Course Handout for 3ʳᵈ Year B.Tech PROGRAM

Course Title	:Computer Architecture
Course Code	:EC 502
L-T-P-S Structure	: 3-0-0-0
Credits	: 3
Pre-requisite	:Knowledge of Digital Electronics and Logic Design
Course Coordinator	: Manas Parai
Team of Instructors	:
Teaching Associates (For LAB only)	:NA

Course Objective: Students will be able to describe the operation, working, design of the computer.

COURSE OUTCOMES (COs):

CO No	Course Outcome (CO)	Blooms Taxonomy Level (BTL)	Target %
CO1	At the end of this module students will learn how computers work	2	60
CO2	At the end of this module students will know the basic principles of computer's working	3	60
CO3	At the end of this module students will analyze the performance of computers	4	60
CO4	At the end of this module students will know how computers are designed and Implemented.	5	60
CO5	At the end of this module students will understand issues affecting modern processors (caches, pipelines etc.).	6	60

PROGRAM OUTCOMES (POs):

PO Number	Description
1. Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem Analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

Mapping of Course Outcomes and Program Outcomes: (Sample Attached)

Course Outcomes	Program Outcomes												PSOs	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12	1.	2.
EC 502.1	2	2	0	0	0	0	0	0	0	0	0	0	1	0
EC 502.2	2	3	0	0	0	0	0	0	0	0	0	0	1	0
EC 502.3	1	2	0	0	0	0	0	0	0	0	0	0	1	0
EC 502.4	1	1	0	0	0	0	0	0	2	0	0	0	1	1
EC 502.5	1	1	0	0	0	0	0	0	2	0	0	0	1	1
EC 502	1.4	1.8	0	0	0	0	0	0	2	0	0	0	1	1

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:

Basic Structure of Computers, Functional units, software, performance issues software, machine instructions and programs, Types of instructions, Instruction sets: Instruction formats, Assembly language, Stacks, Ques, Subroutines.

Processor organization, Information representation, number formats.

Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating point formats
Control Design, Instruction sequencing, Interpretation, Hard wired control - Design methods, and CPU control unit. Microprogrammed Control - Basic concepts, minimizing microinstruction size, multiplier control unit. Microprogrammed computers - CPU control unit

Memory organization, device characteristics, RAM, ROM, Memory management, Concept of Cache & associative memories, Virtual memory.
System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfaces

Concept of parallel processing, Pipelining, Forms of parallel processing, interconnect network

TEXT/ REFERENCE BOOKS:
1. V.Carl Hammacher, "Computer Organisation", Fifth Edition.
2. A.S.Tanenbum, "Structured Computer Organisation", PHI, Third edition
3. Y.Chu, "Computer Organization and Microprogramming", II, Englewood Chiffs, N.J., Prentice Hall Edition

4. M.M.Mano, "Computer System Architecture", Edition

5. C.W.Gear, "Computer Organization and Programming", McGraw Hill, N.V. Edition

6. Hayes J.P, "Computer Architecture and Organization", PHI, Second edition

COURSE DELIVERY PLAN: BRACKET IN SESSION INDICATES NO. OF CLASS (GRA)

Week	Sess. No.	CO	Topic (s)	Book No [CH No][Page No]	Teaching-Learning Methods	Planned Date	Execution Date
1st	1	CO1	Basic Structure of Computers, Functional units	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	18.7.2022	20.7.2022
1st	2	CO1	software, performance issues software, machine instructions and programs	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk , Questioning /Discussion L: Answering questions, Participates	19.7.2022	21.7.2022
1st	3	CO1	Types of instructions, Instruction sets: Instruction formats	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	20.7.2022	21.7.2022
2nd	4	C01	Assembly language, Stacks, Ques, Subroutines	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Lecturing	25.7.2022	25.7.2022
2nd	5	CO2	Processor organization	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	26.7.2022	25.7.2022
2nd	6	CO2	Information representation, number formats	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	27.7.2022	25.7.2022
3rd	7	CO2	Multiplication & division	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	8.8.2022	26.7.2022
3rd	8	CO2	ALU design	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	10.8.2022	26.7.2022
3rd	9	CO2	ALU design	M. M. Mano, "Computer System Architecture",	T: Chalk & Talk	16.8.2022	26.7.2022

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				3rd Edition			
4th	10	CO2	ALU design	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	17.8.2022	27.7.2022
4th	11	CO2	ALU design	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	22.8.2022	27.7.2022
4th	12	CO3	Control Design, Instruction sequencing	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	23.8.2022	1.8.2022
5th	13	CO3	Interpretation, Hard wired control - Design methods, and CPU control unit	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	24.8.2022	1.8.2022
5th	14	CO3	Microprogrammed Control - Basic concepts, minimizing microinstruction size	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	29.08.2022	**03.08.2022**
5th	15	CO3	multiplier control unit. Microprogrammed computers - CPU control unit	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	30.8.2022	**04.08.2022 & 05.08.2022**
6th	16	CO4	Memory organization	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	31.8.2022	10.08.2022
6th		CO4	device characteristics	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	6.09.2022	
6th		CO4	RAM, ROM	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	07.09.2022	
		CO4	Memory management, Concept of	M. M. Mano, "Computer System	T: Chalk & Talk	08.09.2022	

			Cache & associative memories, Virtual memory	Architecture", 3rd Edition			
7th	CO4		System organization, Input - Output systems	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	12.09.2022	
7th	CO4		Interrupt, DMA, Standard I/O interfaces	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	13.09.2022	
8th	CO5		Concept of parallel processing	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	14.09.2022	
8th	CO5		Pipelining	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	19.09.2022	
8th	CO5		Forms of parallel processing	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	20.09.2022	
9th	CO5		interconnect network	M. M. Mano, "Computer System Architecture", 3rd Edition	T: Chalk & Talk	21.09.2022	

LIST OF TUTORIALS:OPTIONAL

Tutorial session no	Topics	CO-Mapping
	NA	

WEEKLY HOMEWORK ASSIGNMENTS/ PROBLEM SETS/OPEN ENDEDED PROBLEM-SOLVING EXERCISES etc.

Week	Assignment/Quiz	Topic	Details	CO
2	A01	Types of instructions, Instruction sets: Instruction formats	Different type of instructions used in computer system. Types of the instruction and use of them to write a meaningful Program.	CO1
4	A02	ALU design	Design of Arithmetic Logic and	CO2

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			Shift unit	

COURSE TIME TABLE

Monday: 3pm -3:50pm
Tuesday: 2:10 pm- 3 pm
Wednesday: 10 am -10:50am

REMEDIAL CLASSES:

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

DELIVERY DETAILS OF CONTENT BEYOND SYLLABUS:

Content beyond syllabus covered (if any) should be delivered to all students that would be planned, and schedule notified accordingly.

NA

EVALUATION: AS PER MAKAUT GUIDELINES

Schedule for Continuous Assessment (CA):

CA	Assessment By	Schedule
CA-I	Presentation, Quiz, Group Discussion	As per Academic Calendar
CA-II	Report writing	
CA-III	Class test in pen and paper mode to be conducted at the College Level	
CA-IV	Centralized online test to be arranged by theUniversity	
PCA1	Rubrics based Evaluation and Viva -Voce	
PCA2	Rubrics based Evaluation and Viva -Voce	

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 of75% 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	Manas Parai	Mon-Fri	1:20-2:10PM	Faculty room adjacent to VLSI Lab	*Parai*

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:

12/8/22

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

Principal
Siliguri Institute of Technology