DARBHANGA COLLEGE OF ENGINEERING
DARBHANGA

COURSE FILE OF
COMPUTER ARCHITECTURE
(PCC CS 402)

DEPARTMENT
OF
COMPUTER SCIENCE AND ENGINEERING

FACULTY NAME
MR. ANAND KAMAL
(Assistant Professor)

Vision of the Department:

To bring forth cultured graduates meeting the expectation of national and multi-national industries exceling in the field of computing as well as in higher studies and research.

Mission of the Department:

1. To provide strong theoretical knowledge of computer science with practical training which meets the industries expectations.

2. To train necessary skills to further higher studies and professional growth.

3. To inculcate ethical valued in graduates through various social-cultural activities.

Program Edudcational Objectives (PEOs) :

1. Students will be able to effectively communicate, understand the problems of industries, environment, society and endeavor to find the solutions with high ethical responsibilities.

2. Students will be able to engage in life-long learning, pursue higher studies and contribute to the evolving research & development.

3. Students will be able to demonstrate their professional skills and leadership roles across multi-disciplinary domains.

Program Specific Outcomes (PSOs) :

1. Students should be able to develop and test sustainable cost effective software for automization in businees application and society.

2. Students should be able to use new technologies and tools for executing multi-disciplinary projects.

Program Outcomes (POs):

PO 1: *Engineering Knowledge : An ability to apply knowledge of computing and mathematics which is appropriate to computer science.*

PO 2: Problem analysis: *An ability to identify, formulate, and develop solutions to computational challenges.*

PO 3: Design/development of solutions: An ability to design, implement, and evaluate a computational system to meet the desired soluitions of problem with feasibility.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and methods including design of experiments, analysis and interpretation of data, and synthesis them to get the valid conclusions.

PO 5: Modern tool usage: An ability to use appropriate techniques, skills, and tools necessary for computing practice and makes human effort less.

PO 6: The engineer and society: An ability to analyze impacts of computing on individuals, organizations, and society.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions on society in environmental contexts, and provide a solution for sustainable development.

PO 8: Ethics: An understanding of professional, ethical, legal, security, and social issues and responsibilities for the computing profession.

PO 9: Individual and team work: An ability to function effectively on teams to accomplish shared idea, computing design, evaluation, or implementation goals.

PO 10: Communication: An ability to communicate and engage effectively with diverse stakeholders.

PO 11: Project management and finance: An ability to apply design and development principles in the construction of software systems of varying complexity.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

1. Scope and Objective of Course

The knowledge of computer architecture will be helpful in selecting which processor fulfill their task and also minimizes the cost. At the end of syllabus student will be able to design or build a new computer version, improve system performance and provide a solution with an embedded computer.

Objectives of Computer Architecture are:

1. How computer work, basic principles.
2. How to analyze their performance (or how not to).
3. How computers are designed and built.
4. Students can be able to distinguish between cost and performance (like uni-processor and multiprocessor) .

2. Course Outcome : Students should be able to:
CO1: Demonstrate design of basic computer.
CO2: Able to perform computer arithmetic oerations.
CO 3: Understanding of pipelining, superscalar execution, branch predicition.
CO4: Understand and apply the memory hierarchy design, memory access time formula, performance improvement techniques.
CO5: Understanding the concept of I/O organization and multi core processors.

Matrix of CO vs PO PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	2	-	-	-	-	-	-	-	-	3	-
CO2	-	1	2	-	-	-	-	-	-	-	-	-	1	-
CO3	1	1	2	2	-	-	-	-	-	-	-	1	2	1
CO4	2	3	3	2	-	-	-	-	-	-	-	1	3	2
CO5	1	2	2	1	-	-	-	-	-	-	-	-	2	-

Low : 1 Substantial : 2 High : 3

2. Textbooks

TB1: Computer System Architecture, M. Morris Mano.
TB2: Modern Computer Architecture, Rafiquzzaman Chandra.
TB3: Computer Architecture and Parallel Processing by Kai Hwang, Briggs, McGraw Hill

3. Reference Books

Computer Architecture A Quantitative Approach, David Paterson

Lecture No.	Date of Lecture	Topics	Web Links for Videos Lecture	Text Books/ Reference books/Reading Materials	Page No. of Text Books
1-4		**Computer Arithmetic** Number System, Addition, Subtraction, Booth Multiplication Algorithm, Array Multiplier, Division Algorithm	http://nptel.ac.in/courses/106102062/11	(TB1) (TB2)	333-376 348-372
5-10		**Instruction Set** Register Transfer and Micro-operation, Basic Computer Organization and Design.	http://nptel.ac.in/courses/106104122/3	(TB1)	93-116 123-164
		Assignment 1			
11		**Introduction to Computer Organization** Comparison of Computer Organization and Computer Architecture		(TB2)	6-16
12-15		**Micro-programmed Control** Control Memory, Address Sequencing, Micro-programmed Example, Control unit Design, Micro-programmed Sequencer.	https://www.youtube.com/watch?v=81v7JqLbTMI	(TB1)	213-231

	Assignment 2			
16-24	**Memory Organization** Hierarchical Memory Structure, Cache memories, set Associative memory, Virtual Memory, paging, segmentation	http://nptel.ac.in/courses/106102062/28	(TB1)	445-482
25-31	**Input-Output Organization** I/O Interface, Asynchronous data transfer, Programmed I/O, Interrupts, Direct memory access.	http://nptel.ac.in/courses/106104122/35	(TB1)	385-428
32-35	**Parallel Processing** Evolution of computer system (RISC vs. CISC), Parallelism in uni-processor system, Architectural classification scheme.	https://www.youtube.com/watch?v=u7eNcAMPVV8	(TB1) (TB2)	282-288 305-307
36-40	**Principle of Pipelining and Vector Processing.** Pipelining, Overlapped Parallelism, Principles of designing pipelines processor, Vector Processing requirements.	http://nptel.ac.in/courses/106104122/10	(TB1) (TB2)	302-325 314-325
	Assignment 3			
41-42	**Structure & algorithm for Array Processors** SIMD Array Processors, SIMD Interconnection networks		(TB2)	308-311,326-333

Other readings and relevant websites

S. No.	Link of journals, Magazines, websites and Research papers
1.	https://www.techopedia.com/definition/26757/computer-architecture
2.	https://www.studytonight.com/computer-architecture/architecture-of-computer-system
3.	**http://nptel.ac.in/courses/106102062/**
4.	**https://www.youtube.com/playlist?list=PL5PHm2jkkXmi5CxxI7b3JCL1TWybTDtKq**
5.	
6.	

Course plans

Syllabus

Topics	No. of Lectures	Weightages
Computer Arithmetic: Number System, Addition, Subtraction, Booth Multiplication Algorithm, Array Multiplier, Division Algorithm	4	10%
Instruction Set: Register Transfer and Micro-operation, Basic Computer Organization and Design..	6	14%
Introduction to Computer Organization: Comparison of Computer Organization and Computer Architecture	1	2%
Micro-programmed Control: Control Memory, Address Sequencing, Micro-programmed Example, Control unit Design, Micro-programmed Sequencer	4	10%
Memory Organization: Hierarchical Memory Structure, Cache memories, set Associative memory, Virtual Memory, paging, segmentation	9	21%
Input-Output Organization: I/O Interface, Asynchronous data transfer, Programmed I/O, Interrupts, Direct memory access.	7	16%
Parallel Processing: Evolution of computer system (RISC vs. CISC), Parallelism in uni-processor system, Architectural classification	4	10%
Principle of Pipelining and Vector Processing: Pipelining, Overlapped Parallelism, Principles of designing pipelines processor, Vector Processing requirements.	5	12%
Structure & algorithm for Array Processors: SIMD Array Processors, SIMD Interconnection networks	2	5%