td> <td>Sovan</td> <td>01-DEC-10</td> </tr> <tr> <td>15</td> <td>Shyamal</td> <td>01-DEC-10</td> </tr> </tbody> </table>	Col. Name	Type	Width	ROLL	NUMBER	2	NAME	VARCHAR2	15	EXAMDATE	DATE		ROLL	NAME	EXAMDATE	11	Sourav	01-JUN-10	12	Kamal	01-JUN-10	13	Rahul	01-JUN-10	14	Sovan	01-DEC-10	15	Shyamal	01-DEC-10	1
Col. Name	Type	Width																														
ROLL	NUMBER	2																														
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13	Rahul	01-JUN-10																														
14	Sovan	01-DEC-10																														
15	Shyamal	01-DEC-10																														
P2	<p>Q2. a) Create a table 'MARKS' with following structures:-</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Col. Name</th> <th style="text-align: left;">Type</th> <th style="text-align: left;">Width</th> </tr> </thead> <tbody> <tr> <td>ROLL</td> <td>NUMBER</td> <td>2</td> </tr> <tr> <td>MATH</td> <td>NUMBER</td> <td>2</td> </tr> <tr> <td>ENG</td> <td>NUMBER</td> <td>3</td> </tr> </tbody> </table> <p>b) Add a foreign key constraint on column 'ROLL' in 'MARKS' table referencing column 'ROLL' in table 'STUDENT' and name the constraint as FK_ROLL.  c) Change width of 'MATH' column to 3.</p>	Col. Name	Type	Width	ROLL	NUMBER	2	MATH	NUMBER	2	ENG	NUMBER	3	1																		
Col. Name	Type	Width																														
ROLL	NUMBER	2																														
MATH	NUMBER	2																														
ENG	NUMBER	3																														

	<p><b>d)</b> Add a check constraint on 'ENG' column so that permissible value for 'ENG' attribute lies between 0 and 50 and name the constraint as CHK_ENG.</p> <p><b>e)</b> Try to insert following data:- &lt;11,90,80&gt;</p> <p><b>f)</b> Now insert following data:</p> <table border="1"> <thead> <tr> <th>ROLL</th> <th>MATH</th> <th>ENG</th> </tr> </thead> <tbody> <tr> <td>11</td> <td>90</td> <td>45</td> </tr> <tr> <td>12</td> <td>45</td> <td>46</td> </tr> <tr> <td>13</td> <td>70</td> <td>30</td> </tr> <tr> <td>14</td> <td>90</td> <td>20</td> </tr> <tr> <td>15</td> <td>45</td> <td>46</td> </tr> </tbody> </table> <p><b>g)</b> Add a new column 'TOTAL' in table 'MARKS'. The data type is number and width is 3.</p> <p><b>h)</b> Update column 'TOTAL' in 'MARKS' table with proper data.</p>	ROLL	MATH	ENG	11	90	45	12	45	46	13	70	30	14	90	20	15	45	46	
ROLL	MATH	ENG																		
11	90	45																		
12	45	46																		
13	70	30																		
14	90	20																		
15	45	46																		
P3	<p><b>i)</b> Display data from table 'STUDENT' with column heading ROLL_NO, STD_NAME.</p> <p><b>j)</b> List students having name starting with letter 'S'.</p> <p><b>k)</b> List students where second character of name is 'a'.</p> <p><b>l)</b> Display EXAMDATE in 'DD/MM/YYYY' format.</p> <p><b>m)</b> Display NAME, MATH, ENG and PER of all students. Assume, total marks of math are 100 and eng is 50.</p> <p><b>n)</b> Display names of all students who are getting above 65 of math.</p> <p><b>o)</b> Display names of students getting marks in eng between 20 and 40.</p> <p><b>p)</b> Display name of the student, who get the same marks (math) as that of 'Shyamal'.</p>	1																		
P4	<p>HOTEL (HOTEL_NO, NAME, ADDRESS )</p> <p>ROOM( ROOM_NO, HOTEL_NO, TYPE, PRICE)</p> <p>BOOKING(HOTEL_NO, GUEST_NO, DATE_FROM, DATE_TO, ROOM_NO)</p> <p>GUEST(GUEST_NO, NAME, ADDRESS)</p> <p>Where HOTEL contains hotel details and HOTEL_NO is the Primary Key. ROOM contains room details for each hotel and (HOTEL_NO,ROOM_NO) forms the Primary key. BOOKING contains details of the bookings and the Primary Key comprises (HOTEL_NO, GUEST_NO, DATE_FORM) and GUEST contains guest details and GUEST_NO is the Primary key and mention the Foreign Key constraints.</p>	1.5																		
P5	<p>ix. List full details of hotels in Mumbai</p> <p>x. List the name and addresses of all guests in New Delhi, alphabetically ordered by the name.</p> <p>xi. List all double or family rooms with a price below Rs. 800 per day, in ascending ordered.</p>	1.5																		

	<p>xii. List the bookings for which no date_to has been specified.</p> <p>xiii. What is the total daily revenue from all the double room?</p> <p>xiv. How many different guests have made booking for august, 2015</p> <p>xv. List the price and type of all rooms at the hotel Land Mark.</p> <p>xvi. What is the total income from booking for the hotel Manor today.</p>																																																							
P6	<p><b>1.a)</b> Create tables for following functional Dependencies -  <math>eno \rightarrow \{ename, address\}</math>  <math>pno \rightarrow \{pname, plocation\}</math>  <math>\{eno, pno\} \rightarrow hours</math>  plocation must be among MUMBAI, KOLKATA, CHENNAI, and DELHI.</p> <p><b>b)</b> Mention primary key, foreign key and CHECK constraints.</p> <p><b>c)</b> i. Insert following data for EMP:-  <table border="1"> <thead> <tr> <th>ENO</th> <th>ENAME</th> <th>ADDRESS</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Swarnali</td> <td>MUMBAI</td> </tr> <tr> <td>2</td> <td>Deboshree</td> <td>MUMBAI</td> </tr> <tr> <td>3</td> <td>Moumita</td> <td>KOLKATA</td> </tr> <tr> <td>4</td> <td>Piyali</td> <td>CHENNAI</td> </tr> <tr> <td>5</td> <td>Surupa</td> <td>DELHI</td> </tr> </tbody> </table> </p> <p>ii. Insert following data for Proj:-  <table border="1"> <thead> <tr> <th>PNO</th> <th>PNAME</th> <th>PLOCATION</th> </tr> </thead> <tbody> <tr> <td>101</td> <td>BANKING</td> <td>DELHI</td> </tr> <tr> <td>102</td> <td>LIBRARY</td> <td>MUMBAI</td> </tr> <tr> <td>103</td> <td>RAILWAY</td> <td>KOLKATA</td> </tr> <tr> <td>104</td> <td>FINANCE</td> <td>CHENNAI</td> </tr> <tr> <td>105</td> <td>ANALYZER</td> <td>DELHI</td> </tr> </tbody> </table> </p> <p>iii. Insert following data for EmpProj:-  <table border="1"> <thead> <tr> <th>ENO</th> <th>PNO</th> <th>HOURS</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>101</td> <td>10</td> </tr> <tr> <td>2</td> <td>103</td> <td>12</td> </tr> <tr> <td>3</td> <td>104</td> <td>19</td> </tr> <tr> <td>3</td> <td>105</td> <td>29</td> </tr> <tr> <td>5</td> <td>102</td> <td>6</td> </tr> </tbody> </table> </p> <p><b>d)</b> List the name of employees who are working on more than one project</p>	ENO	ENAME	ADDRESS	1	Swarnali	MUMBAI	2	Deboshree	MUMBAI	3	Moumita	KOLKATA	4	Piyali	CHENNAI	5	Surupa	DELHI	PNO	PNAME	PLOCATION	101	BANKING	DELHI	102	LIBRARY	MUMBAI	103	RAILWAY	KOLKATA	104	FINANCE	CHENNAI	105	ANALYZER	DELHI	ENO	PNO	HOURS	1	101	10	2	103	12	3	104	19	3	105	29	5	102	6	2
ENO	ENAME	ADDRESS																																																						
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3	105	29																																																						
5	102	6																																																						
P7	<p><b>2.a)</b> Create a table PHONE_BOOK. The fields of the table are NAME, ADDRESS, PHONE_NO.</p> <p><b>b)</b> Insert at least 6 entries into the table of which there are two pairs of duplicate entries.</p> <p><b>c)</b> Delete duplicate rows from the table.</p> <p><b>d)</b> Write a query to select first two rows from the table.</p> <p><b>e)</b> Write a query to select last two rows from the table.</p>	1																																																						
P8	<p><b>3.a)</b> Create a table employee and insert following data into the table.</p> <table border="1"> <thead> <tr> <th>EMPNO</th> <th>EMPNAME</th> <th>MANAGERNO</th> <th>SALARY</th> </tr> </thead> <tbody> <tr> <td>E1</td> <td>Amal</td> <td>--</td> <td>30,000</td> </tr> <tr> <td>E2</td> <td>Bimal</td> <td>E1</td> <td>25,000</td> </tr> <tr> <td>E3</td> <td>Kamal</td> <td>E1</td> <td>20,000</td> </tr> <tr> <td>E4</td> <td>Nirmal</td> <td>E2</td> <td>15,000</td> </tr> </tbody> </table>	EMPNO	EMPNAME	MANAGERNO	SALARY	E1	Amal	--	30,000	E2	Bimal	E1	25,000	E3	Kamal	E1	20,000	E4	Nirmal	E2	15,000	3																																		
EMPNO	EMPNAME	MANAGERNO	SALARY																																																					
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E4	Nirmal	E2	15,000																																																					

	<p>E5 Shymal E2 21,000 E6 Parimal E3 10,000</p> <p><b>b)</b> Retrieve the names of the employees and the names of their respective managers from the employee table.  <b>c)</b> Retrieve the name of the employee who is earning second maximum salary.  <b>d)</b> Retrieve the name of the employee who is earning nth highest salary.  <b>e)</b> Retrieve the names of employees whose salary is greater than the salary of all the employees whose manager no. is E1.  <b>f)</b> Get the details of all employees whose salary is lesser than the average salary of the employee.</p>																																		
P9	<p><b>4.a)</b> Create a table account and insert following data into the table Account.</p> <table border="1"> <thead> <tr> <th>ACCOUNTNO</th> <th>BRANCHNAME</th> <th>AMOUNT</th> </tr> </thead> <tbody> <tr> <td>A1</td> <td>Kolkata</td> <td>50000</td> </tr> <tr> <td>A2</td> <td>Howrah</td> <td>40000</td> </tr> <tr> <td>A3</td> <td>Howrah</td> <td>40000</td> </tr> <tr> <td>A4</td> <td>Kolkata</td> <td>20000</td> </tr> <tr> <td>A5</td> <td>Durgapur</td> <td>30000</td> </tr> </tbody> </table> <p><b>b)</b> Create a view that will show branch name and total amount of that branch. The name of view will be acc_view.  <b>c)</b> Select the branch names having total amount greater than 50,000  i) Using account1 view  ii) Without using view.</p> <p><b>5.a)</b> Create a table Marks and insert following data into the table.</p> <table border="1"> <thead> <tr> <th>STUDENTNAME</th> <th>SUBJECT NAME</th> <th>MARKS</th> </tr> </thead> <tbody> <tr> <td>Amit</td> <td>DBMS</td> <td>80</td> </tr> <tr> <td>Amit</td> <td>OS</td> <td>70</td> </tr> <tr> <td>Bimal</td> <td>DBMS</td> <td>70</td> </tr> <tr> <td>Bimal</td> <td>OS</td> <td>70</td> </tr> </tbody> </table> <p><b>b)</b> Retrieve the name of the students who are getting marks in DBMS above 75 but who are getting marks in OS less than 75.  <b>c)</b> Write a query to retrieve student names from the marks table and output will look like:-  Mr. A  Mr. A  Mr. B  Mr. B</p>	ACCOUNTNO	BRANCHNAME	AMOUNT	A1	Kolkata	50000	A2	Howrah	40000	A3	Howrah	40000	A4	Kolkata	20000	A5	Durgapur	30000	STUDENTNAME	SUBJECT NAME	MARKS	Amit	DBMS	80	Amit	OS	70	Bimal	DBMS	70	Bimal	OS	70	3
ACCOUNTNO	BRANCHNAME	AMOUNT																																	
A1	Kolkata	50000																																	
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A5	Durgapur	30000																																	
STUDENTNAME	SUBJECT NAME	MARKS																																	
Amit	DBMS	80																																	
Amit	OS	70																																	
Bimal	DBMS	70																																	
Bimal	OS	70																																	
P10	<p>6.Create a unique index on ENO column of the table EMP.</p> <p>7.The table Sales_Order_Detail(Product_No, Suppliers_No, Order_ID) has more 50,000 records for 500 distinct Product. Create an index on the Product_No column, which is the best suited according to the above stated scenario.</p>	3																																	

8. Create the following object type rectangle with the attributes length, width and a method area (), which computes the area of the rectangle; as follows.

```
CREATE TYPE rectangle AS OBJECT
(length NUMBER,
width NUMBER,
MEMBER FUNCTION area RETURN NUMBER
DETERMINISTIC
);
/
CREATE OR REPLACE TYPE BODY rectangle AS
MEMBER FUNCTION area RETURN NUMBER IS
BEGIN
RETURN (length*width);
END;
/
```

Now, create a table rect\_tab of type rectangle and create a function-based index on the method area().

9. Make a group of 5 students. Open two terminals. From one terminal login into the Oracle server with the user name FACULTY and password FACULTY. (This user has the **CREATE USER** system privilege. From the other terminal do the experiments with the newly created user.

- g. Create a user **STUDENT** with following characteristics
  1. The password student123
  2. Default tablespace **SYSTEM**, with a quota of 10 megabytes
  3. Temporary tablespace **TEMP**
  4. Access to the tablespace **SYSTEM**, with a quota of 5MB.
  5. Limits on database resources defined by the profile **DEFAULT**
- h. After successfully creating this user, try to connect using this username and password. Note the error message and state the reason.
- i. Grant the role Connect to the user with admin option.
- j. Grant Resource and other necessary system privileges to this user. (e.g. Alter, Create, Insert, Delete, Grant etc.)
- k. Now Create the Table Employee(Eno Number(2), EName Varchar2(15)).
- l. Insert 3 records. Try different DML operations.

10.a. Log in as CSEA (User ID: CSEA, Password: CSEA).

	<p>Display all records from the Employee table of the user Student. Try to insert or update any record. Note down the error.</p> <p>b. Grant the object privileges on the table STUDENT.EMPLOYEE to CSEA with without Grant option.</p> <p>c. Now do the experiments given in 2a.</p> <p>d. Log in as CSEA. Try to grant the object Privilege on STUDENT.EMPLOYEE to the user CSEB. Note down the error. How this can possible.</p>	
P11	<p>Write a PL/SQL program to check the given number is even or odd.</p> <p>Write a program to check whether a given number is prime or not.</p> <p>Write a PL/SQL program to check whether a number is Armstrong number or not.</p>	3
P12	<p>a) Write a procedure to calculate sum of two numbers.</p> <p>b) Write a PL/SQL function, which returns maximum of the three numbers.</p> <p>c) Write a function, which returns true if employee exist in employee table, otherwise it returns false.</p> <p>The Table is as follows: EMPLOYEE (ENO, ENAME, SALARY, MGRNO)</p>	3
P13	<p>a) Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated areas in table.</p> <p>b) Add an extra column diameter to the table circle and update the diameter column for each entry diameter=2* radius.</p> <p>c) Print the number of records in the circle table with the help of an explicit cursor.</p> <p>a) A HRD manager has decided to raise the salary for all the employees in department number 20 by 0.05. Whenever any such raise is given to employees an audit trail of the same is maintained in the <b>EMP_RAISE</b> table. The <b>EMP_RAISE</b> table holds the employee number, the date when the raise was given and the raise amount.</p> <p>b) Write a PL/SQL block to update the salary of each employee of dept-no 20 appropriately and insert a record in the <b>EMP_RAISE</b> table as well.</p> <p>Tables are as follows: EMPLOYEE (EMP_CODE, ENAME, JOB, SALARY, DEPTNO) EMP_RAISE(EMP_CODE, RAISE_AMOUNT, RAISE_DATE)</p>	3
P14	<p>Create a transparent audit system for a table CLIENT_MASTER. The system must keep track of the records that are being deleted or updated. The functionality being when a record is deleted or modified</p>	3

<p>the original record details and the date of operations is stored in the audit-client table, the delete or update is allowed to go through.</p> <p>Write a trigger for the above problem.</p> <p>The Tables are as follows:-</p> <p>CLIENT_MASTER(CLIENT_NO, NAME, ADDRESS, CITY, BAL-DUE)</p> <p>AUDIT_CLIENT(CLIENT_NO, NAME,BAL_DUE,OPERATION, USER_ID, OP_DATE)</p>
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**Siliguri Institute of Technology**  
**SESSIONAL/PRACTICAL PERFORMANCE RECORD**  
**Paper Name: Database Management System Lab**  
**Paper Code: CS 691**

FACULTY NAME : Mrs. Jayashree Singha

YEAR: 2017

STREAM: B.TECH[CSE]      YEAR: 3<sup>RD</sup>      SEMESTER: 2<sup>nd</sup>      SECTION: B

SN	NAME	ROLL NO	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	TOTAL[40]
1	RAKESH KUMAR	11900114049	3	3	3	2	3	3	2	3	2	3	3	2	2	2	36
2	RISAB BISWAS	11900114050	3	3	3	3	3	3	3	3	2	3	3	2	3	3	40
3	RISHITA CHOWDHURY	11900114051	3	3	3	3	2	3	3	2	2	3	2	2	2	2	35
4	RIYA MITRA	11900114052	3	3	3	3	3	3	2	2	1	2	2	2	3	3	35
5	RUPAM MITRA	11900114053	3	3	2	2	2	3	2	2	2	1	2	1	1	1	27
6	SACHIN KUMAR SAHA	11900114054	3	3	2	3	2	3	2	2	2	3	3	1	2	2	33
7	SAGAR BHATTARAI	11900114055	3	3	3	3	3	3	2	2	1	2	3	2	3	3	36
8	SAGARIKA MITRA	11900114056	3	3	3	3	2	3	3	2	2	3	3	2	2	3	37
9	SAHITYA KAUSHIK	11900114057	3	3	3	3	3	2	3	3	2	3	2	2	3	3	38
10	SAMIK ANWAR	11900114058	3	3	3	3	3	3	3	3	2	3	3	2	3	3	40
11	SAMRAT	11900114059	3	3	2	2	3	3	3	3	2	2	2	1	1	1	31

	BHATTACHARJEE																	
12	SANDIPAN CHAKRABORTY	11900114060	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	20
13	SANGAM GURUNG	11900114061	3	3	3	2	3	3	2	2	2	2	3	2	1	1		32
14	SANTANU RAKSHIT	11900114062	3	3	2	2	2	2	2	2	2	3	3	2	2	2		32
15	SAPTARSHI GHOSH	11900114063	3	3	2	3	2	2	2	2	2	2	2	1	2	2		30
16	SAYAN CHAKRABORTY	11900114064	2	2	2	2	3	3	3	3	2	3	3	1	1	1		31
17	SHALINI PRADHAN	11900114065	3	3	3	3	3	3	2	2	1	2	2	2	3	3		35
18	SHALINI ROY CHOWDHURY	11900114066	3	3	3	3	2	3	3	2	2	3	3	2	2	3		37
19	SHASHI KANT PATEL	11900114067	3	3	2	2	3	3	3	3	2	3	2	2	1	1		33
20	SHIRSANA GHATAK	11900114068	3	3	2	3	2	2	2	2	2	3	3	2	2	1		32
21	SNEHA PARIJAAT	11900114069	3	3	3	2	3	3	2	2	2	2	3	2	3	3		36
22	SOHAM SARKAR	11900114070	3	3	3	3	2	3	3	2	2	3	3	2	3	3		38
23	SOURAVENDU NANDY	11900114071	3	3	3	2	3	3	1	2	1	2	3	3	3	3		35
24	SOUVIK BISWAS	11900114072	3	3	3	3	2	3	3	2	2	3	3	2	2	3		37
25	SRIJA GHOSH	11900114073	3	2	3	2	3	2	3	2	2	3	2	2	1	2		32
26	SUBHAM GUHA	11900114074	3	3	3	2	2	1	2	2	1	2	2	2	1	2		28
27	SUBHOJIT KUNDU	11900114075	3	3	3	3	2	3	3	2	2	3	2	2	2	3		36
28	SUDIPTA SAHA	11900114076	2	2	3	2	3	2	3	3	2	3	2	2	2	2		33
29	SURAJ SHARMA	11900114077	3	3	3	3	2	3	3	3	2	3	3	2	2	3		38
30	SURAJIT KUMAR DAS	11900114078	3	3	3	3	3	3	3	3	2	3	3	2	3	3		40
31	SWARNAVA MUKHERJEE	11900114079	3	3	3	3	3	3	3	3	2	3	3	2	3	3		40



32	SWEETY	11900114080	3	3	2	3	3	2	2	2	2	2	2	3	2	2	2	33
33	UJJAL DAS	11900114081	3	3	3	2	2	3	3	2	2	3	3	2	2	2	2	35
34	VINITA KUMARI	11900114082	3	3	2	2	2	2	2	2	2	2	2	2	2	2	1	29
35	ANIRBAN HALDAR	11900114086	3	2	2	3	2	2	2	2	2	2	2	2	2	2	2	30
36	ADRIJA PAUL	11900115095	2	2	2	3	3	2	3	3	2	3	3	2	3	3	3	36
37	BINDHYA MANGAR	11900115096	2	2	1	2	1	2	2	2	2	2	2	2	2	2	2	26
38	POOJA UPADHYAY	11900115097	3	3	2	3	2	2	2	2	2	2	3	2	2	2	2	32
39	RAJAT MUKHIA	11900115098	3	3	2	3	2	3	3	2	2	2	3	2	2	3	3	35
40	SHRADHANJALI PRADHAN	11900115099	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	27
41	RATNADEEP BHATTACHARYA	11900114048	2	2	2	2	2	3	2	2	2	1	2	1	1	1	1	25

NAME WITH ROLL NUMBERS OF STUDENT WHOSE ACADEMIC PERFORMANCE IS NOT SATISFACTORY			
Sl.	Name of Student	Roll No.	Remedial measures taken by teacher
1	RUPAM MITRA	11900114053	<ul style="list-style-type: none"> <li>• Additional doubt clearing sessions</li> <li>• Highlighting important and frequently asked questions</li> </ul>
2	SAMRAT BHATTACHARJEE	11900114059	
3	SAPTARSHI GHOSH	11900114063	
4	SAYAN CHAKRABORTY	11900114064	
5	BINDHYA MANGAR	11900115096	
6	SHRADHANJALI PRADHAN	11900115099	
7	RATNADEEP BHATTACHARYA	11900114048	
8			
9			
10			
11			

## **CERTIFICATE**

I, the undersigned, have completed the course allotted to me as shown below

Sl. No.	Semester	Subject with Code	Total Chapters	Remarks
1.	6 <sup>th</sup>	Database Management System (CS601) Database Management System Laboratory (CS 691)	7	

Date :	<b>Signature of Faculty</b>
--------	-----------------------------

<b>Submitted to HOD</b>
<b>Certificate by HOD</b>
I, the undersigned, certify that <b>Prof. Jayashree Singha</b> has completed the course work allotted to him satisfactorily / not satisfactorily.

Date :	<b>Signature of HOD</b>
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<b>Submitted to Director</b>
------------------------------

Date :	<b>Signature of Director</b>
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**SILIGURI INSTITUTE OF TECHNOLOGY**  
**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**  
**1<sup>ST</sup> INTERNAL EXAM- 2017**

**PAPER NAME: DATABASE MANAGEMENT SYSTEM**

**PAPER CODE: CS 601**

FULL MARKS: 30

TIME: 1HR 30 MINS

**Answer all questions (each question carries 10 marks)**

- Q4.** Construct an E-R diagram for a company database that has to be designed to keep track of employees, departments and projects. The database should also be able to keep track of dependents of each employee for medical purpose. You can make appropriate assumptions to make the specification complete.

Convert E-R schema into relational schemas.

**7 + 3**

**OR**

Describe the three-schema architecture. Why do we need mappings between schema levels?

What is the difference between logical data independence and physical data independence? Which one is harder to achieve? Why?

**4+1+3+2**

**OR**

What do you mean by degree and cardinality of a relationship? Explain with suitable example specialization and generalization. Explain the terms super key and candidate key with example.

**2+(2+2)+(2+2)**

- Q5.** Compare **left outer join**, **right outer join** and **full outer join** with example.

**( 2 + 2 + 2 ) + 2+ 2**

Consider following schemas –

Sailor (sid, sname, rating, age)

Reserve (sid, bid, day)

Give an expression in **Relational Algebra** for each of the following queries :

- c. Find names of the sailors who have reserved boat number 203.
- d. Find names and ages of the sailors who have reserved a boat.

**OR**

- C. Consider the following schemas:

Employee (employee\_no, employee\_name, salary)

Project (project\_no, project\_name, project\_manager)

Works\_for (project\_no, employee\_no)

Write the following queries in **Relational Algebra**:

**3+3**

- iii. List the name of employees working on project 'P2' but not on project 'P1'.
- iv. List the name of employees who are working on a project for which 'E2' is the project manager.

- D. Consider the following tables:

Employee (eno, fname, lname, dob, address, salary, dno)

Department (dnumber, dname)

Write the following query in both **Tuple and Domain Relational Calculus**:

**2+2**

- ii. Find the name and address of all employees who work for the 'Sales' department.

- Q6.** Consider the following schemas:

Employee (employee\_name, street, city)

Works (employee\_name, company\_name, salary)

Company (company\_name, city)

Formulate the following queries in **SQL**

**2+2+3+3**

- a. Find the names and cities of residence of all employees who work for 'FBC'.
- b. Find all employees who live in the same cities as the companies for which they work.
- c. Assume that the companies may be located in several cities. Find all companies located in every city in which 'SBC' is located.
- d. Find the company that has most employees.

**SILIGURI INSTITUTE OF TECHNOLOGY**  
**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

**2<sup>nd</sup> INTERNAL EXAM- 2017**

**PAPER NAME: DATABASE MANAGEMENT SYSTEM**

**PAPER CODE: CS 601**

**FULL MARKS: 30**

**TIME: 1HR 30 MINS**

**Answer any one question form each group, each question carries 10 marks**

**Group- A (CO4)**

- a) Define multi-value dependency with suitable example.
- b) Compute the closure of the following set of functional dependencies for the relation schema R.  
 $R=(A, B, C, D, E); F=\{A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A\}$
- c) Consider the relation schema  $R(A, B, C)$  with a set of functional dependencies  
 $F=\{A \rightarrow BC, B \rightarrow C, A \rightarrow B, AB \rightarrow C\}$ . Compute the irreducible set for F. 3+3+4

**OR**

- a) Consider a relation schema  $R(A, B, C, D, E, F)$  with a set of functional dependencies  
 $F=\{A \rightarrow BCDEF, BC \rightarrow ADEF, B \rightarrow F, D \rightarrow E\}$ .
- I) Find the candidate keys for R.
- II) Decompose r into 3NF.
- III) If another functional dependency R is introduced, what will be the resulting decomposed relation schema?
- IV) Is the decomposition lossless? 2+4+2+2

**OR**

- a) Consider an ordered file with  $r=30000$  records (fixed length) of size  $R=100$  bytes stored on a disk with block size  $B=1024$  bytes. Suppose each index entry in the index file takes 15 bytes (9 bytes for index value, 6 bytes for pointer). What is the number of accessing blocks for the primary index?
- b) Consider a B-tree for the following set of key values: [3,4,6,8,12,17,23,29,31,10,11] when the number of pointers that will fit in one node is: 3. 5+5

**Group-B (CO5)**

- a) Explain 2PL with example.
- b) Prove 2PL protocol ensures serializability.
- c) What do you mean by deadlock in a multi-user environment?
- d) When a schedule is called recoverable schedule? Explain with a suitable example. 3+3+2+2

**OR**

- E. Discuss ACID properties of transaction. 4+(4+2)
- F. Describe one non-log based recovery technique. What is the limitation of this technique?

**OR**

- a) Explain : 'deadlock cannot occur in timestamp based protocol'.
- b) Find out whether the following schedule S is conflict serializable or not?  
 $S: [R3(Y); R3(Z); R1(X); W1(X); W3(Z); W3(Y); R2(Z); R1(Y); W1(Y); R2(Y); W2(Y); R2(X); W2(X)]$   
If conflict serializable then specify the equivalent serial schedule.
- c) What do you mean by shared and exclusive lock? 4+(3+1)+2

**Group-C (CO3)**

Consider the following relations and write the SQL queries: 5X2=10

Book: {isbn, title, subject, pb\_yr, price, aid, pid}

Author: {aid, name, city}

Publisher: {pid, name, city}

Book\_Order: {orderNo, isbn, quantity, date }

- i) Display the title, new\_price of all books published after year 2004. (new\_price= price\*0.15)
- ii) Get the average price as AVG\_PR of each subject books.
- iii) Get the title, subject and price of all books written by Navathe, published by PHI.

- iv) Retrieve the name of publishers who publishes more than 5 books.
- v) Get the id and name of the publishers who have not published any books.

Consider the following relations and write the SQL queries:

Employee (employee\_name, street, city)

Works (employee\_name, company\_name, salary)

Company (company\_name, city)

Manages (employee\_name, manager\_name)

Formulate the following queries in **SQL**

**2+3+2+3**

- e. Find the names, street and cities of residence of all employees who work for 'First Bank Corporation' and earn more than \$10,000.
- f. Find all employees in the database who live in the same cities as the companies for which they work.
- g. Find all employees in the database who earn more than each employee of Small Bank corporation.
- h. Find the names of all employees who work for PQR.



## Assignment -1 for 3<sup>rd</sup> year CSE 2017

Year: 3<sup>RD</sup> Semester: 2<sup>nd</sup> Section: A

**Paper Name:** Database Management System

**FM:** 60

**Paper Code:** CS 601

**Submission Date:** 18/03/2016

4. Construct an E-R diagram for a Car-insurance company that has a set of customers, each of whom owns one or more cars. Each car has associated with it zero to any number of recorded accidents. Convert the E-R schema into Relational schema. (5)
5. Consider following relation schemas (7+7+7)  
Sailors(sid, sname, rating, age)  
Boats(bid, bname, color)  
Reserves(sid, bid, day)  
Write down following queries in RA, TRC and SQL expressions
- h) Find all sailors with rating above 7
  - i) Find names and ages of sailors with rating above 7
  - j) Find the sailor name, boat id and reservation date for each reservation
  - k) Find the names of the sailors who have reserved boat number 103.
  - l) Find the names of the sailors who have reserved a red boat.
  - m) Find the names of the sailors who have reserved at least two boats.
  - n) Find the names of the sailors who have reserved all boats.
6. Consider following two relation schemas:  
Employee (eno, ename, job, hiredate, managerno, salary, comm., dno)  
Dept (dno, dname, location)  
**Solve the following queries using SQL:** (5)
- i) List the name of the employees with their immediate higher authority.
  - ii) List the name of the employee whose name either starts or ends with "S".
  - iii) List the department name and the total salary payable in each department.
  - iv) List out the employees who earn more than the average salary of their department.
  - v) List the names of the employees who are working more than thirty years in the company.
9. Consider a relation schema R(A, B, C, D). For each of the following sets of FDs, assuming those are the only dependencies that hold on R, do the following: 5x3
- i) Identify the candidate key(s) for R.
  - ii) Identify the best normal form that R satisfies (1NF, 2NF, 3NF, or BCNF).
  - iii) If R is not in BCNF, decompose it into a set of BCNF relations that preserve the dependencies.
    - 1.  $C \rightarrow D, C \rightarrow A, B \rightarrow C$
    - 2.  $B \rightarrow C, D \rightarrow A$
    - 3.  $ABC \rightarrow D, D \rightarrow A$
    - 4.  $A \rightarrow B, BC \rightarrow D, A \rightarrow C$
    - 5.  $AB \rightarrow C, AB \rightarrow D, C \rightarrow A, D \rightarrow B$
10. Prove that any relation schema with two attributes is in BCNF. (4)
11. Prove that every 3NF schema is in 2NF. (4)
12. Prove that a relation with primary key of single attribute is always in 2NF. (3)
13. Suppose schema R = (A,B,C,D,E) with F = { A → BC, CD → E, B → D, E → A } is decomposed into (A, B, C) and (A,D,E). Show that this decomposition is lossless-join decomposition. (3)



Director  
Siliguri Institute of Technology







## **SILIGURI INSTITUTE OF TECHNOLOGY CIVIL ENGINEERING**



# **COURSE FILE**

**5TH SEM, 3RD YEAR, 2021**

**PAPER DESCRIPTION:** Design of reinforced concrete structures is an introductory design course in civil engineering. In this course, basic elements governed by bending, shear, axial forces or combination of them are identified and are considered as building blocks of the whole structure. Different methods of design will be briefly described before

introducing the limit states of collapse and serviceability. The designs of elements such as beams, slabs, columns, stairs and foundations will be done as per IS 456:2000.

**PAPER CODE : CE(PC)501**

# Course Description

**Course Title: Design of RC Structures**

**Code: CE(PC)501**

**Semester: 5<sup>th</sup> Year: 3<sup>rd</sup>**

**Name of the Faculty: Pooja Barma**

**E-mail: poojabarma09@gmail.com**

## Class Schedule

Lecture		Tutorial	Practical	
MONDAY (11:40 a.m. to 12:30 p.m.)	THURSDAY (11:40 a.m. to 12:30 p.m.)	THURSDAY (12:30p.m. to 1:20 p.m.)	WEDNESDAY (10:50am to 12:30pm)	THURSDAY (3:00pm to 4:40pm)

## Hours for meeting students:3 HOURS

MONDAY (11:40 a.m. to 12:30 p.m.)	1 HOUR
THURSDAY (11:40 a.m. to 12:30 p.m.)	2 HOUR

## i) Course Objective

To introduce the students to the fundamentals of reinforced concrete design with emphasis on the design of rectangular and T beams, short and slender columns, slabs, staircases and foundations.

## ii) Course Outcomes

- i. After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The student will be able to:

		Target
CO1	Understand material properties and design methodologies for reinforced concrete structures..	50% students will achieve 60% marks
CO2	Assess different types of loads and prepare layout for reinforced concrete structure	50% students will achieve 60% marks
CO3	Identify and apply the applicable industrial design codes relevant to the design of reinforced concrete members	50% students will achieve 60% marks
CO4	Analyse and design various structural elements of reinforced concrete building like beam, slab, column, footing and staircase	50% students will achieve 60% marks

<b>CO5</b>	Assessment of serviceability criteria for reinforced concrete beam and slab.	40% students will achieve 60% marks
<b>CO6</b>	Prepare structural drawings and detailing and produce design calculations and drawing in appropriate professional format	50% students will achieve 60% marks

- ii. Once the student has successfully complete this course, he/she must be able to answer the following questions or perform / demonstrate the following:

<b>Sl.</b>	<b>Question</b>	<b>BT Level</b>
1.	Factor of safety for steel in limit state is	1
2.	Maximum % of steel in beam is	1
3.	Modular ratio "m" =	1
4.	Load factor in limit state collapse theory for dead load and live load is	1
5.	The minimum % of tensile reinforcement(HYSD-415) in reinforced concrete beam should not be less than	2
6.	Minimum clear cover for slab is	1
7.	Bottom bars under the columns are extended into the interior of the footing slab to a distance greater than	2
8.	An R.C.C. column is treated as long if its slenderness ratio is greater than	2
9.	The diameter of longitudinal bars of a column should never be less than	1
10.	If R and T are rise and tread of a stair spanning horizontally, the steps are supported by a wall on one side and by a stringer beam on the other side, the steps are designed as beams of width	2
11.	The percentage of minimum reinforcement of the gross sectional area in slabs, is	2
12.	The maximum unsupported length between end restraints for a R.C. column is	2
13.	A column is termed as short when its slenderness ratio is	2
14.	The minimum cover to reinforcement in column should not be less than	1

15.	The amount of main reinforcement in a slab is based upon	2
16.	The weight of a foundation is assumed as	2
17.	A rectangular reinforced concrete section having a breadth of 350mm is reinforced with 2 bars of 28mm & 2 bars of 25mm diameter at an effective depth of 700mm. Adopting M-20 grade concrete & Fe-415 HYSD bars determine the ultimate moment of resistance of the section	3
18.	Calculate the ultimate moment of resistance of a T-beam having the following section properties: Width of flange= 1300mm Thickness of flange= 100mm Width of rib= 325mm Effective Depth=600mm Area of steel= 4000mm <sup>2</sup> Use M-20 grade concrete and Fe-415 Steel	3
19.	Write short notes on under-reinforced, balanced and over-reinforced section	2
20.	Design a Reinforced concrete beam of Rectangular Section using the following data. Effective span=8m Live-load=30kN/m Overall depth=650mm M-20 grade concrete and Fe-415 HYSD bars Width=300mm Effective cover= 50mm Effective Depth= 600mm	4
21.	Design a two way slab for a floor to suit the following data: Size of floor: 4m by 6m Edge condition= two adjacent edges discontinuous Use M-20 grade concrete and Fe-415 HYSD bars	4
22.	Design a simply supported reinforced concrete rectangular beam whose centre to centre distance between supports is 8 m and supported on brick walls of 300 mm thickness. The beam is subjected to imposed loads of 7.0 kN/m.	4
23.	Design a floor slab for an interior room, with clear dimensions of 3.5m x 9m. the slab is resting on 30 mm thick masonry walls. Use M20 concrete and Fe315 steel.	4
24.	Figure shows a clear area of 12 m x 8.5 m for a hall construction in a school. The slab is supported on beams of size 225 x 500 mm spaced at 4.0 m centers. The slab thickness is to be designed as 150 mm. Given the characteristic permanent action (excluding selfweight) is 1.5 kN/m <sup>2</sup> , characteristic variable action is 4.0 kN/m <sup>2</sup> . Use M 20 Concrete and Fe 415 steel.	4

25.	The main stair of an office building has to be located in a stair measuring 3.5m x5.5m the vertical distance between the floors is 3.75m. design the stairs. Allow a LL of 2000N/m <sup>2</sup> . Use M20 concrete and Fe415 Steel.	4
26.	A reinforced concrete short column 400mm x 400mm has to carry an axial load of 1200kN. Find the area of steel required. Use M20 concrete and Fe415 steel.	3
27.	A reinforced concrete column of 2.75m effective length carries an axial load of 1600 kN. Design the column using M20 concrete and Fe 415 steel.	4
28.	Design the reinforcements in a short column 400mm x 600mm subjected to an ultimate axial load of 1600 kN together with ultimate moments of 120 kNm and 90 kNm about the major and minor axis respectively. Use M20 concrete and Fe 415 steel.	4
29.	A square column 500mm x 500mm carries an axial load of 1500kN. Design the column and the square footing for the column. The safe bearing capacity of the soil is 225 Kn/m <sup>2</sup> . Use M20 concrete and Fe 415 steel.	4

### iii) Topic/Unit/Chapter Layout

Topic/Unit/Chapter	Lecture Hours	Laboratory hours
1. Introduction	1	1
2. Working stress method of design	4	1
3. Limit state method of design	7	2
4. Beam design by LSM	5	4
5. Slab design by LSM	3	4
6. Continuous slab and beam design by LSM	3	4
7. Design of staircases by LSM	4	4
8. Design of columns by LSM	5	4
9. Design of foundation by LSM	8	6

### iv)Textbooks

1. Reinforced Concrete Design, Krishna Raju & Pranesh, New Age
2. R.C.C. Design, B.C. Punmia, Laxmi Publication

### Reference books :

1. Design of Reinforced Concrete Structures, S. Ramamrutham, Dhanpat Rai Publishing Company
2. Reinforced Concrete Structures, N. Subramanian, Oxford University Press

## (v) Evaluation Scheme

### 1) Theory

Evaluation Criteria	Marks
Internal Exam*	15
Quiz / assignment	10
Attendance	5
University Exam/External Exam	70
Total	100

\* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

### Course target attainment levels:

Attainment Level	Inference
Attainment Level 1	40% of the students have attained more than the target level of that CO
Attainment Level 2	50% of the students have attained more than the target level of that CO
Attainment Level 3	60% of the students have attained more than the target level of that CO

Overall Course Attainment Target = 70% of the students will get "A" Grade

Target has been set on the basis of last year's performance / result by the students, student quality this year and difficulty level of the course.

### University Grading System:

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

**(vi) Mapping of Course Outcomes and Program Outcomes:**

Course Outcomes	Program Outcomes												PSOs	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	1.	2.
CO1	1													
CO2	1												2	
CO3	1	2												
CO4		1	2										2	
CO5		2		1									2	
CO6			2									2	2	1

**1** = courses in which the student will be exposed to a topic (BT level 1& 2)

**2** = courses in which students will gain competency in that area (BT level 3-4)

**3**= courses in which students will master that skill (BT level 5-6)

CO1 to CO4 partially satisfies application of knowledge of mathematics and science in solving engineering problems. (PO1, PO2).

CO5 partially satisfies application of knowledge of mathematics and science in solving engineering problems. (PO1, PO2).

CO6 minimally satisfies the condition of designing system components and solutions. (PO3).

**(vii) Delivery Methodology**

Outcome	Method	Supporting Tools	Demonstration
CO1	Video lectures	Googlemet, google classroom	Videos, animation & presentation
CO2	Video lectures	IS Codes, google meet, google classroom	Video lecture, presentation, videos
CO3	Video lectures	IS Codes, google meet, google classroom	Video lecture, presentation
CO4	Video lectures	IS Codes, google meet, google classroom	Video lecture, presentation
CO5	Video lectures	IS Codes, google meet, google classroom	Video lecture, presentation
CO6	Video lectures	IS Codes, google meet, google classroom	Video lecture, presentation



**(viii) Assessment Methodology**

Outcome	Assessment Tool	Specific Question/activity aligned to the Outcome
CO1	GOOGLE FORM	QUIZ
CO2	GOOGLE FORM	QUIZ
CO3	GOOGLE CLASSROOM	ASSIGNMENT
CO4	GOOGLE CLASSROOM	ASSIGNMENT
CO5	GOOGLE CLASSROOM	ASSIGNMENT
CO6	PRACTICAL WORK	RC SESSIONAL LAB

**(ix) A. Weekly Lesson Plan**

Week	Lectures	Tutorial	Practical	Assignment
1	Introduction: principles of design of reinforced concrete members- working stress and limit state method of design			
	Working stress method of design: Basic concepts and IS code provisions(IS 456-2000) for design against bending moment and shear force			
2	Balanced, under reinforced and over reinforced sections			
	Design of singly reinforced section			
		Design of doubly reinforced section		
3	Limit state method of design: Basic concepts and IS code provisions(IS 456-2000) for design against bending moment and shear force			
		Limit state method of design: Basic concepts and IS code provisions(IS 456-2000) for design against bending moment and shear force		
	Concept of bond stress			
4	Concept of development length			
	Use of design aids for reinforced concrete (SP:16)			

		Use of design aids for reinforced concrete (SP:16)		
5	Use of design aids for reinforced concrete (SP:16)			
	Beam design by LSM: Analysis, design and detailing of singly reinforced rectangular beam			
		Analysis, design and detailing of singly reinforced T beam		
6	Analysis, design and detailing of singly reinforced L beam			Assignment1: Numerical on Design of doubly reinforced section
		Analysis, design and detailing of doubly reinforced beam sections		
	Analysis, design and detailing of doubly reinforced beam sections			
	Design and detailing of one way slab			
7	Design and detailing of two way slab			
		Design and detailing of two way slab		
8	Design and detailing of continuous beams			Assignment2: Numerical on Design of continuous slab
	Design and detailing of continuous slab			
		Design and detailing of continuous slab		
9	Design and detailing of reinforced concrete doglegged staircase			
	Design and detailing of reinforced concrete doglegged staircase			
		Design and detailing of reinforced concrete doglegged staircase		
10	Design and detailing of reinforced concrete doglegged staircase			
	Design and detailing of reinforced concrete short column of rectangular c/s			
		Design and detailing of reinforced concrete		

		short column of circular c/s		
11	Design of short column subjected to axial load with uniaxial bending			
	Design of short column subjected to axial load with biaxial bending			
		Design of short column subjected to axial load with biaxial bending		
12	Design and detailing of reinforced concrete isolated square foundation			
	Design and detailing of reinforced concrete isolated rectangular foundation			
		Design and detailing of reinforced concrete combined footing		
	Design and detailing of reinforced concrete combined footing			Assignment3: Numerical on Design of combined footing
13	Design and detailing of reinforced concrete combined footing			
		Design and detailing of reinforced concrete combined footing		
14	Design and detailing of reinforced concrete pile foundation			
	Design and detailing of reinforced concrete pile foundation			

## B. Daily Lesson Plan

Lecture	TOPIC/UNIT/ CHAPTER	Plan date	Execution date	Details of home work/assignment/mini project/ICT used/other	Details of topics that are beyond syllabus (if any)	Remarks
1	Introduction: principles of design	18-08-2020	18-08-2020			

	of reinforced concrete members-working stress and limit state method of design					
2	Working stress method of design: Basic concepts and IS code provisions(IS 456-2000) for design against bending moment and shear force	<b>19-08-2020</b>	<b>19-08-2020</b>			
3	Balanced, under reinforced and over reinforced sections	<b>21-08-2020</b>	<b>21-08-2020</b>			
4	Design of singly reinforced section	<b>24-08-2020</b>	<b>24-08-2020</b>			
5	Design of doubly reinforced section	<b>25-08-2020</b>	<b>25-08-2020</b>			
6	Limit state method of design: Basic concepts and IS code provisions(IS 456-2000) for design against bending moment and shear force	<b>26-08-2020</b>	<b>26-08-2020</b>			
7	Limit state method of design: Basic concepts and IS code provisions(IS 456-2000) for design against bending moment and shear force	<b>27-08-2020</b>	<b>27-08-2020</b>			
8	Concept of bond stress	<b>31-08-2020</b>	<b>31-08-2020</b>			
9	Concept of development length	<b>01-09-2020</b>	<b>01-09-2020</b>			
10	Use of design aids for reinforced concrete (SP:16)	<b>03-09-2020</b>	<b>03-09-2020</b>			
11	Use of design aids for reinforced concrete (SP:16)	<b>04-09-2020</b>	<b>04-09-2020</b>			
12	Use of design aids for reinforced concrete (SP:16)	<b>08-09-2020</b>	<b>08-09-2020</b>			
13	Beam design by LSM: Analysis, design and detailing of singly reinforced rectangular beam	<b>10-09-2020</b>	<b>10-09-2020</b>			
14	Analysis, design and detailing of singly reinforced T beam	<b>14-09-2020</b>	<b>14-09-2020</b>			
15	Analysis, design and detailing of singly	<b>21-09-2020</b>	<b>21-09-2020</b>			

	reinforced L beam					
16	Analysis, design and detailing of doubly reinforced beam sections	<b>24-09-2020</b>	<b>24-09-2020</b>	Assignment1: Numerical on Design of doubly reinforced section		
17	Design and detailing of one way slab	<b>28-09-2020</b>	<b>28-09-2020</b>			
18	Design and detailing of two way slab	<b>01-10-2020</b>	<b>01-10-2020</b>			
19	Design and detailing of two way slab	<b>05-10-2020</b>	<b>05-10-2020</b>			
20	Design and detailing of continuous beams	<b>08-10-2020</b>	<b>08-10-2020</b>			
21	Design and detailing of continuous slab	<b>13-10-2020</b>	<b>13-10-2020</b>			
22	Design and detailing of continuous slab	<b>15-10-2020</b>	<b>15-10-2020</b>	Assignment2: Numerical on Design of continuous slab		
23	Design and detailing of reinforced concrete doglegged staircase	<b>20-10-2020</b>	<b>20-10-2020</b>			
24	Design and detailing of reinforced concrete short column of rectangular c/s	<b>04-11-2020</b>	<b>04-11-2020</b>			
25	Design and detailing of reinforced concrete short column of circular c/s	<b>25-11-2020</b>	<b>25-11-2020</b>			
26	Design of short column subjected to axial load with uniaxial bending	<b>30-11-2020</b>	<b>30-11-2020</b>			
27	Design of short column subjected to axial load with biaxial bending	<b>08-12-2020</b>	<b>08-12-2020</b>			
28	Design of short column subjected to axial load with biaxial bending	<b>11-12-2020</b>	<b>11-12-2020</b>			
29	Design and detailing of reinforced concrete isolated square foundation	<b>14-12-2020</b>	<b>14-12-2020</b>			
30	Design and detailing of reinforced concrete isolated rectangular foundation	<b>22-12-2020</b>	<b>22-12-2020</b>			
31	Design and detailing of reinforced concrete combined footing	<b>07-01-2021</b>	<b>07-01-2021</b>			
32	Design and detailing	<b>13-01-</b>	<b>13-01-2021</b>			

	of reinforced concrete combined footing	<b>2021</b>				
33	Design and detailing of reinforced concrete combined footing	<b>19-01-2021</b>	<b>19-01-2021</b>			
34	Design and detailing of reinforced concrete combined footing	<b>21-01-2021</b>	<b>21-01-2021</b>	Assignment3: Numerical on Design of combined footing		
35	Design and detailing of reinforced concrete pile foundation	<b>22-01-2021</b>	<b>22-01-2021</b>			
36	Design and detailing of reinforced concrete pile foundation	<b>28-01-2021</b>	<b>28-01-2021</b>			
37	REVISION	<b>10-02-2021</b>	<b>10-02-2021</b>			
38	REVISION	<b>20-02-2021</b>	<b>20-02-2021</b>			

<b>Tutorial</b>	<b>Tutorial No.</b>	<b>Plan date</b>	<b>Execution date</b>	<b>Remarks</b>
Design of doubly reinforced section	1	25-08-2020	25-08-2020	
Limit state method of design: Basic concepts and IS code provisions(IS 456-2000) for design against bending moment and shear force	2	27-08-2020	27-08-2020	
Use of design aids for reinforced concrete (SP:16)	3	04-09-2020	04-09-2020	
Analysis, design and detailing of singly reinforced T beam	4	14-09-2020	14-09-2020	
Analysis, design and detailing of doubly reinforced beam sections	5	24-09-2020	24-09-2020	
Design and detailing of two way slab	6	08-10-2020	08-10-2020	
Design and detailing of continuous slab	7	20-10-2020	20-10-2020	
Design and detailing of reinforced concrete doglegged staircase	8	30-11-2020	30-11-2020	
Design and detailing of reinforced concrete short column of circular c/s	9	14-12-2020	14-12-2020	
Design of short column subjected to axial load with biaxial bending	10	13-01-2021	13-01-2021	
Design and detailing of reinforced	11	19-01-2021	19-01-2021	

concrete combined footing				
Design and detailing of reinforced concrete combined footing	12	<b>22-01-2021</b>	<b>22-01-2021</b>	



## (x) Teaching Strategy / Method

### (xa) Strategy to support weak students

1. Conduction of extra classes during doubt clearing classes and free slots
2. Special attention towards the weaker students in the class to encourage them
3. Seminar session by the students

### (xb) Strategy to encourage bright students

1. Allowing them to help their fellow- mates in clearing the doubts
2. Encouraging them by giving them extra grace marks in internals for their regularity
3. Making them leaders for conduction of various team works

### (xc) Efforts to keep students engaged

1. Conduction of seminars by the students
2. Conduction of quizzes
3. Making them solve assignments on regular basis

## (XI) Analysis of Students performance in the course

### INTERNAL ASSESSMENT

### INTERNAL ASSESMENT RECORD

Subject with code: Design of RC Structures (CE(PC)501)

Semester : 5<sup>th</sup>

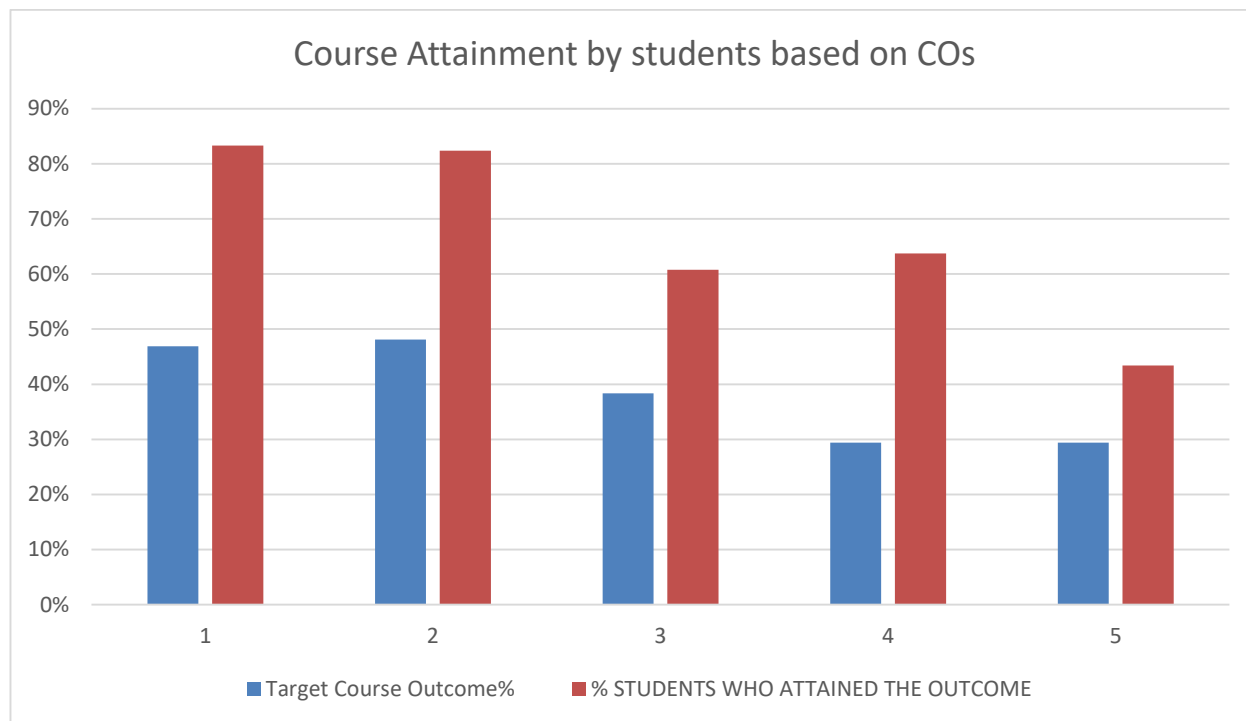
Discipline: CE

Sl.	Roll No.	Name	Attendance		Internal Examination			Assignment / Quiz	Total
			Total	Marks	1 <sup>st</sup>	2nd	Avg.		
1	11901318035	SWARAJ BISWAS	5	4	14	12.5	13.25	9	27
2	11901318036	SURAJIT BISWAS	5	4	11.5	10.5	11	7	22
3	11901318038	SOLANKI SINHA	5	5	12.5	12	12.25	8	26
4	11901318039	SNEHARTA ROY	5	3	10	10	10	6	19
5	11901318040	SHUVAM NAHA	5	5	14	13.5	13.75	9	28
6	11901318041	SHIVAM KUMAR	5	4	12	10.5	11.25	8	24
7	11901318042	RIBHU BISWAS	5	4	12.5	12.5	12.5	9	26
8	11901318043	RAJDEEP GHOSH	5	3	7	7	7	4	14

9	11901318044	PROTIK SAHA	5	3	11.5	11.5	11.5	10	25
10	11901318045	PRODYUT ROY	5	4	12	12	12	7	23
11	11901318046	PRATI KSHA PRADHAN	5	5	14.5	14.5	14.5	10	29.5
12	11901318047	MANAB ROY	5	4	9	9	9	6	19
13	11901318048	LOVE OJHA	5	5	11.5	11	11.25	9	26
14	11901318049	DIPAN NATH	5	3	7.5	7	7.25	4	15
15	11901318050	DIG BIJAY SHAHA	5	4	12	12	12	8	24
16	11901318051	BROJABIHARI DAS	5	4	11	10.5	10.75	7	22
17	11901318052	ASHIF IQUBAL	5	5	12.5	12	12.25	8	26
18	11901318053	ANUBRATA BARMAN	5	3	11.5	11	11.25	9	24
19	11901318054	ANINDYA MAHAPATRA	5	4	14	12.5	13.25	10	28
20	11901318055	AJAY KUMAR	5	3	11.5	11	11.25	8	23
21	11901319001	SOU MYADEEP SINGHA	5	4	12	11	11.5	8	23
22	11901319002	SUMAN DUTTA	5	5	12.5	12.5	12.5	10	28
23	11901319003	PINKU ROY	5	3	7	7	7	4	14
24	11901319004	BISWADIP SARKAR	5	3	10	10	10	6	19
25	11901319005	SHUBHADEEP DEY	5	5	12.5	12.5	12.5	10	27.5
26	11901319006	RANADITYA ROY	5	4	12.5	12.5	12.5	7	23.5
27	11901319007	SANGEETA SARKAR	5	4	11	11.5	11.25	8	24
28	11901319008	POUSHALI GHOSH	5	3	10	10	10	7	20
29	11901319009	ANKITA DUTTA	5	4	10	10	10	7	21
30	11901319010	NINGLAMU TAMANG	5	3	11.5	11.5	11.5	10	24.5
31	11901319011	ANAMIKA SARKAR	5	5	11	11	11	8	24
32	11901319012	NILADRI GHOSH	5	4	11	11	11	7	22
33	11901319013	SUBECHA RAI	5	5	13.5	13	13.25	10	28.5
34	11901319014	NIHAL ROUTH	5	5	14.5	14	14.25	10	29.5
35	11901319015	ESHITA GHOSH	5	4	10.5	10.5	10.5	8	22.5
36	11901319029	RWITWIKA DAS	5	4	10.5	10.5	10.5	7	21.5
37	11901319030	SOUVIK MANDAL	5	3	6.5	6.5	6.5	4	14
38	11901319031	ARINDAM ROY	5	5	11.5	11.5	11.5	8	24.5
39	11901319032	NABENDU DEY	5	3	6.5	7	6.75	4	14
40	11901319034	PRATIMA BARMAN	5	3	6	6	6	4	13
41	11901319036	BISWAJIT DAS	5	5	9.5	9.5	9.5	6	20.5
42	11901319037	PARIJAT MAJUMDER	5	3	5	5	5	2	10
43	11901319039	SOU MIK DATTA	5	5	14	14	14	9	28
44	11901319040	ABHISHEK CHAKI	5	5	14	13.5	13.75	8	27
45	11901319041	MASOOB SARKAR	5	3	10	10	10	5	18
46	11901319043	SHUBHROJEET BASU	5	4	8	8	8	8	20
47	11901319044	PRITHIRAJ DEBNATH	5	5	14.5	14.5	14.5	10	29.5
48	11901319045	TIRTHANKAR SAHA	5	4	13.5	13.5	13.5	10	27.5
49	11901319046	CHAYAN BISWAS	5	3	10.5	10.5	10.5	6	19.5

50	11901319047	ABHIK CHOWDHURY	5	5	12.5	12.5	12.5	10	27.5
51	11901319048	INDRA KUMAR PRASAD	5	4	11.5	11.5	11.5	8	23.5

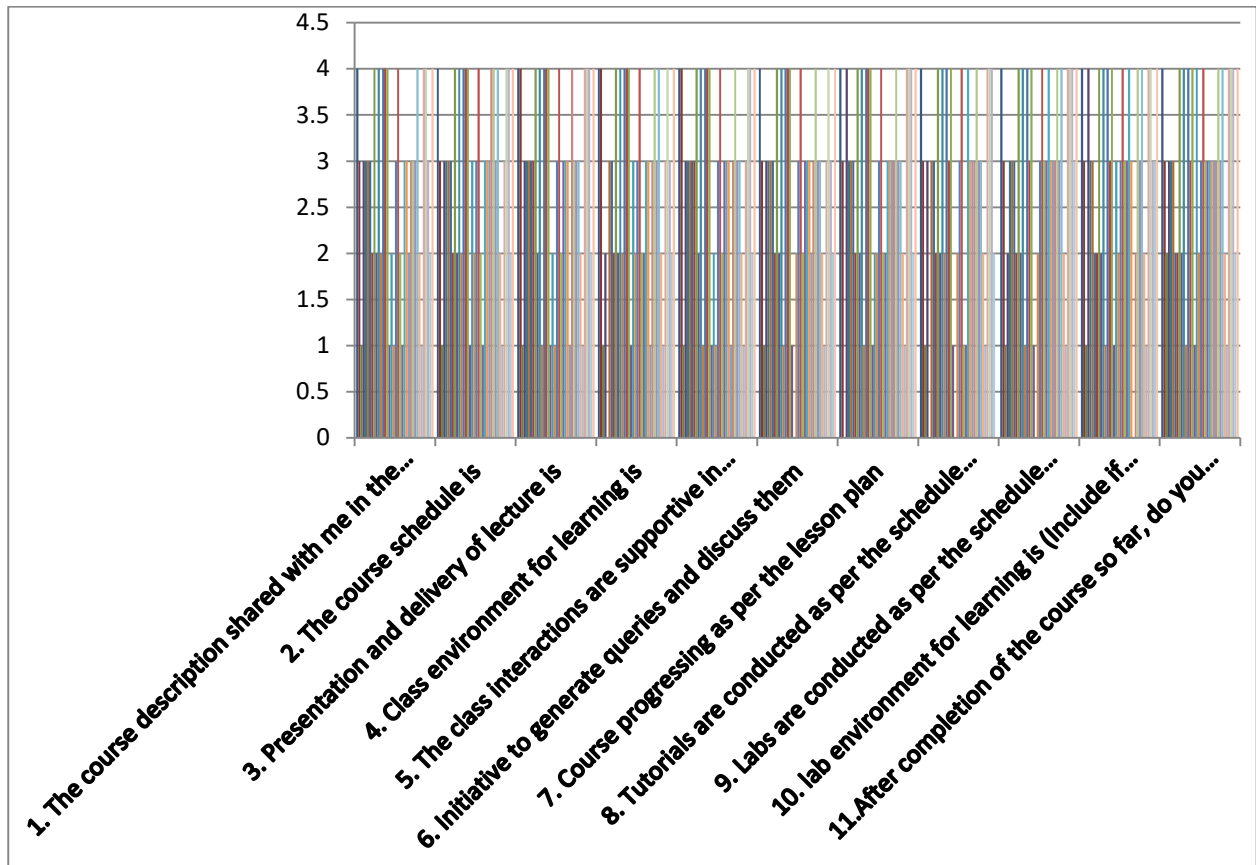
### (XI) Attainment Record



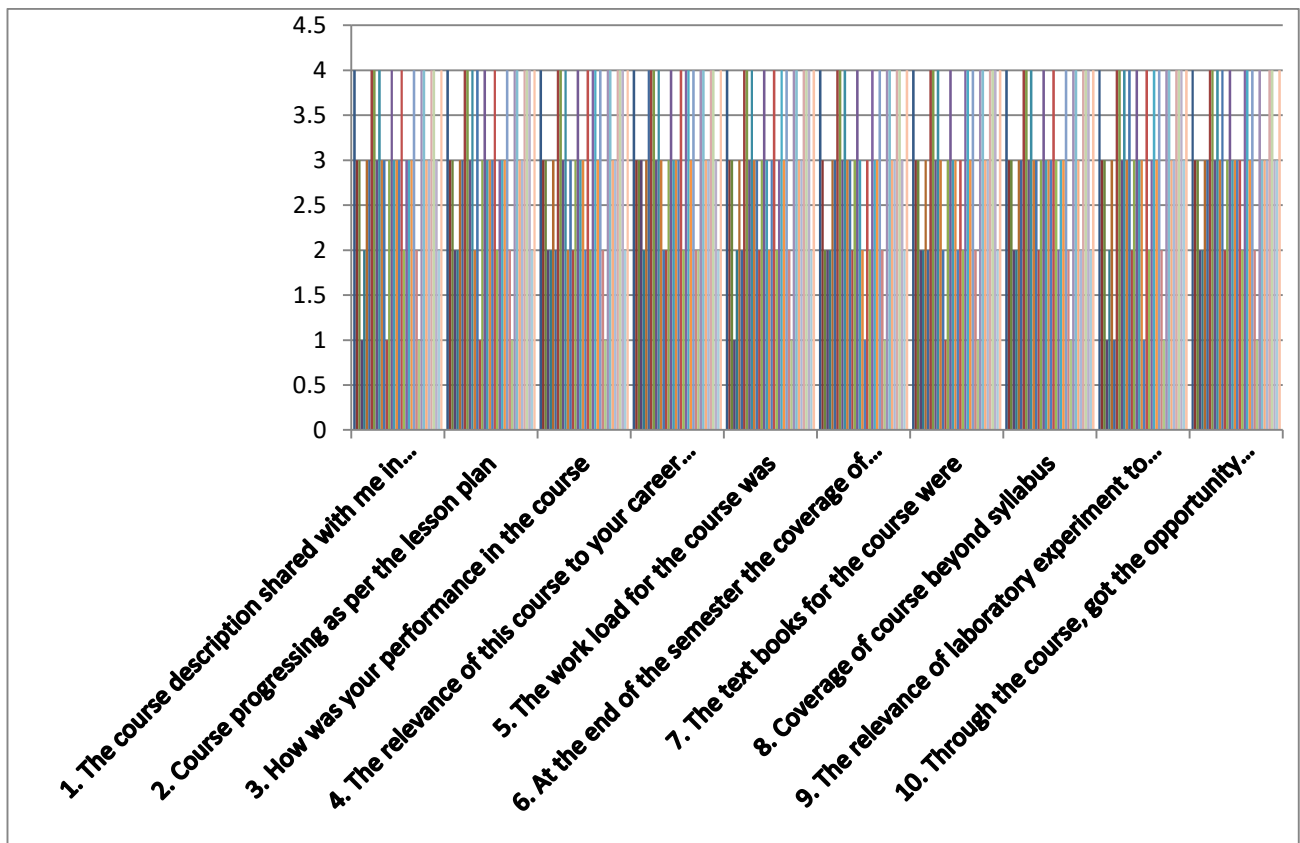
### (XII) University Result

### (XII) Analysis of Student Feed Back

**Formative feedback:**



**Summative feedback:**



### **(XIII) Teacher Self-Assessment (at the completion of course)**

After completion of the course we observe the following

- (i) More classes related to CO5 is needed to improve the attainment
- (ii) Number of numerical to be solved in class should be increase to make the class more interactive
- (iii) More mock test should be conducted (specially online) to increase the numerical solving pace of the students.

# ATTENDANCE SHEET (Lecture)

**Subject with code: Design of RC Structures CE(PC)501**

**Semester : 5<sup>th</sup>**

**Discipline: CE**

Sl.	Roll No.	Name	18-08-2020	19-08-2020	21-08-2020	24-08-2020	25-08-2020	26-08-2020	27-08-2020	31-08-2020	01-09-2020	03-09-2020	04-09-2020	08-09-2020	10-09-2020	14-09-2020	21-09-2020	24-09-2020	28-09-2020	01-10-2020
1	11901318035	SWARAJ BISWAS	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P	A	P	P
2	11901318036	SURAJIT BISWAS	P	A	P	A	A	P	P	P	P	A	A	P	P	P	A	A	A	P
3	11901318038	SOLANKI SINHA	P	P	A	A	A	A	P	P	A	P	A	A	P	P	P	P	P	P
4	11901318039	SNEHARTA ROY	P	A	A	A	P	P	P	P	A	P	P	P	A	A	A	P	P	P
5	11901318040	SHUVAM NAHA	P	P	P	P	P	P	P	A	P	P	A	P	P	P	P	P	P	A
6	11901318041	SHIVAM KUMAR	A	P	P	P	P	A	A	A	P	P	P	P	P	P	P	P	P	P
7	11901318042	RIBHU BISWAS	A	A	A	A	P	P	P	A	P	P	P	P	P	P	A	P	P	P
8	11901318043	RAJDEEP GHOSH	p	A	p	A	A	p	P	P	A	p	A	A	p	A	p	p	P	A
9	11901318044	PROTIK SAHA	A	P	P	P	P	A	A	P	A	A	P	A	P	P	A	P	P	A
10	11901318045	PRODYUT ROY	P	P	P	P	P	P	A	A	P	P	P	A	A	A	P	P	P	A
11	11901318046	PRATIKA PRADHAN	P	P	P	P	P	P	P	P	A	A	P	P	P	P	P	P	P	P
12	11901318047	MANAB ROY	P	P	P	P	P	P	P	A	P	A	A	P	P	P	P	P	P	P
13	11901318048	LOVE OJHA	P	P	P	P	P	P	P	A	P	P	A	P	P	P	P	P	P	A
14	11901318049	DIPAN NATH	p	p	A	p	p	p	A	A	p	A	p	A	A	p	A	p	p	p
15	11901318050	DIG BIJAY SHAHA	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P	A	P	P
16	11901318051	BROJABIHARI DAS	P	P	A	A	P	A	P	P	A	P	A	A	P	P	P	P	P	P
17	11901318052	ASHIF IQUBAL	A	A	P	P	P	P	P	A	P	P	A	P	P	P	P	P	P	A
18	11901318053	ANUBRATA BARMAN	A	A	A	A	P	P	A	P	P	A	P	P	P	P	P	P	P	A
19	11901318054	ANINDYA MAHAPATRA	A	A	A	P	P	P	P	P	P	P	P	P	A	P	P	P	P	P
20	11901318055	AJAY KUMAR	A	A	P	P	P	P	A	A	P	P	P	A	A	P	P	P	A	P
21	11901319001	SOUMYADEEP SINGHA	P	P	P	A	A	A	P	P	A	P	P	P	P	P	P	P	A	P
22	11901319002	SUMAN DUTTA	P	P	P	P	P	P	P	P	A	P	P	P	A	P	P	P	P	P
23	11901319003	PINKU ROY	A	p	p	p	A	p	A	p	A	A	p	p	p	A	A	A	p	p
24	11901319004	BISWADIP SARKAR	P	A	A	P	P	P	P	P	P	P	P	A	P	P	P	A	P	P

Sl.	Roll No.	Name	05-10-2020	08-10-2020	13-10-2020	15-10-2020	20-10-2020	04-11-2020	25-11-2020	30-11-2020	08-12-2020	11-12-2020	14-12-2020	22-12-2020	07-01-2021	13-01-2021	19-01-2021	21-01-2021	22-01-2021	28-01-2021	
1	11901318035	SWARAJ BISWAS	P	P	P	P	P	A	P	P	A	A	P	P	P	P	P	P	P	P	
2	11901318036	SURAJIT BISWAS	P	P	P	A	P	P	A	P	P	P	P	P	A	A	P	P	P	P	
3	11901318038	SOLANKI SINHA	A	P	P	P	A	A	P	P	P	P	P	P	P	P	P	P	P	P	
4	11901318039	SNEHARTA ROY	P	P	P	A	A	A	P	P	P	A	P	P	P	P	A	P	P	P	
5	11901318040	SHUVAM NAHA	P	P	P	P	P	A	A	P	P	P	P	P	P	P	P	P	P	P	
6	11901318041	SHIVAM KUMAR	P	P	A	A	A	A	P	P	P	P	P	P	P	P	P	P	P	P	
7	11901318042	RIBHU BISWAS	P	P	P	P	P	P	P	P	P	P	A	P	P	P	P	P	P	P	
8	11901318043	RAJDEEP GHOSH	p	A	A	p	A	p	A	A	A	A	p	p	p	A	A	A	P	p	
9	11901318044	PROTIK SAHA	A	P	A	P	P	P	A	A	P	A	A	P	A	P	A	P	A	P	
10	11901318045	PRODYUT ROY	A	A	A	A	A	P	P	P	P	P	P	A	A	P	P	P	P	P	
11	11901318046	PRATIKSHA PRADHAN	P	P	P	P	P	P	P	P	A	P	P	P	P	P	P	P	P	P	
12	11901318047	MANAB ROY	A	P	A	P	P	A	A	A	P	P	P	P	P	P	P	P	P	A	P
13	11901318048	LOVE OJHA	P	P	P	P	P	A	A	A	P	P	P	P	P	P	P	P	P	P	
14	11901318049	DIPAN NATH	A	A	A	p	p	P	A	A	A	A	P	P	A	A	A	A	A	A	
15	11901318050	DIG BIJAY SHAHA	P	P	P	P	P	A	P	P	A	A	P	P	P	P	P	P	P	P	
16	11901318051	BROJABIHARI DAS	A	P	P	P	A	A	P	P	P	P	P	P	P	P	P	P	P	A	
17	11901318052	ASHIF IQUBAL	P	P	P	P	P	A	A	A	P	P	P	P	P	P	P	P	P	P	
18	11901318053	ANUBRATA BARMAN	P	P	P	P	P	A	A	P	P	P	P	P	A	P	P	P	P	P	
19	11901318054	ANINDYA MAHAPATRA	P	P	A	P	P	P	P	P	P	P	A	P	P	A	P	P	P	P	
20	11901318055	AJAY KUMAR	P	P	P	P	P	A	P	P	P	P	P	A	A	A	P	P	P	P	
21	11901319001	SOUMYADEEP SINGHA	P	P	P	P	P	P	P	P	P	P	P	P	A	P	P	P	P	P	
22	11901319002	SUMAN DUTTA	A	P	P	P	P	P	A	A	P	P	P	P	P	P	P	P	A	P	
23	11901319003	PINKU ROY	p	A	A	P	p	A	A	p	p	p	A	p	A	p	A	A	p	p	
24	11901319004	BISWADIP SARKAR	P	P	A	P	A	A	P	P	P	P	P	A	A	A	P	P	P	P	





## ATTENDANCE SHEET (Lecture)

**Subject with code: Design of RC Structures CE(PC)501**

**Semester : 5<sup>th</sup>**

**Discipline: CE**

Sl.	Roll No.	Name	18-08-2020	19-08-2020	21-08-2020	24-08-2020	25-08-2020	26-08-2020	27-08-2020	31-08-2020	01-09-2020	03-09-2020	04-09-2020	08-09-2020	10-09-2020	14-09-2020	21-09-2020	24-09-2020	28-09-2020	01-10-2020	
25	11901319005	SHUBHADEEP DEY	A	A	P	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P	A
26	11901319006	RANADITYA ROY	P	P	P	P	A	P	P	A	P	P	A	P	P	P	P	P	P	P	A
27	11901319007	SANGEETA SARKAR	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P	A	P	P	
28	11901319008	POUSHALI GHOSH	P	P	P	A	A	A	P	P	A	P	P	P	P	P	P	P	A	P	
29	11901319009	ANKITA DUTTA	P	P	P	P	A	P	P	P	P	P	P	P	A	A	P	P	P	P	
30	11901319010	NINGLAMU TAMANG	A	A	A	A	A	P	P	A	P	P	A	A	P	P	P	A	P	P	
31	11901319011	ANAMIKA SARKAR	A	P	P	P	A	P	P	P	A	P	A	P	A	A	P	A	P	P	
32	11901319012	NILADRI GHOSH	P	P	P	A	A	A	P	P	A	A	A	P	A	P	P	P	P	P	
33	11901319013	SUBECHA RAI	A	A	A	P	P	P	P	P	P	P	P	P	P	P	P	A	A	A	
34	11901319014	NIHAL ROUTH	A	P	P	P	P	P	P	A	A	P	P	P	P	P	P	P	P	P	
35	11901319015	ESHITA GHOSH	A	A	P	P	A	A	A	P	A	A	P	P	P	P	P	A	P	P	
36	11901319029	RWITWIKA DAS	P	P	A	A	A	P	P	P	P	P	P	P	P	P	P	P	P	P	
37	11901319030	SOUVIK MANDAL	p	p	A	A	p	p	p	p	P	A	p	A	p	A	A	p	p	A	
38	11901319031	ARINDAM ROY	A	A	P	P	P	P	P	A	A	A	A	P	P	P	P	P	P	P	
39	11901319032	NABENDU DEY	A	p	p	p	A	A	p	A	p	A	p	p	p	A	A	A	p	p	
40	11901319034	PRATIMA BARMAN	p	p	p	p	p	A	A	A	p	p	A	A	A	p	P	A	A	p	
41	11901319036	BISWAJIT DAS	A	P	P	P	A	A	P	P	A	P	A	P	A	A	P	A	P	P	
42	11901319037	PARIJAT MAJUMDER	p	p	p	A	A	A	p	p	p	p	A	A	p	A	p	p	p	A	
43	11901319039	SOUMIK DATTA	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P	A	P	P	
44	11901319040	ABHISHEK CHAKI	A	A	P	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P	
45	11901319041	MASOOB SARKAR	A	P	P	P	A	A	P	P	A	P	A	P	A	A	P	P	P	P	
46	11901319043	SHUBHROJEET BASU	p	p	p	p	p	P	A	p	P	A	A	p	P	p	p	A	P	p	
47	11901319044	PRITHIRAJ DEBNATH	P	P	P	P	P	P	P	P	P	A	P	P	P	P	P	P	P	P	
48	11901319045	TIRTHANKAR SAHA	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
49	11901319046	CHAYAN BISWAS	p	p	p	P	A	A	p	A	p	A	A	A	A	A	P	P	P	P	
50	11901319047	ABHIK CHOWDHURY	A	P	P	P	A	P	P	P	A	P	A	P	A	A	P	A	P	P	
51	11901319048	INDRA KUMAR PRASAD	A	A	A	P	P	P	P	P	A	P	P	P	P	P	A	P	P	P	

Sl.	Roll No.	Name	05-10-2020	08-10-2020	13-10-2020	15-10-2020	20-10-2020	04-11-2020	25-11-2020	30-11-2020	08-12-2020	11-12-2020	14-12-2020	22-12-2020	07-01-2021	13-01-2021	19-01-2021	21-01-2021	22-01-2021	28-01-2021
25	11901319005	SHUBHADEEP DEY	P	P	P	P	P	A	A	P	P	P	P	P	P	P	P	A	P	P
26	11901319006	RANADITYA ROY	P	P	P	P	P	A	A	A	P	P	P	P	P	P	P	P	P	A
27	11901319007	SANGEETA SARKAR	P	P	P	P	P	A	P	P	A	A	P	P	P	P	P	P	P	P
28	11901319008	POUSHALI GHOSH	P	P	P	P	P	P	P	A	P	A	A	P	P	P	P	P	P	A
29	11901319009	ANKITA DUTTA	P	P	P	A	P	A	P	P	A	A	A	P	P	P	P	P	P	P
30	11901319010	NINGLAMU TAMANG	P	P	P	P	A	P	P	P	P	P	A	A	P	P	P	A	P	P
31	11901319011	ANAMIKA SARKAR	A	P	P	A	A	P	A	P	P	P	P	P	A	P	P	P	P	P
32	11901319012	NILADRI GHOSH	P	P	P	P	P	P	P	A	A	A	A	P	P	P	P	P	P	P
33	11901319013	SUBECHA RAI	P	P	P	P	P	P	P	P	P	P	P	P	P	A	P	P	P	P
34	11901319014	NIHAL ROUTH	P	P	P	A	P	P	P	P	P	P	P	P	P	P	P	P	P	P
35	11901319015	ESHITA GHOSH	P	P	P	A	A	A	P	P	P	P	P	A	A	P	P	P	P	P
36	11901319029	RWITWIKA DAS	P	P	A	A	A	P	A	P	P	P	P	A	P	P	P	P	P	A
37	11901319030	SOUVIK MANDAL	A	A	A	p	p	p	A	A	P	p	p	A	A	p	A	p	A	p
38	11901319031	ARINDAM ROY	P	P	P	P	P	A	A	P	P	P	P	P	P	P	P	A	P	P
39	11901319032	NABENDU DEY	A	A	A	A	A	p	p	p	A	A	p	A	p	A	p	A	A	p
40	11901319034	PRATIMA BARMAN	A	p	A	A	A	A	p	p	p	P	A	p	p	A	A	A	A	A
41	11901319036	BISWAJIT DAS	A	P	P	A	A	P	A	P	P	P	P	P	P	P	P	P	P	P
42	11901319037	PARIJAT MAJUMDER	A	A	p	p	A	A	A	p	p	A	A	A	p	A	A	A	p	p
43	11901319039	SOUMIK DATTA	P	P	P	P	P	A	P	P	A	P	P	P	P	P	P	P	P	P
44	11901319040	ABHISHEK CHAKI	A	P	P	A	P	P	P	P	P	P	P	P	A	P	P	P	P	P
45	11901319041	MASOOB SARKAR	P	P	A	P	P	P	P	P	A	A	P	P	P	A	P	P	P	A
46	11901319043	SHUBHROJEET BASU	A	p	A	p	p	p	A	A	A	P	P	P	A	P	A	P	P	P
47	11901319044	PRITHIRAJ DEBNATH	P	P	A	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
48	11901319045	TIRTHANKAR SAHA	P	P	A	P	A	P	A	P	P	P	P	A	P	P	P	P	A	P
49	11901319046	CHAYAN BISWAS	P	P	A	p	A	A	P	P	P	P	P	A	A	A	A	P	P	P
50	11901319047	ABHIK CHOWDHURY	A	P	P	A	A	P	A	P	P	P	P	P	A	P	P	P	P	P
51	11901319048	INDRA KUMAR PRASAD	P	P	P	P	P	P	A	P	P	P	A	P	P	A	P	P	P	P







**SILIGURI INSTITUTE OF TECHNOLOGY  
CIVIL ENGINEERING**



**COURSE FILE**

**7TH SEM, 4TH YEAR, 2021**

**PAPER DESCRIPTION:** Demonstrate and understanding of advanced fluid mechanics principles. Implementation of geotechnical engineering principles. To get a knowledge of various types of dam and their design criteria. Understand the different elements of dam.

**PAPER CODE : CE 704B**

# Course Description

**Course Title: Hydraulic Structures**

**Code: CE 704B**

**Semester: 7<sup>th</sup> Year: 4<sup>th</sup>**

**Name of the Faculty: Pooja Barma**

**E-mail: poojabarma09@gmail.com**

## Class Schedule

Lecture		
TUESDAY (10:00 a.m. to 10:50a.m.)	THURSDAY (10:00 a.m. to 10:50a.m.)	FRIDAY (12:30p.m. to 1:20p.m.)

## Hours for meeting students:3 HOURS

TUESDAY (10:00 a.m. to 10:50a.m.)	1 HOUR
THURSDAY (10:00 a.m. to 10:50a.m.)	1 HOUR
FRIDAY (12:30p.m. to 1:20p.m.)	1 HOUR

## i) Course Objective

This course is designed to study the fundamental concept, design and maintenance of hydraulic structures. Also to provide basic understanding of heavy structures like dam have to study. To give the basic idea of canal regulation, canal headwork and cross-drainage.

## ii) Course Outcomes

- i. After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The student will be able to:

		Target
CO1	Identify the characteristics of various types of dams and their selection procedure.	50% students will achieve 60% marks
CO2	Perform the reconnaissance survey and, geophysical investigations necessary for selection of suitable dam site	50% students will achieve 60% marks
CO3	Estimate forces acting on a gravity dams and perform stability analysis.	50% students will achieve 60% marks

<b>CO4</b>	Estimate the seepage loss through embankment dams and suggest necessary remedial measures.	50% students will achieve 60% marks
<b>CO5</b>	Calculate the discharge through the overflow section and design the appropriate energy dissipation structures.	40% students will achieve 60% marks

- ii. Once the student has successfully complete this course, he/she must be able to answer the following questions or perform / demonstrate the following:

<b>Sl.</b>	<b>Question</b>	<b>BT Level</b>
<b>1.</b>	The safety of a hydraulic structure founded on pervious foundation can be ensured by	2
<b>2.</b>	A trapezoidal notch fall can maintain normal water depth in the upstream channel at	2
<b>3.</b>	According to Khosla's theory , the exit gradient in the absence of a downstream cut-off is	1
<b>4.</b>	Function of Canal drops	2
<b>5.</b>	According to Bligh's Creep theory, the creep length is	1
<b>6.</b>	The discharge co-efficient of an Ogee-shaped spillway is	1
<b>7.</b>	What is canal drop structure?	2
<b>8.</b>	Why is canal drop provided?	2
<b>9.</b>	What is Bligh's theory?	2
<b>10.</b>	What are the different limitations of Bligh's theory?	2
<b>11.</b>	What are barrage and weir? Differentiate them with sketches.	2
<b>12.</b>	An impervious floor of a weir on permeable soil is 16 m long and has sheet piles at both the ends. The upstream pile is 4m deep and the downstream pile is 5m deep. The weir creates a net head of 2.5m. Neglecting thickness of the weir floor, calculate the uplift pressures at the junction of the inner faces of the piles with the weir floor, by using Khosla's theory.	3
<b>13.</b>	Design the salient dimensions of a siphon well drop for the following particulars. Fall: 3.6m, general ground level: +163.46m, full supply depth= 75cm, bed level u/s=+162.8m, discharge= 1cumec, bed width upstream and downstream= 2.4m.	4
<b>14.</b>	Which of the following CD works carry drainage over the canal?	2



15.	The drainage water is sometimes allowed to join the canal water to augment canal supplies through a hydraulic structure is called as _____	2
16.	The type of canal alignment which involves maximum CD works is a _____	1
17.	Earthen dams are _____	1
18.	Multiple arch dam is an example of _____	2
19.	Which type of dam design gives a wider choice of materials including earth-fill and rock-fill dams?	2
20.	A narrow V-shaped valley indicates the choice of _____	2
21.	The central core of the zoned embankment type earth dam _____	2
22.	A gravity dam is subjected to hydrodynamic pressure caused by _____	2
23.	The factor of safety against overturning generally varies between _____	1
24.	What is the maximum permissible tensile stress for high concrete gravity dam under worst conditions?	1
25.	Calculate the value of minimum base width for an elementary triangular concrete gravity dam supporting 72 m height of reservoir water and full uplift? (Take specific gravity of concrete as 2.4 and coefficient of friction as 0.7)	3
26.	For usual values of permissible compressive stress and specific gravity of concrete, a high concrete gravity is the one whose height exceeds	1
27.	Calculate the top width of the dam if the height of water stored is 84m.	3
28.	A phreatic line in seepage analysis is defined as the line on which pressure is	1
29.	Calculate the top width of the earth dam of height 50 m.	3
30.	A gravity dam is subjected to hydrodynamic pressure caused by	2
31.	What is the value of horizontal destabilizing force caused by the formation of waves in a storage reservoir having a fetch of 52 km due to high wind of 172 km/h?	3
32.	A weir is constructed to withstand water 4.5m deep. The floor length is 25m with sheet piles 5m and 8m deep at either ends. The weir is erected at a distance of 6m on the upstream end of the floor. Find using Bling's theory the uplift pressures at 6m, 12m and 18m from the upstream end of the floor and find thickness of the floor at those points.	4
33.	An earthen dam made of a homogeneous material has the following data: coefficient of the permeability of dam material = $5 \times 10^{-4}$ cm/sec. level of top of dam= 200m. level of deepest river bed= 178m. H.F.L. of reservoir= 197.5m. Width of the top of dam= 4.5m. upstream slope= 2:1. Determine the phreatic line of the dam section	4

34.	<p>The particulars of a concrete dam are-</p> <ul style="list-style-type: none"> <li>• RL of top of dam = 145m</li> <li>• Freeboard= 3</li> <li>• Upstream face inclined at a slope of 0.25(H) : 1(v) for RL 120m upto the base</li> <li>• Downstream face sloped at 0.8 (H) : 1(v) from RL 140 m upto the base</li> <li>• RL of base = 110m</li> <li>• Top width= 6m</li> </ul> <p>Calculate the forces acting on the dam due to self weight, hydrostatic thrust and uplift pressure. Determine the stability of the dam when the reservoir is full. Determine the stresses included in the dam in full condition.</p>	4
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### iii) Topic/Unit/Chapter Layout

Topic/Unit/Chapter	Lecture Hours	Laboratory hours
1. Diversion Head works	4	
2. Theories of seepage and Design of weirs and Barrages	6	
3. Hydraulic structures for canals	4	
4. Cross-Drainage Works	4	
5. Dam	2	
6. Earthen Dams	6	
7. Gravity Dam	6	

### iv)Textbooks

1. Irrigation Engineering and hydraulic structures, Santosh Kumar Garg, Khanna Publishers
2. Irrigation, water Resources and Water Power Engg. Dr.P.N. Modi, Standard Book House, Delhi-6

#### Reference books :

1. Structural Analysis, R. Agor
2. Structural Analysis, (Vol I & Vol II), S.S.S Bhavikatti, Vikas Publishing House Pvt. Ltd.

### (v) Evaluation Scheme

#### 1) Theory

Evaluation Criteria	Marks
Internal Exam*	15
Quiz / assignment	10
Attendance	5
University Exam/External Exam	70
Total	100

\* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15.

### Course target attainment levels:

Attainment Level	Inference
Attainment Level 1	40% of the students have attained more than the target level of that CO
Attainment Level 2	50% of the students have attained more than the target level of that CO
Attainment Level 3	60% of the students have attained more than the target level of that CO

Overall Course Attainment Target = 70% of the students will get "A" Grade

Target has been set on the basis of last year's performance / result by the students, student quality this year and difficulty level of the course.

### University Grading System:

Grade	Marks
O	90% and above
E	80 – 89.9%
A	70 – 79.9%
B	60 – 69.9%
C	50 – 59.9%
D	40 – 49.9%
F	Below 40%

### (vi) Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes												PSOs	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	1.	2.
CO1	1													
CO2	1			1									1	
CO3		2											1	
CO4		2											1	
CO5		2											1	

1 = courses in which the student will be exposed to a topic (BT level 1& 2)

2 = courses in which students will gain competency in that area (BT level 3-4)

3= courses in which students will master that skill (BT level 5-6)

CO1 to CO4 partially satisfies application of knowledge of mathematics and science in solving engineering problems. (PO1, PO2).

CO5 partially satisfies application of knowledge of mathematics and science in solving engineering problems. (PO1, PO2).

CO5 minimally satisfies the condition of designing system components and solutions. (PO3).

### (vii) Delivery Methodology

Outcome	Method	Supporting Tools	Demonstration
CO1	Video lectures	Googlemeet, google classroom	Videos & presentation
CO2	Video lectures	Google meet, google classroom	Video lecture, presentation, videos
CO3	Video lectures	Google meet, google classroom	Video lecture, presentation
CO4	Video lectures	Google meet, google classroom	Video lecture, presentation
CO5	Video lectures	Google meet, google classroom	Video lecture, presentation

### (ix) A. Weekly Lesson Plan

Week	Lectures	Tutorial	Practical	Assignment
1	Diversion Head works: Necessity, Difference between weir and Barrage, Type of Weirs			
	Selection of site, layout and description of each part			
	Effects of construction of a weir on the river regime			
2	Causes of failure of weirs on permeable foundation and their remedies			Assignment 1: Numerical on weir
	Theories of seepage and Design of weirs and Barrages: Failure of Hydraulic Structures Founded on Pervious foundations: i) By piping ii) By Direct uplift			
	Bligh's creep theory of seepage flow, Khosla's theory & concept of flow nets			
3	Concept of exit gradient and critical exit gradient			
	Khosla's method of independent variable for determination of pressures and exit gradient for seepage below a weir or a barrage			

	Khosla's method of independent variable for determination of pressures and exit gradient for seepage below a weir or a barrage			
4	Necessary corrections, examples			Assignment 2: Numerical on canal fall
	Hydraulic structures for canals: Canal falls – necessity, locations			
	Types and description of Ogee fall			
5	Trapezoidal-notch fall			
	Syphon well drop. Examples			
	Cross-Drainage Works: Necessity			
6	Types of cross drainage			
	Types of cross drainage			
	Selection of a suitable type of cross drainage			
7	Dam (General): Definition, classification of Dams			
	Factors governing selection of type of dam, selection of suitable site for a dam.			
	Earthen Dams: Introduction, Types of Earthen Dams			
8	Methods of Construction of earthen Dam. Causes of failure,			
	Design Criteria, Determination of line of seepage or phreatic line in Earthen Dam			
	Seepage control in Earthen Dam, Examples			
9	Gravity Dam: Definition, Typical cross- section			
	Forces acting on Gravity Dam			
	Combination of forces for design			

10	Combination of forces for design			Assignment 3: Numerical on Gravity Dam
	Mode of failure and criteria for structural stability of Gravity Dams			
	Principal and shear stresses			
11	Elementary profile of a Gravity Dam			
	Concept of High and low Gravity Dam			
	Concept of High and low Gravity Dam			
12	Spillways: Types, Location, Essential requirements			
	Spillway capacity			
	Components of spillway			
13	Energy Dissipators, Stilling basins			

## B. Daily Lesson Plan

Lecture	TOPIC/UNIT/ CHAPTER	Plan date	Execution date	Details of home work/assignment/mini project/ICT used/other	Details of topics that are beyond syllabus (if any)	Remarks
1	Diversion Head works: Necessity, Difference between weir and Barrage, Type of Weirs	19-08-2020	19-08-2020			
2	Selection of site, layout and description of each part	21-08-2020	21-08-2020			
3	Effects of construction of a weir on the	24-08-2020	24-08-2020			

	river regime					
4	Causes of failure of weirs on permeable foundation and their remedies	25-08-2020	25-08-2020			
5	Theories of seepage and Design of weirs and Barrages: Failure of Hydraulic Structures Founded on Pervious foundations: i) By piping ii) By Direct uplift	26-08-2020	26-08-2020			
6	Bligh's creep theory of seepage flow, Khosla's theory & concept of flow nets	27-08-2020	27-08-2020	Assignment 1: Numerical on weir		
7	Concept of exit gradient and critical exit gradient	31-08-2020	31-08-2020			
8	Khosla's method of independent variable for determination of pressures and exit gradient for seepage below a weir or a barrage	01-09-2020	01-09-2020			
9	Khosla's method of independent variable for determination of pressures and exit gradient for seepage below a weir or a barrage	04-09-2020	04-09-2020			
10	Necessary corrections, examples	08-09-2020	08-09-2020			
11	Hydraulic structures for canals: Canal falls – necessity, locations	10-09-2020	10-09-2020			
12	Types and description of Ogee fall	14-09-2020	14-09-2020	Assignment 2: Numerical on canal fall		
13	Trapezoidal-notch fall	21-09-2020	21-09-2020			
14	Syphon well drop. Examples	24-09-2020	24-09-2020			
15	Cross-Drainage Works: Necessity	28-09-2020	28-09-2020			
16	Types of cross drainage	01-10-2020	01-10-2020			
17	Types of cross drainage	05-10-2020	05-10-2020			
18	Selection of a suitable type of cross drainage	08-10-2020	08-10-2020			
19	Dam (General): Definition, classification of Dams	13-10-2020	13-10-2020			
20	Factors governing selection of type of dam, selection of suitable	15-10-2020	15-10-2020			

	site for a dam.					
21	Earthen Dams: Introduction, Types of Earthen Dams	<b>20-10-2020</b>	<b>20-10-2020</b>			
22	Methods of Construction of earthen Dam. Causes of failure,	<b>04-11-2020</b>	<b>04-11-2020</b>			
23	Design Criteria, Determination of line of seepage or phreatic line in Earthen Dam	<b>25-11-2020</b>	<b>25-11-2020</b>			
24	Seepage control in Earthen Dam, Examples	<b>30-11-2020</b>	<b>30-11-2020</b>			
25	Gravity Dam: Definition, Typical cross- section	<b>08-12-2020</b>	<b>08-12-2020</b>			
26	Forces acting on Gravity Dam	<b>11-12-2020</b>	<b>11-12-2020</b>			
27	Combination of forces for design	<b>14-12-2020</b>	<b>14-12-2020</b>			
28	Combination of forces for design	<b>22-12-2020</b>	<b>22-12-2020</b>			
29	Mode of failure and criteria for structural stability of Gravity Dams	<b>07-01-2021</b>	<b>07-01-2021</b>			
30	Principal and shear stresses	<b>13-01-2021</b>	<b>13-01-2021</b>	Assignment 3: Numerical on Gravity Dam		
31	Elementary profile of a Gravity Dam	<b>19-01-2021</b>	<b>19-01-2021</b>			
32	Concept of High and low Gravity Dam	<b>21-01-2021</b>	<b>21-01-2021</b>			
33	Concept of High and low Gravity Dam	<b>22-01-2021</b>	<b>22-01-2021</b>			
34	Spillways: Types, Location, Essential requirements	<b>28-01-2021</b>	<b>28-01-2021</b>			
35	Spillway capacity	<b>10-02-2021</b>	<b>10-02-2021</b>			
36	Components of spillway	<b>22-02-2021</b>	<b>22-02-2021</b>			
37	Energy Dissipators, Stilling basins	<b>22-02-2021</b>	<b>22-02-2021</b>			



## (x) Teaching Strategy / Method

### (xa) Strategy to support weak students

1. Conduction of extra classes during doubt clearing classes and free slots
2. Special attention towards the weaker students in the class to encourage them
3. Seminar session by the students

### (xb) Strategy to encourage bright students

1. Allowing them to help their fellow- mates in clearing the doubts
2. Encouraging them by giving them extra grace marks in internals for their regularity
3. Making them leaders for conduction of various team works

### (xc) Efforts to keep students engaged

1. Conduction of seminars by the students
2. Conduction of quizzes
3. Making them solve assignments on regular basis

## (XI) Analysis of Students performance in the course

### INTERNAL ASSESSMENT

## INTERNAL ASSESMENT RECORD

Subject with code: Hydraulic Structures (CE 704B)

Semester : 7<sup>th</sup>

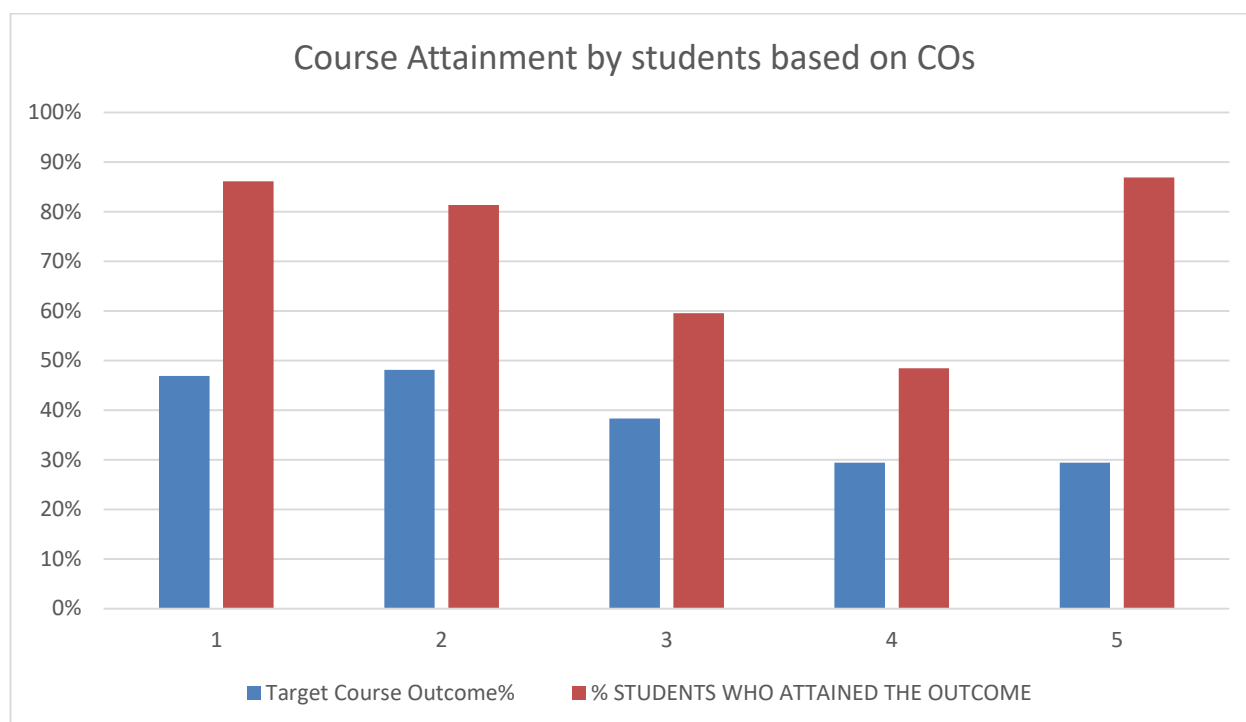
Discipline: CE

Sl.	Roll No.	Name	Attendance		Internal Examination			Assignment / Quiz	Total
			Total	Marks	1 <sup>st</sup>	2nd	Avg.		
1	11901317011	Wang Dorjee Tamang	5	3	8	6.5	7.25	7	18
2	11901317012	Souvik Barua	5	4	11.5	11.5	11.5	9	25
3	11901317013	Shubhadip Ghosh	5	3	12.5	10	11.25	9	24
4	11901317014	Sanketh Banik	5	5	10.5	10	10.25	8	24
5	11901317015	Rojina Pradhan	5	5	14	14	14	10	29
6	11901317016	Rhythm Roy	5	4	12	10.5	11.25	9	25
7	11901317017	Preetam Deb	5	4	12.5	11	11.75	9	25
8	11901317018	Pratik Debnath	5	3	9	8.5	8.75	7	19

9	11901317019	Pranav Kumar Mishra	5	3	11	10.5	10.75	8	22
10	11901317020	Piyush Raj	5	4	13	12	12.5	9	6
11	11901317021	Motluba Parveen	5	4	14	14	14	9	27
12	11901317022	Manish Kumar Ray	5	5	9.5	8.5	9	7	21
13	11901317023	Kishan Kumar Agarwal	5	3	11.5	10	10.75	9	23
14	11901317024	Kaustav Sarkar	5	4	9.5	9	9.25	9	23
15	11901317025	Gokul Barman	5	4	13	13	13	10	27
16	11901317026	Debosree Roy	5	4	12	11.5	11.75	9	25
17	11901317027	Debojyoti Mantri	5	5	14	13	13.5	10	29
18	11901317028	Debojit Basak	5	3	11.5	10.5	11	10	24
19	11901317030	Debjyoti Roy	5	3	11.5	10.5	11	10	24
20	11901317031	Debargho Saha	5	3	9	8.5	8.75	6	18
21	11901317032	Debadrita Majumdar	5	4	12	11.5	11.75	9	25
22	11901317033	Bittu Barman	5	3	13	12.5	12.75	9	25
23	11901317034	Bikash Singh	5	4	10.5	9.5	10	10	24
24	11901317035	Bhaskar Sarkar	5	4	12	11.5	11.75	9	25
25	11901317036	Barna Shreshtra Sarkar	5	4	12.5	12	12.25	9	26
26	11901317037	Avisek Acharya	5	4	12.5	12.5	12.5	9	26
27	11901317038	Ashutosh Kumar	5	3	11	10.5	10.75	8	22
28	11901317039	Arpan Mandal	5	4	12	11	11.5	10	25.5
29	11901317040	Anurup Roy	5	4	9	8.5	8.75	7	20
30	11901317041	Anshuman	5	5	10.5	9	9.75	7	22
31	11901317042	Anirban Dutta	5	3	12	9.5	10.75	10	24
32	11901317043	Abhishek Roy	5	4	11.5	10	10.75	10	25
33	11901317044	Abhishek Kumar Singh	5	3	11	10	10.5	9	22.5
34	11901318001	Vivek Gazmer	5	4	12.5	11.5	12	9	25
35	11901318002	Vivek Ekka	5	3	12	11	11.5	9	23.5
36	11901318003	Ujjal Barman	5	3	12.5	12	12.25	9	24
37	11901318004	Supratim Dutta	5	3	12	10.5	11.25	10	25
38	11901318006	Subhankar Sen	5	5	14	13.5	13.75	10	28
39	11901318007	Subham Sarkar	5	3	10.5	9.5	10	9	22
40	11901318008	Subham Saha	5	3	10.5	10	10.25	8	22
41	11901318009	Shuvam Hazra	5	3	10.5	10	10.25	6	20
42	11901318010	Shubham Sarkar	5	5	12.5	12	12.25	7	24
43	11901318011	Shouvik Debnath	5	3	9	8.5	8.75	6	18
44	11901318013	Sanjib Kumar Barman	5	5	10	9.5	9.75	6	21
45	11901318014	Sanchita Sarkar	5	4	10	9	9.5	9	22.5
46	11901318015	Ritwik Ghosh	5	3	12.5	13	12.75	10	26
47	11901318017	Pritama Roy	5	5	11.5	10.5	11	8	24
48	11901318018	Pritam Dutta	5	4	13.5	13	13.25	9	26
49	11901318019	Pratik Chandra Dey	5	4	13.5	13	13.25	9	26

50	11901318020	Pranta Das	5	3	11	9.5	10.25	9	22
51	11901318021	Pankaj Kumar Mahato	5	5	11.5	11	11.25	9	25
52	11901318022	Mukesh Roy	5	4	9.5	9.5	9.5	9	23
53	11901318023	Mrinalini Paul	5	3	11	10.5	10.75	8	22
54	11901318024	Moubani Waddedar	5	5	9.5	9	9.25	8	23
55	11901318025	Koushik Chandra Sarkar	5	4	10	7.5	8.75	9	22
56	11901318026	Jotin Roy	5	5	10	10	10	8	23
57	11901318027	Bibhas Basu	5	5	12	11.5	11.75	9	26
58	11901318028	Baishakhi Roy	5	3	13.5	13	13.25	9	25
59	11901318029	Arnab Sarkar	5	3	12.5	12.5	12.5	9	24.5
60	11901318030	Arindam Guha	5	5	10.5	10	10.25	8	23
61	11901318031	Archisman Karjee	5	4	10.5	10.5	10.5	8	22.5
62	11901318032	Anannya Guha	5	3	14.5	11.5	13	10	26
63	11901318033	Alik Raha	5	5	13	12.5	12.75	9	27

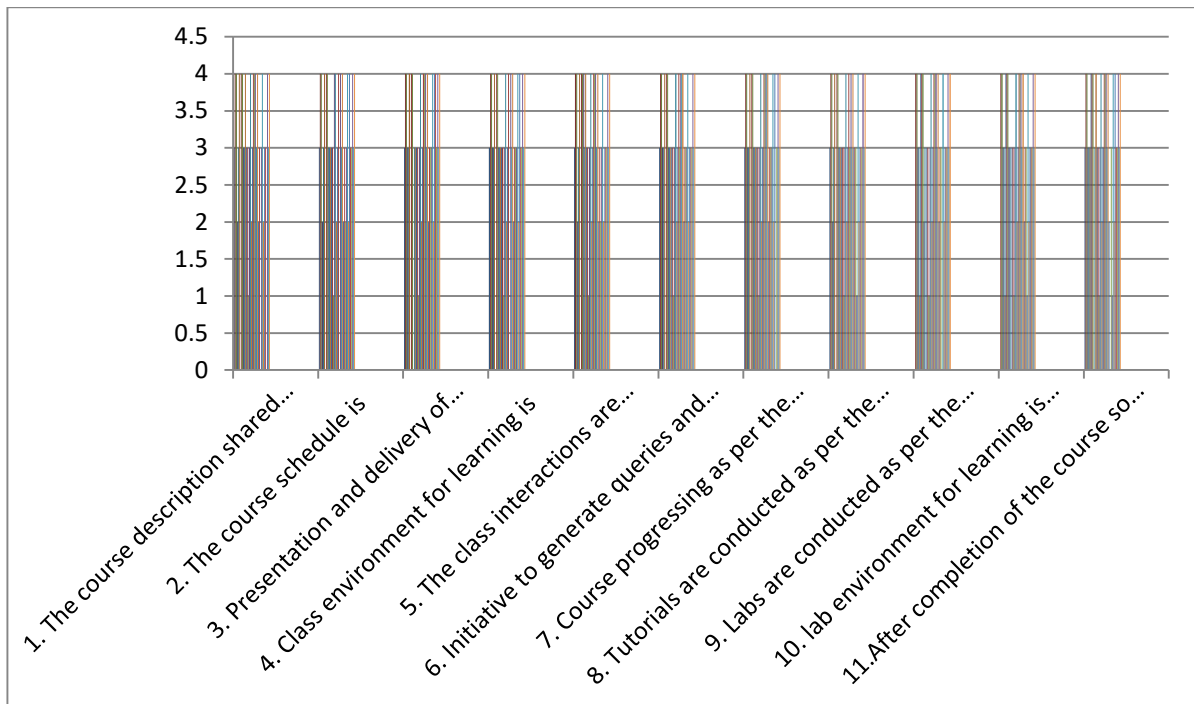
## (XI) Attainment Record



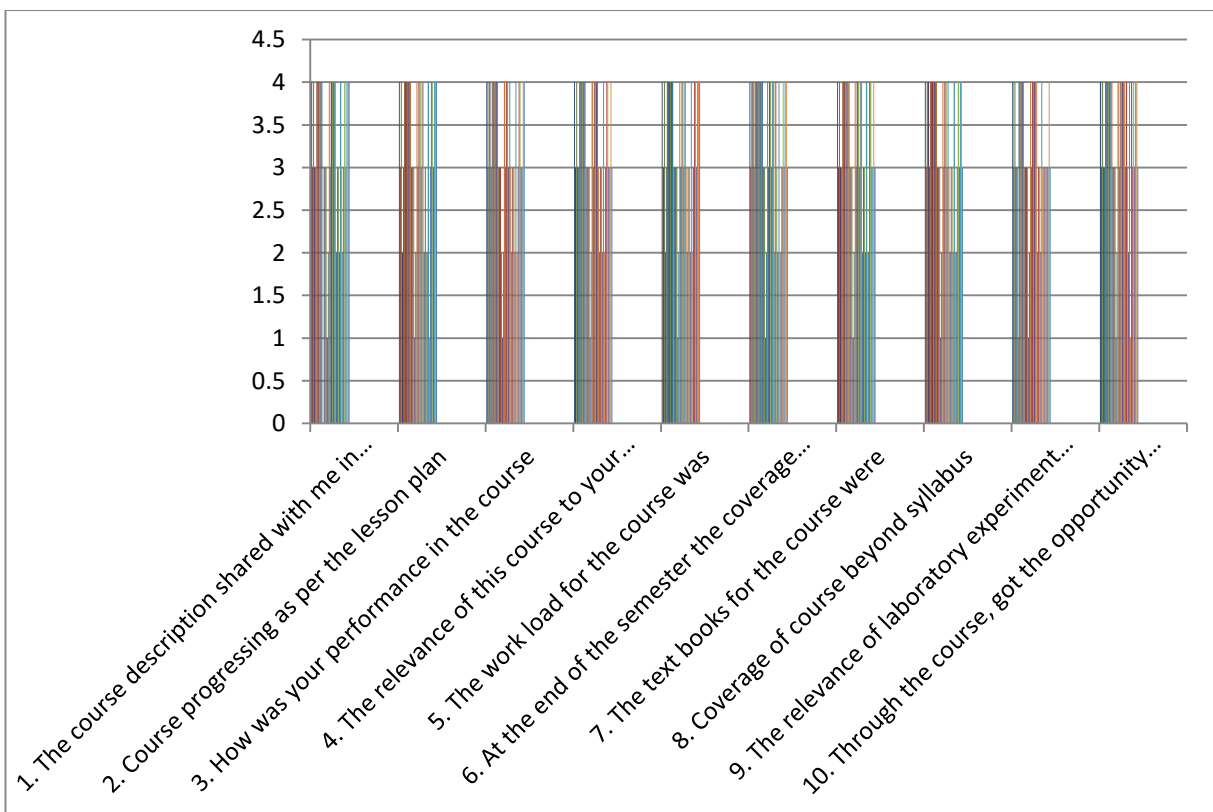
## (XII) University Result

## (XII) Analysis of Student Feed Back

### Formative feedback:



### Summative feedback:



### **(XIII) Teacher Self-Assessment (at the completion of course)**

After completion of the course we observe the following

- (i) More classes related to CO4 is needed to improve the attainment
- (ii) Number of numerical to be solved in class should be increase to make the class more interactive
- (iii) More mock test should be conducted (specially online) to increase the numerical solving pace of the students.

## ATTENDANCE SHEET (Lecture)

**Subject with code: Hydraulic Structures (CE 704B)**

**Semester : 7<sup>th</sup>**

**Discipline: CE**

Sl.	Roll No.	Name	19-08-2020	21-08-2020	24-08-2020	25-08-2020	26-08-2020	27-08-2020	31-08-2020	01-09-2020	04-09-2020	08-09-2020	10-09-2020	14-09-2020	21-09-2020	24-09-2020	28-09-2020	01-10-2020	05-10-2020	08-10-2020
1	11901317011	Wang Dorjee Tamang	A	p	p	A	P	P	A	A	P	P	P	A	A	A	P	P	P	P
2	11901317012	Souvik Barua	P	P	A	P	P	P	P	P	A	P	P	P	A	A	A	P	P	P
3	11901317013	Shubhadip Ghosh	P	A	A	A	A	P	P	A	A	A	P	A	P	P	P	A	A	A
4	11901317014	Sanketh Banik	A	A	A	P	P	P	P	A	P	P	A	A	A	P	P	P	P	P
5	11901317015	Rojina Pradhan	P	P	P	P	P	P	A	P	A	P	P	P	P	P	P	A	P	P
6	11901317016	Rhythm Roy	P	P	P	P	A	A	A	P	P	P	P	P	P	P	P	P	P	P
7	11901317017	Preetam Deb	P	A	P	P	A	P	A	P	P	P	P	P	A	P	P	P	P	A
8	11901317018	Pratik Debnath	P	A	A	A	P	A	P	P	P	P	A	P	P	P	P	P	A	A
9	11901317019	Pranav Kumar Mishra	P	P	P	P	A	A	P	A	P	A	P	P	A	P	P	A	A	P
10	11901317020	Piyush Raj	P	P	P	P	P	A	A	P	P	A	A	A	P	P	P	A	A	A
11	11901317021	Motluba Parveen	P	P	P	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P
12	11901317022	Manish Kumar Ray	P	P	P	P	P	P	A	P	A	P	P	P	P	P	P	P	A	P
13	11901317023	Kishan Kumar Agarwal	P	P	P	P	P	P	A	P	A	P	P	P	P	P	P	A	P	P
14	11901317024	Kaustav Sarkar	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	A	P	P
15	11901317025	Gokul Barman	P	P	P	A	P	P	P	P	P	P	P	P	P	A	P	P	P	P
16	11901317026	Debosree Roy	P	P	P	P	P	P	P	A	P	P	P	P	P	P	P	P	A	P
17	11901317027	Debojyoti Mantri	A	P	P	P	P	P	A	P	P	P	P	P	P	P	P	A	P	P
18	11901317028	Debojit Basak	A	A	A	P	P	A	P	P	P	P	P	P	P	P	P	A	P	P
19	11901317030	Debjyoti Roy	A	A	P	P	P	P	P	P	P	P	A	P	P	P	P	P	P	P
20	11901317031	Debargho Saha	A	A	A	A	A	A	A	P	A	A	A	P	A	A	A	P	P	A
21	11901317032	Debadrita Majumdar	P	P	A	A	A	P	P	A	P	P	P	P	P	P	A	P	P	P
22	11901317033	Bittu Barman	P	P	P	P	P	P	P	A	P	P	A	P	P	P	P	P	A	P
23	11901317034	Bikash Singh	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	A	A
24	11901317035	Bhaskar Sarkar	P	P	P	P	P	P	P	P	P	A	P	P	P	A	P	P	P	P
25	11901317036	Barna Shreshtra Sarkar	A	p	p	A	P	P	A	A	P	P	P	A	A	A	P	P	P	P

Sl.	Roll No.	Name	13-10-2020	15-10-2020	20-10-2020	04-11-2020	25-11-2020	30-11-2020	08-12-2020	11-12-2020	14-12-2020	22-12-2020	07-01-2021	13-01-2021	19-01-2021	21-01-2021	22-01-2021	28-01-2021	10-02-2021	22-02-2021
1	11901317011	Wang Dorjee Tamang	A	A	P	A	P	P	A	A	P	P	A	P	P	P	P	A	A	A
2	11901317012	Souvik Barua	P	A	P	P	A	P	P	P	P	P	A	A	P	P	P	P	P	P
3	11901317013	Shubhadip Ghosh	A	P	A	A	P	P	P	A	A	A	P	P	A	P	P	A	P	P
4	11901317014	Sanketh Banik	P	A	A	A	P	P	P	P	P	P	P	P	A	P	P	P	P	P
5	11901317015	Rojina Pradhan	P	P	P	A	A	P	P	P	P	P	P	P	P	P	P	P	P	P
6	11901317016	Rhythm Roy	A	A	A	A	P	P	P	P	P	P	P	P	P	P	P	P	P	P
7	11901317017	Preetam Deb	P	P	P	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P
8	11901317018	Pratik Debnath	A	P	P	A	A	A	A	A	A	A	A	A	A	A	P	A	A	A
9	11901317019	Pranav Kumar Mishra	A	P	P	P	A	A	P	A	A	P	A	P	A	P	A	P	P	P
10	11901317020	Piyush Raj	A	A	A	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P
11	11901317021	Motluba Parveen	P	P	P	P	P	A	P	P	P	P	P	P	P	P	P	A	P	P
12	11901317022	Manish Kumar Ray	A	P	P	A	A	A	P	P	P	P	P	P	P	P	P	P	P	P
13	11901317023	Kishan Kumar Agarwal	P	P	P	A	A	A	P	P	P	P	A	P	P	P	P	P	P	P
14	11901317024	Kaustav Sarkar	P	P	A	P	A	A	P	P	A	P	P	A	P	P	P	P	P	P
15	11901317025	Gokul Barman	P	P	P	A	P	P	P	P	P	A	P	P	P	P	P	P	P	P
16	11901317026	Debosree Roy	P	P	A	P	P	P	P	P	P	P	A	P	P	P	P	P	P	P
17	11901317027	Debojyoti Mantri	P	P	P	A	A	A	P	P	P	P	P	P	P	P	A	P	P	P
18	11901317028	Debojit Basak	P	P	P	A	A	P	P	A	A	A	A	A	A	A	A	A	A	A
19	11901317030	Debjyoti Roy	P	P	P	P	P	P	P	P	P	A	A	A	P	P	P	P	P	P
20	11901317031	Debargho Saha	A	A	P	A	P	P	A	A	A	A	A	P	P	A	P	A	P	A
21	11901317032	Debadrita Majumdar	P	P	P	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P
22	11901317033	Bittu Barman	P	P	P	P	A	A	P	P	A	A	P	P	P	P	P	A	A	A
23	11901317034	Bikash Singh	P	P	A	P	P	P	P	P	P	A	A	P	P	P	P	P	P	P
24	11901317035	Bhaskar Sarkar	A	P	A	A	P	P	P	P	A	P	P	A	P	P	P	P	P	P
25	11901317036	Barna Shreshtra Sarkar	A	A	P	A	P	P	A	A	P	P	A	P	P	P	P	A	A	A

## ATTENDANCE SHEET (Lecture)

**Subject with code: Hydraulic Structures (CE 704B)**

**Semester : 7<sup>th</sup>**

**Discipline: CE**

Sl.	Roll No.	Name	19-08-2020	21-08-2020	24-08-2020	25-08-2020	26-08-2020	27-08-2020	31-08-2020	01-09-2020	04-09-2020	08-09-2020	10-09-2020	14-09-2020	21-09-2020	24-09-2020	28-09-2020	01-10-2020	05-10-2020	08-10-2020
26	11901317037	Avisek Acharya	A	P	P	P	P	P	A	P	P	P	P	P	P	P	P	A	P	A
27	11901317038	Ashutosh Kumar	P	P	P	P	P	P	A	P	A	P	P	P	P	P	P	A	P	P
28	11901317039	Arpan Mandal	A	P	P	A	P	A	A	P	P	P	P	A	P	A	P	P	P	A
29	11901317040	Anurup Roy	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
30	11901317041	Anshuman	P	P	P	A	A	A	A	A	A	A	A	P	P	P	A	A	A	P
31	11901317042	Anirban Dutta	P	P	A	A	P	P	A	P	P	AP	P	P	P	A	P	P	P	P
32	11901317043	Abhishek Roy	P	P	P	A	P	P	P	A	A	P	P	P	P	A	P	P	A	P
33	11901317044	Abhishek Kumar Singh	P	P	A	A	A	P	P	A	A	P	A	P	P	P	P	P	P	P
34	11901318001	Vivek Gazmer	A	A	P	P	P	P	P	P	P	P	P	P	P	A	A	A	P	A
35	11901318002	Vivek Ekka	P	P	P	P	P	P	A	A	P	P	P	P	P	P	P	P	P	P
36	11901318003	Ujjal Barman	A	P	P	A	A	A	P	A	P	P	P	P	P	A	P	P	P	A
37	11901318004	Supratim Dutta	P	A	A	A	P	P	P	P	P	P	P	P	P	P	P	P	P	P
38	11901318006	Subhankar Sen	P	P	P	P	P	P	P	P	P	P	P	A	A	P	P	P	P	P
39	11901318007	Subham Sarkar	A	P	P	P	P	P	A	A	A	P	P	P	P	P	P	A	P	A
40	11901318008	Subham Saha	A	P	P	A	A	A	P	P	P	A	A	A	P	P	P	P	A	A
41	11901318009	Shuvam Hazra	A	P	P	A	A	A	P	P	P	P	A	A	P	A	A	A	P	A
42	11901318010	Shubham Sarkar	A	P	P	P	P	P	A	A	A	P	P	P	P	P	P	A	P	A
43	11901318011	Shouvik Debnath	P	P	P	A	A	P	P	A	A	P	A	A	P	A	P	P	A	P
44	11901318013	Sanjib Kumar Barman	P	A	A	A	P	P	P	P	P	P	P	P	P	P	P	P	P	P
45	11901318014	Sanchita Sarkar	P	P	P	P	P	P	P	P	P	P	A	A	A	P	A	A	A	P
46	11901318015	Ritwik Ghosh	A	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	P	A
47	11901318017	Pritama Roy	A	A	P	A	A	A	P	A	A	P	P	P	P	A	A	P	P	A
48	11901318018	Pritam Dutta	A	P	P	P	P	P	P	P	P	A	A	A	P	P	P	A	A	A
49	11901318019	Pratik Chandra Dey	A	P	P	P	P	P	A	A	A	P	P	P	P	P	P	A	P	A
50	11901318020	Pranta Das	P	P	P	A	A	P	P	A	A	P	A	A	P	A	P	P	A	P
51	11901318021	Pankaj Kumar Mahato	P	P	P	A	P	P	P	P	P	P	P	P	P	A	P	P	P	P
52	11901318022	Mukesh Roy	A	A	P	P	A	A	A	P	P	A	P	P	A	P	P	P	A	A



Sl.	Roll No.	Name	13-10-2020	15-10-2020	20-10-2020	04-11-2020	25-11-2020	30-11-2020	08-12-2020	11-12-2020	14-12-2020	22-12-2020	07-01-2021	13-01-2021	19-01-2021	21-01-2021	22-01-2021	28-01-2021	10-02-2021	22-02-2021
26	11901317037	Avisek Acharya	P	P	P	P	P	A	P	P	P	P	A	P	P	P	A	P	P	P
27	11901317038	Ashutosh Kumar	P	P	P	P	P	A	P	P	A	P	A	P	P	P	P	P	P	P
28	11901317039	Arpan Mandal	P	A	P	A	P	P	P	A	P	P	A	A	A	A	A	A	A	A
29	11901317040	Anurup Roy	P	P	P	P	P	P	P	A	P	P	P	P	P	P	P	P	P	P
30	11901317041	Anshuman	A	P	P	P	A	A	A	P	P	P	P	P	P	P	P	A	P	P
31	11901317042	Anirban Dutta	P	P	P	A	P	P	P	P	P	P	P	P	P	P	P	P	P	P
32	11901317043	Abhishek Roy	P	P	P	A	P	P	A	P	P	P	A	P	P	P	P	P	P	P
33	11901317044	Abhishek Kumar Singh	A	P	P	P	P	P	P	P	A	P	P	A	P	P	P	P	P	P
34	11901318001	Vivek Gazmer	P	P	P	A	A	A	P	P	P	A	A	A	P	P	P	P	P	P
35	11901318002	Vivek Ekka	P	P	P	P	P	P	P	P	P	P	A	P	P	P	P	P	P	P
36	11901318003	Ujjal Barman	P	P	P	A	P	P	P	P	P	A	A	P	A	P	A	P	P	P
37	11901318004	Supratim Dutta	P	P	P	P	P	P	P	P	P	P	P	A	A	P	A	P	P	A
38	11901318006	Subhankar Sen	P	A	A	P	P	P	P	P	P	A	A	A	P	P	P	P	P	P
39	11901318007	Subham Sarkar	P	P	P	P	P	A	P	P	P	P	P	P	P	A	P	P	P	P
40	11901318008	Subham Saha	A	A	P	P	P	P	A	A	A	P	A	P	A	A	P	A	P	P
41	11901318009	Shuvam Hazra	A	A	P	A	A	A	P	A	P	P	A	P	A	P	A	A	A	P
42	11901318010	Shubham Sarkar	P	P	P	P	P	A	P	P	A	A	P	P	P	P	P	A	A	A
43	11901318011	Shouvik Debnath	A	A	P	A	P	P	A	P	A	P	P	P	P	P	P	P	P	P
44	11901318013	Sanjib Kumar Barman	P	P	P	P	P	P	P	P	A	A	P	P	P	A	P	P	P	P
45	11901318014	Sanchita Sarkar	A	A	A	P	A	A	A	P	P	P	A	P	P	P	P	P	P	P
46	11901318015	Ritwik Ghosh	P	P	P	P	P	A	P	A	A	P	P	P	P	P	P	P	P	P
47	11901318017	Pritama Roy	P	P	P	A	A	P	P	P	P	A	A	A	P	P	A	A	A	P
48	11901318018	Pritam Dutta	A	A	P	P	P	A	A	P	P	P	P	P	P	P	P	P	P	P
49	11901318019	Pratik Chandra Dey	P	P	P	P	P	A	P	P	P	A	A	P	P	P	P	P	P	P
50	11901318020	Pranta Das	A	A	P	A	P	P	A	P	P	A	P	P	P	P	A	P	P	P
51	11901318021	Pankaj Kumar Mahato	P	P	P	A	P	P	P	A	P	P	A	A	A	P	P	P	P	P
52	11901318022	Mukesh Roy	P	P	A	P	P	P	A	P	P	P	P	P	P	A	P	P	P	P





