



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



# **COURSE FILE**

## **2<sup>ND</sup> SEM, 3<sup>RD</sup> YEAR, 2016**

**PAPER NAME : Operating System**

**PAPER CODE : CS 603 & CS 693**

# Course File

Course Title/Code: Operating System/CS 603 & CS 693

Semester:- 1<sup>st</sup> Year:- 6<sup>th</sup> Group:- A

Name of the Faculty: **Prof. Anupam Mukherjee**

E-mail : **anupamsit@gmail.com**

## Class Schedule:

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Timing(A)	10:00AM - 10:50AM	12:30PM - 13:20PM	---	10:00 AM - 10:50 AM	10:00 AM - 10:50 AM

## Lab Schedule:

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Timing(A)			10:50AM - 13:30PM (A2)		14:10PM - 16:40PM (A1)

## Hours of Meeting Students:-

Tuesday	Thursday	Other Days
10:50 AM - 12:30 PM	10:50 AM - 12:30 PM	1.30pm - 2pm or by appointment

## i) Course Objective:

The students will be able to understand the underlying principles, techniques and approaches which constitute a coherent knowledge in operating systems.

## 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:

Outcomes		Target
CS 603.1	<b>Differentiate</b> the working of an operating system and its components. (B.T. Level 2)	60% marks
CS 603.2	<b>Describe</b> process management and analyze the synchronization process. ( B.T. Level 1)	60% marks
CS 603..3	<b>Identify</b> the working methodology of multithreaded applications and distinguish different scheduling algorithms. (B.T. Level 4)	60% marks
CS 603.4	<b>Identify</b> the reasons of deadlocks and their remedial measures and explain different memory management techniques used in operating system. (B.T. Level 4)	60% marks
CS 603.5	<b>Classify</b> different storage management and protection techniques used in operating system. (B.T. Level 5)	60% marks

b) Once the student has successfully complete this course, he/she must be demonstrate the following:

Sl.	Question	BT Level
1.	<b>Explain</b> Operating system architecture with suitable diagram?	2
2.	<b>Describe</b> process state diagram?	2
3.	Consider the following page reference string:- 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 <b>Calculate</b> how many page faults would occur for the following replacement algorithms? Assuming 3 frames are available. Also assume that initially none of pages in main memory. i) Optimal replacement ii) FIFO replacement.	3
4.	Suppose a disk drive has 300 cylinders, numbered 0 to 299. The current head position of the disk is at 90. The queue of pending requests, in FIFO order is 36, 79, 15, 120, 199, 270, 89, and 170. <b>Calculate</b> the average cylinder movements for the following algorithms: i) SSTF ii) C-SCAN	3
5.	<b>Explain</b> Belady's anomaly with example.	2

6.	<b>Distinguish</b> between “Starvation” and “Deadlock”.	4																																																									
7.	<p>Consider the following snapshot of a system:- Allocation Request Available</p> <table border="1"> <thead> <tr> <th rowspan="2">Process</th> <th colspan="3">Allocation</th> <th colspan="3">Request</th> <th colspan="3">Available</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> <th>A</th> <th>B</th> <th>C</th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td rowspan="5">0</td> <td rowspan="5">0</td> <td rowspan="5">0</td> </tr> <tr> <td>P2</td> <td>2</td> <td>0</td> <td>0</td> <td>2</td> <td>0</td> <td>2</td> </tr> <tr> <td>P3</td> <td>3</td> <td>0</td> <td>3</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>P4</td> <td>2</td> <td>1</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>P5</td> <td>0</td> <td>0</td> <td>2</td> <td>0</td> <td>0</td> <td>2</td> </tr> </tbody> </table> <p><b>Justify</b> the solution using the deadlock detection algorithm:  i) Is the system in a deadlocked state?  ii) Suppose that <i>P2</i> makes one additional request for an instance of type <i>C</i>. If this request is granted then check deadlock occur or not.</p>	Process	Allocation			Request			Available			A	B	C	A	B	C	A	B	C	P1	0	1	0	0	0	0	0	0	0	P2	2	0	0	2	0	2	P3	3	0	3	0	0	0	P4	2	1	1	1	0	0	P5	0	0	2	0	0	2	5
Process	Allocation			Request			Available																																																				
	A	B	C	A	B	C	A	B	C																																																		
P1	0	1	0	0	0	0	0	0	0																																																		
P2	2	0	0	2	0	2																																																					
P3	3	0	3	0	0	0																																																					
P4	2	1	1	1	0	0																																																					
P5	0	0	2	0	0	2																																																					
8.	<b>"All unsafe states may not lead to deadlock."</b> – Why or why not? <b>Justify</b> your answer.	5																																																									

## Operating System

**Code: CS 603**

Contact: 3L

### CHAPTER-1

#### Introduction [4L]

- Introduction to OS. Operating system functions, evaluation of O.S.,
- Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

#### System Structure[3L]

- Computer system operation,
- I/O structure, storage structure, storage hierarchy,
- Different types of protections,
- Operating system structure (simple, layered, virtual machine), O/S services,
- System calls.

### CHAPTER-2

#### Processes [3L]

- Concept of processes,
- Process scheduling,
- Operations on processes, co-operating processes, inter-process communication.

#### Threads [2L]

- Overview of threads
- Benefits of threads

- User and kernel threads.

## **CHAPTER-3**

### **CPU scheduling [3L]**

- Scheduling criteria,
- Preemptive & non-preemptive scheduling,
- Scheduling algorithms (FCFS, SJF, RR,priority),
- Algorithm evaluation, multi-processor scheduling.

## **CHAPTER-4**

### **Deadlocks [4L]**

- System model,
- Deadlock characterization,
- Methods for handling deadlocks, deadlock prevention,
- Deadlock avoidance, deadlock detection, recovery from deadlock.

## **CHAPTER-5**

### **Process Synchronization [5L]**

- Background of process synchronization
- Critical section problem, critical region,
- Synchronization hardware,
- Classical problems of synchronization,
- Semaphores.

## **CHAPTER-6**

### **Memory Management [5L]**

- Background,
- Logical vs. physical address space, swapping,
- Contiguous memory allocation,
- Paging, Segmentation, segmentation with paging.

## **CHAPTER-7**

### **Virtual Memory [3L]**

- Background,
- Demand paging,
- Page replacement, Page replacement algorithms (FCFS, LRU),
- Allocation of frames, thrashing.

## **CHAPTER-8**

### **Disk Management [3L]**

- Disk structure,
- Disk scheduling (FCFS, SSTF, SCAN,C-SCAN) ,
- Disk reliability, disk formatting, boot block, bad blocks.

5

## **CHAPTER-9**

### **File Systems [4L]**

- File concept, access methods,

- Directory structure, file system structure,
- Allocation methods (contiguous, linked, indexed),
- Free-space management (bit vector, linked list, grouping),
- Directory implementation (linear list, hash table), efficiency & performance.

## CHAPTER-10

### I/O Management [4L]

- I/O hardware, polling, interrupts, DMA,
- Application I/O interface (block and character devices, network devices, clocks and timers, blocking and nonblocking I/O),
- Kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

## CHAPTER-11

### Protection & Security [4L]

- Goals of protection, domain of protection,
- Security problem, authentication, one time password,
- Program threats, system threats, threat monitoring, encryption.

## Chapter Layout

Chapter	Lecture Hours	Laboratory hours	Tutorials
Chapter - 1	6 hrs	3 hrs	1
Chapter - 2	5 hrs	3 hrs	1
Chapter - 3	3 hrs	3 hrs	
Chapter - 4	4 hrs	6 hrs	1
Chapter - 5	5 hrs	3 hrs	
Chapter - 6	5 hrs	3 hrs	1
Chapter - 7	3 hrs		
Chapter - 8	3 hrs		
Chapter - 9	4 hrs	3 hrs	1
Chapter - 10	4 hrs	3 hrs	
Chapter - 11	4		
<b>Total</b>	<b>42 hrs</b>	<b>27 hrs</b>	<b>7</b>

### c) Textbooks:

1. "Operating System Concepts" (8th Edition), Silberschatz, P. B. Galvin, and G. Gagne, John Wiley & Sons, Inc, ISBN: 0471694665.
2. Milenkovic M., "Operating System : Concept & Design", McGraw Hill.

### d) Reference Books:

1. "Operating System Design & Implementation", Tanenbaum A.S., Practice Hall NJ.
2. "Operating Systems", Stalling, William, Maxwell McMillan International Editions
3. "Operating Systems", Dhamdhere, TMH

### e) Evaluation Scheme:

Evaluation Criteria	Marks
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
<b>O</b>	90% and above
<b>E</b>	80 – 89.9%
<b>A</b>	70 – 79.9%
<b>B</b>	60 – 69.9%
<b>C</b>	50 – 59.9%
<b>D</b>	40 – 49.9%
<b>F</b>	Below 40%

## 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:

### f) Laboratory Evaluation:

Experiment No.	Experiment Name	Schedule	Marks
P 01	Execute following commands: <i>man, ls, mkdir, cd, cp, mv, rm, touch, cat, cal, date, pwd, who, fg, bg, jobs, kill.</i>	3HRS	5
P 02	<ul style="list-style-type: none"><li>• Write a shell script to calculate addition of two numbers.</li><li>• Write a shell script to find factorial of any number.</li><li>• Write a shell script to find whether a given number is prime or not.</li><li>• Write a shell script to generate Fibonacci series.</li></ul>	3HRS	2+2
P 03	<ul style="list-style-type: none"><li>• Write a shell script to show the maximum of three numbers provided as command line arguments.</li></ul>	3HRS	2+2+2



P 04	<ul style="list-style-type: none"> <li>• Write a shell script that accept a filename as argument and displays the last modification time, if the file exists and suitable message if it does not.</li> <li>• Write programs using the following system calls of UNIX operating system: <i>fork, exec, getpid, exit</i></li> </ul>	3HRS	2+2
P 05	<ul style="list-style-type: none"> <li>• Write a shell script which will displays a list of all files in the current directory to which you have read, write and executes permissions.</li> <li>• Write a program to get the PID of parent and Child Process.</li> </ul>	3HRS	2+2
P 06	<ul style="list-style-type: none"> <li>• Implement a Zombie process using fork.</li> <li>• Write a program for inter process communication between two processes using PIPE.</li> </ul>	3HRS	2+2
P 07	<ul style="list-style-type: none"> <li>• Write a shell script which counts the number of consonants and vowels in a given sentence.</li> <li>• Write a program for a process which cannot be killed by pressing Ctrl + c and again restore the default status of it.</li> </ul>	3HRS	2.5+2.5
P 08	<ul style="list-style-type: none"> <li>• Write a shell program, which display the message "welcome" and prints the date when you login to your system.</li> </ul>	3HRS	3
P 09	<ul style="list-style-type: none"> <li>• Write a synchronize Producer Consumer problem using semaphore</li> </ul>	3HRS	5

### 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 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.

### 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.
CS 603.1	1	2	1	-	-	-	-	-	-	-	-	-	1	
CS 603.2	1	1	2	-	-	-	-	-	-	-	-	-		2
CS 603.3	1	2	2	-	-	-	-	-	-	-	-	-		1
CS 603.4	1	3	1	1	-	-	-	-	-	-	-	-		1
CS 603.5	2	2	1	-	-	-	-	-	-	-	-	-	1	2
CS 603	1	2	2	1									1	2

- CO1, 4 & 5 partially satisfies whereas CO 2 & 3 fully satisfies the application of knowledge of mathematics, science, engineering fundamentals to the solution of complex engineering problems (PO1).
- CO2 & 4 minimally satisfies whereas CO 3 & 4 partially satisfies the ability of the student to identify, formulate, and analyze engineering problems to arrive at substantiated conclusions (PO2).
- CO 4 & 5 minimally satisfies the student's ability to function effectively as an individual and as a member in a team (PO9).

## h) Delivery Methodology:

Outcome	Method	Supporting Tools	Demonstration
CS 603.1	Structured (Partially Supervised Whole-Class Grouping)	Blackboard & Chalk	Distinguished different types and components of OS.
CS 603.2	Structured (Partially Supervised Whole-Class Grouping)	Blackboard & Chalk, Software Based	Able to solve synchronization problems.
CS 603.3	Structured (Partially Supervised Whole-Class Grouping)	Blackboard & Chalk, Video Lecture, NPTEL materials	Able to solve CPU Scheduling problems.
CS 603.4	Structured (Partially Supervised Independent work)	Blackboard & Chalk, Video Lecture, NPTEL materials	Solve Deadlock and memory management related problems.
CS 603.5	Structured (Partially Supervised Independent work)	Blackboard & Chalk	Identify different security issues of OS.

## i) Assessment Methodology:

Outcome	Assessment Tool	Specific Question / activity aligned to the Outcome
CS 603.1	Internal Test	1. What is Operating System? What are the functionalities of Operating System? What are

		the different types of Operating System? Draw the Layered Architecture of Operating System.																	
	Assignment	<p>1. Define the essential properties of the following types of operating systems:</p> <p>A. Batch</p> <p>B. Time sharing</p> <p>C. Real time</p> <p>D. Distributed</p> <p>2. Explain Operating system architecture with suitable diagram?</p>																	
	University Exam																		
CS 603.2	Internal Test	Discuss the structure of Process Control Block.																	
	Assignment	Describe the differences among short-term, medium-term, and long-term scheduling.																	
	University Exam																		
CS 603.3	Internal Test	<p>Consider the following set of process. CPU burst times of them are given in milliseconds.</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Process</th> <th>CPU Burst Time</th> </tr> </thead> <tbody> <tr> <td><i>P1</i></td> <td>15</td> </tr> <tr> <td><i>P2</i></td> <td>5</td> </tr> <tr> <td><i>P3</i></td> <td>7</td> </tr> <tr> <td><i>P4</i></td> <td>10</td> </tr> </tbody> </table> <p>Draw the Gantt chart for FCFS and R.R. scheduling where time quantum <math>q = 5</math> milliseconds. Calculate the average waiting time</p>	Process	CPU Burst Time	<i>P1</i>	15	<i>P2</i>	5	<i>P3</i>	7	<i>P4</i>	10							
	Process	CPU Burst Time																	
<i>P1</i>	15																		
<i>P2</i>	5																		
<i>P3</i>	7																		
<i>P4</i>	10																		
Assignment	<p>Consider the following set of processes, with the length of the CPU-burst time given in milliseconds:</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Process</th> <th>Burst Time</th> <th>Priority</th> </tr> </thead> <tbody> <tr> <td><i>P1</i></td> <td>10</td> <td>3</td> </tr> <tr> <td><i>P2</i></td> <td>1</td> <td>1</td> </tr> <tr> <td><i>P3</i></td> <td>2</td> <td>3</td> </tr> <tr> <td><i>P4</i></td> <td>1</td> <td>4</td> </tr> <tr> <td><i>P5</i></td> <td>5</td> <td>2</td> </tr> </tbody> </table> <p>The processes are assumed to have arrived in</p>	Process	Burst Time	Priority	<i>P1</i>	10	3	<i>P2</i>	1	1	<i>P3</i>	2	3	<i>P4</i>	1	4	<i>P5</i>	5	2
Process	Burst Time	Priority																	
<i>P1</i>	10	3																	
<i>P2</i>	1	1																	
<i>P3</i>	2	3																	
<i>P4</i>	1	4																	
<i>P5</i>	5	2																	

		<p>the order <math>P1, P2, P3, P4, P5</math>, all at time 0.</p> <p>a. Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a non-preemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.</p> <p>b. What is the turnaround time of each process for each of the scheduling algorithms in part a?</p> <p>c. What is the waiting time of each process for each of the scheduling algorithms in part a?</p> <p>d. Which of the schedules in part a results in the minimal average waiting time (over all processes)?</p>
	University Exam	
CS 603.4	Internal Test	<b>"All unsafe states may not lead to deadlock."</b> - Why or why not?
	Assignment	What are the disadvantages of segmentation memory management technique? How can these disadvantages be avoided if segmentation with paging is used?
	University Exam	
CS 603.5	Internal Test	<p>Suppose a disk drive has 300 cylinders, numbered 0 to 299. The current head position of the disk is at 90. The queue of pending requests, in FIFO order is 36, 79, 15, 120, 199, 270, 89, and 170. Calculate the average cylinder movements for the following algorithms:</p> <p>i) SSTF</p> <p>ii) C-SCAN</p>
	University Exam	

## j) A. Weekly Lesson Plan

Week	Lectures	Laboratory	Assignment/Quiz
1	<p>Discussion on course outcome and program outcome</p> <p>Introduction to OS. Operating system functions, evaluation of O.S</p> <p>Different types of O.S.: batch, multi-programmed, time-sharing, real-time,</p> <p>Discussion of distributed, parallel OS.</p>	<p>Familiarization with basic LINUX commands.</p>	--
2	<p>System structure of OS, Computer system operations, I/O structure, storage structure, storage hierarchy</p> <p>Operating system structure (simple, layered, virtual machine), O/S services, protections, System calls.</p> <p>Process: basic concept, state diagram/operation on processes,</p> <p>Process (contd.): co-operating processes, inter-process communication.</p> <p>Threads: Overview of threads. Benefits of threads.</p>	<p><b>Sell Programming:</b></p> <p>Creation of shell script and implementation of shell syntax</p>	--

3	<p>User and kernel threads. POSIX: P thread.</p> <p><b>CPU scheduling:</b> Scheduling criteria, Preemptive &amp; non-preemptive scheduling. Scheduling algorithms (FCFS, SJF, SRTF, RR, priority), Algorithm evaluation, multi-processor scheduling.</p>	<p><b>Process:</b> Process creation, duplication</p>	<b>Assignment - 1</b>
4	<p><b>Deadlocks:</b> System model, Deadlock characterization/necessary conditions, Methods for handling deadlocks, deadlock prevention, Deadlock avoidance, deadlock detection, recovery from deadlock. Problem analysis</p>	<p><b>Process:</b> Zombie process Orphan Process Sleeping process</p>	
5	<p><b>Revision on Week 1 to 4</b> Process Synchronization: Background of process synchronization, critical region. <b>Process Synchronization:</b> Necessary conditions, Critical section problem analysis. Different solutions strategy: software solutions.</p>	<p><b>Signal:</b> Signal handling System call</p>	<b>Quiz 1</b>
6	<p>Hardware solutions, OS based solution. Classical problems of synchronization semaphores.</p> <p><b>Memory Management:</b> Background, Logical vs. physical address space swapping, Contiguous memory allocation, First fit, Best fit and worst fit algorithm.</p>	<p><b>Programming with Semaphore</b></p>	--

7	<p>Paging, TLB. Segmentation, segmentation with paging.</p> <p><b>Virtual Memory:</b> Background, Demand paging, Page replacement, Page replacement algorithms (FCFS, LRU, Optimal), Allocation of frames, thrashing.</p>	Programming with <b>Pthread</b> functions	Assignment - 2
8	<p><b>Disk Management:</b> Disk structure, Disk scheduling (FCFS, SSTF, SCAN,C-SCAN) , Disk reliability, disk formatting, boot block, bad blocks.</p> <p><b>File Systems:</b> File concept, access methods, Directory structure, file system structure, Allocation methods (contiguous, linked, indexed),</p>	Inter-process communication using PIPES	Assignment - 3





9	<p>Free-space management (bit vector, linked list, grouping), Directory implementation (linear list, hash table), efficiency &amp; performance. I/O Management: I/O hardware, polling, interrupts, DMA,</p> <p>Application I/O interface (block and character devices, network devices, clocks and timers, blocking and nonblocking I/O), Kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance. Protection &amp; Security: Goals of protection, domain of protection, Security problem, authentication, one time password,</p>	<b>Revision</b>	<b>Quiz 2</b>
10	<p>Program threats, system threats, threat monitoring, encryption.</p> <p><b>Revision on Week 4 to 8</b> <b>Revision on Week 9 to 12</b> Discuss on University QP</p>		

**B. Daily Lesson Plan (Repeat format for each topic/unit/chapter)**

<p><b>CHAPTER: 1</b></p> <p><b>Title : Introductions to Operating System</b></p> <p>Date: 1/2/2016 Day: Monday</p>
<p><b>CONTENTS</b></p> <p>Detail discussion on OS and its components, user view and system view of Operating system,</p>

Goals of Operating system.
Topic/Unit/Chapter Objectives: Identify the need, components and view point of an Operating System.
Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. able to understand the need of Operating System.</li> <li>2. Classification of different components of Operating System.</li> <li>3. Identify different views and goal of Operating System.</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 an Operating System? (Level 2)</li> <li>2. What are the different components of Operating System? (Level 2)</li> <li>3. Why we need an Operating System? (Level 2)</li> <li>4. Briefly explain user view and system view of Operating System? (Level 4)</li> </ol>
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria <ol style="list-style-type: none"> <li>1. Write down the fundamental difference between Windows and Linux Operating System?</li> <li>2. List down the different Operating System (Windows/Linux) in subsequent order?</li> </ol>
QUIZ: related to Topic objective and outcome (new quiz with real world examples)
LABORATORY EXPERIMENT: related to the Topic objective and outcome
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
<b>Remarks, if any:</b>

<b>TOPIC/UNIT/ CHAPTER: 1</b>
<b>Title : Introductions to Operating System</b>
Date: 02/2/2016 Day: Tuesday
<b>CONTENTS</b>
Detail discussion on different types of Operating system: batch, multi-programmed, time-sharing, real-time OS.

<p>Topic/Unit/Chapter Objectives: Analyze various types of Operating system</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Understand batch processing system with its requirements.</li> <li>2. Identify multi-programming and time sharing system.</li> <li>3. Describing RTOS with proper examples.</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 a short note on: Batch processing system, RTOS? (Level 1)</li> <li>2. Identify the basic difference between time sharing and multi-programming system? (Level 4)</li> <li>3. Briefly explain hard and soft RTOS with example? (Level 4)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. Explain hard, firm and soft RTOS with real life examples?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p> <p style="text-align: center;">Discuss <b>hard, firm and soft RTOS</b> with real life examples</p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 1</b></p> <p><b>Title : Introductions to Operating System</b></p> <p>Date: 04/2/2016 Day: Thursday</p>
<p><b>CONTENTS</b></p> <p>Detail discussion on Discussion of distributed, parallel OS.</p>

<p>Topic/Unit/Chapter Objectives: Explaining distributed and parallel Operating System.</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Identifying distributed and centralized operating system.</li> <li>2. Understand Parallel operating system.</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 a short note on: Distributed Operating System, Parallel Operating System (Level 1)</li> <li>2. Identify the basic difference between Distributed and Centralized operating system? (Level 4)</li> <li>3. Identify the basic difference between Parallel and Network operating system? (Level 4)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p> <p style="text-align: center;">Discuss <b>Network Operating System</b> with real life examples</p>

<p><b>TOPIC/UNIT/ CHAPTER: 1</b></p> <p><b>Title : Introductions to Operating System</b></p> <p>Date: 08/2/2016 Day: Monday</p>
<p>CONTENTS</p>
<p>System structure of OS, Computer system operations, I/O structure, storage structure, storage hierarchy</p>
<p>Topic/Unit/Chapter Objectives: Explaining Operating System structures, operations and</p>

<p>storage.</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Identifying operating system structures and operations.</li> <li>2. Analyze I/O structure, storage structure, storage hierarchy of centralized OS .</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. Classify the different layers of an OS? (Level 5)</li> <li>2. Define Shell and Kernel? (Level 1)</li> <li>3. Identify the storage structure and its hierarchy of an operating system? (Level 4)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. What are the different types of shells available in LINUX?</li> <li>2. Describe different types of system calls available in OS?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p> <p>Execute following commands:</p> <p><i>man, ls, mkdir, cd, cp, mv, rm, touch, cat, cal, date, pwd, who, fg, bg, jobs, kill.</i></p>

<p><b>TOPIC/UNIT/ CHAPTER: 2</b></p> <p><b>Title : Processes and Threads</b></p> <p>Date: 09/2/2016 Day: Tuesday</p>
<p>CONTENTS</p>
<p>Process: basic concept, state diagram/operation on processes</p>
<p>Topic/Unit/Chapter Objectives: Identifying processes in there different states and operations.</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Identifying process in contrast with PCB.</li> <li>2. Distinguished between program, process and threads.</li> </ol>

<b>3. Analyze Process state diagram and context switching.</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):
<ol style="list-style-type: none"> <li>1. What is process? What are the different states of processes? (Level 1)</li> <li>2. Write the difference between program and process? (Level 1)</li> <li>3. <b>Explain</b> PCB with block diagram? (Level 2)</li> </ol>
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria
<ol style="list-style-type: none"> <li>1. Why context switching is a pure overhead of an operating system?</li> </ol>
QUIZ: related to Topic objective and outcome (new quiz with real world examples)
LABORATORY EXPERIMENT: related to the Topic objective and outcome
<ul style="list-style-type: none"> <li>• Write a shell script to calculate addition of two numbers.</li> <li>• Write a shell script to find factorial of any number.</li> </ul>
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
<b>Remarks, if any</b>

<b>TOPIC/UNIT/ CHAPTER: 2</b>
<b>Title : Processes and Threads</b>
Date: 11/2/2016 Day: Thursday
CONTENTS
Co-operating processes and inter-process communication.
Topic/Unit/Chapter Objectives: discuss the concepts of co-operating processes and, inter-process communication.
Broad Objectives of the chapter/topic are:
<ol style="list-style-type: none"> <li>1. Identifying the communication between more than two processes.</li> <li>2. Analyzed process creation and terminations through system calls.</li> </ol>

3. Defining process scheduler.
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 IPC? (Level 1)</li> <li>2. Discuss different operations on process – creation of parent, child, and process cancellation? (Level 2)</li> <li>3. Discuss the difference between long, medium and short term scheduler? (Level 2)</li> </ol>
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria
<ol style="list-style-type: none"> <li>1. Write a program to create a parent, child and orphan process?</li> </ol>
QUIZ: related to Topic objective and outcome (new quiz with real world examples)
LABORATORY EXPERIMENT: related to the Topic objective and outcome
<ul style="list-style-type: none"> <li>• Write a shell script to find whether a given number is prime or not.</li> <li>• Write a shell script to generate Fibonacci series.</li> <li>• Write a shell script to show the maximum of three numbers provided as command line arguments.</li> </ul>
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
<b>Remarks, if any</b>

**TOPIC/UNIT/ CHAPTER: 2**

**Title : Processes and Threads**

Date: 12/2/2016 Day: Friday

**CONTENTS**

Threads: Overview of threads. Benefits of threads.

Topic/Unit/Chapter Objectives: discuss the concepts of threads and its advantages

Broad Objectives of the chapter/topic are:

2. Identifying threads and distinguished single thread with multi threaded programs.
2. Analyzed the difference between process and threads.

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. What is Thread? (Level 1)
2. Discuss difference between single threaded and multi threaded programs? (Level 2)
3. What are the difference between process and thread? (Level 2)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

LABORATORY EXPERIMENT: related to the Topic objective and outcome

- Implement a Zombie process using fork.
- Write a program for inter process communication between two processes using PIPE.

**List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.**

**Remarks, if any**

<b>TOPIC/UNIT/ CHAPTER: 2</b> <b>Title : Processes and Threads</b> Date: 15/2/2016 Day: Monday
CONTENTS
User level threads and kernel level threads. Thread modeling, POSIX: P thread.
Topic/Unit/Chapter Objectives: discuss the concepts of user level and kernel level threads with different thread modeling techniques.



<p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Identify different types of threads: user level and kernel level.</li> <li>2. Analyzed thread one to many, one to one and many to many thread modeling techniques.</li> <li>3. Defining IEEE POSIX PThread.</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 user level and kernel level threads? (Level 2)</li> <li>2. Find out the drawback of many to one and one to one model of threads? (Level 4)</li> <li>3. Discuss POSIX PThread? (Level 2)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>2. What are the different APIs provided by POSIX PThread?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p> <ul style="list-style-type: none"> <li>• Write a shell script which counts the number of consonants and vowels in a given sentence.</li> <li>• Write a program for a process which cannot be killed by pressing Ctrl + c and again restore the default status of it.</li> <li>• Write a shell program, which display the message "welcome" and prints the date when you login to your system.</li> </ul>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

**TOPIC/UNIT/ CHAPTER: 3**

**Title : CPU scheduling**

Date: 16/2/2016 Day: Tuesday

**CONTENTS**

CPU scheduling: Scheduling criteria, Preemptive & non-preemptive scheduling.

Topic/Unit/Chapter Objectives: Describing different CPU scheduling types and criteria.

Broad Objectives of the chapter/topic are:

3. Identifying CPU scheduling criteria.
2. Analyzed Preemptive and non preemptive CPU scheduling.

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. What is CPU scheduling? (Level 1)
2. Discuss CPU- I/O burst cycle? (Level 2)
3. Explain preemptive and non preemptive scheduling with suitable examples? (Level 4)
4. What is dispatcher? (Level 1)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

LABORATORY EXPERIMENT: related to the Topic objective and outcome

**List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.**

**Remarks, if any**

<b>TOPIC/UNIT/ CHAPTER: 3</b> <b>Title : CPU scheduling</b> Date: 18/2/2016 Day: Thursday
CONTENTS
Scheduling algorithms (FCFS, SJF, Priority, RR)
Topic/Unit/Chapter Objectives: Understand the concepts of various CPU scheduling algorithms.
Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"><li>1. Identifying the requirement of CPU scheduling algorithms.</li><li>2. Analyze the importance of First Come First Serve, Shortest Job First, Priority and Round</li></ol>

Robin CPU scheduling algorithms.

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 CPU Utilization, Throughput, Turnaround Time, Waiting Time, Response Time? (Level 4)
2. Discuss Starvation problem and its solution? (Level 2)
3. Using preemptive SJF algorithm draw the Gantt chart and calculate the average waiting time and turnaround time for the following processes:

Process	Arrival time	Burst time
P0	0	6
P1	2	4
P2	3	10
P3	7	9

(Level 4)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

Using Round Robin algorithm draw the Gantt chart and calculate the average waiting time for the following processes (Time quantum: 3):

Process	Arrival time	Burst time
P0	0	6
P1	2	4
P2	3	10
P3	7	9

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

LABORATORY EXPERIMENT: related to the Topic objective and outcome

- Write a shell script that accept a filename as argument and displays the last modification time, if the file exists and suitable message if it does not.
- Write programs using the following system calls of UNIX operating system:  
*fork, exec, getpid, exit*

**List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.**

**Remarks, if any**

**TOPIC/UNIT/ CHAPTER: 3**

**Title : CPU scheduling**

Date: 19/2/2016 Day: Friday

**CONTENTS**

Algorithm evaluation, multi-processor scheduling.

Topic/Unit/Chapter Objectives: Identify the concepts of algorithm evaluation and multiprocessor scheduling.

Broad Objectives of the chapter/topic are:

1. Apply different CPU algorithms on the same problem.
2. Analyze the importance of multi-processor scheduling.

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 problem using FCFS, SJF, SRTF, Priority, RR ( $T_q = 2$ ) algorithms and draw the Gantt chart and calculate the average waiting time for the following processes:

Process	Arrival time	Burst time
P0	0	6
P1	2	4
P2	3	10
P3	7	9

(Level 3)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

1.Solve the problem using FCFS, SJF, SRTF, Priority, RR ( $T_q = 2$ ) algorithms and draw the Gantt chart and calculate the average waiting time for the following processes:

Process	Arrival time	Burst time
P0	0	4
P1	1	7
P2	2	8
P3	6	6

Which algorithm performs Best with respect to waiting time?

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

**QUIZ on OS (FIRST) - It has 20 MCQ Questions. It has to be solved within 20 minutes.**

LABORATORY EXPERIMENT: related to the Topic objective and outcome

- Write a shell script which will displays a list of all files in the current directory to which you have read, write and executes permissions.
- Write a program to get the PID of parent and Child Process.

**List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.**

Remarks, if any

**Students have to solve Assignment No.: 1**

**TOPIC/UNIT/ CHAPTER: 4**

**Title : Deadlock**

Date: 29/2/2016 Day: Monday

**CONTENTS**

System model, Deadlock characterization,

Topic/Unit/Chapter Objectives: Identify the concepts of deadlock and justify its different properties.

Broad Objectives of the chapter/topic are:

1. Identify deadlock and its strategy.
2. Able to explain the necessary conditions of deadlock.

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 deadlock? (Level 1)</li> <li>2. What are the necessary conditions of deadlock? (Level 1)</li> </ol>
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria
QUIZ: related to Topic objective and outcome (new quiz with real world examples)
LABORATORY EXPERIMENT: related to the Topic objective and outcome
•
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
<b>Remarks, if any</b>

<p><b>TOPIC/UNIT/ CHAPTER: 4</b></p> <p><b>Title : Deadlock</b></p> <p>Date: 1/3/2016 Day: Tuesday</p>
<p><b>CONTENTS</b></p> <p>Methods for handling deadlocks, deadlock prevention,</p>
<p>Topic/Unit/Chapter Objectives: Able to identify different methods for handling deadlock and deadlock prevention strategy.</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Identify different methods for handling deadlock.</li> <li>2. Able to explain the deadlock prevention strategy.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following</p>

<p>questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. What are the different methods for handling deadlock? (Level 1)</li> <li>2. Explain deadlock prevention strategy? (Level 4)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. Discuss circular waiting condition?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p> <ul style="list-style-type: none"> <li>•</li> </ul>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p> <p style="text-align: center;">Phantom deadlock</p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 4</b></p> <p><b>Title : Deadlock</b></p> <p>Date: 3/3/2016 Day: Thursday</p>
<p><b>CONTENTS</b></p> <p>Deadlock avoidance, deadlock detection, recovery from deadlock.</p>
<p>Topic/Unit/Chapter Objectives: Able to identify deadlock avoidance strategies and recovery methods.</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Identify deadlock avoidance through bankers' algorithm.</li> <li>2. Able to explain the deadlock recovery strategy.</li> </ol>
<p>Once the student has completed this topic/ chapter he/she will be able to answer following</p>



<p>questions/perform the following activities with Levels of Bloom's Taxonomy):</p> <ol style="list-style-type: none"> <li>1. Explain Bankers' algorithm with suitable example? (Level 4)</li> <li>2. Explain deadlock recovery strategy? (Level 4)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. What is safe and unsafe state?</li> <li>2. Why all unsafe states are not deadlock state?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p> <ul style="list-style-type: none"> <li>•</li> </ul>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p style="text-align: center;"><b>TOPIC/UNIT/ CHAPTER: 4</b></p> <p style="text-align: center;"><b>Title : Deadlock</b></p> <p style="text-align: center;">Date: 4/3/2016 Day: Friday</p>
<p style="text-align: center;">CONTENTS</p> <p>Different problem analysis on deadlock.</p> <p>Topic/Unit/Chapter Objectives: Able to solve deadlock problems.</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to solve deadlock problems based on bankers' algorithm.</li> <li>2. Able to find out safe sequence of order.</li> </ol>
<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):

1. Consider the following snapshot of a system. (level 3)

	<u>Allocation</u>			<u>Max</u>			<u>Available</u>		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

Answer the following questions?

- i) What is the content of the need matrix?
- ii) Is the system is in a safe state?
- iii) If the request from process P1 arrives for (1,0,2), can the request be granted immediately?

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

LABORATORY EXPERIMENT: related to the Topic objective and outcome

**List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.**

Remarks, if any

**TOPIC/UNIT/ CHAPTER: 4**

**Title : Revision**

Date: 7/3/2016 Day: Monday

CONTENTS

**Revision** class from **Chapter 1:** Introduction of OS to **Chapter 4:**Deadlock

Topic/Unit/Chapter Objectives: This will help the students for doubt clearance.

Broad Objectives of the chapter/topic are:

1. Doubt clearance.
2. Teacher student interaction.
3. Problem 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):
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria
ASSIGNMENT : related to Topic objective and outcome (new quiz with real world examples) <b>Students have to solve Assignment No.: 2</b>
LABORATORY EXPERIMENT: related to the Topic objective and outcome •
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
Remarks, if any

<b>TOPIC/UNIT/ CHAPTER: 5</b> <b>Title : Process Synchronization</b> Date: 8/3/2016 Day: Tuesday
<b>CONTENTS</b> <b>Process Synchronization:</b> Background of process synchronization, critical region.
Topic/Unit/Chapter Objectives: Able to identify the problems of process synchronization and critical regions.

<p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to identify co-operating process and synchronization problems.</li> <li>2. Able to find out critical region.</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 co-operating process?</li> <li>2. What is critical region?</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 5</b></p> <p><b>Title : Process Synchronization</b></p> <p>Date: 10/3/2016 Day: Thursday</p>
<p><b>CONTENTS</b></p>
<p><b>Process Synchronization:</b> Necessary conditions, Critical section problem analysis.</p>
<p>Topic/Unit/Chapter Objectives: Discuss the necessary conditions and critical section for process synchronization.</p>

<p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to identify three necessary conditions for process synchronization.</li> <li>2. Able to find out critical section.</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 progress? (level 1)</li> <li>2. Identify different sections of any critical section problem? (level 4)</li> <li>3. Explain Bounded waiting? (level 4)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. Explain Producer consumer problem and identify the critical resources?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p style="text-align: center;"><b>TOPIC/UNIT/ CHAPTER: 5</b></p> <p style="text-align: center;"><b>Title : Process Synchronization</b></p> <p style="text-align: center;">Date: 14/3/2016 Day: Monday</p>
<p style="text-align: center;"><b>CONTENTS</b></p> <p><b>Process Synchronization:</b> Different solutions strategy: software solutions.</p> <p>Topic/Unit/Chapter Objectives: Discuss the solution strategies for process synchronization.</p>

<p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to identify software solution through Dekker’s approach.</li> <li>2. Able to identify software solution through Peterson’s approach.</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 Dekker’s algorithm with its drawback? (level 4)</li> <li>2. Justify Peterson’s algorithm? (level 5)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. Why Dekker’s algorithms suffer from Bounded waiting conditions?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 5</b></p> <p><b>Title : Process Synchronization</b></p> <p>Date: 15/3/2016 Day: Tuesday</p>
<p><b>CONTENTS</b></p> <p><b>Process Synchronization:</b> Hardware solutions, OS based solution, Semaphore.</p>

<p>Topic/Unit/Chapter Objectives: Discuss the solution strategies for process synchronization.</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to identify Hardware solutions.</li> <li>2. Able to identify OS based solutions and semaphore.</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 Test &amp; Set Instruction? (level 4)</li> <li>2. What is Semaphore? (level 1)</li> <li>3. Describe wait and signal of Semaphore with suitable examples? (Level 1)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. How Test &amp; Set Instruction satisfies the necessary conditions for process synchronization?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 5</b></p> <p><b>Title : Process Synchronization</b></p> <p>Date: 29/3/2016 Day: Tuesday</p>
<p><b>CONTENTS</b></p>
<p><b>Process Synchronization:</b> Classical problems of process synchronization.</p>
<p>Topic/Unit/Chapter Objectives: Discuss different classical problems of process synchronization.</p>

<p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to understand Bounded Buffer problem.</li> <li>2. Able to understand Dining Philosopher problem.</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 Test &amp; Set Instruction? (level 4)</li> <li>2. What is Semaphore? (level 1)</li> <li>3. Describe wait and signal of Semaphore with suitable examples? (Level 1)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. Discuss the solution approach for Dining philosopher problem?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p> <p>Write a synchronize Producer Consumer problem using semaphore</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p> <p style="text-align: center;"><i><b>n - process critical section problem: Bakery Algorithm</b></i></p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 6</b></p> <p><b>Title : Memory Management</b></p> <p>Date: 31/3/2016 Day: Thursday</p>
<p><b>CONTENTS</b></p> <p>Memory Management: Background, Logical vs. physical address space.</p>
<p>Topic/Unit/Chapter Objectives: They are able to understand the basic concepts of memory management scheme and addressing layouts.</p> <p>Broad Objectives of the chapter/topic are:</p>



<ol style="list-style-type: none"> <li>1. Able to understand contiguous and non-contiguous memory management.</li> <li>2. Able to understand real memory and virtual memory management.</li> <li>3. Able to identify address binding techniques.</li> <li>4. Able to distinguished logical vs physical address space.</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 Address Binding techniques? (level 4)</li> <li>2. How logical addresses are mapped with physical addresses? (level 1)</li> <li>3. What is the utilization of MMU? (Level 1)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. What is the difference between real and virtual memory?</li> <li>2. What is the purpose of relocation register?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p style="text-align: center;"><b>TOPIC/UNIT/ CHAPTER: 6</b></p> <p style="text-align: center;"><b>Title : Memory Management</b></p> <p style="text-align: center;">Date: 1/4/2016 Day: Friday</p>
<p style="text-align: center;"><b>CONTENTS</b></p> <p><b>Memory Management:</b> swapping, Contiguous memory allocation, First fit, Best fit and worst fit algorithm.</p>
<p>Topic/Unit/Chapter Objectives: They are able to understand memory allocation techniques.</p>

<p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to understand the need of swapping.</li> <li>2. Able to explain various memory allocation techniques.</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 a short note on swapping? (level 1)</li> <li>2. Explain First fit, Best fit and Worst fit algorithms with examples? (level 4)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. Given six memory partitions of 300KB, 600KB, 350KB, 200KB, 750KB and 125KB (in order), how would the first fit, best fit and worst fit algorithms place processes of size 115KB, 500 KB, 358 KB, 200 KB, 375 KB (in order)? Rank the algorithms in terms of how efficiently they use memory.</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p style="text-align: center;"><b>TOPIC/UNIT/ CHAPTER: 6</b></p> <p style="text-align: center;"><b>Title : Memory Management</b></p> <p style="text-align: center;">Date: 4/4/2016 Day: Monday</p>
<p style="text-align: center;"><b>CONTENTS</b></p> <p><b>Memory Management:</b> Paging, Translation Look-aside Buffer.</p>
<p>Topic/Unit/Chapter Objectives: They are able to understand fragmentation and non contiguous memory management scheme.</p>

<p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to identify internal and external fragmentation.</li> <li>2. Able to understand paging techniques.</li> <li>3. Able to understand Look-aside Buffer.</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 a short note on TLB? (level 1)</li> <li>2. What is compaction? (level 1)</li> <li>3. What do mean by internal and external fragmentation? (level 1)</li> <li>4. Describe paging with suitable example? (level 1)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. What is TLB hit and TLB miss?</li> <li>2. Why TLB technique is faster?</li> <li>3. Draw the logical diagram of Paging?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 6</b></p> <p><b>Title : Memory Management</b></p> <p>Date: 5/4/2016 Day: Tuesday</p>
<p><b>CONTENTS</b></p> <p><b>Memory Management:</b> Segmentation, segmentation with paging.</p>
<p>Topic/Unit/Chapter Objectives: They are able to understand the segmentation technique and</p>

<p>its drawback, which can be overcome by segmentation with paging.</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to understand Segmentation techniques.</li> <li>2. Able to understand the drawback of paging and segmentation.</li> <li>3. Able to understand the concepts of Segmentation with Paging.</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. Describe Segmentation with suitable example? (level 1)</li> <li>2. What are the difference between paging and segmentation? (level 4)</li> <li>3. Briefly explain segmentation with paging techniques? (level 4)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. What are the difference between paging and segmentation?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 7</b></p> <p><b>Title : Virtual Memory</b></p> <p>Date: 7/4/2016 Day: Thursday</p>
<p><b>CONTENTS</b></p>
<p><b>Virtual Memory:</b> Background, Demand paging, Page replacement.</p>
<p>Topic/Unit/Chapter Objectives: They are able to understand the basic concepts of virtual memory and analyze demand paging with page replacement strategy.</p>

<p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to understand the basic concept of Virtual memory.</li> <li>2. Able to analyze demand paging.</li> <li>3. Able to understand the concepts of page replacement strategy.</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 virtual memory? (level 1)</li> <li>2. Write a short note on demand paging? (level 1)</li> <li>3. Calculate page faults using optimal page replacement algorithm with the following reference string with four page frames. 1 2 3 4 5 3 4 1 6 7 8 7 8 9 7 8 9 5 4 5 4 2 (level 5)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. Draw the block diagram of demand paging</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 7</b></p> <p><b>Title : Virtual Memory</b></p> <p>Date: 11/4/2016 Day: Monday</p>
<p><b>CONTENTS</b></p> <p><b>Virtual Memory:</b> Page replacement algorithms (FCFS, LRU, Optimal), Allocation of frames, thrashing.</p>
<p>Topic/Unit/Chapter Objectives: They are able to analyze page replacement algorithms (FCFS, LRU, Optimal).</p>

<p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to understand the basic concept of page replacement algorithms (FCFS, LRU, Optimal).</li> <li>2. Able to analyze the problem of thrashing.</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 thrashing? (level 1)</li> <li>2. Calculate page faults using optimal page replacement algorithm with the following reference string with four page frames. 1 2 3 4 5 3 4 1 6 7 8 7 8 9 7 8 9 5 4 5 4 2 <ol style="list-style-type: none"> <li>a. (level 5)</li> </ol> </li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <p>i) Given references to the following pages by a program, 0, 9, 0, 1, 8, 1, 8, 7, 8, 7, 1, 2, 8, 2, 7.</p> <p>How many page faults will occur if the program has three (3) page frames available to it and uses both FIFO replacement strategy and LRU replacement strategy.</p> <p>ii) Which replacement strategy in the above performs better and why?</p>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 8</b></p> <p><b>Title : Disk Management</b></p> <p>Date: 12/4/2016 Day: Tuesday</p>
<p><b>CONTENTS</b></p> <p><b>Disk Management:</b> Disk structure, Disk scheduling (FCFS, SSTF, SCAN,C-SCAN) ,</p>
<p>Topic/Unit/Chapter Objectives: They are able to understand the disk structure and disk scheduling algorithm.</p>

<p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to understand the basic concept disk structure.</li> <li>2. Able to analyze the problem of Disk scheduling (FCFS, SSTF, SCAN,C-SCAN).</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. Suppose a disk drive has 300 cylinders, numbered 0 to 299. The current position of the desk arm is 90. The queue of pending requests, in FIFO order is 36, 79, 15, 120, 199, 270, 89, 170. Calculate the average head movements for the following algorithms: <ol style="list-style-type: none"> <li>i) FCFS</li> <li>ii) SSTF.</li> </ol> </li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. Suppose a disk drive has 300 cylinders, numbered 0 to 299. The current position of the desk arm is 90. The queue of pending requests, in FIFO order is 36, 79, 15, 120, 199, 270, 89, 170. Calculate the average head movements for the following algorithms: <ol style="list-style-type: none"> <li>i) FCFS</li> <li>ii) SSTF.</li> </ol> </li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 8</b></p> <p><b>Title : Disk Management</b></p> <p>Date: 15/4/2016 Day: Friday</p>
<p><b>CONTENTS</b></p>
<p><b>Disk Management:</b> Disk reliability, disk formatting, boot block, bad blocks.</p>
<p>Topic/Unit/Chapter Objectives: They are able to understand reliability factors and block</p>

structures of disk.  Broad Objectives of the chapter/topic are:  1. Able to understand the reliability factor of a disk. 2. Able to analyze the boot and bad blocks.
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 short note on disk reliability factor? 2. What is boot block? 3. What is bad block?
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria
QUIZ: related to Topic objective and outcome (new quiz with real world examples)
LABORATORY EXPERIMENT: related to the Topic objective and outcome
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
<b>Remarks, if any</b>  <b>Students have to solve Assignment No.: 3</b>

<b>TOPIC/UNIT/ CHAPTER: 9</b>  <b>Title : File Systems</b>  Date: 19/4/2016 Day: Tuesday
<b>CONTENTS</b>  File Systems: File concept, access methods, Directory structure, file system structure,



<p>Topic/Unit/Chapter Objectives: They are able to learn the basic concepts, access methods and directory structures of file system.</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to understand various file accessing methods.</li> <li>2. Able to analyze directory and file system structures.</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 sequential and direct access of file system? (level 4)</li> <li>2. Explain RAID? (level 4)</li> <li>3. Explain single, two, tree and acyclic graph directory structures? (level 4)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <p style="text-align: center;">What is acyclic graph? Draw acyclic graph directory structures?</p>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

**TOPIC/UNIT/ CHAPTER: 9**

**Title : File Systems**

Date: 21/4/2016 Day: Thursday

**CONTENTS**

File Systems:

File Allocation methods (contiguous, linked, indexed),

<p>Topic/Unit/Chapter Objectives: They are able to learn the different file allocation methods.</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. Able to understand various file allocation methods (contiguous, linked, indexed).</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>4. Explain contiguous, linked and indexed file allocation methods? (level 4)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p> <ol style="list-style-type: none"> <li>1. What is inode?</li> </ol>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 9</b></p> <p><b>Title : File Systems</b></p> <p>Date: 25/4/2016 Day: Monday</p>
<p><b>CONTENTS</b></p> <p>File Systems: Free-space management (bit vector, linked list, grouping),</p>

Topic/Unit/Chapter Objectives: They are able to understand free-space management. Broad Objectives of the chapter/topic are: 1. Able to understand various free-space management strategies.
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 short note on Free-space management? (level 4)
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria
QUIZ: related to Topic objective and outcome (new quiz with real world examples)
LABORATORY EXPERIMENT: related to the Topic objective and outcome
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
<b>Remarks, if any</b>

**TOPIC/UNIT/ CHAPTER: 9****Title : File Systems**

Date: 26/4/2016 Day: Tuesday

**CONTENTS**

File Systems:

Directory implementation (linear list, hash table), efficiency & performance.
Topic/Unit/Chapter Objectives: They are able to analyze directory implementation techniques and justify its efficiency and performance.  Broad Objectives of the chapter/topic are:  1. Able to analyze directory implementation techniques through linear list and hash table. 2. Able to measure efficiency and performance of file 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. Explain directory implementation through linear list and hash table? (level 4)
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria
QUIZ: related to Topic objective and outcome (new quiz with real world examples)
LABORATORY EXPERIMENT: related to the Topic objective and outcome
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
<b>Remarks, if any</b>

<b>TOPIC/UNIT/ CHAPTER: 10</b>
<b>Title : I/O Management</b>
Date: 28/4/2016 Day: Thursday
<b>CONTENTS</b>

I/O Management: I/O hardware, polling, interrupts, DMA.
Topic/Unit/Chapter Objectives: They are able to analyze I/O hardware, polling, interrupts, DMA  Broad Objectives of the chapter/topic are:  <ol style="list-style-type: none"> <li>1. Able to analyze I/O hardware,</li> <li>2. Able to understand polling and interrupts mechanism.</li> <li>3. Able to analyze direct memory access</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 a short note on Direct memory Access? (level 1)</li> <li>3. Explain two interrupt request line? (level 4)</li> <li>4. Explain busy-waiting or polling? (level 4)</li> </ol>
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria
QUIZ: related to Topic objective and outcome (new quiz with real world examples)
LABORATORY EXPERIMENT: related to the Topic objective and outcome
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
<b>Remarks, if any</b>

<b>TOPIC/UNIT/ CHAPTER: 10</b>
<b>Title : I/O Management</b>
Date: 29/4/2016 Day: Friday
<b>CONTENTS</b>
I/O Management: Application I/O interface (block and character devices, network devices, clocks and timers,

blocking and non-blocking I/O), Kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.
Topic/Unit/Chapter Objectives: They are able to understand applications of I/O interface and kernel I/O subsystem.  Broad Objectives of the chapter/topic are:  <ol style="list-style-type: none"> <li>1. Able to analyze applications of I/O interface like block and character devices, network devices, clocks and timers, blocking and non-blocking I/O.</li> <li>2. Able to understand Kernel I/O subsystem and its scheduling, buffering, caching, spooling and device reservation, error handling techniques.</li> <li>3. Able to analyze I/O performance.</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>5. Write a short note on Kernel I/O Subsystem? (level 1)</li> <li>6. Explain non-blocking technique and asynchronous I/O? (level 4)</li> <li>7. Explain block device interface? (level 4)</li> </ol>
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria
QUIZ: related to Topic objective and outcome (new quiz with real world examples)
LABORATORY EXPERIMENT: related to the Topic objective and outcome
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
Remarks, if any

**TOPIC/UNIT/ CHAPTER: 11**

**Title : Protection & Security**

Date: 2/5/2016 Day: Monday

### **CONTENTS**

Protection & Security: Goals of protection, domain of protection,

Topic/Unit/Chapter Objectives: to discuss goals of protection and security.

Broad Objectives of the chapter/topic are:

1. Able to analyze security problems and its solution.
2. Able to discuss security threats and attacks.
3. To describe various countermeasures to security attacks.

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):

8. Explain active and passive attacks? (level 4)
9. Explain Denial-of-service (DOS) attack? (level 4)
10. Explain masquerading? (level 4)

HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria

Discuss man in the middle attack problem.

QUIZ: related to Topic objective and outcome (new quiz with real world examples)

LABORATORY EXPERIMENT: related to the Topic objective and outcome

**List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.**

**Remarks, if any**

**CHAPTER: 11**

**Title : Protection & Security**

Date: 3/5/2016 Day: Tuesday

**CONTENTS**

Protection & Security: Security problem, authentication, one time password.

Topic/Unit/Chapter Objectives: To explain the fundamentals of security problem,

<p>authentication and hashing.</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. To examine the use of cryptography in computing.</li> <li>2. To explain the fundamentals of encryption, authentication and hashing.</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 intruder, cracker and hacker? (level 1)</li> <li>2. What are authentication, integrity and confidentiality? (level 1)</li> <li>3. Write a short note on one time password? (level 1)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p><b>TOPIC/UNIT/ CHAPTER: 11</b></p> <p><b>Title : Protection &amp; Security</b></p> <p>Date: 5/5/2016 Day: Thursday</p>
<p><b>CONTENTS</b></p> <p>Protection &amp; Security: Program threats, system threats, threat monitoring, encryption.</p>



<p>Topic/Unit/Chapter Objectives: To explain the fundamentals of encryption and different threats.</p> <p>Broad Objectives of the chapter/topic are:</p> <ol style="list-style-type: none"> <li>1. To examine the use of cryptography in computing.</li> <li>2. To explain the fundamentals of program threats, system threats, threat monitoring.</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>4. Discuss symmetric and asymmetric key cryptography? (level 2)</li> <li>5. What is port scanning? (level 1)</li> <li>6. Write a short note on Trojan horse, Trap Door and Logic Bomb? (level 1)</li> </ol>
<p>HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria</p>
<p>QUIZ: related to Topic objective and outcome (new quiz with real world examples)</p>
<p>LABORATORY EXPERIMENT: related to the Topic objective and outcome</p>
<p><b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b></p>
<p><b>Remarks, if any</b></p>

<p style="text-align: center;"><b>Title : Revision from</b></p> <p style="text-align: center;"><b>Chapter 5:Process Synchronization to Chapter 8: Disk Management</b></p> <p style="text-align: center;">Date: 6/5/2016 Day: Friday</p>
<p style="text-align: center;"><b>CONTENTS</b></p> <p>Chapter 5: Process Synchronization</p>

Chapter 6: Memory Management Chapter 7: Virtual Memory Chapter 8: Disk Management
Topic/Unit/Chapter Objectives: To recapitulate the critical portions, so that the students can analyze and understand the above chapters in a better way.  Broad Objectives of the chapter/topic are: <ol style="list-style-type: none"> <li>1. Doubt clearance.</li> <li>2. Teacher student interaction.</li> <li>3. Problem analysis.</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):
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria
QUIZ: related to Topic objective and outcome (new quiz with real world examples)
LABORATORY EXPERIMENT: related to the Topic objective and outcome
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
<b>Remarks, if any</b>

<b>Title : Revision from</b>  <b>Chapter 9:File System to Chapter 11: Protection &amp; Security</b>  Date: 12/5/2016 Day: Thursday
<b>CONTENTS</b>  Chapter 9: File System

Chapter 10: I/O Management Chapter 11: Protection & Security
Topic/Unit/Chapter Objectives: To recapitulate the critical portions, so that the students can analyze and understand the above chapters in a better way.  Broad Objectives of the chapter/topic are:  <ol style="list-style-type: none"> <li>1. Doubt clearance.</li> <li>2. Teacher student interaction.</li> <li>3. Problem analysis.</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):
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria
QUIZ: related to Topic objective and outcome (new quiz with real world examples)
LABORATORY EXPERIMENT: related to the Topic objective and outcome
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
Remarks, if any

<b>Title : Discussion Of Previous Year Question Paper</b>
Date: 13/5/2016 Day: Friday
<b>CONTENTS</b>
<b>Previous Year Question Paper of MAKAUT(WB)</b>
Topic/Unit/Chapter Objectives: To understand the problems and how to solve those problems.

Broad Objectives of the chapter/topic are:  1. Able to understand the problem in a better way. 2. Able to solve the tricky/critical problems.
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):
HOME WORK: related to Topic objective and outcome as expressed in terms of indicators/criteria
QUIZ: related to Topic objective and outcome (new quiz with real world examples)
LABORATORY EXPERIMENT: related to the Topic objective and outcome
<b>List Topics/Activities Planned that are beyond Syllabus found as a result of gap analysis between university prescribed syllabus and POs and PSOs.</b>
<b>Remarks, if any</b>

**a) Teaching Strategy/Methods:**

- Learning is a memorization technique based on repetition. The idea is that one will be able to quickly recall the meaning of the material the more one repeats it.
- Taking interactive classes through Power Point Presentation.
- Conducting question answer session at the end of the class.
- Providing real life examples for their better understanding.

**b) Strategy to support weak students**

- Learning carefully to their doubts.
- Enhance students' self-belief.
- 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.
- Weak students need special attention, merging of weak students with bright students to solve some assignments.

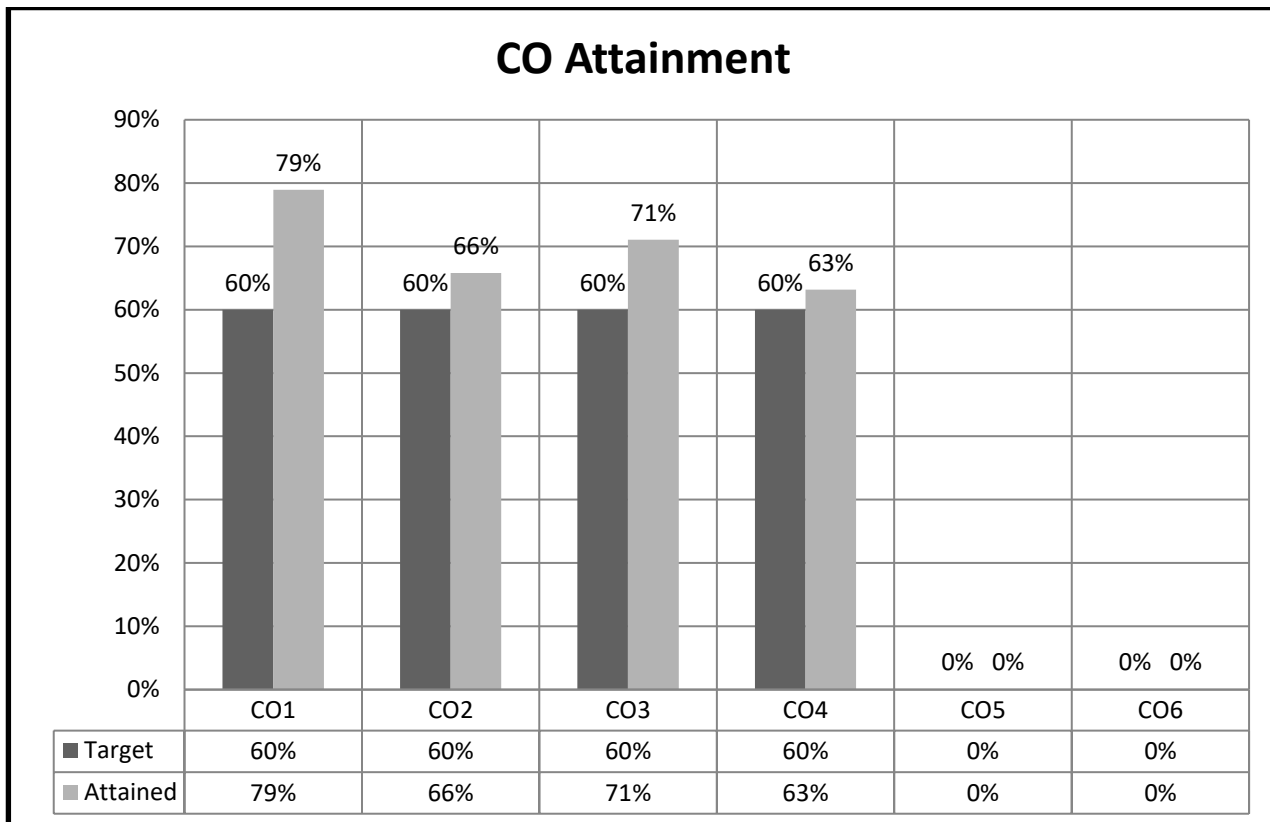
**c) Strategy to encourage bright students**

- 1) Provide challenging problems/Assignments to them.
- 2) Question answer session.
- 3) Motivate them to published research papers.

**d) Efforts to keep students engaged**

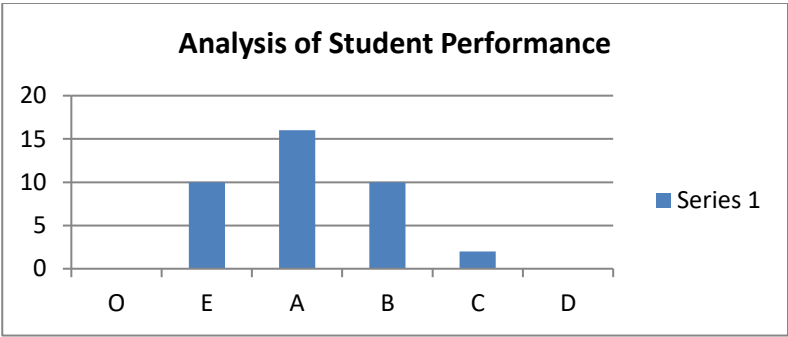
- 1) Regular basis Home Work.
- 2) 5-10 minutes spend in an every class for question answer session.
- 3) Quiz in regular basis.
- 4) Class tests in each semester.
- 5) Some technical assignments in group wise.

**e) Analysis of Students performance in the course (internal) (labs, seminars, tests, assignments, quiz, exam etc)**



- 79% students have attained the set target of 60% marks for CO1
- 66% students have attained the set target of 60% marks for CO2
- 71% students have attained the set target of 60% marks for CO3
- 63% students have attained the set target of 60% marks for CO4

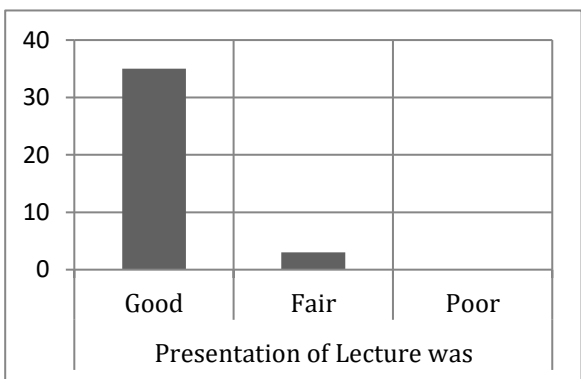
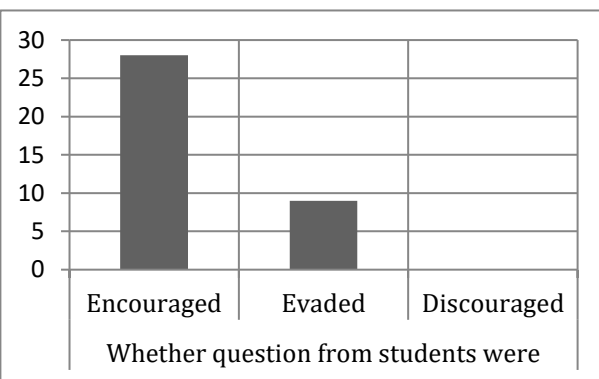
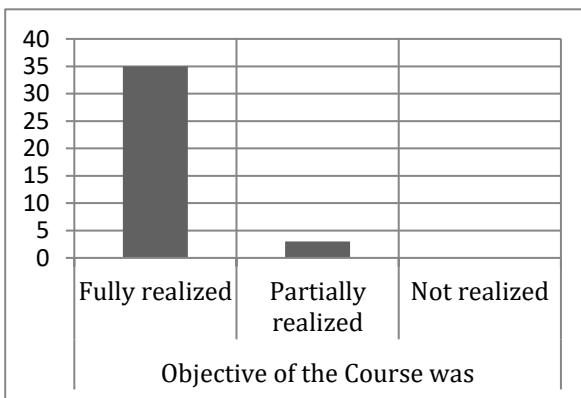
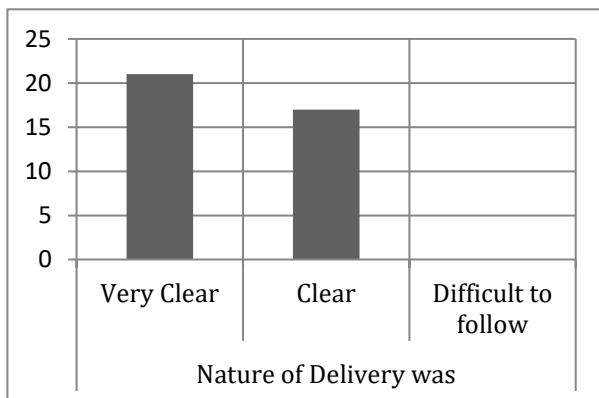
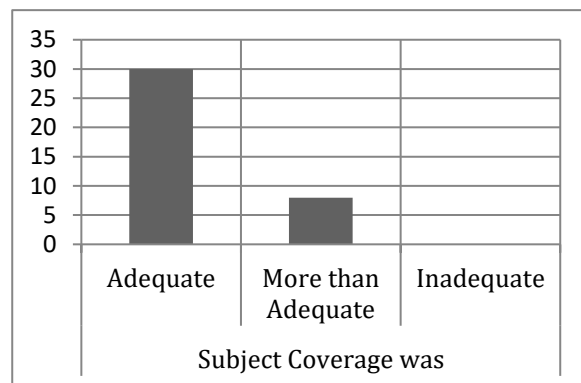
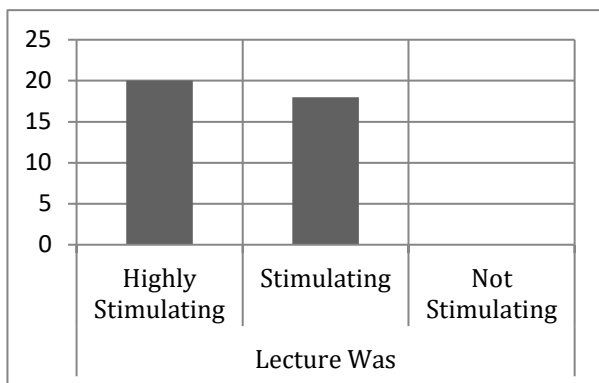
**f) Analysis of Students performance in the course (university results)**



Grade	O	E	A	B	C	D
Marks	$\geq 90$	$\geq 80$	$\geq 70$	$\geq 60$	$\geq 50$	$\geq 40$
Student Performance	0	10	16	10	2	0

**r) Analysis of Student Feed Back**





**s) Teacher Self Assessment (at the completion of course)**

- All COs are successfully attained.
- Student performance is satisfactory.
- Students' feedback indicates that the course objective was adequate.

**t) Recommendations/Suggestions for improvement by faculty**

*CO2 should be focused in details. This portion has great impact in software industries.*



**Paper Name: Operating System**  
**Paper Code: CS 705A**

FACULTY NAME : **Prof. Anupam Mukherjee**

**YEAR: 2015**

STREAM: **B.TECH[ CSE ]** YEAR: 4<sup>th</sup>

SEMESTER: **IST**

SECTION: **A**

NO. OF CLASS HELD: **23**

SN	NAME	ROLL NO.	ATTENDANCE		MARKS IN			ASSIGNMENT [10 MARKS]				TOTAL
			[5 MARKS]		INTERNAL EXAM [15]			MARKS=[((I+II +III)/55)*100]/10				[30 MARKS]
			TOTAL	MARKS	I	II	AVG/2	A-I	A-II	A-III	MARKS	
%					[20]	[20]	[20]					
1	RAHUL KUMAR THAKUR	11900111054	73	4	17	14	8	14	19	14	9	21
2	AALOK SEN	11900112055	76	4	21	20	11	13	20	14	9	24
3	ABHIK ADITYA BASUMATA	11900112057	71	4	15	18	9	12	18	13	8	21
4	ABHINAV ANAND	11900112058	72	4	14	17	8	13	18	13	8	20
5	ABHISHEK KUMAR UPADHYAY	11900112059	72	4	19	20	10	15	19	15	9	23
6	ABHISHEK NATH	11900112060	82	5	17	21	10	14	17	15	8	23
7	ABHISHEK VERMA	11900112061	69	4	18	12	8	13	17	16	8	20
8	ADITI PAL	11900112062	71	4	21	13	9	13	20	14	9	22
9	AKANSHA ANAND	11900112063	79	4	18	25	11	14	18	15	9	24
10	AKASH KUMAR VARMA	11900112064	71	4	21	16	10	12	19	15	8	22
11	AMIT KUMAR	11900112065	76	4	19	13	8	14	20	15	9	21
12	AMIT ROY	11900112066	67	3	21	17	10	15	20	16	9	22
13	ANIL KUMAR	11900112067	66	4	16	16	8	12	20	15	9	21
14	ANIMESH BHANJA	11900112068	80	5	18	22	10	14	19	16	9	24
15	ANIMESH MANI	11900112069	74	4	21	19	10	13	17	15	8	22
16	ANIRUDDHA DAS	11900112070	71	4	27	14	11	15	17	15	9	24
17	ANIRUDDHYA BASU	11900112071	82	5	21	12	9	13	18	13	8	22
18	ANKITA AGARWAL	11900112072	67	3	20	10	8	13	18	13	8	19
19	APURBA ROY	11900112073	73	4	21	9	8	13	19	14	8	20
20	ARGHYA PAUL	11900112074	77	4	16	13	8	13	18	14	8	20
21	ARUNEEL DAS	11900112075	67	3	16	23	10	13	19	13	8	21
22	ATUL VIJAY	11900112076	78	4	17	26	11	12	20	16	9	24
23	BHARATI AGARWAL	11900112077	78	4	21	3	6	12	19	16	9	19
24	BIBHUTI KUMAR	11900112078	79	5	19	3	6	12	20	15	9	20
25	BISWAJIT ROY	11900112079	70	4	25	10	9	14	18	16	9	22
26	CHANDAN KUMAR YADAV	11900112080	69	3	14	8	6	12	17	15	8	17
27	DEBANJAN BHOWMICK	11900112081	67	3	23	5	7	15	20	14	9	19
28	DEEPSHIKHA SINHA	11900112082	69	4	21	10	8	12	18	16	8	20
29	DIKSHA AGARWAL	11900112083	76	4	24	16	10	15	17	14	8	22
30	DIPANNITA PAUL	11900112084	69	4	17	15	8	15	17	14	8	20
31	HARI SHANKAR KUMAR	11900112085	75	4	21	15	9	12	18	13	8	21
32	ISHANT SHARMA	11900112086	77	4	15	12	8	13	18	13	8	20

33	JOYDEEP ROY CHOWDHURY	11900112087	72	4	18	9	7	13	18	14	8	19
34	KUMAR GAURAV	11900112088	79	4	21	16	10	12	20	15	9	23
35	MD ASIMUL ISLAM	11900112089	80	5	19	15	9	13	19	15	9	23
36	MD DANISH	11900112090	67	4	19	16	9	15	17	16	9	22
37	MEGHA CHAUDHURI	11900112091	80	5	16	14	8	13	17	13	8	21
38	MOUMITA MAITY	11900112092	68	3	24	16	10	13	18	13	8	21
39	NEELANJANA CHOUHDURY	11900112093	75	4	17	18	9	13	18	14	8	21
40	NEELIMA SINGH	11900112094	66	3	19	20	10	12	20	15	8	21
41	NIKHIL KUMAR	11900112095	76	4	20	17	10	13	19	15	8	22
42	NIKITA RAJ	11900112096	82	5	18	19	10	15	17	16	9	24
43	NITIN LAL	11900112097	83	5	10	20	8	13	17	13	9	22
44	PAWAN KUMAR MAHATO	11900112098	78	4	20	19	10	13	18	13	9	23
45	PAYEL MAJUMDAR	11900112099	81	5	20	22	11	13	19	15	8	24
46	PITAM DAS	11900112100	73	4	17	23	10	15	17	16	8	22
47	PRANAV KUMAR	11900112101	73	4	13	21	9	13	17	13	8	21
48	PRASHANT DUBEY	11900112102	75	4	17	24	11	13	18	13	9	24

Paper Code: CS 705A

ROLL NO.	28/7	30/7	31/7	4/8	6/8	7/8	11/8	13/8	20/8	3/9	8/9	10/9	11/9	15/9	17/9	1/10	8/10	9/10	15/10
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ROLL NO.	28/7	30/7	31/7	4/8	6/8	7/8	11/8	13/8	20/8	3/9	8/9	10/9	11/9	15/9	17/9	1/10	8/10	9/10	15/10
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**Siliguri Institute of Technology**  
**LABORATORY ATTENDANCE SHEET**  
**Paper Name: Internet Technology lab**  
**Paper Code: CS 795A**

FACULTY NAME : **Mr. Anupam Mukherjee**

YEAR: 2015

STREAM: **B.TECH[CSE]**YEAR: 4<sup>th</sup>SEMESTER: **1<sup>ST</sup>**GROUP: **A1**NO. OF PRACTICAL HELD: **15**

SN	NAME	DAY	1	2	3	4	5	6	7	8	9	10	TOTAL MARKS
		DATE	31/7	7/8	21/8	28/8	4/9	11/9	18/9	25/9	2/10	9/10	
		ROLL NO											
1	RAHUL KUMAR THAKUR	11900111054	0	1	1	1	0	1	1	1	1	0	7
2	AALOK SEN	11900112055	1	1	1	1	0	0	1	0	1	0	6
3	ABHIK ADITYA BASUMATA	11900112057	0	1	1	1	1	1	1	0	1	0	7
4	ABHINAV ANAND	11900112058	0	1	1	1	0	0	1	1	0	0	5
5	ABHISHEK KUMAR UPADHYAY	11900112059	0	1	1	1	1	1	1	1	1	0	8
6	ABHISHEK NATH	11900112060	1	1	1	1	1	0	1	0	1	0	7
7	ABHISHEK VERMA	11900112061	1	1	1	1	1	1	0	0	1	0	7
8	ADITI PAL	11900112062	1	1	0	1	1	1	1	1	1	0	8
9	AKANSHA ANAND	11900112063	1	1	1	1	1	1	1	1	1	1	10
10	AKASH KUMAR VARMA	11900112064	1	1	1	1	1	1	0	1	1	0	8
11	AMIT KUMAR	11900112065	0	1	1	1	0	0	1	1	1	0	6
12	AMIT ROY	11900112066	0	1	1	0	1	0	1	1	1	1	7
13	ANIL KUMAR	11900112067	1	1	1	1	1	1	1	0	1	0	8
14	ANIMESH BHANJA	11900112068	1	1	1	1	1	1	1	1	1	0	9
15	ANIMESH MANI	11900112069	1	1	1	1	1	1	1	1	1	0	9
16	ANIRUDDHA DAS	11900112070	1	1	1	1	0	0	0	1	1	0	6
17	ANIRUDDHYA BASU	11900112071	1	1	1	1	1	1	1	1	1	0	9
18	ANKITA AGARWAL	11900112072	1	1	1	1	1	0	1	0	1	0	7
19	APURBA ROY	11900112073	1	1	1	1	1	1	1	1	1	0	9
20	ARGHYA PAUL	11900112074	1	1	1	1	1	1	0	1	1	0	8
21	ARUNEEL DAS	11900112075	0	1	1	1	0	0	1	1	1	0	6
22	ATUL VIJAY	11900112076	0	1	1	0	1	0	1	1	1	1	7
23	BHARATI AGARWAL	11900112077	1	1	1	1	1	1	1	0	1	0	8
24	BIBHUTI KUMAR	11900112078	1	1	1	1	1	1	1	1	1	0	9
25	BISWAJIT ROY	11900112079	1	1	1	1	1	1	1	1	1	0	9

SN	NAME	DAY	1	2	3	4	5	6	7	8	9	10	TOTAL MARKS
		DATE	4/8	11/8	18/8	25/8	1/9	8/9	15/9	22/9	6/10	13/10	
		ROLL NO											
1	CHANDAN KUMAR YADAV	11900112080	1	1	1	1	1	1	1	1	1	0	9
2	DEBANJAN BHOWMICK	11900112081	0	1	1	1	1	1	1	1	1	0	8
3	DEEPSHIKHA SINHA	11900112082	1	1	1	1	1	1	1	1	1	1	10
4	DIKSHA AGARWAL	11900112083	1	0	1	1	1	1	1	0	1	1	8
5	DIPANNITA PAUL	11900112084	1	0	0	0	1	1	1	0	0	0	4
6	HARI SHANKAR KUMAR	11900112085	1	0	1	1	0	1	1	1	1	1	8
7	ISHANT SHARMA	11900112086	1	1	0	1	0	1	1	0	1	1	7
8	JOYDEEP ROY CHOWDHURY	11900112087	1	0	1	1	1	1	0	1	1	0	7
9	KUMAR GAURAV	11900112088	1	1	0	1	0	1	1	1	1	0	7
10	MD ASIMUL ISLAM	11900112089	1	1	1	1	1	1	1	1	0	0	8
11	MD DANISH	11900112090	1	0	1	1	1	0	1	1	1	1	8
12	MEGHA CHAUDHURI	11900112091	1	0	0	1	1	0	1	1	0	0	5
13	MOUMITA MAITY	11900112092	1	1	1	1	1	1	1	1	0	1	9
14	NEELANJANA CHOUDHURY	11900112093	1	1	0	1	1	1	0	1	0	0	6
15	NEELIMA SINGH	11900112094	1	0	1	0	1	1	0	1	1	0	6
16	NIKHIL KUMAR	11900112095	1	0	1	0	1	1	1	0	1	0	6
17	NIKITA RAJ	11900112096	1	1	1	1	1	1	1	1	1	0	9
18	NITIN LAL	11900112097	0	1	1	1	1	1	1	1	0	0	7
19	PAWAN KUMAR MAHATO	11900112098	1	0	1	1	1	1	1	0	1	1	8
20	PAYEL MAJUMDAR	11900112099	1	0	0	0	1	1	1	0	0	0	4
21	PITAM DAS	11900112100	1	0	1	1	0	1	1	1	1	1	8
22	PRANAV KUMAR	11900112101	1	1	0	1	0	1	1	0	1	1	7
23	PRASHANT DUBEY	11900112102	1	0	1	1	1	1	0	1	1	0	7

**Siliguri Institute of Technology**  
**RECORDS OF ASSIGNMENTS/QUIZ**  
**Paper Name: Internet Technology**  
**Paper Code: CS 705A**

SN	NAME	ROLL NO.	Assign - I	Assign - II	Assign - III	SN	NAME	ROLL NO.	Assign - I	Assign - II	Assign - III
1	RAHUL KUMAR THAKUR	11900111054	1	1	1	26	CHANDAN KUMAR YADAV	11900112080	1	1	1
2	AALOK SEN	11900112055	1	1	1	27	DEBANJAN BHOWMICK	11900112081	1	1	1
3	ABHIK ADITYA BASUMATA	11900112057	1	1	1	28	DEEPSHIKHA SINHA	11900112082	1	1	1
4	ABHINAV ANAND	11900112058	1	1	1	29	DIKSHA AGARWAL	11900112083	1	1	1
5	ABHISHEK KUMAR UPADHYAY	11900112059	1	1	1	30	DIPANNITA PAUL	11900112084	1	1	1
6	ABHISHEK NATH	11900112060	1	1	1	31	HARI SHANKAR KUMAR	11900112085	1	1	1
7	ABHISHEK VERMA	11900112061	1	1	1	32	ISHANT SHARMA	11900112086	1	1	1
8	ADITI PAL	11900112062	1	1	1	33	JOYDEEP ROY CHOWDHURY	11900112087	1	1	1
9	AKANSHA ANAND	11900112063	1	1	1	34	KUMAR GAURAV	11900112088	1	1	1
10	AKASH KUMAR VARMA	11900112064	1	1	1	35	MD ASIMUL ISLAM	11900112089	1	1	1
11	AMIT KUMAR	11900112065	1	1	1	36	MD DANISH	11900112090	1	1	1
12	AMIT ROY	11900112066	1	1	1	37	MEGHA CHAUDHURI	11900112091	1	1	1
13	ANIL KUMAR	11900112067	1	1	1	38	MOUMITA MAITY	11900112092	1	1	1
14	ANIMESH BHANJA	11900112068	1	1	1	39	NEELANJANA CHOUDHURY	11900112093	1	1	1
15	ANIMESH MANI	11900112069	1	1	1	40	NEELIMA SINGH	11900112094	1	1	1
16	ANIRUDDHA DAS	11900112070	1	1	1	41	NIKHIL KUMAR	11900112095	1	1	1
17	ANIRUDDHYA BASU	11900112071	1	1	1	42	NIKITA RAJ	11900112096	1	1	1
18	ANKITA AGARWAL	11900112072	1	1	1	43	NITIN LAL	11900112097	1	1	1
19	APURBA ROY	11900112073	1	1	1	44	PAWAN KUMAR MAHATO	11900112098	1	1	1
20	ARGHYA PAUL	11900112074	1	1	1	45	PAYEL MAJUMDAR	11900112099	1	1	1
21	ARUNEEL DAS	11900112075	1	1	1	46	PITAM DAS	11900112100	1	1	1
22	ATUL VIJAY	11900112076	1	1	1	47	PRANAV KUMAR	11900112101	1	1	1
23	BHARATI AGARWAL	11900112077	1	1	1	48	PRASHANT DUBEY	11900112102	1	1	1
24	BIBHUTI KUMAR	11900112078	1	1	1						
25	BISWAJIT ROY	11900112079	1	1	1						

**Siliguri Institute of Technology**  
**SESSIONAL/PRACTICAL PERFORMANCE RECORD**  
**Paper Name: Internet Technology Lab**  
**Paper Code: CS 795A**

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SN	NAME	ROLL NO	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	TOTAL[40]
1	RAHUL KUMAR THAKUR	11900111054	3	2	2	3	2	2	2	3	4	0	2	0	3	3	2	33

[Type the company name] | [Type the company address]

2	AALOK SEN	11900112055	3	2	2	3	2	2	2	3	0	4	2	3	3	0	2	33
3	ABHIK ADITYA BASUMATA	11900112057	3	2	2	3	2	2	2	3	4	4	2	3	0	3	2	37
4	ABHINAV ANAND	11900112058	3	2	0	3	2	2	2	0	4	4	2	3	3	3	2	35
5	ABHISHEK KUMAR UPADHYAY	11900112059	0	2	2	3	2	2	2	0	4	4	2	3	0	3	2	31
6	ABHISHEK NATH	11900112060	3	2	2	3	2	2	2	3	4	0	2	0	3	3	2	33
7	ABHISHEK VERMA	11900112061	3	0	2	0	2	2	2	3	4	4	2	3	3	3	2	35
8	ADITI PAL	11900112062	3	2	0	3	2	2	2	3	4	4	0	3	3	3	2	36
9	AKANSHA ANAND	11900112063	3	0	2	3	2	0	2	3	4	4	0	3	3	3	2	34
10	AKASH KUMAR VARMA	11900112064	3	2	2	3	0	0	2	3	0	4	2	3	3	3	2	33
11	AMIT KUMAR	11900112065	3	0	0	3	2	0	2	3	4	0	2	3	3	3	2	30
12	AMIT ROY	11900112066	3	2	2	3	2	2	2	3	4	0	2	3	0	3	2	33
13	ANIL KUMAR	11900112067	3	2	2	3	2	2	2	3	4	4	0	3	3	3	2	38
14	ANIMESH BHANJA	11900112068	3	2	2	3	2	2	2	0	4	4	2	0	3	0	2	31
15	ANIMESH MANI	11900112069	3	2	2	3	2	2	2	3	4	0	2	3	3	0	2	33
16	ANIRUDDHA DAS	11900112070	3	2	2	3	2	2	2	3	4	4	2	0	3	0	2	34
17	ANIRUDDHYA BASU	11900112071	3	2	2	3	2	0	2	3	4	4	2	3	0	3	2	35
18	ANKITA AGARWAL	11900112072	3	2	0	3	2	2	2	3	4	4	0	3	3	3	2	36
19	APURBA ROY	11900112073	3	2	2	3	2	0	2	3	0	4	0	3	3	3	2	32
20	ARGHYA PAUL	11900112074	3	2	2	3	0	2	2	3	4	4	2	0	3	3	2	35
21	ARUNEEL DAS	11900112075	3	0	0	3	2	2	2	3	4	4	2	3	3	0	2	33
22	ATUL VIJAY	11900112076	3	2	2	3	0	2	2	3	4	4	0	3	3	3	2	36
23	BHARATI AGARWAL	11900112077	3	2	2	0	2	2	0	3	4	4	2	3	0	3	2	33
24	BIBHUTI KUMAR	11900112078	3	2	2	0	2	2	2	3	4	4	0	3	3	3	2	35
25	BISWAJIT ROY	11900112079	3	2	2	3	2	0	2	3	4	4	2	3	0	3	2	35
26	CHANDAN KUMAR YADAV	11900112080	3	0	2	0	2	2	0	3	4	4	2	3	0	3	2	30
27	DEBANJAN BHOWMICK	11900112081	3	2	2	3	0	2	2	3	4	4	2	0	3	3	2	35
28	DEEPSHIKHA SINHA	11900112082	3	2	2	3	2	2	2	3	4	0	2	3	0	3	2	37
29	DIKSHA AGARWAL	11900112083	3	2	2	0	2	2	2	3	4	4	2	0	3	0	2	31

[Type the company name] | [Type the company address]



30	DIPANNITA PAUL	11900112084	3	2	2	3	2	2	2	3	0	4	2	0	3	3	2	33
31	HARI SHANKAR KUMAR	11900112085	3	2	2	0	2	2	2	3	4	4	2	3	0	3	2	34
32	ISHANT SHARMA	11900112086	0	2	2	0	2	2	2	3	4	4	2	3	0	3	2	31
33	JOYDEEP ROY CHOWDHURY	11900112087	3	2	2	0	2	2	2	3	0	4	2	3	0	3	2	30
34	KUMAR GAURAV	11900112088	3	2	0	3	2	2	2	3	4	4	2	3	0	3	2	35
35	MD ASIMUL ISLAM	11900112089	3	2	2	3	2	2	2	3	4	4	2	3	0	3	2	37
36	MD DANISH	11900112090	3	2	2	3	2	2	2	0	4	4	2	3	3	3	2	37
37	MEGHA CHAUDHURI	11900112091	3	2	2	3	2	2	2	0	4	4	2	3	3	3	2	37
38	MOUMITA MAITY	11900112092	3	2	2	3	2	2	2	3	0	4	2	3	3	3	2	36
39	NEELANJANA CHOUDHURY	11900112093	3	2	2	3	2	2	2	3	4	4	2	3	0	3	0	35
40	NEELIMA SINGH	11900112094	3	2	2	3	2	2	2	3	4	4	2	0	3	3	2	37
41	NIKHIL KUMAR	11900112095	3	2	2	3	2	2	2	0	4	4	2	3	3	3	2	37
42	NIKITA RAJ	11900112096	3	2	0	3	2	2	2	0	4	4	2	3	3	3	2	35
43	NITIN LAL	11900112097	3	2	2	3	2	2	2	0	4	4	2	3	3	3	2	37
44	PAWAN KUMAR MAHATO	11900112098	3	2	2	0	2	2	2	0	4	4	2	0	3	3	2	31
45	PAYEL MAJUMDAR	11900112099	3	2	2	0	2	2	2	0	4	4	2	0	3	3	2	31
46	PITAM DAS	11900112100	3	2	2	3	2	2	2	3	4	0	2	0	3	3	2	33
47	PRANAV KUMAR	11900112101	3	2	2	3	2	2	2	0	4	4	2	0	3	3	2	34
48	PRASHANT DUBEY	11900112102	3	2	2	0	2	2	2	0	4	4	2	3	3	0	2	31

### NAME WITH ROLL NUMBERS OF STUDENT WHOSE ACADEMIC PERFORMANCE IS NOT SATISFACTORY

Sl.	Name of Student	Roll No.	Remedial measures taken by teacher
1	ABHIK ADITYA BASUMATA	11900112057	
2	ANIRUDDHYA BASU	11900112071	
3	HARI SHANKAR KUMAR	11900112085	
4	JOYDEEP ROY CHOWDHURY	11900112087	
5	NIKHIL KUMAR	11900112095	
6	PRANAV KUMAR	11900112101	<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>

## CERTIFICATE

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

Sl. No.	Semester	Subject with Code	Total Unit	Remarks
1.	7 <sup>th</sup>	Internet Technology (CS 705A) Internet Technology Lab (CS 795A)	05	

Date :

**Signature of Faculty**

## **Submitted to HOD**

### **Certificate by HOD**

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

Date :

**Signature of HOD**

## **Submitted to Director**

Date :

**Signature of Director**



## Course Handout for 04 Years B.Tech PROGRAM

Name of the Faculty: Mrs. Ankita Sinha

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

<b>Course Title</b>	: Artificial Intelligence
<b>Course Code</b>	: PEC-IT 501B
<b>L-T-P-S Structure</b>	: 3-0-0
<b>Credits</b>	: 3
<b>Pre-requisite</b>	: Basic Data Structure & Design and Analysis of Algorithm
<b>Course Coordinator</b>	: Mrs. Ankita Sinha

### Course Objective:

1. To understand the meaning of AI, its alternative approaches.
2. To expand knowledge about inform and uniform search heuristics search, genetic algorithm, planning and learning algorithms.
3. To understand the basic methods in planning and reasoning using both logic and uncertain inference.
4. To know different way to represent the knowledge and information.

### COURSE OUTCOMES (COs):

CO No	Course Outcome (CO)	Blooms Taxonomy Level (BTL)	Target %
PEC-IT 501B.1	<b>Explain</b> the various types of AI agent and search algorithm (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms, game playing).	(BT-Level 2)	60%
PEC-IT 501B.2	<b>Develop</b> the basic knowledge-based system with the help of knowledge representation.	(BT-Level 3)	60%
PEC-IT 501B.3	<b>Analyze</b> the working knowledge of reasoning in the presence of probabilistic approaches.	(BT-Level 4)	60%
PEC-IT 501B.4	<b>Describe</b> the notion of machine learning techniques.	(BT-Level 4)	60%

### PROGRAM OUTCOMES (POs):

PO Number	Description
1. <b>Engineering Knowledge</b>	Engineering knowledge: Apply the knowledge of mathematics, science, Electronics & Communication engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. <b>Problem Analysis</b>	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.
3. <b>Design/ development of solutions</b>	Design/development of solutions: Design solutions for complex Electronics & Communication 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. <b>Conduct investigations of complex problems</b>	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 in the field of Electronics & Communication Engineering.
5. <b>Modern tool usage</b>	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex Electronics & Communication engineering activities with an understanding of the limitations.

PO Number	Description
6. <b>The engineer and society</b>	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 Electronics & Communication engineering practice.
7. <b>Environment and sustainability</b>	Environment and sustainability: Understand the impact of the professional Electronics & Communication engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. <b>Ethics</b>	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. <b>Individual and team work</b>	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. <b>Communication</b>	Communicate effectively on complex Electronics & Communication 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. <b>Project management and finance</b>	Demonstrate knowledge and understanding of the Electronics & Communication 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.

### Mapping of Course Outcomes and Program Outcomes:

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
PEC-IT 501B.1	1	2	--	--	2	--	--	--	--	--	2	1	1	1	1
PEC-IT 501B.2	2	2	2	--	2	--	--	--	2	--	2	1	1	1	1
PEC-IT 501B.3	2	2	2	--	2	--	--	--	--	--	2	1	1	---	1
PEC-IT 501B.4	1	2	2	--	2	1	--	--	2	--	2	1	1	1	1
<b>PEC-IT 501B</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>--</b>	<b>2</b>	<b>1</b>	<b>--</b>	<b>--</b>	<b>2</b>	<b>--</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</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

### SYLLABUS:

#### CHAPTER-1

Introduction - Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem. [2L]  
Intelligent Agents - Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents. [2L]

Problem Solving - Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs. [2L]

#### CHAPTER-2

Search techniques - Solving problems by searching: problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. [5L]

Heuristic search strategies - Greedy best-first search, A\* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems. [5L]

Adversarial search - Games, optimal decisions & strategies in games, the mini-max search procedure, alpha-beta pruning, additional refinements, iterative deepening. [3L]

### CHAPTER-3

Knowledge & reasoning - Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation. [3L]

### CHAPTER-4

Using predicate logic - Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. [2L]

Probabilistic reasoning - Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics. [4L]

### CHAPTER-5

Natural Language processing - Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing. [2L]

Learning - Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning. [2L]

Expert Systems - Representing and using domain knowledge, expert system shells, and knowledge acquisition. [2L]

### TEXT BOOKS:

1. “Artificial Intelligence”, Ritch & Knight, TMH.
2. “Artificial Intelligence- A Modern Approach” , Stuart Russel Peter Norvig Pearson.
3. “Artificial Intelligence” , A Classical Approach, Munish Chandra Trivedi, Khanna Publishing.
4. “Introduction to Artificial Intelligence & Expert Systems” , Patterson, PHI

### REFERENCE BOOKS:

5. “Poole, Computational Intelligence” , OUP.
6. “Logic & Prolog Programming” , Saroj Kaushik, New Age International.
7. “Expert Systems”, Giarranto, VIKAS.
8. “Introduction to Artificial Intelligence”, Rajendra Akerkar, PHI

### COURSE DELIVERY PLAN:

Week	Sess. No.	CO	Topic (s)	Book No [CH No] [Page No]	Teaching-Learning Methods	Planned Date	Executi on Date
1	1	1	Introduction to the Syllabus and basic concept of artificial intelligence, its applications, few examples, Problems of AI, AI technique	1[1][3]	T: Chalk & Talk L: Observes understands	17.7.23	

	2	1	Tic- Tac -Toe problem, Agents & environment, nature of environment and types of environment,	2[2] [35-37] 2[2] [43-45]	T:Questioning /Discussion L: Answering questions, Participates	19.7.23	
	3	1	Types of agents-structure of agents, goal-based agents, utility-based agents, learning agents	8[12] [260-270]	T: Lecturing L: Observes understands	21.7.23	
2	4	2	Problems, Problem Space & search: Defining the problem as state space search	1[2][29-36]	T: Lecturing L: Observes understands	24.7.23	
	5	2	Production system, problem characteristics, issues in the design of search programs.	1[2] [44-58]	T: Lecturing L: Observes understands	26.7.23	
	6	2	Solving problems by searching: problem solving agents, searching for solutions, Type of search	2[3] [81-88]	T: Lecturing L: Observes understands	28.7.23	
3	7	3	Uniform search strategies: breadth first search, depth first search,	2[3] [81-88]	T: Chalk & Talk L: Observes understands, Problem solving	31.7.23	
	8	3	Depth limited search,	2[3] [89-92]	T: Chalk & Talk L: Observes understands, Problem solving	2.8.23	
	9	3	Bidirectional search, comparing uniform search strategies.	2[3] [92-100]	T: Chalk & Talk L: Observes understands, Problem solving	4.8.23	
4	10	3	Heuristic search strategies: Greedy best-first search	1[3][63-79] 2 [4][120-129]	T: Chalk & Talk L: Observes understands, Problem solving	7.8.23	
	11	3	A* search, memory bounded heuristic search: local search algorithms	8[6][127-130]	T: Chalk & Talk L: Observes understands, Problem solving	9.8.23	
	12	2	Optimization problems: Hill climbing search,	8[6][125-126]	T: Chalk & Talk L: Observes understands	11.8.23	
5	13	2,3	Simulated annealing search, local beam search	8[6][130-134]	T: Chalk & Talk L: Observes understands	14.8.23	
	14	1	Genetic algorithms	Web Source	T: PPT	16.8.23	

				( <a href="https://www.tutorialspoint.com/genetic_algorithm/genetic_algorithms_introduction.htm">https://www.tutorialspoint.com/genetic_algorithm/genetic_algorithms_introduction.htm</a> )	L: Observes understands		
	15	2	Constraint satisfaction problems,	1[3][68-72]	T: Chalk & Talk L: Observes understands	18.8.23	
	16	2	local search for constraint satisfaction problems.	8[6][137-138]	T: Chalk & Talk L: Observes understands	21.8.23	
	17	2,3	Adversarial search : Games, optimal decisions & strategies in games,	1[12][231-232]	T: Chalk & Talk L: Observes understands, Problem solving	23.8.23	
	18	2	The minimax search procedure	1[12][233-235]	T: Chalk & Talk L: Observes understands, Problem solving	25.8.23	
6	19	2	Alpha-beta pruning,	1[12][236-239]	T: Chalk & Talk L: Observes understands, Problem solving	28.8.23	
	20	2	Additional refinements, iterative deepening.	1[12][239-243]	T: Lecturing L: Observes understands	30.8.23	
	21	2	Knowledge representation issues, representation & mapping,	8[3][49-50]	T: Chalk & Talk L: Observes understands, Problem solving	1.9.23	
7	22	2	Different approaches for knowledge representation	8[3][50-55]	T: Chalk & Talk L: Observes understands	4.9.23	
	23	2	Issues in knowledge representation.	8[3][55-58]	T: Chalk & Talk L: Observes understands	6.9.23	
	24	2,3	Representing simple fact in logic, representing instant & ISA relationship,	8[3][58-64]	T: Chalk & Talk L: Problem based learning	8.9.23	
8	25	1	Computable functions & predicates, resolution, natural deduction.	8[3][64-68]	T: Lecturing L: Problem based learning	11.9.23	



	26	2	Representing knowledge in an uncertain domain, the semantics of Bayesian networks	8[5][96-98]	T: Lecturing L: Observes understands	13.9.23	
	27	2	Dempster-Shafer theory	8[5][100-103]	T: PPT L: Observes understands	15.9.23	
9	28	2,3	Fuzzy sets & fuzzy logics	8[5][108-111]	T: PPT L: Observes understands	18.9.23	
	29	1	Natural Language processing: Introduction, Syntactic processing,	1[15][285-299]	T: PPT L: Observes understands	20.9.23	
	30	1	Natural Language processing: semantic analysis, discourse & pragmatic processing.	1[15][300-320]	T: PPT L: Observes understands	22.9.23	
10	31	2	Learning : Forms of learning, inductive learning, learning decision trees, explanation based learning	1[17][347-364]	T: PPT L: Observes understands	25.9.23	
	32	2	Learning : learning using relevance information, neural net learning & genetic learning	1[15][365-373]	T: PPT L: Observes understands	27.9.23	
	33		Revision Lesson		T: PPT L: Observes understands	29.9.23	
11	34		Revision Lesson		T: PPT L: Observes understands	4.10.23	
	35		Previous years questions discussion		T: PPT L: Observes understands	6.10.23	

**COURSE TIME TABLE:**

Day	Monday	Wednesday	Friday
Timing	3:00 PM - 3:50 PM (07 Periods)	10:50 AM - 11:40 AM (02 Period)	10:00 AM-10:50 AM (01 Period)

**REMEDIAL CLASSES:**

**Supplement course handout**, which may perhaps include special lectures and discussions that would be planned, and schedule notified accordingly.

**EVALUATION: AS PER MAKAUT GUIDELINES**

**Schedule for Continuous Assessment (CA):**

CA	Assessment By	Schedule
CA-I	Presentation, Quiz, Group Discussion	11.08.23 – 14.08.23
CA-II	Report writing	11.09.23 – 14.09.23
CA-III	Class test in pen and paper mode to be conducted at the College Level	03.14.23 – 06.10.23
CA-IV	Centralized online test to be	As per Academic Calendar

	arranged by theUniversity	
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### **ATTENDANCE POLICY**

Every student is expected to be responsible for regularity of his/her attendance in class rooms and laboratories, to appear in scheduled tests and examinations and fulfil all other tasks assigned to him/her in every course. For Promotion, a Minimum of 50% of internal marks must be obtained. In every course, student has to maintain a minimum of 75% attendance to be eligible for appearing in Semester end examination of the course, for cases of medical issues and other unavoidable circumstances the students will be condoned if their attendance is between 60% to 75% in every course, subjected to submission of medical certificates, medical case file and other needful documental proof to the concerned departments.

### **DETENTION POLICY**

In any course, a student has to maintain a minimum of 75% attendance and must secure a minimum of 50% marks in In-Semester Examinations to be eligible for appearing to the Semester End Examination, failing to fulfill these conditions will deem such student to have been detained in that course.

### **PLAGIARISM POLICY**

Use of unfair means in any of the evaluation components will be dealt with strictly, and the case will be reported to the examination committee.

### **COURSE TEAM MEMBERS, CHAMBER CONSULTATION HOURS AND CHAMBER VENUE DETAILS:**

Each instructor will specify his / her chamber consultation hours during which the student can contact him / her in his / her chamber for consultation.

S.No.	Name of Faculty	Chamber Consultation Day (s)	Chamber Consultation Timings for each day	Chamber Consultation Room No:	Signature of Course faculty
1.	Ankita Sinha		As per prior appointment	Faculty cubicle-II	

### **GENERAL INSTRUCTIONS**

Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

### **NOTICES**

All notices will be communicated through the institution email.

All notices concerning the course will be displayed on the respective Notice Boards.

**Signature of COURSE COORDINATOR:**

**HEAD OF DEPARTMENT:**

**Approval from: Head of the Institutions  
(Sign with Office Seal)**



**SILIGURI INSTITUTE OF TECHNOLOGY  
DEPARTMENT OF BUSINESS ADMINISTRATION**



**COURSE FILE  
3<sup>rd</sup> SEMESTER, 2<sup>ND</sup> YEAR**

**PAPER NAME: DIGITAL & SOCIAL MEDIA MARKETING  
PAPER CODE: MM 302 (NEW)  
(MARKETING SPECIALISATION)  
NEW SYLLABUS FROM 2018 SESSION**

**Session: 2021 – 2 (Odd Semester 21)**

**Online Google Classroom (Code: ucg36xl) & Live Google Meet class for COVID19 Pandemic**

# Course File

**Course Title: Digital & Social Media Marketing**

**Code: MM 302 (Marketing Specialisation)**

**Semester: 3<sup>rd</sup>, Year 2<sup>nd</sup>**

**Name of the Faculty: Shomnath Dutta**

**E-mail: shomnath76@gmail.com**

**Class Schedule of MM 302, Odd Semester 21**

Lecture (Online via Google Meet & Class for Covid 19 Pandemic)		Tutorial/Case Study	Practical
Monday		02.10 - 03.00 PM	N.A
Tuesday	10.00 - 10.50 AM		N.A
Wednesday		02.10 - 03.00 PM	N.A
Thursday		04.40 - 5.20 PM	N.A
Friday		03.50 -04.40 PM	N.A
Saturday (1 <sup>st</sup> & 3 <sup>rd</sup> )		11.30 - 12.30 pm	

**Hours for meeting students:**

Day	Time
Monday	01.30 pm – 02.00 pm
Tuesday	01.30 pm – 02.00 pm
Wednesday	04.40 pm – 05.10 pm
Thursday	04.40 pm – 05.10 pm

## i) Course Objective

By the end of the course, you are expected to be able to (i) Provide students with the essential philosophies and practices of marketing and digital marketing technologies, (ii) equip students with specific knowledge in the areas of digital marketing communications, (iii) Familiarize students to methodologies, tools and technologies involved in digital marketing, (iv) Provide students with sufficient background that will allow them to pursue their careers in the Digital Marketing 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:

No	CO Description	Target
CO1	Description of online market presence, segmentation and the 4 Ps of marketing and their implications for digital marketing. review the history of digital marketing to give some perspective to your digital strategic plan (BT 1)	60%
CO2	Outline an approach to developing a digital marketing plan (BT 2)	70%
CO3	Explain the key digital marketing activities needed for competitive success (BT 3)	60%
CO4	Discuss the opportunities and risks of integrated digital marketing (BT 4)	65%
CO5	translate some of the key marketing and business models that will help to shape your digital marketing strategy (BT 5)	60%

- 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>What is Digital Marketing? Briefly discuss the 5Ds of digital marketing</b>	BT 1
2.	What are the different types of online digital marketing platforms available to sell the product? What are KPI metrics of email marketing?	BT 2

3.	Describe the operations of SEO. Write concept of Keyword frequency & utility of Long tail keywords.	BT 3
4.	Briefly discuss On & Off page SEO tools. State the utilities of Facebook analytics. How can the GOOGLE PENALTIES be avoided?	BT 4
5.	<b>How has Digital Marketing Transformed the Consumer Buying Process? State the main vehicles of Social Media Marketing.</b>	BT 2
6.	What do you understand the term "Page Ranking"? Explain its importance. Why is blogging valuable?	BT 4
7.	How long does SEO take to make a business successful? "Digital marketing and branding go hand-in-hand", justify the statement with examples	BT 5
8.	Differentiate between Digital & Traditional Marketing. Discuss the core components & benefits of Digital Marketing. How does Digital Marketing Sales Funnel differ from traditional marketing funnel? Elucidate with an example	BT 1
9.	Why is Mobile SEO Important? Describe The Role Of Social Media Optimization In Digital Marketing Strategy	BT 5
10.	How to optimize your Meta tags? Explain the best practices for anchor text optimization	BT 3

### iii) Topic/Unit/Chapter Layout (MM 302)

Topic/Unit/Chapter	Lecture Hours	Laboratory hours	Tutorials
Fundamentals of Digital Marketing: concept, history, types, implementation and benefits of digital marketing	2	Not Applicable as per MAKAUT	
Search Engine optimization: concept of Search Engines optimization, how SEO operates, website domain, file name, design layouts, optimized keywords, keyword frequency weightage, prominence, placement of keywords, finding keyword, word stemming, metatag optimization, title optimization, anchor optimization, mobile SEO techniques	8		1
Social Media Marketing: concept, as a marketing tool, importance of social media marketing, Social marketing strategy (SMO) for business, SMO key concepts, business profile creation, brand awareness, social engagement; Viral marketing, tools of measurement of popularity, traffic , analytics and statistics.	8		1
Facebook marketing: overview-types of Facebook pages, growth of business through Facebook; profile page setup, page navigation, influencer, ad options, page promotion, identity target ,likes philosophy, create and engaging fans, call to action, video promotion, Marketing tricks, FB analytics.	8		
Twitter Marketing: Concept, advantages, implementation of twitter; create of twitter account, follower growth, hash tags, sponsor of twitter/hash tags, twitter analytics.	4		1
Google+: Concepts, advantages, creating page on Google+, customization, integration with website/blog, increase in followers, promotion and tools.	3		1
Linkedin: concept, benefits, promotion and growth of business using Linkedin.	4		1
Case Studies	2		

### IV) Textbooks

1. Understanding Digital Marketing by Damian Ryan, Pearson
2. Fundamentals of Digital Marketing by Puneet Singh Bhatia
3. Marketing 4.0: Moving from Traditional to Digital by Kotler, Kartajaya, Setiawan

### Reference Books

1. Social Media Marketing by Tracy L Tuten and Michel R Solomon by SAGE
2. Social Media: 2017 Marketing Tools for Facebook, Twitter, Linkedin, YouTube, Instagram and Beyond by McDonald Jason.

**(v) Evaluation Scheme****1) Theory**

Evaluation Criteria	Marks
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.

**Course Target Attainment Levels For Internal Assessment:**

Target (No. of Students)	Target Level of CO (Marks)	Attainment Level
≤49.9 %	60%	1
50 – 59.9 %	60%	2
60 % and above	60%	3

Overall Course Attainment Target = 70% of the students will get 60% marks.

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:**

Letter Grade	Point
<b>O</b>	<b>10</b>
<b>E</b>	<b>9</b>
<b>A</b>	<b>8</b>
<b>B</b>	<b>7</b>
<b>C</b>	<b>6</b>
<b>D</b>	<b>5</b>
<b>F</b>	<b>Less Than 5</b>

**Course target attainment levels for university assessment:**

Target (No. of Students)	Target Level of CO (Marks) in point	Attainment Level
≤ 49.9 %	7	1
50 – 59.9 %	7	2
60 % and above	7	3

Overall Course Attainment Target = 60% of the students will get 7 points.

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

Course Outcomes	Program Outcomes						PSOs	
	1	2	3	4	5	6	1	2
C MM302.1				1			1	1
C MM302.2	1			2	1		1	
C MM302.3	1	1	1	2		2	2	1
C MM302.4		1			1		1	2
C MM302.5			1	2	1	1	1	2
C MM302	1	1	1	2	1		1	2

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 CO5 partially satisfies application of knowledge of digital marketing & use of social media in solving real life Marketing Management problems. (PO1, PO2).

CO1 to CO4 partially satisfies the concept of Digitisation in Marketing arena using Social Media.

CO1 to CO5 partially satisfies the concept of applied management science through management research tools and demonstrate proficiency in use of digital media Apps to be required to practice Customer centric Marketing Management profession.

**(vii) Delivery Methodology**

Outcome	Method	Supporting Tools	Demonstration
CMM302.1	Structured, partially supervised	Power point presentation, real life example	Assignment, Quiz, Internal
CMM302.2	Structured, partially supervised	Class Lectures, Power point presentation	Assignment, Quiz, Internal
CMM302.3	Structured, partially supervised	Class Lectures, Power point presentation	Case Study, Assignment, Quiz, Internal
CMM302.4	Structured, partially supervised	Class Lectures, Power point presentation	Case Study, Assignment, Quiz, Internal
CMM302.5	Structured, partially supervised	Class Lectures, Real life example	Case Study, Assignment, Quiz, Internal

**(viii) Assessment Methodology**

Outcome	Assessment Tool	Specific Question/activity aligned to the Outcome
<b>CMM302.1, CMM302.2, CMM303.3</b>	Internal Test	1. What are the different types of online digital marketing platforms available to sell the product? 2. Explain different benefits of digital marketing for the marketers 3. Describe the operations of SEO 4. Write short note on Keyword frequency. Write short note on Long tail keywords
<b>CMM302.3, CMM302.4, CMM302.5</b>	Assignment	1. What Is Audience Segmentation? Explain the types Of Audience Segmentation In Digital Marketing 2. Describe the core components of Google Analytics 3. What are Meta tags? Why is blogging valuable? Is video important for SEO?
<b>CMM302.1, CMM302.2, CMM302.3, CMM302.4, CMM302.5</b>	End Semester (Even) Examination	1. a. What do you understand the term "Page Ranking"? Explain its importance. b. What is audience segmentation? Explain the types of audience segmentation in digital marketing. 2. What is Web analytics? How it contributes and benefits Digital Marketing? 3. a. Describe AIDAA model of Digital Marketing b. How does Digital Marketing Sales Funnel differ from traditional marketing funnel? Elucidate with an example 4. How do you integrate online and offline marketing? Explain 5. a. How is digital marketing classified? b. Explain social media strategies

**Weekly Lesson Plan**

Week	Lectures	Tutorial	Practical	Assignment
Week 1	Fundamentals of Digital Marketing: concept, history, types, implementation and benefits of digital marketing. overview-types of Facebook pages, growth of business through Facebook			<b>Assignment 1:</b> 1. Need & Drivers of Digital Marketing 2. SEO utility & tools
Week 2	Concept of Search Engines Optimization (SEO), how SEO operates, website domain, file name, design layouts, mobile SEO techniques.	SEO design layouts,	Caselets	
Week 3	Optimized keywords, keyword frequency weightage, prominence, placement of keywords, finding keyword, word stemming, metatag optimization, title optimization, anchor optimization	Keyword Optimization, Meta Data		

Week 4	Facebook profile page setup, page navigation, influencer, ad options, page promotion, identity target, likes philosophy		Caselets	<u>Assignment 2</u> 1. Facebook Marketing 2. Facebook Analytics
Week 5	Using Facebook create and engaging fans, call to action, video promotion, marketing tricks, FB analytics.	Face Book analytics	Case Study on	
Week 6	Social Media Marketing: concept, as a marketing tool, importance of social media marketing, Social marketing strategy (SMO) for business, SMO key concepts			
Week 7	For Social media business profile creation, brand awareness, social engagement; Viral marketing, tools of Measurement of popularity, traffic, analytics and statistics.	Viral Marketing	Caselets	<u>Assignment 3</u> Use of Google+ & LinkedIn for Business growth
Week 8	Twitter Marketing: Concept, advantages, implementation of twitter; create of twitter account, follower growth, hash tags, sponsor of twitter/hash tags, twitter analytics.	Twitter Analytics		
Week 9	Google+: Concepts, advantages, creating page on Google+, customization, integration with website/blog, increase in followers, promotion and tools.	Google+		
Week 10	Linkedin: concept, benefits, promotion and growth of business using LinkedIn.		Caselets	
Week 11	Case Study			

### COMBINED DAILY LESSON PLAN & EXECUTION REPORT

<b>NAME OF FACULTY</b> Mr. SHOMNATH DUTTA	<b>DEPARTMENT</b> M.B.A	<b>SUBJECT: DIGITAL &amp; SOCIAL MEDIA MARKETING</b> (Marketing Specialisation) <b>SUBJECT CODE : MM 302</b>	<b>SEMESTER: 3<sup>rd</sup></b> (Odd Sem'21)
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Sl. No.	Unit No	Lecture No	Topic Description ( to be quoted from syllabus )	Planned Date	Execution Date	Teaching Pedagogy
1	1.1 1.2 1.3	01-03	Fundamentals of Digital Marketing: concept, history, types	17.08.20	17.08.20	Online Google class & Google Meet for COVID 19 PANDEMIC
			Customers journey from Traditional to Digital	18.08.20	18.08.20	
			Implementation and benefits of digital marketing.	19.08.20	19.08.20	
2	2.1 2.2 2.3	04-11	Basics of Facebook Marketing, Utilities	21.08.20	21.08.20	
			Facebook profile page setup, page navigation, influencer, ad options, page promotion, identity target, likes philosophy	24.08.20 to 28.08.20	07.09.20 to 11.09.20	
			Facebook's creation and engaging fans, call to action, v marketing tricks, Face Book Analytics.			
3	3.1 3.2 3.3 3.4	12-19	Concept of Search Engines Optimization (SEO), how SEO operates, website domain, file name, design layouts	14.09.20 to 18.09.20	14.09.20 to 18.09.20	
			Optimized keywords, keyword frequency weightage, prominence, placement of keywords, finding keyword			
			On & Off page SEO	21.09.20 to 25.09.20	21.09.20 to 25.09.20	
			Word-Stemming, 'Metatag' optimization, Title optimization, anchor optimization, Mobile SEO techniques			
4	4.1 4.2 4.3 4.4	20-27	Social Media Marketing concept as a marketing tool, importance of social media marketing, SMO key concepts	28.09.20 to 30.09.20	05.10.20 to 09.10.20 (Interview)	
			Social Media marketing strategy (SMO) for business, For Social media business profile creation, brand awareness, social engagement	05.10.20 to 09.10.20	12.10.20 to 14.10.20 (Online 1 <sup>st</sup> Internal Test)	
			Viral marketing, tools of Measurement of popularity, traffic, analytics and statistics.	12.10.20 to 14.10.20	19.10.20-20.10.20 & 03.11.20	
			Twitter Marketing: Concept, advantages, implementation of twitter	04.11.20 to 06.11.20	09.11.20 - 11.11.20 (Poor connectivity)	
5	5.1	28-34	Creation of twitter account, follower growth,			



	5.2		hash tags, sponsor of twitter/hash tags	23.11.20 to 30.11.20	07.12.20 - 12.12.20 (Campus Interview)	
	5.3		Twitter analytics			
	5.4		Google+: Concepts, advantages, creating page on Google+	14.12.20 to 18.12.20	21.12.20 to 24.12.20	
6	6.1	35-40	Google+ Page Customization, integration with website/blog, increases in followers, promotion and tools.	05.01.21 to 09.01.21	19.01.21 to 22.01.21	Online Google class & Google Meet for COVID 19 PANDEMIC
	6.2		Linkedin: concept, benefits			
	6.3		Promotion and growth of business using Linkedin.			
7	Extra Class	1	Doubt Clearance Class	08.02.21 to 12.02.21	22.02.21 to 26.02.21 (2 <sup>nd</sup> Internal & Saraswati puja)	
8	Extra Class	1	Discussions on typical real life based applied questions from previous MAKAUT papers	08.03.21 to 10.03.21	08.03.21 to 10.03.21	

## B. Topic & Week-wise Lesson Plan Details

<b>TOPIC/UNIT/Module</b> <b>Title: Introduction to Digital &amp; Social Media Marketing</b> <b>Week No 1</b>						
<b>CONTENTS</b> Discussion of Course outcome and program outcome. Introduction to Digital & Social Media Marketing fundamentals						
<b>Topic/Unit/Chapter Objectives</b> Understanding basics of Digital Marketing						
<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):</b> 1. Explain Digital Marketing basics with examples from India [L1] 2. State & brief the motives behind switching digital platform from traditional marketing [L2] 3. Differentiate between Digital & Traditional Marketing [L2] 4. Discuss the stages by which a firm can adopt digitization route for marketing [L4] 5. Write short note on Digital Disruption [L2]						
<b>TOPIC/UNIT/Module</b> <b>Title: Search Engines Optimization (SEO)</b> <b>Week No 2 &amp; 3</b>						
<b>CONTENTS</b> Discussion on SEO concept, Tools & Techniques						
<b>Topic/Unit/Chapter Objectives:</b> 1. Detailed discussion on SEO Process 2. Elaboration of Types & Techniques of SEO						
<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):</b> 1. Discuss the process of SEO [L3] 2. Briefly outline need of SEO in Digitization of Marketing [L2] 3. Discussion on Types of SEO On & Off page [L2] 4. Discuss on Meta-data, Keyword Optimization, Interlinking etc [L3] 5. Conceptualisation of Anchoring of Text, Blogging [L3] 6. Word-stemming in SEO & Mobile SEO techniques						
<b>TOPIC/UNIT/ Module</b> <b>Title: Facebook Marketing</b> <b>Week No 4 &amp; 5</b>						
<b>CONTENTS</b> Discussion on different aspects of Use of Facebook in Marketing						
<b>Topic/Unit/Chapter Objectives:</b> 1. Usage of social media Facebook for Marketing purposes 2. Understanding the Facebook Analytics						
<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):</b> 1. Explain the Facebook profile page setup, page navigation, influencer [L3] 2. Describe the process of Facebook page promotion, identity target, [L2]						

3. Outline the Facebook's creation and engaging fans, call to action, v marketing tricks [L3] 4. Write a brief note on Face Book Analytics [L3]
<b>TOPIC/UNIT/Module</b> <b>Title: Social Media Marketing &amp; Optimization</b> <b>Week No 6 &amp; 7</b>
<b>CONTENTS</b> Discussion on different aspects Social Media Marketing & Optimization Strategy
<b>Topic/Unit/Chapter Objectives</b> Social Media Marketing : Key concepts & Strategies for Optimization
<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):</b> 1. What is Social Media as marketing tool online? (L1) 2. State importance in Social media marketing in current era of Digitisation (L2) 3. What are different strategies for Social Media Optimization (SMO)? (L3) 4. What do you mean by 'Viral marketing'? (L2) 5. State the tools of measurement of popularity, traffic, analytics and statistics. (L3)
<b>TOPIC/UNIT/Module</b> <b>Title: Twitter Marketing</b> <b>Week No 8</b>
<b>CONTENTS</b> Discussion on Basics of Twitter Marketing
<b>Topic/Unit/Chapter Objectives</b> Application of social media Twitter in Marketing field
<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):</b> 1. Give a brief account on the Concept, advantages, implementation of twitter as marketing tool. (L1) 2. How to create of Twitter account & how to track follower growth in twitter? (L3) 3. Explain concept of 'hash tags' & sponsor of twitter/hash tags (L3) 4. Explain the components of Twitter analytics (L4)
<b>TOPIC/UNIT/ Module</b> <b>Title: Google+</b> <b>Week No 9</b>
<b>CONTENTS</b> Discussion on utility of Google+
<b>Topic/Unit/Chapter Objectives:</b> Brief understanding about Google+ & its applications
<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):</b> 1. Discuss on Concepts & advantages of using Google+ (L2) 2. How to create a page on Google+ along with techniques of its customization (L3) 3. Explain how to integrate a Google+ page with a website/blog (L4) 4. Explain the usage of Google+ in increasing followers count, promotion and tools (L3)
<b>TOPIC/UNIT/ Module</b> <b>Title: Marketing using LinkedIn</b> <b>Week No 10</b>
<b>CONTENTS</b> Discussion on use of LinkedIn Professional Social media for Marketing
<b>Topic/Unit/Chapter Objectives:</b> To apply LinkedIn network in Marketing of goods & services
<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):</b> 1. Briefly discuss the professional social networking tool LinkedIn 2. Explain the benefits of using LinkedIn in Business. 3. discuss the ways to utilize LinkedIn for growth of business

**Teaching Strategy/Method (Instructional methods, usage of ICT, efficient and engaging instructions and displays the best practices on institutional website)**

- Learning by analogous examples
- Learning by question and answering

- Learning by different Current industry business models and Pilot Business Plan
- Learning by team work (think, pair, share)
- Learning by solving numerical problems
- Learning by good video lectures and animation

**(x.a) Strategy to support weak students**

- Encouraging them to express their point of trouble
- Paying extra attention regarding subject matter beyond the class and regular follow up
- Involve them in such real life based live business project work/designing of business plan
- Engage some bright students to put attention on their friends i.e. weak students

**(x.b) Strategy to encourage bright students**

- Try to encourage them to study beyond the syllabus
- Suggest them to follow comparatively advanced and well equipped text books
- Motivate them to browse the internet and go through the latest invention/developments in the particular field
- Encourage them to implement some real life based hand on business oriented project work on the subject matter

**(x.c) Efforts to keep students engaged**

- Asking random questions to the students found unmindful from the topic
- Engage them by providing interesting problem solving
- Introducing some informal business quiz among different groups
- Assigning regular home works and follow up
- Delivering some interesting lectures apart from conventional teaching

**DETAILS OF TUTORIALS(Case Study)/MM 302/Odd Sem'2020**

Tutorial No	Tutorial/Case Study Topic	Plan date with day	Execution date	Remarks
01	SEO & Operational tools	26.09.20 & 03.10.20	26.09.20 & 03.10.20	
02	Keyword Optimization, Meta Data	24.10.20 & 31.10.20	24.10.20 & 31.10.20	
03	Facebook Analytics	14.11.20 & 16.11.20	14.11.20 & 16.11.20	
04	Viral Marketing	12.12.20 & 19.12.20	12.12.20 & 14.12.20	
05	Twitter Analytics	07.02.21 & 09.02.21	07.02.21 & 09.02.21	

**ATTENDANCE SHEET (Tutorial/Case Study)**

**SUBJECT: DIGITAL & SOCIAL MEDIA MARKETING (Marketing)**  
**SEMESTER: 3<sup>rd</sup>**

**Subject Code: MM 302**  
**Stream: MBA (New)**

	Roll No.	Name	26.09.20 & 03.10.20	24.10.20 & 31.10.20	14.11.20 & 16.11.20	12.12.20 & 14.12.20	07.02.21 & 09.02.21
1	11900920001	AJAY KUMAR PRASAD		P		P	P
2	11900920002	KUSHAL DAM (Minor)	P		P	P	P
3	11900920003	SUROJIT PAUL	P	P		P	P
4	11900920004	RUPJIT DUTTA (Minor)	P	P	P	P	P
5	11900920005	SIMRAN CHOUDHURY	P	P	P	P	

6	11900920006	BIPLOB BARMAN (Minor)	P	P	P	P	
7	11900920007	PRAYANKAR DAHAL (Minor)	P	P	P		P
8	11900920008	ROHIT THAPA	P	P	P	P	P
9	11900920009	PRATIK CHHETRI (Minor)	P	P	P		P
10	11900920010	SANKHA GHOSH (Minor)	P	P		P	P
11	11900920012	RISHAV DUTTA (GJC) (Minor)		P	P	P	P
12	11900920015	RIYA SARKAR	P	P	P	P	
13	11900920017	BISWAJIT BAKSHI	P	P	P		P
14	11900920018	PRIYADARSINI MUKHERJEE (Minor)	P		P	P	P
15	11900920019	RIYA DEB	P	P	P	P	P
16	11900920024	SUPRIYO GHOSH	P		P	P	P
17	11900920026	NILADRI BISWAS	P	P	P	P	P
18	11900920027	MANISH CHETTRI	P	P	P	P	
19	11900920028	PRENA GUPTA (Minor)		P	P	P	P
20	11900920029	ROHIT ALAM	P		P		P
21	11900920030	ASHMITA SHARMA	P	P	P	P	P
22	11900920032	SUBARNA CHOWDHURY (Minor)	P		P		
23	11900920033	ASHISH SHARMA (Minor)	P		P		P
24	11900920034	KIRTY DAS (Minor)			P	P	P
25	11900920035	PRABIR AICH	P	P	P	P	P
26	11900920036	SOUMYAJIT DAS (Minor)	P		P		P
27	11900920037	PUNAM KUMARI GUPTA	P	P	P	P	P
28	11900920038	SHUVODEEP GHOSH (Minor)		P	P	P	
29	11900920039	DEBANGI DAS (Minor)	P	P	P	P	P
30	11900920040	TANMOY DEY (Minor)	P	P	P	P	P
31	11900920042	TINNY SARKAR (Minor)	P	P	P	P	
32	11900920043	MAINI SARKAR		P	P	P	P
33	11900920044	DEBAPRIYA RAHA		P	P	P	P
34	11900920045	SOUMYAJIT GUHA	P	P	P	P	
35	11900920046	SUBHANKAR DAS	P	P	P	P	P
36	11900920047	KAJAL GUPTA	P	P	P	P	P
37	11900920048	ARABINDU BOSE	P	P	P	P	P

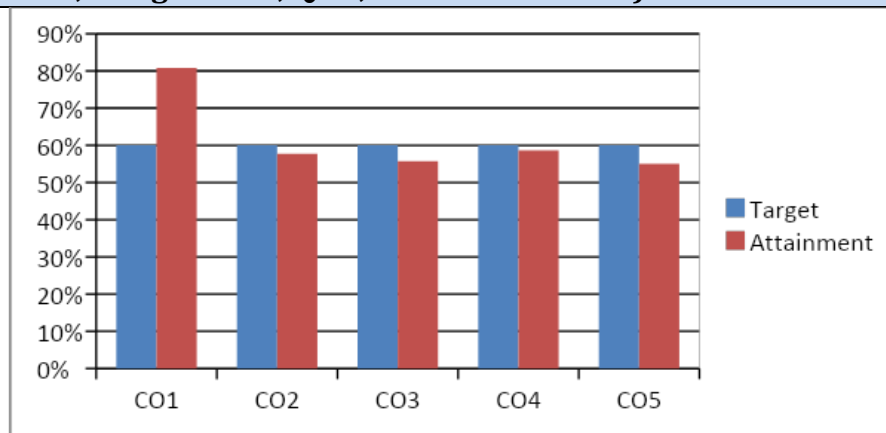
38	11900920049	RISHAV DUTTA (SIT)	P	P	P		P
39	11900920050	ANGELA YOLMO (Minor)	P	P	P	P	P
40	11900920051	REKHA POKHREL (Minor)	P	P	P	P	
41	11900920052	GHANANTIKA BARUA (Minor)	P		P		
42	11900920053	ASHMITA SHERPA	P	P	P	P	P
43	11900920054	SAMAJIT DEY (Minor)	P	P	P	P	
44	11900920055	RIYA GURUNG (Minor)		P	P	P	P
45	11900920056	SITANGSHU BANDHU CHATTERJEE		P	P	P	P
46	11900920057	ARUNABH MODAK (Minor)	P	P	P	P	
47	11900920058	SHREYA PALIT (Minor)	P	P	P	P	P
48	11900920059	ANINDA BHATTACHARYA	P	P	P	P	P
49	11900920060	DEEPAK KUMAR (Minor)	P	P	P	P	P

### CONSOLIDATED INTERNAL TEST RECORDS of MM 302; MBA (N) MAKAUT Odd SEM 2020

Sl	Roll No.	Name	Continuous Assessment			
			CA 1	CA 2	CA 3	CA 4
1	11900920001	AJAY KUMAR PRASAD	20	21	21	21
2	11900920002	KUSHAL DAM (Minor)	21	23	19	19
3	11900920003	SUROJIT PAUL	19	21	20	22
4	11900920004	RUPJIT DUTTA (Minor)	20	22	18	22
5	11900920005	SIMRAN CHOUDHURY	19	18	20	20
6	11900920006	BIPLOB BARMAN (Minor)	20	21	19	22
7	11900920007	PRAYANKAR DAHAL (Minor)	22	23	20	23
8	11900920008	ROHIT THAPA	21	23	19	21
9	11900920009	PRATIK CHHETRI (Minor)	18	22	20	21
10	11900920010	SANKHA GHOSH (Minor)	23	23	21	23
11	11900920012	RISHAV DUTTA (GJC) (Minor)	22	24	19	21
12	11900920015	RIYA SARKAR	22	22	20	22
13	11900920017	BISWAJIT BAKSHI	21	21	19	18
14	11900920018	PRIYADARSINI MUKHERJEE (Minor)	19	22	20	21
15	11900920019	RIYA DEB	17	19	22	23
16	11900920024	SUPRIYO GHOSH	18	22	21	23
17	11900920026	NILADRI BISWAS	20	23	18	22
18	11900920027	MANISH CHETTRI	18	21	23	23
19	11900920028	PRENA GUPTA (Minor)	15	20	22	24
20	11900920029	ROHIT ALAM	20	22	18	22

21	11900920030	ASHMITA SHARMA	19	22	18	08
22	11900920032	SUBARNA CHOWDHURY (Minor)	21	23	20	22
23	11900920033	ASHISH SHARMA (Minor)	21	23	15	20
24	11900920034	KIRTY DAS (Minor)	15	20	20	22
25	11900920035	PRABIR AICH	19	21	19	22
26	11900920036	SOUMYAJIT DAS (Minor)	20	21	21	23
27	11900920037	PUNAM KUMARI GUPTA	21	23	21	23
28	11900920038	SHUVODEEP GHOSH (Minor)	19	21	22	21
29	11900920039	DEBANGI DAS (Minor)	20	22	18	22
30	11900920040	TANMOY DEY (Minor)	19	18	20	23
31	11900920042	TINNY SARKAR (Minor)	20	21	22	22
32	11900920043	MAINI SARKAR	22	23	21	21
33	11900920044	DEBAPRIYA RAHA	21	23	19	22
34	11900920045	SOUMYAJIT GUHA	18	22	17	19
35	11900920046	SUBHANKAR DAS	23	23	18	22
36	11900920047	KAJAL GUPTA	22	24	20	23
37	11900920048	ARABINDU BOSE	20	19	18	21
38	11900920049	RISHAV DUTTA (SIT)	18	22	17	19
39	11900920050	ANGELA YOLMO (Minor)	23	23	18	22
40	11900920051	REKHA POKHREL (Minor)	22	24	20	23
41	11900920052	GHANANTIKA BARUA (Minor)	20	19	18	21
42	11900920053	ASHMITA SHERPA	20	21	22	22
43	11900920054	SAMAJIT DEY (Minor)	22	23	21	21
44	11900920055	RIYA GURUNG (Minor)	21	23	19	22
45	11900920056	SITANGSHU BANDHU CHATTERJEE	18	22	17	19
46	11900920057	ARUNABH MODAK (Minor)	20	21	22	22
47	11900920058	SHREYA PALIT (Minor)	22	23	21	21
48	11900920059	ANINDA BHATTACHARYA	21	23	19	22
49	11900920060	DEEPAK KUMAR (Minor)	18	22	17	19

**(xi) Analysis of Students performance in the course (Internal) (Case Study, Seminars, Class-tests, Assignments, Quiz, Internal Exam etc)**



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

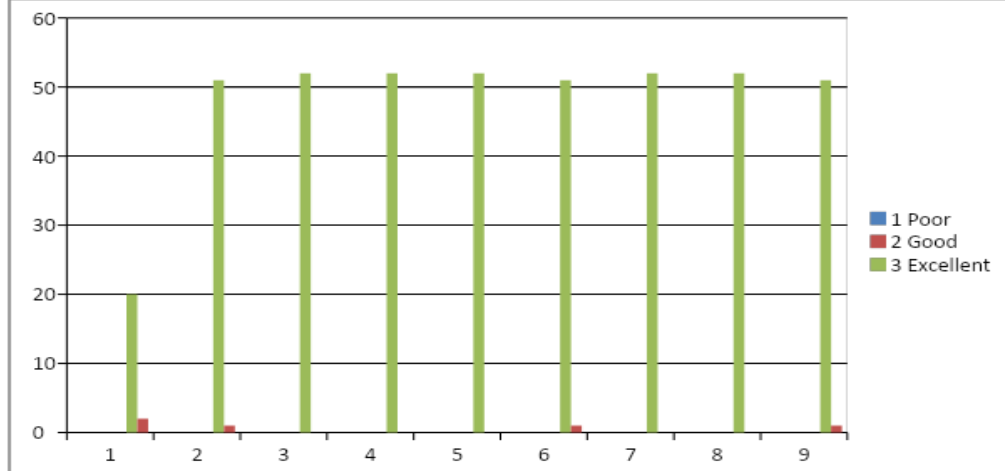
University Roll No.	NAME OF STUDENTS	Letter Grade (Point) Obtained Theory	ATTAINMENT	
		Maximum Point		10
		Set Target Level (In Point)		6
11900920001	AJAY KUMAR PRASAD	6	1	
11900920002	KUSHAL DAM (Minor)	7	1	
11900920003	SUROJIT PAUL	4	0	
11900920004	RUPJIT DUTTA (Minor)	9	1	
11900920005	SIMRAN CHOUDHURY	8	1	
11900920006	BIPLOB BARMAN (Minor)	6	1	
11900920007	PRAYANKAR DAHAL (Minor)	8	1	
11900920008	ROHIT THAPA	7	1	
11900920009	PRATIK CHHETRI (Minor)	8	1	
11900920010	SANKHA GHOSH (Minor)	7	1	
11900920012	RISHAV DUTTA (GJC) (Minor)	8	1	
11900920015	RIYA SARKAR	9	1	
11900920017	BISWAJIT BAKSHI	6	1	
11900920018	PRIYADARSINI MUKHERJEE (Minor)	8	1	
11900920019	RIYA DEB	7	1	
11900920024	SUPRIYO GHOSH	8	1	
11900920026	NILADRI BISWAS	5	0	

11900920027	MANISH CHETTRI	9	1
11900920028	PRENA GUPTA (Minor)	6	1
11900920029	ROHIT ALAM	8	1
11900920030	ASHMITA SHARMA	7	1
11900920032	SUBARNA CHOWDHURY (Minor)	9	1
11900920033	ASHISH SHARMA (Minor)	6	1
11900920034	KIRTY DAS (Minor)	5	0
11900920035	PRABIR AICH	7	1
11900920036	SOUMYAJIT DAS (Minor)	7	1
11900920037	PUNAM KUMARI GUPTA	9	1
11900920038	SHUVODEEP GHOSH (Minor)	6	1
11900920039	DEBANGI DAS (Minor)	6	1
11900920040	TANMOY DEY (Minor)	8	1
11900920042	TINNY SARKAR (Minor)	7	1
11900920043	MAINI SARKAR	7	1
11900920044	DEBAPRIYA RAHA	6	1
11900920045	SOUMYAJIT GUHA	9	1
11900920046	SUBHANKAR DAS	6	1
11900920047	KAJAL GUPTA	7	1
11900920048	ARABINDU BOSE	6	1
11900920049	RISHAV DUTTA (SIT)	6	1
11900920050	ANGELA YOLMO (Minor)	9	1
11900920051	REKHA POKHREL (Minor)	6	1
11900920052	GHANANTIKA BARUA (Minor)	6	1
11900920053	ASHMITA SHERPA	8	1
11900920054	SAMAJIT DEY (Minor)	7	1
11900920055	RIYA GURUNG (Minor)	7	1
11900920056	SITANGSHU BANDHU CHATTERJEE	7	1
11900920057	ARUNABH MODAK (Minor)	8	1
11900920058	SHREYA PALIT (Minor)	7	1
11900920059	ANINDA BHATTACHARYA	7	1
11900920060	DEEPAK KUMAR (Minor)	6	1
Total No. of Students		49	38
%age of students who attained target		93.87%	3
TARGET(%)			60

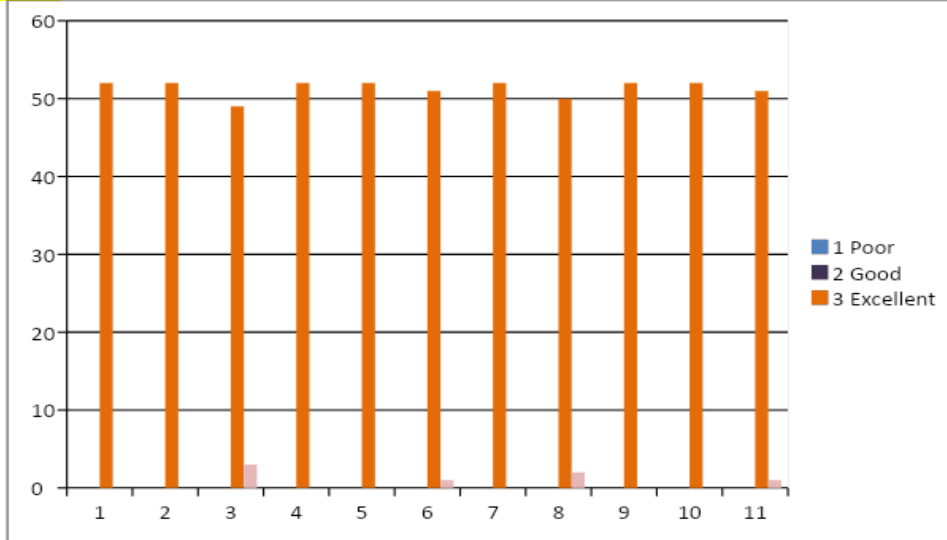
## Theory Assessment



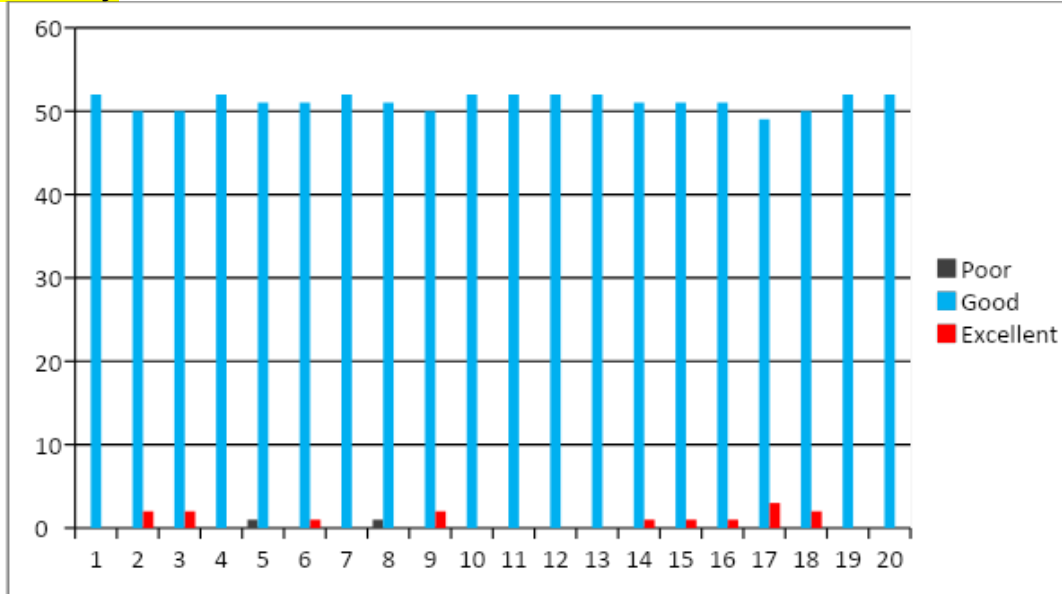
**Summative**



**Formative**



**Course Survey**



List of Students with Roll Nos whose Academic Performance is poor

Serial No	Roll No	Name of Student	Remedial measures taken by Teacher
01	11900920033	ASHISH SHARMA	Extra Classes Online via Google Meet for Conceptualisation
02	11900920034	KIRTY DAS	Extra Classes Online via Google Meet for Conceptualisation
03	11900920035	PRABIR AICH	Extra Classes Online via Google Meet for Conceptualisation

<b>CERTIFICATE</b>				
I, the undersigned, have completed the course allotted to me as shown below				
Sl. No.	Semester	Subject with Code	Total Units/ Chapters	Remarks
01.	MBA 3 <sup>rd</sup> (New) 2021	Digital & Social Media Marketing (MM - 302) Marketing Specialisation	08	
Date :		<b>Signature of Faculty</b>		
<b>Submitted to HOD</b>				
Certificate by HOD				
I, the undersigned, certify that.....has completed the course work allotted to him/ her satisfactorily/ not satisfactorily.				
Date :		<b>Signature of HOD</b>		
<b>Submitted to Principal/Director</b>				
Date :		<b>Signature of Principal/Director</b>		



**SILIGURI INSTITUTE OF TECHNOLOGY  
DEPARTMENT OF BUSINESS ADMINISTRATION**



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

**SESSION 2021 - 2022 (EVEN SEMESTER 2022)**

**PAPER NAME : OPERATIONS MANAGEMENT**

**PAPER CODE: MB 204**

**MBA [NEW SYLLABUS FROM 2018 SESSION]**

# Course File

**Course Title: Operations Management**

**Code: MB 204 (MBA New Syllabus from 2018-19 Session)**

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

**Name of the Faculty: Shomnath Dutta**

**E-mail: shomnath76@gmail.com**

**Class Schedule of MB 204 (Even Semester'22)**

Lecture			Tutorial	
<b>Monday</b>	10.00 AM - 10.50 AM			02.15 PM - 04.00 PM
<b>Tuesday</b>	10.00 AM - 10.50 AM			
<b>Wednesday</b>				
<b>Thursday</b>	10.00 AM - 10.50 AM			
<b>Friday</b>	10.50 AM - 11.40 AM			

**Hours for meeting students:**

Day	Time
<b>Monday</b>	<b>01.30 PM - 02.00 PM (ONLINE Google Meet for Covid 19 2<sup>nd</sup> wave)</b>
<b>Tuesday</b>	<b>04.40 PM - 05.00 PM (ONLINE Google Meet for Covid 19 2<sup>nd</sup> wave)</b>
<b>Wednesday</b>	<b>04.40 PM - 05.00 PM (ONLINE Google Meet for Covid 19 2<sup>nd</sup> wave)</b>
<b>Thursday</b>	<b>01.30 PM - 02.00 PM (ONLINE Google Meet for Covid 19 2<sup>nd</sup> wave)</b>

## **i) Course Objective**

This course facilitates the students about the role of Operations Management in the overall business strategy of the firm & the interdependence of the operating system with other key functional areas of the firm followed by application of operations management policies and techniques to the service sector as well as manufacturing firms.

## **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:

Description of Course Outcomes		Target
<b>CO1</b>	Understand the role of Operations in overall Business Strategy of the firm - the application of OM policies and techniques to the service sector as well as manufacturing firms. ( <i>Knowledge, Comprehending, Remembering</i> )	60%
<b>CO2</b>	Understand and apply the concepts of Material Management, Supply Chain Management and TQM perspectives. ( <i>Knowledge, Comprehending, Applying</i> )	60%
<b>CO3</b>	Identify and evaluate the key factors and their interdependence of these factors in the design of effective operating systems. ( <i>Comprehending, Applying</i> )	60%
<b>CO4</b>	Analyze / understand the trends and challenges of Operations Management in the current business environment. ( <i>Analyzing</i> )	60%
<b>CO5</b>	Apply techniques for effective utilization of operational resources and managing the processes to produce good quality products and services at competitive prices. ( <i>Analyzing, Evaluating</i> )	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.	State the working principle of Production/Operations system & associated sub-systems with the help of block diagram representation.	BT 1
2.	Explain the Plant location selection and Layout design considerations. How does PPC get affected by Layout and material handling decisions?	BT 2
3.	How is the Break Even Analysis applied to find out the best plant location and manufacturing process selection? Can Make/Buy be evaluated by Break Even Analysis tool? If so how	BT 3
4.	Analyze the Inventory control of perishable items as per EOQ Models with quantity discount	BT 4
5.	State the features and relative merits & demerits of different Production systems (Jobshop/Batch/Mass/Project)? How are scheduling & sequencing designed in various production systems?	BT 2
6.	Give an analytical overview of situations call for Make or Buy decisions. Analytically explain the Assembly Line Balancing techniques.	BT 4
7.	Evaluate the comparative evaluation of Product & Process layout design & their applications. Evaluate Capacity Planning cases.	BT 5
8.	State the Meaning & Features of TQM, JIT, Kaizen philosophies of Quality Management, ERP basics	BT 1
9.	Appraise the P-System & Q-System of Inventory Control techniques	BT 5
10.	How do you apply Forward & Backward pass methodologies in PERT networking Project schedule preparation?	BT 3

### iii) Topic/Unit/Chapter Layout

Topic/Unit/Chapter	Lecture Hours	Tutorials
Difference between Manufacturing & service Operations, Product Process Matrix, Concept of Production Cycle, Capacity planning, Production Planning & Control Concept, Production as a Coordination Function, Responsibilities of Production Manager	4	Numerical on Capacity planning & Production Cycle
<b>Manufacturing Systems</b> Characteristics of Manufacturing Systems; Classification of Manufacturing Systems Batch, Job-shop, Mass etc with Examples; Differences between Intermittent and Continuous Production	2	Numerical on Process selection using Break Even criteria
<b>Plant Location:</b> Need for a Good Plant Location; Factors influencing Plant Location; Tangible and Intangible Factors; Economic Survey of Site Selection	2	Numerical on different models of Plant Location selection
<b>Plant Layout Fundamentals:</b> Need for a Good Plant Layout; Characteristics of a Good Layout; Different types of Layouts-Product, Process, Hybrid etc; Process Layout vs. Product Layout; Optimization in a Process Layout and Product Layout; Designing Product and Process Layout; CORELAP, ALDEP, CRAFT software packages etc;	4	Conceptual issues in plant Layout Design
<b>Assembly Line Balancing</b> – Concept and Problems; Cellular Manufacturing Concept	2	Numerical on Line balancing using Heuristics
<b>Maintenance Management:</b> Objectives, Benefits, Cost Domains etc -. Principles followed; Types of Maintenance Breakdown and Preventive Maintenance & their features; Total Productive Maintenance (TPM) & Numerical	3	Numerical on Replacement problems & OEE calculation

<b>Purchase Management:</b> Purchasing Procedure; Value Analysis; Vendor Selection; Negotiation; Make or Buy decision	2	Numerical on Vendor rating & Make/Buy decision
<b>Inventory Management:</b> Classification of inventory items – ABC, FSN, VED classification; Introduction to EOQ and EBQ; Deterministic demand model–EOQ- Continuous and Periodic review Inventory models	4	Numerical on EOQ models, ABC & P system & Q system
<b>MRP</b> – Concept, inputs and outputs, benefits, examples; Master Production Schedule and MRP; Concepts of MRP II, JIT and ERP	3	Numerical on Product Tree & MRP outputs from BOM
<b>Inspection &amp; Quality Control:</b> Types and criteria of inspection significance & benefits of quality control; Statistical Quality Control: Meaning, Benefits; Control charts for Variables & attributes with numerical application	3	Numerical on Control Charts
<b>Acceptance Sampling</b> – Need, Meaning; OC Curve, Consumer’s & Producer’s risk, LTPD, AQL	2	
<b>Scheduling &amp; Sequencing</b> – Definition and Assumptions; Sequencing of n jobs on a single machine; Shortest Processing Time, Longest Processing Time, Earliest Due Date and First Come First Serve basis; Sequencing of 2 jobs on 2 machines – <b>Gantt Charts</b> , Limitations of Gantt Charts; <b>Johnson’s Rule:</b> Sequencing of n jobs on 2 and 3 machines	3	Numerical on Johnson’s Rule; EDD, FCFS etc
Introduction to <b>Project Management</b> – CPM and PERT basics; Identification and Importance of the Critical Path, Forward & Backward pass, Slack/Floats	3	Numerical on PERT & CPM network drawing & Critical path identification
<b>Work Study:</b> Definition and its Importance; Basic Procedure in Performing a Work Study; <b>Method Study</b> – Objectives and Procedure; <b>Work Measurement</b> –Objectives and Procedure; Concepts of Performance Rating, Basic Time, Allowances and Standard Time	4	Numerical on Standard Time Calculation

#### IV) Textbooks

Bedi – Production and Operations Management (2k edition); Oxford University Press  
 Chary, S.N. – Production and Operations Management (3k edition); TMH  
 Chase, Jacobs, Aquilano and Agarwal – Operations Management for Competitive Advantage (11th edition); TMH  
 Buffa, E. S. and Sarin, R. K. – Modern Production /Operations Management; John Wiley  
 Aswathappa & Bhat K Sridhara – Production & Operations Management; HPH

#### Reference Books

Mahadevan – Operations Management; Pearson Education  
 Krajewski, Ritzman and Malhotra – Operations Management (8k edition); Pearson Education  
 Hansen and Ghare – Quality Control and Applications; PHI  
 Gaither and Frazier – Operations Management (9k edition); Thomson Learning  
 Hansen and Ghare – Quality Control and Applications; PHI

#### (v) Evaluation Scheme

##### 1) Theory

Evaluation Criteria	Marks
Internal Exam*	50
Assignment	40
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.

### Course Target Attainment Levels for Internal Assessment:

Target (No. of Students)	Target Level of CO (Marks)	Attainment Level
≤49.9 %	60%	1
50 – 59.9 %	60%	2
60 % and above	60%	3

Overall Course Attainment Target = 70% of the students will get 60% marks.

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:

Letter Grade	Point
O	10
E	9
A	8
B	7
C	6
D	5
F	Less Than 5

### Course target attainment levels for university assessment:

Target (No. of Students)	Target Level of CO (Marks) in point	Attainment Level
≤ 49.9 %	7	1
50 – 59.9 %	7	2
60 % and above	7	3

Overall Course Attainment Target = 60% of the students will get 7 points.

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

Course Outcomes	Program Outcomes					PSOs	
	1	2	3	4	5	6	7
C MB204.1	1				1	1	
C MB204.2	1	1		1	1		
C MB204.3		1		1		1	1
C MB204.4	1	1			1	1	
C MB204.5		1				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 CO5 partially satisfies application of knowledge of scientific management in solving real life Shop floor Management problems. (PO1, PO2).

CO1 to CO4 partially satisfies the concept of individual and team work.

CO1 to CO5 partially satisfies the concept of applied management science, mathematics through mathematical & operations research tools and demonstrates proficiency in use of software to be required to practice Production/Operations related managerial professions.

### (vii) Delivery Methodology

Outcome	Method	Supporting Tools	Demonstration
C MB204.1	Structured, partially supervised	Powerpoint presentation, real life example	Assignment, Quiz, Internal
C MB204.2	Structured, partially supervised	Class Lectures, Powerpoint presentation	Assignment, Quiz, Internal
C MB204.3	Structured, partially supervised	Class Lectures, Powerpoint presentation	Assignment, Quiz, Internal
C MB204.4	Structured, partially supervised	Class Lectures, Powerpoint presentation	Tutorial, Assignment, Quiz, Internal

C MB204.5	Structured, partially supervised	Class Lectures, real life example	Tutorial, Assignment, Quiz, Internal
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### (viii) Assessment Methodology

Outcome	Assessment Tool	Specific Question/activity aligned to the Outcome
C.MB204.1, C.MB204.2, C.MB204.3, C.MB204.4, C.MB204.5	Internal Test	<ol style="list-style-type: none"> <li>1. Discuss several types of Production methodologies with applicability</li> <li>2. Explain the factors determining selection of a plant location.</li> <li>3. Discuss different types of Plant layouts used in manufacturing &amp; service units along with their relative merits/demerits.</li> <li>4. Explain the functionalities involved &amp; features &amp; benefits of PPC</li> <li>5. Discuss how Johnson's Rule can be applied in sequencing <math>n</math> jobs in 2 machines</li> <li>6. Discuss different types of Plant Maintenance policies – Breakdown, Preventive, Planned etc</li> <li>7. Explain the concepts of Performance Rating, Allowances, Normal &amp; Standard Times</li> <li>8. Discuss the objectives and benefits of TPM</li> <li>9. Write short notes on Process-Product matrix and Production Cycle</li> </ol>
C.MB204.2, C.MB204.3, C.MB204.4	Assignment	<ol style="list-style-type: none"> <li>1. Explain the functionalities involved in Loading, Scheduling &amp; Sequencing of Jobs</li> <li>2. Give a brief account of value Analysis</li> <li>3. Write short notes on Control Charts &amp; OC curve.</li> <li>4. Discuss on Capacity Planning</li> </ol>
C.MB204.1, C.MB204.2, C.MB204.3, C.MB204.4, C.MB204.5	End of Semester Test	

### (ix) A. Weekly Lesson Plan

Week	Lectures	Tutorial	Practical	Assignment
Week 1	<ol style="list-style-type: none"> <li>a. Discussion of Course outcome and program outcome.</li> <li>b. Conceptual understanding of Operations Management as a System in a manufacturing/Service unit.</li> <li>c. <b>Different types of Manufacturing System</b> – Mass, Assembly line, Job-shop, Batch, Project type, Cellular, Make-to-Order, Make-to-Stock etc</li> </ol>	Decision making on Process Selection		
Week 2	<b>Plant Location Decision:</b> Plant Location selection factors & Location decision models	Numerical on Plant location models		<u>Assignment 1:</u> a. Problems on Factor rating, ROI and Break



Week 3	<b>Plant Layout Fundamentals</b> <b>a.</b> Characteristics of a Good Layout; Different types of Layouts-Product, Process, Hybrid etc <b>b.</b> Process Layout vs. Product Layout; Optimization in a Process Layout and Product Layout; Designing Product and Process Layout; CORELAP, ALDEP, CRAFT software packages <b>c.</b> Assembly Line Balancing technique	Numerical on Line balancing problem		even models of Plant Location selection b. Assembly Line balancing problem c. Application of Johnson's rule of job scheduling & sequencing
Week 4	<b>Scheduling &amp; Sequencing:</b> <b>a.</b> Sequencing of n jobs on a single machine Shortest Processing Time, Longest Processing Time, Earliest Due Date and First Come First Serve basis <b>b.</b> Sequencing of 2 jobs on 2 machines - Gantt Charts, Limitations of Gantt Charts <b>c.</b> Sequencing of n jobs on 2 and 3 machines - Johnson's Rule	Numerical on Johnson's Algorithm & on EDD, FCFS rule etc		
Week 5	<b>Work Study fundamentals -</b> Method Study & Work Measurement	Standard time Calculation		<u>Assignment 2:</u> a. Numerical on Method study & Work sampling b. Numerical on Make/buy & Vendor rating
Week 6	<b>a. Vendor Rating exercise</b> - Methods & Application, <b>b. Make/Buy Decision</b> - Methods & Application, <b>c. PPC Concept:</b> Meaning, Features, Components; Elements of Production Planning & Production Control functions;	Numerical on Make/buy & Vendor rating		
Week 7	<b>Project Networking &amp; Scheduling</b> - Networking fundamentals, drawing of Project network, - Forward & Backward pass scheduling in PERT & CPM - Critical path & Float determination in CPM/PERT	Numerical on PERT/CPM		<u>Assignment 3:</u> a. Numerical on PERT/CPM b. Capacity planning
Week 8	<b>a.</b> Product Process Matrix, Concept of Production Cycle, Capacity planning, <b>b.</b> Production as a Coordination Function, Responsibilities of Production Manager	Numerical on Capacity calculation, Takt time, throughput		
Week 9	<b>a. Purchase Management:</b> Purchasing Principles & Procedure; Value Analysis; <b>b. MRP Concepts</b> - Independent demand, BOM explosion, Inputs & Outputs of MRP-I model	MRP table Calculations		
Week 10	<b>Inventory fundamentals-</b> Meaning, Benefits, Types of Inventories, Types of Inventory Costs, <b>EOQ Models</b> - Basic; without shortage, with shortage, with price breaks; Effect of quantity discount;	Numerical on EOQ Models		<u>Assignment 4:</u> a. EOQ Models b. ABC analysis c. Control Charts
Week 11	<b>Inventory Control Tools</b> - ABC, FSN and VED classification; Perpetual, Two-bin and Periodic Inventory System	Numerical on ABC Analysis		
Week 12	<b>Plant Maintenance -</b> <b>a.</b> Objectives, Benefits, Cost Domains etc Types of Maintenance Breakdown and Preventive Maintenance & their features; <b>b.</b> Total Productive Maintenance (TPM) & Numerical	Numerical on machine replacement		

Week 13	<b>Statistical Quality Control (SQC) &amp; Inspection</b> - Types and criteria of inspection significance of quality control, Statistical Quality Control, Control charts, Acceptance Sampling Plans; Numerical on Control Charts	Numerical on Control charts		
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## B. Topic/Chapter wise Weekly Lesson Plan

TOPIC/UNIT/ Module Title: <b>Basics of Production/Operations System</b> <b>Week No 1</b>
<b>CONTENTS</b> Discussion of Course outcome and program outcome. Introduction to Production/Operations System & its components for Manufacturing/Service unit
<b>Topic/Unit/Chapter Objectives</b> <b>Broad Objectives of the chapter/topic are:</b> <ol style="list-style-type: none"> <li>To be familiar with the basic characteristics and working principle of Production/Operations System</li> <li>To aware &amp; conceptualise several types of Production methodologies with applicability</li> </ol>
<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):</b> <ol style="list-style-type: none"> <li>Explain the basic characteristics of Production/operations system. [L1]</li> <li>Discuss the features &amp; relative merits and demerits of several Production Methodologies [L2]</li> <li>Differentiate between various Production systems techniques. [L1]</li> </ol>

TOPIC/UNIT/ Module Title: <b>Plant Location Decision</b> <b>Week No 2</b>
<b>CONTENTS</b> Discussion on Plant Location decision factors & site evaluation models
<b>Topic/Unit/Chapter Objectives:</b> <b>Broad Objectives of the chapter/topic are:</b> <ol style="list-style-type: none"> <li>Detailed discussion on Plant Location decision factors &amp; evaluation techniques</li> </ol>
<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):</b> <ol style="list-style-type: none"> <li>Explain the factors determining selection of a plant location. [L1]</li> <li>How plant location selection is carried out by Break Even , Factor rating, ROI methods [L2]</li> </ol>

TOPIC/UNIT/ Module Title: <b>Tutorial on Plant Location Decision</b> <b>Week 2</b>
<b>CONTENT</b> Numerical on Plant Location Selection
<b>Topic/Unit/Chapter Objectives:</b> <b>Broad Objectives of the chapter/topic are:</b> <ol style="list-style-type: none"> <li>To solve numerical problem on Plant Location decision</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. A TV manufacturer of Gujarat has to select one of the two locations from Sanand and Ramgarh. Based on the following Locational and factor ratings following 10 point and 5 point scales respectively. Which option is suitable for the company to set up its plant?

Particulars	Factor Rating	Location Rating	
		Sanand	Ramgarh
Proximity to market	4	6	5
Skilled Labour availability	5	7	6
Energy Provisions & Cost	2	6	4
Transport & Communication	4	9	8
Civic & Municipal amenities	2	8	9
Environment friendliness	1	5	4
Technical & Managerial Talents	3	2	4
R&D and Financial facilities	3	1	2 [L4]

2. Akash Dairy Limited. Made location survey to set up its new plant for processing & distributing milk and milk-based items and found two potential locations A and B. The estimated cost & revenue structure of the two locations are:-

Location	Annual fixed Cost (Rs)	Variable Cost (Rs)/Unit	Revenue (Rs)/Unit
A	5 Lakhs	63	68
B	8 Lakhs	52	68

Calculate the following:-

- The best plant location with respect to break even production volume.
  - Production level at which either of the two locations can be selected.
  - At 20000 liters of milk production, which location will be economical? [L4]
3. A cement manufacturing company intends to select one of the three shortlisted locations - Pune, Bilaspur and Rourkela for its new factory. Based on the following information what location do you suggest as the best site to the company for their new factory?

Particulars	Pune	Bilaspur	Rourkela
Total Investment (Rs)	250000	315000	250000
Raw material expenses (Rs)	80000	90000	105000
Expenses on service utilities (Rs)	50000	40000	25000
Expenses on Distribution (Rs)	50000	50000	80000
Wage & Salary (Rs)	25000	30000	25000
Taxes (Rs)	5000	10000	15000
Projected Revenue (Rs)	340000	390000	350000

TOPIC/UNIT/ Module

Title: **Plant Layout & Its Design decisions**

Week No 3

**CONTENTS**

Discussion on Plant Layout design decision

**Topic/Unit/Chapter Objectives:**

**Broad Objectives of the chapter/topic are:**

- Detailed discussion on Plant Layout decision factors & principles
- Study of different Plant Layout designs and their applicability situations, merits demerits
- Layout Design Issues & Software Packages

**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):**

- Explain the objectives & factors determining selection of a plant layout [L1]
- Discuss different types of Plant layouts used in manufacturing & service units along with their relative merits/demerits. [L1]
- Make a comparative assessment of Product, Process layout & their design issues [L2]
- Briefly discuss the available layout design software packages ALDEP, CORELAP, CRAFT [L1 & L2]

**HOME WORK:**

TOPIC/UNIT/ Module  
Title: **Production/Operations Planning & Control**  
**Week No 6 (later half)**

**CONTENTS**

Production Planning & Control – concepts & components  
Discussion on activities involved in Production Planning & Production Control

**Topic/Unit/Chapter Objectives**

**Broad Objectives of the chapter/topic are:**

1. Detailed discussion on various functions of Production Planning & Control

**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. Brief overview of Production Planning & Control Mechanisms ( L1 )
2. Explain the functionalities involved & features & benefits of PPC (L2)

TOPIC/UNIT/ Module  
Title: **Job scheduling & Sequencing & Johnson's Algorithm**  
**Week No 4**

**CONTENTS**

Basic Concepts of Loading, Job scheduling Job Sequencing,  
Priority sequencing Rules & Johnson's Algorithm

**Topic/Unit/Chapter Objectives**

**Broad Objectives of the chapter/topic are:**

1. Forward & Backward scheduling,
2. Priority sequencing Rules – FCFS, EDD, SPT, CR rule
3. Johnson's Rule of scheduling  $n$  jobs on 2 and 3 machines

**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 functionalities involved in Loading, Scheduling & Sequencing of Jobs ( L1 )
2. Discuss how Johnson's Rule can be applied in sequencing  $n$  jobs in 2 machines ( L3 )

**HOME WORK:**

TOPIC/UNIT/ Module  
Title: **Tutorial on Priority Sequencing Rules & Johnson's Algorithm**

**CONTENTS**

Solving Numerical Problems on Johnson's Algorithm in sequencing  $n$  jobs by 2 machines

**Topic/Unit/Chapter Objectives**

**Broad Objectives of the chapter/topic are:**

1. To solve numerical problems on Johnson'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. M/s. Raj Engineering Works, Durgapur has been given a contract by Indian Railways to make seven components. Each of these components requires processing on two machines  $M_1$  and  $M_2$  in the order  $M_1, M_2$ . The time required by each of these jobs for processing on two machines is given below. Find the optimal sequence for processing the seven jobs and calculate the waiting time for jobs

Job	A	B	C	D	E	F	G
M1	9	5	8	3	4	1	7
M2	2	4	10	5	6	11	6

2. A book binder has one printing press, one binding machine and manuscripts of seven different books. The time required for performing printing and binding operations for different books are shown below:

Book:	1	2	3	4	5	6	7
Printing Time (Days):	20	90	80	20	120	15	65
Binding time (Days):	25	60	75	30	90	35	50

Decide the optimum sequence of processing of books in order to minimize the total time required to turn out all the books.

3. Jobs A through E in the aircraft repair facility must each pass through the Sheet Metal centre and then through Paint centre. The processing time for each job in each centre is shown below. Find the sequence that minimizes completion time of the job. Calculate the cumulative flow time and idle time.

PROCESSING TIME IN DAYS

Job	Work Center 1 (Sheet metal center)	Work Center 2 (Paint Center)
A	4	5
B	17	7
C	14	12
D	9	2
E	11	6

TOPIC/UNIT/ Module  
Title: **Plant Maintenance**  
**Week No 12**

**CONTENTS**

Plant Maintenance fundamentals

**Topic/Unit/Chapter Objectives:**

**Broad Objectives of the chapter/topic are:**

1. Plant Maintenance- meaning, Need, Objectives, Benefits.
2. Different types of Maintenance,
3. Concept of TPM & Overall Equipment effectiveness (OEE)

**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 Objectives & benefits of Plant maintenance.
2. Discuss different types of Plant Maintenance policies – Breakdown, Preventive, Planned etc
3. Brief account on Total Productive Maintenance and OEE parameters

**HOME WORK:**

TOPIC/UNIT/ Module: I  
Title: **Work Study**  
**Week No 5**

**CONTENTS**

Concept of Work Study – Method Study and its applications.  
Concept of Time study & Work Measurement techniques

**Topic/Unit/Chapter Objectives:**

**Broad Objectives of the chapter/topic are:**

1. Details of Work Study procedure - Method study & Motion study
2. How to determine Performance Rating, Allowances, Calculation of Standard time
3. How to Conduct Time Study & Work Measurement

**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 objectives & procedure of conducting Method study, Time study, Work Sampling [L1]
2. Explain the concepts of Performance Rating, Allowances, Normal & Standard Times[L1]
3. Explain the steps involved in Time Study & Work measurement by various methods[L2]
4. Different Work Measurement tools – PMTS, MTM, Work Sampling [L1]
5. What is Standard time? Discuss the process of computation of standard time from a time study exercise. Why is the performance rating factor used in such a computation? [L1 & L2]

TOPIC/UNIT/ Module

Title: **Tutorial on Work study Numerical**

**CONTENTS**

Numerical Calculation of Normal & Standard Time

**Topic/Unit/Chapter Objectives:**

**Broad Objectives of the chapter/topic are:**

1. To solve numerical problems on Elemental & a Job's Normal and Standard time

**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. Work measurement study in a plant was conducted in a shift of 8 hours. The study reveals the following data:- No. of workers observed = 15; Shift production = 400 units; Idle time recorded = 15%

Total allowance entitled = 20%; Average performance of workers = 75%

Find out the standard time per unit produced and per shift production quantity. [L4]

2. An industrial Engineer conducted a time study of a job consisting of 3 elements. Stop watch readings of all elements in 3 cycles are given below:-

Element	Cycle Time (minute)		
	I	II	III
P	0.5	4.2	8.6
Q	1.5	5.7	9.9
R	3.8	8.1	12.6

Performance ratings assessed for three elements are 105%, 115% and 95% respectively. If allowances for relaxation and contingency allowed are 12% and 3% respectively, find the standard time of the job. Calculate the daily production if the shop-floor works on a 2 shift (8 hours each) basis considering half an hour lunch break in each shift. [L4]

3. Work sampling study in a workshop of 40 machines was conducted and first two days analysis recorded machine idle time 40%. If the study was planned for +2 % to -2% accuracy with 95% confidence limit. Determine the following –

- a. No. of observations and no. of rounds undertaken.
- b. Now of rounds per day and the average time between the successive rounds, considering 26 working days with single shift (8 hours) in each day for the entire study. [L4]

4. An 8 hour work measurement study in a plant reveals the following:-

Units produced = 320 nos. Idle time 15%; Performance rating = 120 % of normal time.

Determine the standard time per unit produced. [L4]

5. A group of 10 workmen working 8 hours per day (one shift) on a group of engine lathes produced 320 pieces of a component. During the study, it was observed that workmen were idle for 20% of the total available time and 80% of the available time they worked at an average performance of 75%. Calculate standard time for the job assuming the operation to be completely manual and the workmen are entitled to 20% allowance for this type of work. [L4]

6. In a work measurement exercise, a worker was observed for 30 minutes continuously. In this period, the worker completed 42 parts. The performance rating for the worker is 130 If the company allows 15% as a fatigue and personal time allowance, what should be the Normal time for the job, Standard time for the job?

TOPIC/UNIT/ Module

Title: **Purchase Issues**

**Week No 9 (First half)**

**CONTENTS**

Fundamentals of Purchasing

**Topic/Unit/Chapter Objectives:****Broad Objectives of the chapter/topic are:**

1. Purchasing Management -Concept, Objectives, Scope, Benefits
2. Purchasing policy, procedure, 5R principles, different types of purchase

**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 conceptual basics behind management of materials with benefits, significance[L1]
2. Discuss Purchasing Cycle & governing Principles and relevant documents [Purchase Indent]
3. Explain detailed process involved in various types of Purchasing schemes used in Industry[L1]

TOPIC/UNIT/ Module  
Title: **Project Networking**  
Week No 7

**CONTENTS**

Project Networking fundamentals & time scheduling of a Project Network Scheduling by CPM & PERT

**Topic/Unit/Chapter Objectives:****Broad Objectives of the chapter/topic are:**

1. Concept of a Project & its features
2. Basic understanding of Project Networking & Scheduling
3. To be familiar with the working principle of PERT & CPM tools of Project Scheduling
4. To study the identification of Critical path & Floats from a Project Network using CPM/PERT

**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 meaning of a Project & Project Network [L1]
2. How to draw a Project Network maintaining rules of Drawing Project Network [L3]
3. Explain the concepts of Forward & Backward Pass Time-Calculations of a Project network [L2]
4. Discuss the method of identification of Critical Activities & Critical Path in a Project applying PERT/CPM along with Floats for each activity, if any. [L3]
5. What do you mean by PERT in Project analysis? What are the three time estimates related to PERT? Write down the difference between PERT and CPM? [L1 & L2]

TOPIC/UNIT/ Module  
Title: **Tutorial on PERT & CPM**

**CONTENTS**

Numerical Problems on Project Scheduling by PERT & CPM

**Topic/Unit/Chapter Objectives:****Broad Objectives of the chapter/topic are:**

To solve numerical problems on PERT & CPM

**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. A small project is composed of time activities whose time estimates are given below :

ACTIVITY	Optimistic Duration (week)	Most Duration (week)	Pessimistic Duration (week)
A	2	2	8
B	2	5	8
C	4	4	10
D	2	2	2
E	2	5	14
F	3	6	15
G	2	5	8
H	5	8	11
I	3	6	15

Activities A, B and C can start simultaneously. Activity D follows activity A while E follows B. Activity D and E are followed by activity G while F is dependent on C H depends on D and E, while I depends on F and G. Construct the network. Find the expected duration and variance of each activity. What is the critical path and expected project duration of the project?

2. ABC organization is preparing a project proposal to the major projects of Department of Information & Technology for development of product for a disabled person. The following table shows the activities, times and sequence require

ACTIVITY	Immediate Predecessor	Optimistic Duration (week)	Most Duration (week)	Pessimistic Duration (week)
A	NONE	2	3	4
B	NONE	1	5	9
C	A	1	3	5
D	B	2	3	4
E	C,D	2	3	4
F	E	2	4	6
G	F	2	4	10
H	E	5	7	9
I	E	3	5	7
J	G,H,I	5	7	9
K	J	2	3	4

Draw the network diagram. Show the ES, EF, LS, LF expected time of each activity. Find the critical path and expected project completion time.

TOPIC/UNIT/ Module  
Title: **Vendor Rating & Make/Buy Decision**  
Week No 6 (First half)

**CONTENTS**

Vendor Rating Methodologies

**Topic/Unit/Chapter Objectives:**

**Broad Objectives of the chapter/topic are:**

1. To be familiar with the detailed discussion of Vendor rating & selection mechanism
2. To gain knowledge on three main methods of Vendor evaluation
3. To understand the situations calling for Make or Buy decision
4. To be familiar with the criteria which leads to making in-house or procuring from outside



**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. State the objectives of vendor rating. [L1]
2. Mention the usual criteria or factors based on which vendors are assessed. Give one quantitative technique by which vendor rating can be performed.
3. Explain the cost ratio method of Vendor evaluation & rating
4. When does Make or Buy decision arise? [L1]
5. Give arguments in favour of (In-house) Making option and also favouring Outsourcing [L1]
6. Explain the concept of Make/Buy Trade-off using Break-even Analysis. [L2 & L3]

TOPIC/UNIT/ Module

Title: **Tutorial class on Vendor Rating & Make/Buy**

**CONTENTS**

Numerical problems on Vendor Rating & Make/Buy

**Topic/Unit/Chapter Objectives:**

**Broad Objectives of the chapter/topic are:**

1. To solve numerical on Vendor Rating & Make/Buy

**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. A gear making firm consumes on an average 7580 units of a component per annum. If the component is outsourced, it costs Rs 2.80 per unit purchased to the company but when made in-house, it will incur a fixed cost of nearly Rs 10000 and variable expense of Rs 1.50 per unit manufactured. Find the amount of that component at which the firm should switch from outsourcing to in-house making? Considering the given annual requirement, which option will be favourable for the company – whether making in-house or purchasing from outside?
2. From the information furnished below, select the best vendor after conducting rating analysis. The company has assigned weightages for Quality: 50%, for Delivery: 25%, for Price: 15% and for suggestion response: 10%. The following table provides various performance data of the three vendors namely – A, B and C as given below:-

Particulars of Vendor	A	B	C
Quantity received	1200	1500	1350
Quantity accepted	1100	1400	1050
Basic unit price (Rs)	6.00	5.80	6.20
Committed delivery period	4 weeks	3 weeks	4 weeks
Actual delivery	4.2 weeks	2.9 weeks	4.5 weeks
Suggestions made	2	4	3

TOPIC/UNIT/ Module

Title: **MRP (Material Requirement Planning)**  
**Week No 9 (Second half)**

**CONTENTS**

In-depth study of Objectives, Functions & detailed MRP processing logic

**Topic/Unit/Chapter Objectives:**

**Broad Objectives of the chapter/topic are:**

1. To familiar with MRP concepts, terminologies
2. MRP processing logic & solving MRP problems

**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 'Material Requirement Planning'? How is it used in planning for materials?
2. Discuss the working mechanism of MRP. Briefly discuss the various reports generated by MRP system
3. Explain the terms BOM, MPS, Scheduled Receipt, and Planned Order Release & Planned Order Receipt.
4. Differentiate between MRP I & MRP II

TOPIC/UNIT/ Module: II

Title: **Tutorial on MRP I**  
**Week No**

**CONTENTS**

Numerical problems on MRP processing logic

**Topic/Unit/Chapter Objectives:****Broad Objectives of the chapter/topic are:**

1. To solve numerical on MRP

**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. Each unit of A is composed of one unit of B, two units of C, and one unit of D. C is composed of two units of D and three units of E. Items A, C, D, and E have on-hand inventories of 20, 10, 20, and 10 units, respectively. Item B has a scheduled receipt of 10 units in period 1, and C has a scheduled receipt of 50 units in Period 1. Lot-for-lot (L4L) is used for Items A and B. Item C requires a minimum lot size of 50 units. D and E are required to be purchased in multiples of 100 and 50, respectively. Lead times are one period for Items A, B, and C, and two periods for Items D and E. The gross requirements for A are 30 in Period 2, 30 in Period 5, and 40 in Period 8. Find the planned order releases for all items. [L4]

## TOPIC/UNIT/Module

Title: **Inventory control & Management**

**Week No 10**

**CONTENTS**

- a. Basics of Inventory Management – Need, Objectives, Terminologies & Basic EOQ Model
- b. EOQ Model Variants; P-System, Q-System, ABC, VED & Probabilistic Models

**Topic/Unit/Chapter Objectives:****Broad Objectives of the chapter/topic are:**

1. To be familiar with the concept of Inventory & its Management, Inventory Costs
2. Introduction to Basic EOQ Models with different situations/conditions
3. To be familiar with the concept of ROL, Safety stock, Lead time

**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 different types of Inventory Costs. Discuss how these costs behave in Quantity Discount model with changes in order size.
2. Discuss why ordering costs decrease with increase in management?
3. Derive the basic EOQ model along with assumptions
4. Explain concepts of ROL and need for safety stock &. Discuss how these ROL & Safety Stock changes in P-System & Q-Systems
5. Discuss working principle of ABC Analysis
6. How do fluctuations in lead time and safety stock affect inventory decisions?
7. Differentiate between P-system and Q-system of inventory control. Explain Recorder level (ROL) and safety stock.

## TOPIC/UNIT/Module

Title: **Tutorial class on Inventory Management**

**Week No**

**CONTENTS**

Numerical problems on EOQ Model & Inventory Control techniques

**Topic/Unit/Chapter Objectives:****Broad Objectives of the chapter/topic are:**

1. To solve numerical on EOQ Model & Inventory Control 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. A factory uses annually 24,000 units of raw material, costing Rs. 1.25 per unit. Placing an order costs Rs. 25 per order carrying cost is 6% per year of the average inventory. If the factory works for 320 days a year and procurement time is 10 days, find the maximum inventory level and ROL. Assume safety stock 450 units.

2. A company manufacturing electrical control panels uses 4000 toggle switches a year. It costs approximately Rs. 3,000.00 to prepare an order and receive it. Carrying costs are 40 per cent of purchase price per unit on annual basis. Determine the optimal order quantity and total annual cost considering switches are priced as follows:

Range of Order	Unit price (Rs.)
1 to 499	90.00
500 to 999	85.00
1000 and above	80.00

3. Develop an ABC classification for a store with the following data:

Item No	Average Monthly Demand (Units)	Price per unit (Rs)
1	1500	20
2	8000	1
3	700	6
4	200	4
5	2000	12
6	2500	1
7	100	10
8	3000	2
9	1000	2
10	500	10

4. A publishing house purchase 2,000 units of particular item per year at a unit cost of Rs. 20, the ordering cost per order is Rs. 50 and the inventory ordering cost is 25%. Find the optimal order quantity and the minimum total cost including purchase cost. If a 3% discount is offered by the supplier for purchase in lots of 1, 000 or more, should the publishing house accept the order?

5. A spare part "I-10" is produced by a water pump manufacturer from a local firm and the average usage rate in pump manufacturing activity is 500 numbers per month. Ordering cost of "I-10" is Rs. 36 per order and the cost of holding this inventory is Rs. 1.20 per piece per year determine the quantity that should be procured at a time to optimize the total cost. If the usage of I-10 increases to 40 numbers per day and inventory carrying cost becomes Re. 0.02 per unit per day, what will be the revised EOQ? (Assume: 300 days in a year.) From the sum, show that ordering cost is equal to inventory holding cost in case of EOQ. If the company maintains a safety stock of 1000 units, calculate total cost (ordering cost and inventory carrying cost) with respect to above.

TOPIC/UNIT/Module

Title: **Statistical Quality Control (SQC)**

**Week No 13**

**CONTENTS**

Introduction to Statistical Quality Control (SQC) & associated concepts  
Fundamentals of Control Charts & Acceptance Sampling

**Topic/Unit/Chapter Objectives:****Broad Objectives of the chapter/topic are:**

1. Detailed discussion of SQC as quality control tool
2. Understanding SQC terminologies – Variable/Attribute, Variations, Inspections for Quality Control
3. Discussion on Control Charts for Variables & Attributes
4. Detailed Study on Acceptance Sampling

**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. State and explain the objectives and benefits of SQC. ( L1 )
2. Differentiate assignable and chance variations.
3. Explain the significance of Inspection in Quality Control. Differentiate between Inspection & SQC
4. Explain the different control limits used in Control charts with mathematical expressions[L1]
5. Discuss the significance of Acceptance sampling. [L2].
6. Explain the terms – AQL, LTPD, Consumer's Risk & Producer's Risk [L1]
7. What is operating characteristics curve (OC)? What are the parameters of OC curve? [L1]

## TOPIC/UNIT/ Module

Title: **Tutorial class on Control Charts**

Week No

**CONTENTS**

Numerical problems on Control Charts

**Topic/Unit/Chapter Objectives:**

To solve numerical on Control Charts for both Variables and Attributes

**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 Mean and Range chart from the following data and comment on the results of process control:-

Sample No	Value of sampled items inspected (Diameter in mm)			
1	15.58	18.82	15.45	15.71
2	15.94	15.07	15.02	15.81
3	15.63	15.67	15.60	15.54
4	15.17	15.08	14.81	15.02
5	15.18	15.40	15.34	15.36

Given that  $A_2 = 0.73$ ,  $D_3 = 0$ ,  $D_4 = 2.282$  for sample size,  $n = 4$ .

2. 10 samples of 100 bolts each are taken at random and the number of defectives in each sample are noted below:-

Sample Number	1	2	3	4	5	6	7	8	9	10
No of defectives	18	12	6	15	2	20	14	10	8	6

Draw p-chart and comment on the result

3. 10 woollen carpets were studied critically for total number of defects in each sample in their texture. The details of the numbers of defects found in each carpet are given below:

Sample Number	1	2	3	4	5	6	7	8	9	10
No of defects	2	4	3	5	1	3	2	3	4	3

Draw the relevant control chart and comment on the process control. [WBUT B.Tech Exam'10]

4. 10 samples each of size 50 of a pipe were inspected in pressure testing. The results of the inspection are given below:

Sample Number	1	2	3	4	5	6	7	8	9	10
No of defectives	2	3	2	0	2	3	2	1	2	3

Draw the np-chart and comment on the status of process control.

**COMBINED DAILY LESSON PLAN & EXECUTION REPORT**

<b>NAME OF FACULTY</b> Mr. SHOMNATH DUTTA	<b>DEPARTMENT</b> M.B.A	<b>SUBJECT: OPERATIONS MANAGEMENT</b> CODE : MB 204	<b>SEMESTER: 2<sup>ND</sup></b>
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Sl. No.	Lecture No	Unit No	Topic Description ( to be quoted from syllabus )	Planned Date	Execution Date	Teaching Pedagogy	
<b>MODULE I (Total No of Lectures: 18)</b>							
1	1	1	Difference between Manufacturing & service Operations	12.04.22	12.04.22	Whiteboard work & PPT presentation	
	2		Product Process Matrix, Concept of Production Cycle	13.04.22	13.04.22		
	3		Capacity planning, Production Planning & Control Concept,	13.04.22	13.04.22		
	4		Production as a Coordination Function, Responsibilities of Production Manager	12.04.22	12.04.22		
2	5	2	Characteristics of Manufacturing Systems; Classification of Manufacturing Systems Batch, Job-shop, Mass etc with Examples	16.04.22	16.04.22		
	6		Differences between Intermittent and Continuous Production	16.04.221	16.04.22		
3	8	3	Plant Location: Need for a Good Plant Location; Factors influencing Plant Location	19.04.22	19.04.22		
	9		Tangible and Intangible Factors; Economic Survey of Site Selection	19.04.22	19.04.22		
4	10	4	Plant Layout: Need for a Good Plant Layout; Characteristics of a Good Layout	20.04.22	20.04.22		Whiteboard work & PPT presentation
	11		Plant Layout: Need for a Good Plant Layout; Characteristics of a Good Layout; Different types of Layouts-Product, Process, Hybrid etc	20.04.22	20.04.22		
	12		Process Layout vs. Product Layout; Optimization in a Process Layout and Product Layout	22.04.22	22.04.22		
	13		Designing Product and Process Layout; CORELAP, ALDEP, CRAFT software packages etc	23.04.22	23.04.22		
	14		Assembly Line Balancing Technique - Concept and Problems	26.04.22	26.04.22		
	15		Cellular Manufacturing Concept	27.04.22	27.04.22		
5	16	5	Maintenance Management: Objectives, Benefits, Cost Domains etc -. Principles followed	07.05.22	07.05.22		
	17		Types of Maintenance Breakdown and Preventive Maintenance & their features	10.05.22	10.05.22		
	18		Total Productive Maintenance (TPM) & Numerical	11.05.22	11.05.22		
<b>MODULE II (Total No of Lectures: 22)</b>							
6	19	6	Purchase Management: Purchasing Procedure, 5R Principles; Value Analysis	25.05.22	25.05.22		
	20		Vendor Selection; Negotiation; Make or Buy decision	27.05.22	27.05.22		
7	21	7	Inventory Management: Classification of inventory items - ABC, FSN, VED classification;	28.05.22	28.05.22	Whiteboard work & PPT presentation	
	22		Introduction to EOQ and EBQ	31.05.22	31.05.22		
	23		Deterministic demand model-EOQ- Continuous and Periodic review Inventory models	01.06.22	01.06.22		
	24		MRP - Concept, inputs and outputs, benefits, examples	03.06.22	03.06.22		
	25		Master Production Schedule and MRP	04.06.22	04.06.22		
	26		Concepts of MRP II, JIT and ERP	07.06.22	07.06.22		
8	27	8	Inspection & Quality Control: Types and criteria of inspection significance & benefits of quality control	13.05.22	13.05.22	Whiteboard work & PPT presentation	
	28		Statistical Quality Control: Meaning, Benefits	13.05.22	13.05.22		
	29		Control charts for Variables & attributes with numerical application	17.05.22	17.05.22		
	30		Acceptance Sampling - Need, Meaning	18.05.22	18.05.22		
	31		OC Curve, Consumer's & Producer's risk, LTPD, AQL	18.05.22	18.05.22		
9	32	9	Scheduling & Sequencing - Definition and Assumptions; Sequencing of n jobs on a single machine Shortest Processing Time, Longest Processing Time, Earliest Due Date and First Come First Serve basis	29.04.22	29.04.22	Whiteboard work & PPT presentation	
	33		Sequencing of 2 jobs on 2 machines - Gantt Charts, Limitations of Gantt Charts	30.04.22	30.04.22		
	34		Sequencing of n jobs on 2 and 3 machines - Johnson's Rule;	03.05.22	03.05.22		

	35		Introduction to Project Management – CPM and PERT basics	04.05.22	04.05.22	
	36		Identification and Importance of the Critical Path, Forward & Backward pass, Slack/Floats	06.05.22	06.05.22	
10	37	10	Work Study: Definition and its Importance	20.05.22	20.05.22	Whiteboard work & PPT presentation
	38		Basic Procedure in Performing a Work Study; Method Study –Objectives and Procedure;	20.05.22	20.05.22	
	39		Work Measurement–Objectives and Procedure;	21.05.22	21.05.22	
	40		Concepts of Performance Rating, Basic Time, Allowances and Standard Time	24.05.22	31.05.22	
11	Extra Class		Doubt Clearance Class I	08.06.22	08.06.22	Whiteboard work & PPT presentation
12	Extra Class		Doubt Clearance Class II	10.06.22	10.06.22	
13	Extra Class		Typical numerical problem Solving from previous MAKAUT papers	11.06.22	11.06.22	

### DETAILS OF TUTORIALS

Tutorial No	Tutorial Topic	Plan date with day	Execution date	Remarks
01	Manufacturing Process selection – Factors & Numerical evaluation	19.04.22	19.04.22	All students attentively cleared doubts on various concepts specially numerical part
02	Plant Location Selection – Factor Rating method, Break Even Analysis, ROI method, Combined method	03.05.22	03.05.22	
03	Priority Sequencing Rule (FCFS, EDD, SPT, CR) & Johnson's Rule (n x 2 and n x 3)	10.05.22	10.05.22	
04	Work Study Numerical on Standard Time Calculation in Time study & Work sampling	30.05.22	30.05.22	
05	PERT & CPM methods of Project Network Scheduling & Critical Path Identification	24.05.22	24.05.22	
06	Numerical Evaluations of Vendor Rating Exercise & Make/Buy decision taking	31.05.22	31.05.22	
07	Control Chart (Mean & Range Charts, p-Chart, np-Chart, c-Chart etc)	07.06.22	07.06.22	
08	Inventory Control – EOQ Models, P system & Q system, ABC analysis, ROP	14.06.22	14.06.22	

### **ATTENDANCE OF TUTORIAL CLASS on MB 204 (Even 22)**

Sl	Roll No.	Student Name	19.04.21	03.05.22	10.05.22	24.05.22	30.05.22	31.05.22	07.06.21	14.06.22
1	1900921001	SAYONTONI PAUL	P	P		P	P	P	P	P
2	1900921002	KOUSHIK SARKAR		P		P	P	P	P	P
3	1900921003	SAYAN KUMAR DEY		P	P	P	P	P	P	P
4	1900921004	AMLAN MUKHERJEE	P	P		P				P
5	1900921005	SAYAN KUNDU		P		P				P
6	1900921006	BIDHAN THAPA	P	P	P	P				P
7	1900921007	RAJU PRASAD SHAH	P	P	P	P				P
8	1900921008	DEBABRATA DUTTA	P	P	P	P				P
9	1900921009	ANUBHAB CHATTOPADHYAY	P	P		P				P
10	1900921010	NIDHI BHARATI	P	P	P	P				P

11	1900921011	AMUNA DEVI NEWAR	P	P	P	P	P	P	P	P
12	1900921012	VANSIKHA PRASAD	P	P	P	P	P	P	P	P
13	1900921013	SAYANTANI CHATTERJEE	P	P	P	P	P		P	P
14	1900921014	ANJALI MISHRA	P	P	P	P	P	P	P	P
15	1900921015	ANKITA GUPTA	P	P	P	P	P	P	P	P
16	1900921016	RAJ PRASAD SAHA	P	P	P	P	P	P	P	P
17	1900921017	APRITA KUMARI	P	P	P	P	P		P	P
18	1900921018	DIPENDU SAHA	P	P			P		P	P
19	1900921019	SOURISH KANTI KONER	P	P	P	P	P	P	P	P
20	1900921020	SUBHAM CHANDRA SINGHA	P	P	P	P	P	P	P	P
21	1900921021	ARITRA SEN	P	P	P	P		P	P	P
22	1900921022	NEELANJANA CHATTOPADHYAY	P	P		P		P	P	P
23	1900921023	ANWESHA MODAK	P	P	P	P		P	P	P
24	1900921024	RESHMA PARVEEN	P	P	P	P		P	P	P
25	1900921025	SOURADIP BOSE	P	P	P	P			P	
26	1900921026	MEENAL JHA	P	P		P	P		P	
27	1900921027	JYOTI RAI	P	P		P	P		P	
28	1900921028	PRIYANKA JHA	P	P	P	P	P		P	
29	1900921029	PRIYANKA SHARMA	P	P	P	P	P		P	
30	1900921030	DEBADREE KAR	P	P	P	P	P		P	
31	1900921031	DEBOPRIYA KAR	P	P			P	P	P	
32	1900921032	SHILADITYA GHOSH	P	P	P	P	P	P		
33	1900921033	SUSMITA MUSTAFI	P	P	P	P	P	P		P
34	1900921034	ABHISHEK KARMAKAR	P	P		P	P	P		P
35	1900921035	SUBHANKAR DEY	P	P		P	P	P		P
36	1900921036	TAMANNA AHAMED	P	P		P	P		P	P
37	1900921037	SAGAR SARKAR	P	P			P	P		P
38	1900921038	NILANJAN CHOWDHURY	P	P		P	P	P	P	P
39	1900921039	APU BARMAN	P	P		P	P	P	P	P
40	11900921040	PREETAM NAG	P	P	P	P	P	P	P	P

41	11900921043	ANINDITA SAHA	P	P	P	P	P	P	P	P
42	11900921045	SAURAV TIWARI	P	P	P	P	P	P	P	P
43	11900921046	ROHAN SHAMIM	P	P	P	P	P	P	P	P
44	11900921047	DEBANIK NAYAK	P	P	P	P	P	P	P	P
45	11900921048	AMIT CHANDRA ROY	P	P		P	P	P	P	P
46	11900921049	NIKITA KESHARI		P	P	P	P	P	P	P
47	11900921050	DIPANKAR MAITY	P	P	P	P	P	P	P	P
48	11900921051	SUBHADIP GOON		P	P	P	P	P	P	P
49	11900921053	ANIK GHOSH CHOWDHURY	P	P	P	P	P	P	P	P

**x) Teaching Strategy/Method (describes instructional methods, usage of ICT, efficient and engaging instructions and displays the best practices on institutional website)**

- Learning by analogous examples
- Learning by question and answering
- Learning by different Current industry business models and Pilot Business Plan
- Learning by team work (think, pair, share)
- Learning by solving numerical problems
- Learning by good video lectures and animation

**(x.a) Strategy to support weak students**

- Encouraging them to express their point of trouble
- Paying extra attention regarding subject matter beyond the class and regular follow up
- Involve them in such real life based live business project work/designing of business plan
- Engage some bright students to put attention on their friends i.e. weak students

**(x.b) Strategy to encourage bright students**

- Try to encourage them to study beyond the syllabus
- Suggest them to follow comparatively advanced and well equipped text books
- Motivate them to browse the internet and go through the latest invention/developments in the particular field
- Encourage them to implement some real life based hand on business oriented project work on the subject matter

**(x.c) Efforts to keep students engaged**

- Asking random questions to the students found unmindful from the topic
- Engage them by providing interesting problem solving
- Introducing some informal business quiz among different groups
- Assigning regular home works and follow up
- Delivering some interesting lectures apart from conventional teaching

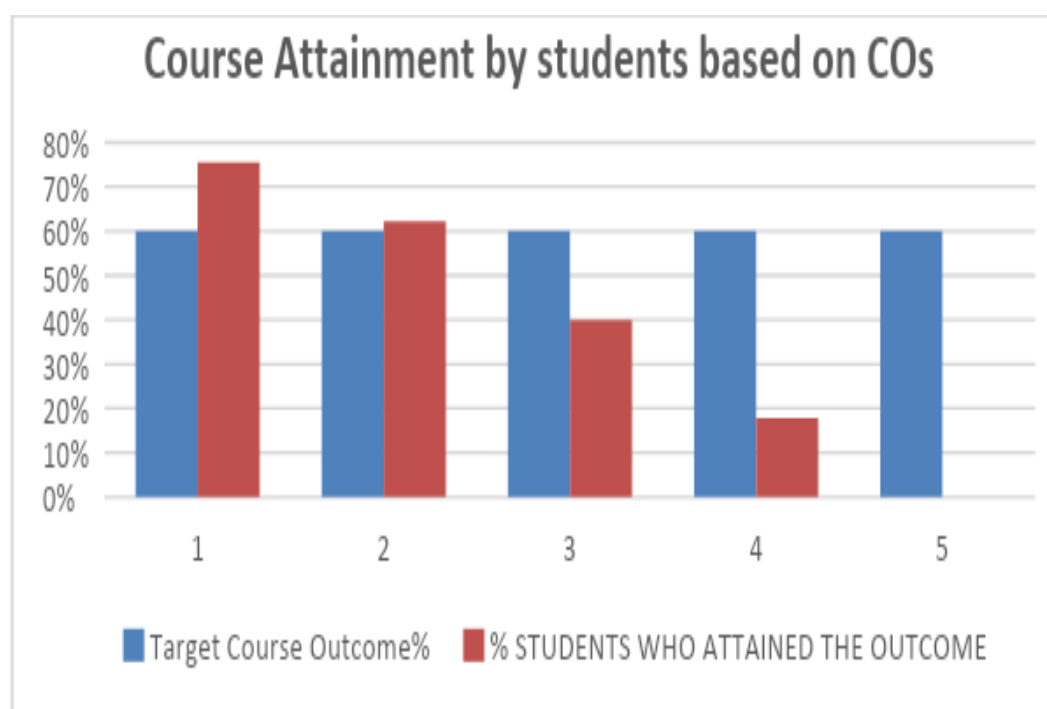
**CONSOLIDATED INTERNAL TEST RECORDS of MB 204; MAKAUT Even Semester 2022**

	Roll No.	Name	Continuous Assessment			
			CA 1 Assignment /Quiz (25)	CA 2 1 <sup>st</sup> Internal Test (25)	CA 3 Quiz/ (25) Assignment	CA 4 2 <sup>nd</sup> Internal Test (25)
1	11900921001	SAYANTONI PAUL	N.A	23	22	24
2	11900921002	KOUSHIK SARKAR	N.A	21	22	23



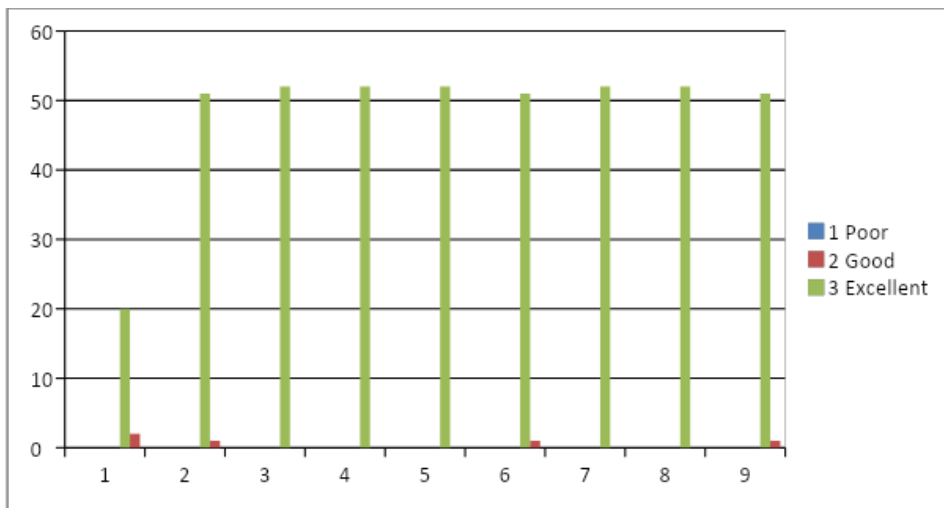
3	1900921003	SAYAN KUMAR DEY	N.A	23	22	22
4	1900921004	AMLAN MUKHERJEE	N.A	23	23	23
5	1900921005	SAYAN KUNDU	N.A	23	23	23
6	1900921006	BIDHAN THAPA	N.A	24	23	23
7	1900921007	RAJU PRASAD SHAH	N.A	24	23	24
8	1900921008	DEBABRATA DUTTA	N.A	22	23	24
9	1900921009	ANUBHAB CHATTOPADHYAY	N.A	23	23	23
10	1900921010	NIDHI BHARATI	N.A	24	24	24
11	1900921011	AMUNA DEVI NEWAR	N.A	23	24	24
12	1900921012	VANSIKHA PRASAD	N.A	23	23	24
13	1900921013	SAYANTANI CHATTERJEE	N.A	22	22	23
14	1900921014	ANJALI MISHRA	N.A	24	23	22
15	1900921015	ANKITA GUPTA	N.A	24	23	23
16	1900921016	RAJ PRASAD SAHA	N.A	22	23	23
17	1900921017	APRITA KUMARI	N.A	24	24	23
18	1900921018	DIPENDU SAHA	N.A	24	24	24
19	1900921019	SOURISH KANTI KONER	N.A	24	23	24
20	1900921020	SUBHAM CHANDRA SINGHA	N.A	22	24	23
21	1900921021	ARITRA SEN	N.A	22	24	24
22	1900921022	NEELANJANA CHATTOPADHYAY	N.A	22	24	24
23	1900921023	ANWESHA MODAK	N.A	23	23	24
24	1900921024	RESHMA PARVEEN	N.A	23	23	23
25	1900921025	SOURADIP BOSE	N.A	23	23	22
26	1900921026	MEENAL JHA	N.A	23	22	23
27	1900921027	JYOTI RAI	N.A	23	22	23
28	1900921028	PRIYANKA JHA	N.A	23	22	23
29	1900921029	PRIYANKA SHARMA	N.A	24	23	24
30	1900921030	DEBADREE KAR	N.A	24	23	24
31	1900921031	DEBOPRIYA KAR	N.A	23	23	23
32	1900921032	SHILADITYA GHOSH	N.A	22	23	24
33	1900921033	SUSMITA MUSTAFI	N.A	23	23	24
34	1900921034	ABHISHEK KARMAKAR	N.A	23	23	24
35	1900921035	SUBHANKAR DEY	N.A	23	24	23

36	11900921036	TAMANNA AHAMED	N.A	24	24	22
37	11900921037	SAGAR SARKAR	N.A	24	23	23
38	11900921038	NILANJAN CHOWDHURY	N.A	23	22	23
39	11900921039	APU BARMAN	N.A	24	23	23
40	11900921040	PREETAM NAG	N.A	24	23	24
41	11900921043	ANINDITA SAHA	N.A	24	23	24
42	11900921045	SAURAV TIWARI	N.A	23	24	23
43	11900921046	ROHAN SHAMIM	N.A	23	24	24
44	11900921047	DEBANIK NAYAK	N.A	23	23	24
45	11900921048	AMIT CHANDRA ROY	N.A	23	24	24
46	11900921049	NIKITA KESHARI	N.A	23	24	23
47	11900921050	DIPANKAR MAITY	N.A	23	24	22
48	11900921051	SUBHADIP GOON	N.A	23	23	23
49	11900921053	ANIK GHOSH CHOWDHURY	N.A	23	23	23

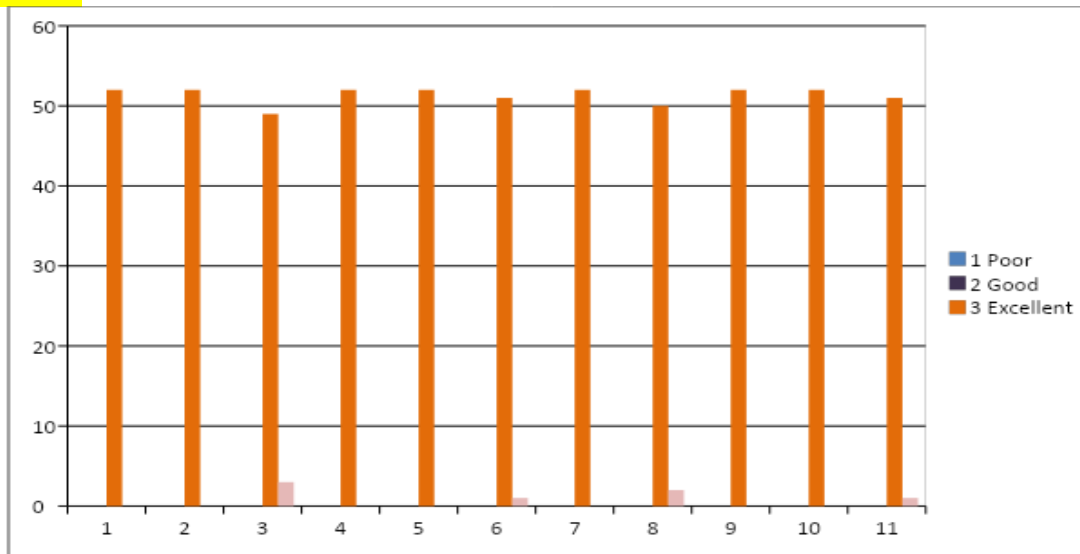


**(xiii) Analysis of Student Feed Back: MB 204 Even Sem 2022**

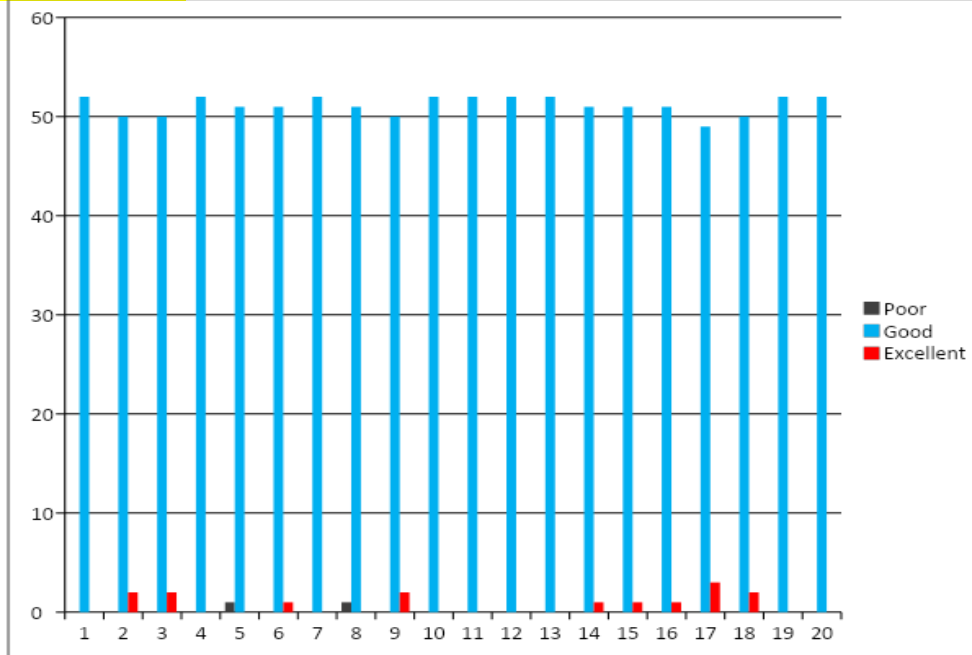
**Summative**



## Formative



## Course Survey



**List of Students with Roll Nos whose Academic Performance is poor**

Serial No	Roll No	Name of Student	Remedial measures taken by Teacher
01	11900921014	ANJALI MISHRA	Extra Classes via Online Mode taken using Live Google Meet & Canvas digital board for Conceptualisation & Numerical
02	11900921015	ANKITA GUPTA	Extra Live Google Meet & Canvas digital board for Numerical
03	11900921046	ROHAN SHAMIM	Extra Live Google Meet & Canvas digital board for Numerical
04	11900921047	DEBANIK NAYAK	Extra Classes via Online Mode taken using Live Google Meet & Canvas digital board for Conceptualisation & Numerical
05	11900921048	AMIT CHANDRA ROY	Extra Live Google Meet & Canvas digital board for Numerical

**CERTIFICATE**

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

Sl. No.	Semester	Subject with Code	Total Units/ Chapters	Remarks
01.	MBA (N) 2 <sup>nd</sup> 2022	Operations Management (MB-204)	20	

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**



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



**COURSE FILE  
2<sup>ND</sup> SEM, 4<sup>TH</sup> YEAR, 2020**

**PAPER NAME : Digital Image Processing  
PAPER CODE : EC 801B**

# Course File

**Course Title: Digital Image Processing (EC- 801B)**

Semester:2<sup>nd</sup>, Year:4<sup>th</sup>

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Name of the Faculty: Manas Saha  
E-mail: manassaha77@yahoo.com

## Class Schedule

**Lecture:**Monday – 10.00am – 11.40am  
Thursday – 10.00am – 10.50am

**Hours for meeting students:**1.30pm to 2pm or by appointment

### i) Course Objective

This course is designed to deliver the students an insight to Image processing so that they can remember, understand, apply, analyze and evaluate the science and applications of Digital Image Processing.

### ii) Course Outcome

**i) After completion of this course the students are expected to have the following outcomes.**

#### **The student will be able to:Target**

1. **EC801B.1**To recall, identify, compare and explain the fundamentals of Digital Image Processing.(60%)[Level 2]
2. **EC801B.2**To determine, describe, explain and implement the different techniques of image processing like denoising, compression, representations of digital images. (60%)[Level 3]
3. **EC801B.3**To employ, modify, study and find the mathematical treatments of Digital Image Processing. (60%)[Level 4]
4. **EC801B.4** To be able to explain, resolve and justify the various algorithms. (60%) [Level 5]
5. **EC801B.5** To propose and design various new application based concepts. (60%) [Level 6]

Note: EC801B.1 also targets Level 1. But only higher level is suggested to be displayed, it is not shown.

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

1. Explain the sampling and quantization processes of creating a digital image. [Level 2]
2. What are the logical operations in digital image?[Level 1]
3. Using first order derivative discuss how an image is sharpened.[Level 3]
4. What are the morphological operations of a digital image ?[Level 1 and Level 2]
5. Mathematically show the computational advantage of Fast Fourier transform over a direct implementation of 1 dimension Discrete Fourier Transform. [Level 3]
6. Explain and justify the applicability of global and local thresholding. [Level 4]
7. What is homomorphic filtering? Mention its uses. [Level 1 and level 2]
8. Why image compression is required [Level 2]
9. Justify the role of high boost filtering in improving the quality of digital image? [Level 5]
10. Propose a suitable wavelet based thresholding technique to denoise an image. [Level 6]

**iii) Module Layout**

Module	Lecture Hours
<b>Digital Image Processing Systems:</b> Introduction to structure of human eye, Image formation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, storage, Processing, Communication, Display Image Sampling and quantization, Basic relationships between pixels.	4
<b>Image Transforms (implementation):</b> Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen-Loeve (Hotelling)transform.	7
<b>Image Enhancement in the Spatial and Frequency Domain:</b> Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing and sharpening filters. Frequency domain filters: Homomorphic filtering.	6

<b>Image Data Compression:</b> Fundamentals, Redundancies: Coding, Interpixel Psycho-visual, fidelity criteria, Image compression models, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous tone Still Image compression standards, Video compression standards.	6
<b>Morphological Image Processing:</b> Introduction, Dilation, Erosion, Opening, closing, Hit -or-miss transformation, Morphological algorithm operations on binary Images, Morphological algorithm operations on gray-scale Images.	6
<b>Image Segmentation, Representation and Description:</b> Detection of discontinuities, Edge linking and Boundary detection, Thresholding Region based segmentation, Image Representation schemes, Boundary descriptors, and Regional descriptors.	7

#### iv) Text Books

1. R.C Gonzalez and R. Woods :-Digital Image Processing, (Indian reprint: Pearson publication, 2001)
2. Anil K. Jain :- Digital Image Processing (Prentice-Hall, India)

#### Reference Books

1. W. K. Pratt :- Digital Image Processing, - 2nd Edition, (John Wiley & Sons).
2. B. Chanda & D. Dutta Majumder, Digital Image Processing and Analysis, (Prentice-Hall, India)

#### (v) Evaluation Scheme

##### 1) Theory

Evaluation Criteria	Marks
Internal Exam 1*	15
Quiz Exam	10
Attendance	5
University Exam	70
Total	100

\* Two internal examinations are conducted. Average of them is taken to fit 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%

**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 (POs)												(PSOs)	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	1.	2.
EC 801B.1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
EC 801B.2	1	1	0	0	0	0	0	0	0	0	0	0	1	0
EC 801B.3	1	1	0	0	0	0	0	0	0	0	0	0	1	0
EC 801B.4	1	1	0	0	0	0	0	0	0	0	0	0	1	0
EC 801B.5	1	1	0	1	1	0	0	0	0	0	0	0	1	1
EC 801B	1	1	0	1	1	0	0	0	0	0	0	0	1	1

- CO1, 2, 3, 4 & 5 minimally satisfies the application of knowledge of mathematics, science, engineering fundamentals to the solution of complex engineering problems.
- CO2, 3, 4& 5 minimally satisfies problem analysis.
- CO5satisfies the investigation of complex problem and utilize modern tools

**(vii) Delivery Methodology**

Outcome	Method	Supporting Tools	Demonstration
EC 801B.1	Structured (Whole-Class Grouping)	Blackboard & Chalk, Over head Projector with Matlab loaded computer	To demonstrate the fundamentals of digital image processing
EC 801B.2	Structured (Whole-Class Grouping)	Blackboard & Chalk, Over head Projector with Matlab loaded computer	To describe different methodologies of image processing
EC 801B.3	Structured (Whole-Class Grouping)	Blackboard & Chalk, Over head Projector with Matlab loaded computer	To mathematically interpret the image processing phenomenon
EC 801B.4	Structured (Whole-Class Grouping)	Blackboard & Chalk, Over head Projector with Matlab loaded computer	To explain various algorithms
EC 801B.5	Structured (Whole-Class Grouping)	Blackboard & Chalk, Over head Projector with Matlab loaded computer	To suggest new concepts

**(viii) Assessment Methodology**

Outcome	Assessment Tool	Specific Question / activity aligned to the Outcome
EC 801B.1	Internal Test	Define with suitable diagram 4 neighbors of pixel P, diagonal neighbors of pixel P, and 8 neighbors of pixel P.
	Quiz	When threshold T depends on $f(x, y)$ (that is only on the gray level values), it is called ... <b>global</b> ..... threshold.
	University Exam	Explain the formation of a digital image from a continuous image with the help of suitable diagram.
EC 801B.2	Internal Test	Discuss the formation of a digital image with only precise diagram and focus on where and how sampling and quantization takes place in the diagram.

	Quiz	If T depends on both $f(x, y)$ and $p(x, y)$ i.e., some local property of the point, it called ... <b>local</b> ..... threshold.
	University Exam	What is bit plane slicing? What would be the effect on the histogram if we set to zero (0) the higher order bit planes instead?
EC 801B.3	Internal Test	Mathematically show ( <b>find</b> ) the fundamental way in which we use the Laplacian for image enhancement.
	Quiz	The most fundamental relationship between spatial and frequenc domains is established by ..... <b>convolution</b> ..... theorem.
	University Exam	Consider transformation function of a random image variable (r) is T. If $s=T(r)$ , prove the PDF of s, $P_s(s)=1$ , where 's' is also a random image variable.
EC 801B.4	Internal Test	Develop an algorithm to enhance some parts of a good image with low contrast and darkness.
	Quiz	One of the filter characteristics acts as the transition between the other two filters. a) ideal low pass filter, b) <b>Butterworth low pass filter</b> c) Gaussian low pass filter
	University Exam	Based on the concept of basic global thresholding, develop an algorithm to obtain a shadow free clean image of an object using histogram approach
EC 801B.5	Internal Test	Explain with suitable diagram the particular approach of gray level slicing which leads to a binary image.
	Quiz	Develop an algorithm to enhance some parts of a good image with low contrast and darkness.
	University Exam	Show mathematically the enhancement of an image by averaging so many noisy images of the same image

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

Week	Lectures	Quiz
1	<p><b>Discussion of Course outcome and program outcome.</b></p> <p><b>Digital Image Processing Systems:</b>  Introduction tostructure of human eye, Imageformation in the human eye, Brightness adaptation and discrimination, Image sensing and</p>	

	acquisition, storage, Processing, Communication, Display Image Sampling and quantization, Basic relationships between pixels.	
2	<b>Image Transforms (implementation):</b> Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT,	
3	Walsh transform, Hadamard transform, Discrete cosine transform,	
4	Slant transform, Optimum transform: Karhunen-Loeve (Hotelling) transform.  <b>Image Enhancement in the Spatial and Frequency Domain:</b> Gray level transformations, Histogram processing,	Quiz based on fundamentals of Digital Image Processing , image transforms, (CO1, CO2)
5	Arithmetic and logic operations, Spatial filtering: Introduction, .	
6	Smoothing and sharpening filters. Frequency domain filters: Homomorphic filtering	
7	<b>Image Data Compression:</b> Fundamentals, Redundancies: Coding, Interpixel Psycho-visual, fidelity criteria,  Image compression models, Error free compression	
8	Lossy compression, Image compression standards: Binary image  and Continuous tone Still Image compression standards, Video compression standards.	Quiz based on image enhancement in spatial and frequency domain, data compression (CO3, CO4)
9	<b>Morphological Image Processing:</b> Introduction, Dilation, Erosion,  Opening, closing, Hit -or-miss transformation,	
10	Morphological algorithm operations on binary Images,  Morphological algorithm operations on gray-scale	

	Images.	
11	<b>Image Segmentation, Representation and Description:</b> Detection of discontinuities, Edge linking and Boundary detection,  Thresholding Region based segmentation,	
12	Image Representation schemes, Boundary descriptors, and Regional descriptors.	Quiz based on complete syllabus (CO1, CO2, CO3, CO4, CO5)

**(x) Teaching Strategy/Method**

Practice of good blackboard work.

Lecture with sound volume so that the last bench student can follow.

Entertain any question from student.

Sometimes gives practical and analogous example to clarify harder topics.

**(xi) Strategy to support weak students**

Friendly attitude outside the class so that they can freely ventilate their problem.

Listen carefully to their doubts.

Give suggestions according to their problems.

**(xii) Strategy to encourage bright students**

Motivate them to browse the internet to find the latest topics in that field.

Motivate them to read good and authentic books.

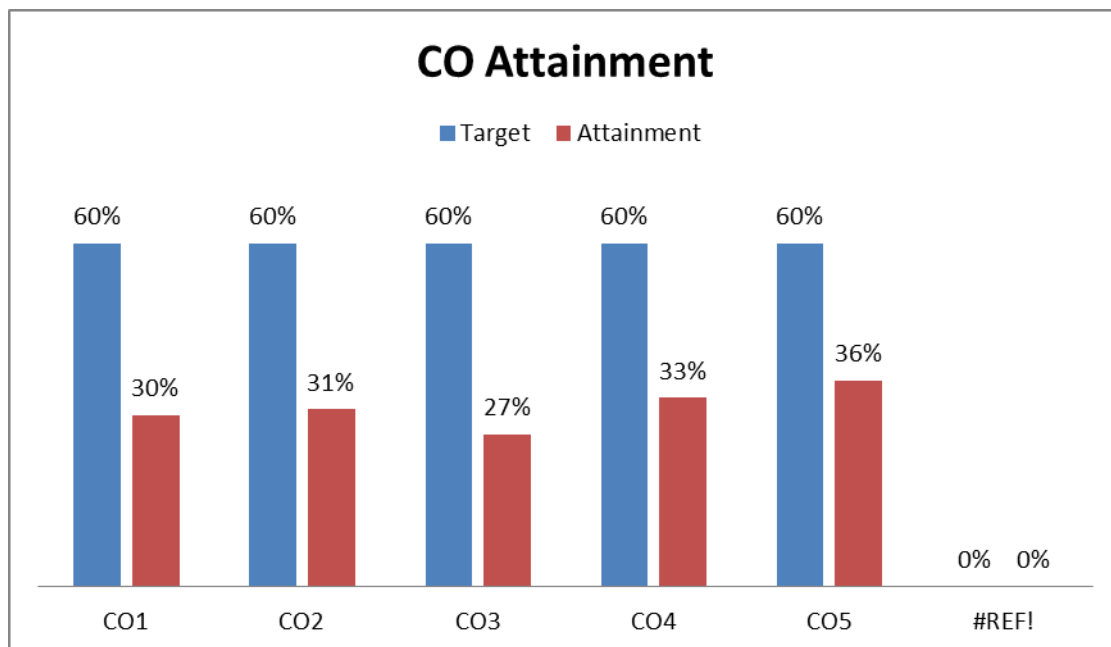
**(xiii) Efforts to keep students engaged**

Other than quiz, assignments are also given to the students.

They are checked and the best ones are emailed to the students so that they can get the corrected answers.

Lab assignments (beyond curriculum) are demonstrated and given as homework.

**(xiv) Analysis of Students performance in the course**



- 48% students have attained the set target of 60% marks for CO1
- 55% students have attained the set target of 60% marks for CO2
- 38% students have attained the set target of 60% marks for CO3
- 65% students have attained the set target of 60% marks for CO4
- 48% students have attained the set target of 60% marks for CO5

**(xv) 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
Internals	60%	50	16	31%	1
University	70%	16	15	94%	3
<b>Overall Attainment of Course Outcome=70% University +30% Internals</b>					<b>2</b>

94% students have attained the set target of 70% marks for University Exams

Based on the 14 feedback forms collected from the heterogeneous type of students it is found that the majority of the students have opted for “3” and “4” for the Course objective and course outcome related queries mentioned above.

**(xvi) Teacher Self Assessment (at the completion of course)**

Some more experiments should be incorporated in the curriculum.

Mathematical analysis of the image processing algorithms should be intensely practiced by the students.

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

The lecture should be slower so that the poor students can get time to listen and simultaneously take down notes.

**STUDENT LIST**

sl.	University Roll	Student
1	11900316009	YASH VARDHAN
2	11900316010	UTSA GHOSH
3	11900316011	TRIDIBESH NAYEK
4	11900316012	TANMOY DEY
5	11900316013	TANIYA CHATTERJEE
6	11900316014	SUSMITA CHOWDHURY
7	11900316015	SUSHMITA SARKAR
8	11900316016	SUPRATIV SENGUPTA
9	11900316017	SUDESHNA SAHA
10	11900316018	SUBHAM UPADHYAY
11	11900316019	SUBHAM GHOSH
12	11900316020	SOUVIK MONDAL
13	11900316021	SOUMYADEEP PAUL
14	11900316022	SHIVAM SINHA
15	11900316023	SHAYATA SARKAR
16	11900316024	SHANKHADEEP DEY
17	11900316025	SEJUTI ROY MUKHERJEE
18	11900316026	SAYANTANI DEY
19	11900316027	SAYANI MAITRA
20	11900316028	SAURAV KUMAR VERMA
21	11900316029	SANDIPAN BHATTACHARJEE
22	11900316030	SANDEEP DAS
23	11900316031	SAGNIK KUMAR SINHA

24	11900316032	RUPESH RAJ
25	11900316034	RISHAV KUMAR MAHATO
26	11900316035	RAKTIM MONDAL
27	11900316036	RAJESH RANJAN PRASAD
28	11900316037	RAHUL GHOSH
29	11900316038	RAHUL BHOWAL
30	11900316039	PRITAM KUMAR DAS
31	11900316040	PRATIK PRADHAN
32	11900316041	PRARTHITA GUHA
33	11900316042	PRALAY BISWAS
34	11900316043	POURABI SENGUPTA
35	11900316044	PANKAJ KUMAR TIWARI
36	11900316045	PALLAVI BHARDWAJ
37	11900316046	NILANJAN DEB
38	11900316047	NIKITA PRASAD
39	11900316048	MRIGANKA BHUSAN BARAI
40	11900316049	MD SHADAD REZWI
41	11900316050	MARMEN DOLMA SHERPA
42	11900316051	MANDIRA SAHA
43	11900316052	MADHURIMA YADAV
44	11900316053	LOK BAHADUR CHHETRI
45	11900316054	KUNDAN KUMAR
1	11900316055	KOYENA KUNDU
2	11900316056	KOSHISH KUMAR GUPTA
3	11900316057	JOY MAZUMDAR
4	11900316058	HIRAK DUTTA ROY
5	11900316059	GULSHAN KUMAR SAH
6	11900316060	GOPAL PANDEY
7	11900316061	GAURAV SHARMA
8	11900316062	GAURAV MUKHERJEE
9	11900316063	DHRUBAJYATI DEY
10	11900316064	DEEP CHAKRABORTY
11	11900316065	DEBOLINA BHATTACHARJEE
12	11900316066	DEBMALYA GHOSH
13	11900316067	DEBJEET CHOWDHURY
14	11900316068	DEBJANI BANERJEE
15	11900316069	DEBASMITA BAKSHI
16	11900316070	CHIRANJIB PAUL
17	11900316071	CHINMOY PATHAK
18	11900316072	CHETKAR KUMAR
19	11900316073	BIPLOB BARMAN



20	11900316074	BIKASH PRATAP SINGH
21	11900316075	AYAN CHAKRABORTY
22	11900316076	AVISEKH PANDEY
23	11900316077	AVISEKH GURUNG
24	11900316078	ASHIF ALI
25	11900316079	ARUNABHA BHOWMICK
26	11900316080	ARKAPROVA DEB
27	11900316081	ARINDAM PAL
28	11900316082	ARGHYANIL SAHA
29	11900316083	ARGHA KAMAL RAY
30	11900316084	APEKSHA KUMARI
31	11900316085	ANTARDEEPA KAR
32	11900316086	ANKITA PRASAD
33	11900316087	ANJALI SHUKLA
34	11900316088	ANJALI PRASAD
35	11900316089	ANISH BHATTACHARJEE
36	11900316090	ANIRBAN KAR ROY
37	11900316091	ANIMESH CH ROY
38	11900316092	ANIK SARKAR
39	11900316093	AMIT MAHATO
40	11900316094	AKASH GHOSH
41	11900316095	AKASH CHETTRI
42	11900316096	ADUDA BEGUM
43	11900316097	ADITYA MANDAL
44	11900316098	ADITYA KUMAR
45	11900316099	ADARSH KUMAR SRIVASTAV

