

COURSE CODE	COURSE TITLE	L	T	P	C
1151IT103	COMPUTER Organization and Digital Design	3	0	0	3

Course Category: Program Core

a. Preamble :

This course provides the basics of Number Systems, Boolean Functions, Simplification of Boolean Functions, Logic Gates, Combinational circuits, Multiplexers and Demultiplexers. Also gives knowledge on basics of organizational and architectural issues of a digital computer, analyze performance issues in processor and memory design of a digital computer, various data transfer techniques in digital and performance improvement using instruction level parallelism.

b. Prerequisite Courses:

Sl. No	Course Code	Course Name
1	1150CS201	Problem Solving using C
2	1150MA202	Mathematics II

c. Related Courses:

Sl. No	Course Code	Course Name
1	1152IT101	Fundamentals of IT
2	1151IT105	Operating System

d. Course Outcomes :

Upon the successful completion of the course, students will be able to:

CO No's	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Able to understand the fundamentals of digital principles and able to design digital circuits by simplifying the Boolean functions.	K3,S3
CO2	Able to design various combinational and sequential circuits.	K3, S3
CO3	Able to Understand the organization and working principle of computer hardware components.	K2, S3
CO4	Able to trace the execution sequence of an instruction through the processor.	K4, S3
CO5	Acquire knowledge about multiprocessor organization and parallel processing also can understand mapping between virtual and physical memory.	K3, S3

e. **Correlation of COs with POs :**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H							M			H
CO2	H	H	H	M			L		M			
CO3	M		H		L	H			M			H
CO4	H	L	M		L		L	L	M	M		H
CO5	M							L		H		

H- High; M-Medium; L-Low

f. **Course Content:**

UNIT I DIGITAL FUNDAMENTALS

Number Systems and Conversions – Boolean Algebra and Simplification – Minimization of Boolean Functions – Karnaugh Map, Logic Gates – NAND – NOR Implementation

UNIT II COMBINATIONAL AND SEQUENTIAL CIRCUITS

Design of Combinational Circuits – Adder / Subtractor – Encoder – Decoder – MUX / DEMUX – Comparators, Flip Flops – Triggering – Master – Slave Flip Flop – State Diagram and Minimization – Counters – Registers.

UNIT III BASIC STRUCTURE OF COMPUTERS & PARALLEL PROCESSING

Functional units – Basic operational concepts – Bus structures – Performance and Metrics – Instruction and instruction sequencing – Addressing modes – ALU design – Fixed point and Floating point operation .

UNIT IV PROCESSOR DESIGN

Processor basics – CPU Organization – Data path design – Control design – Basic concepts – Hard wired control – Micro programmed control – Pipeline control – Hazards – Super scalar operation.

UNIT V MEMORY, I/O SYSTEM AND PARALLEL PROCESSING

Memory technology – Memory systems – Virtual memory – Caches – Design methods – Associative memories – Input/output system – Programmed I/O – DMA and Interrupts – I/O Devices and Interfaces - Multiprocessor Organization – Symmetric multiprocessors – Cache Coherence – Clusters: Non Uniform Memory Access- Vector Computation.

TOTAL: 45 PERIODS

h. Learning Resources

i. Text Books:

1. Morris Mano, “Digital Design”, Prentice Hall of India, Fourth Edition 2007.

2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, “Computer organization and Embedded Systems”, Sixth Edition, Tata McGraw Hill, 2012.

ii. Reference Books:

1. Charles H. Roth, Jr., “Fundamentals of Logic Design”, Jaico Publishing House, Mumbai, Fourth Edition, 1992.

2. William Stallings, “Computer Organization & Architecture – Designing for Performance” 9th Edition 2012.

3. David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, Fourth Edition, Morgan Kaufmann / Elsevier, 2009.

4. P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata McGraw Hill, 1998. N. Yanushkevich, Vlad P. Shmerko, “Introduction to Logic Design”, CRC Press, 2012.

iii. Online resources

1. nptel.ac.in/courses/106103068/pdf/coa.pdf

2. www.svecw.edu.in/Docs%5CITIIBTechIISemLecCOA.pdf

3. www.kinindia.net/29-cs6201-digital-principles-and-system-design-notes/