

Shanti Education Society's
A. G. Patil Institute of Technology, Solapur.

An Autonomous Institute and affiliated to DBATU, Lonere

Accredited by NAAC with “B++” Grade



Second Year to Final Year B.Tech.

Computer Engineering

Structure & Curriculum

(w.e.f. A. Y. 2026-27)

As Per NEP 2020

Recommended in BOS (Computer Engineering) Meeting dated:
22nd May 2026

and

Approved in Academic Council Meeting dated: 22nd May 2026

Prof. M.N. Deshmukh
Member Secretary
Academic Council

Prof. S.V. Kulkarni
BOS chairman
(Comp. Engg.)

Dr. V. V. Potdar
Principal

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Structure for B. Tech. Programme as per NEP 2020

(For students admitted in First Year of A.Y.2024-25 onwards)

Key Features of Curriculum

1. Multiple entry and exit option after every year.
2. Provision for Open Electives (OE), Vocational and Skill Enhancement Courses (VSE), Ability Enhancement Courses (AE), Indian Knowledge System (IKS), Value Education Courses (VE), Co-Curricular Courses (CC) in addition to program core courses.
3. Mandatory internship of one semester.
4. Credits for Value education courses, Ability Enhancement Courses, Co-Curricular Curricular Activities. 5. Mandatory Non-Credit Courses.
5. Interdisciplinary and multidisciplinary education through single and double minors and open electives. 7. Skill based courses and multiple exit level.
6. Provision for learning in online mode through Swayam / NPTEL etc. courses
7. Provision for B. Tech. Honours with Research degree through research project.
8. Opportunity for learner to choose courses of their interest in all disciplines.
9. Provision of Skill Based Courses and internship/Field project/mini projects for exit options at each level.
10. Flexibility for all types of learners i.e. Good, Normal and Exit.

Good Students	Normal Students	Exit
B. Tech. Major with Multidisciplinary Minor	B. Tech. Major with Multidisciplinary Mino	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered in 8 weeks.
B. Tech. Honors and Multidisciplinary Minor	--	
B. Tech. Honors with Research and Multidisciplinary Minor	--	
B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	--	

CREDIT DISTRIBUTION FOR EACH YEAR AND EXIT OPTION

NCrF Level	Year/ Semester	Exit Option	Minimum Credit Requirement	Maximum Credit Requirement	AGPIT CE Credits	Additional Credits for exit students	AGPIT CE Total Credits
4.5	Semester I & II	U. G. Certificate	40	44	44	8	52
5.0	Semester III & IV	U. G. Diploma	80	88	88	8	96
5.5	Semester V & VI	B. Vocational / B.Sc. Engg	120	132	132	8	140
6.0	Semester VII & VIII	B. Tech. Major with Multidisciplinary Minor	160	176	173	—	173
		B. Tech. Honors and Multidisciplinary Minor	180	194	173 + 18 = 191	—	191
		B. Tech. Honors with Research and Multidisciplinary Minor	180	194	173 + 18 = 191	—	191
		B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	180	194	173 + 18 = 191	—	191

CURRICULUM FRAME WORK LIST OF ABBREVIATIONS

Sr.No.	Abbreviation	Type of Course
1	BSC	Basic Science Course
2	ESC	Engineering Science Course
3	PCC	Program Core Course
4	PEC	Program Elective Course
5	MDM	Multidisciplinary Minor
6	OE	Open Elective
7	VSEC	Vocational and Skill Enhancement Course
8	AEC	Ability Enhancement Course
9	EEM	Entrepreneurship/Economics/Management Course
10	IKS	Indian Knowledge System
11	VEC	Value Education Course
12	CC	Co-Curricular Courses
13	RM	Research Methodology
14	CEP/FP	Community Engagement Project / Field Project
15	PW	Project
16	IT/OJT	Internship/OnJob Training

COURSE CATEGORY-WISE CREDIT DISTRIBUTION

Course Category	As per NEP GR	AGPIT Credits	CC	As per NEP GR	AGPIT Credits
BSC/ESC	30	31	BSC	14-18	14
			ESC	12-16	17
Program Courses	64 - 76	74	PCC	44-56	55
			PEC	20	19
Multidisciplinary Courses	22	22	MDM	14	14
			OE	8	8
Skill Courses	8	8	VSEC	8	8
Humanity, Social Science & Management (HSSM)	14	14	AEC	4	4
			EMC	4	4
			IKS	2	2
			VEC	4	4
Experiential Learning Courses(ELC)	22	20	RM	4	2
			CEP/FP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	160-176	173		160-176	173

Semester Wise Credit Distribution

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course(BS)	BSC/ESC	7	7							14
Engineering Science Course(ES)		7	10							17
Programme Core Course (PCC)	Program Courses (PCC)			13	12	11	11	8		55
Programme Elective Course(PEC)					4		6	6	3	19
Multi-disciplinary Minor (MDM)	Multi-disciplinary Courses			3	3	3	3	2		14
Open Elective (OE)Other Than a particular program				2	3	3				8
Vocational and Skill Enhancement Course (VSEC)	Skill Courses(SC)	2	2					4		8
Ability Enhancement Course (AEC -01, AEC-02)	Humanities Social Science and Management (HSSM)	3					1			4
Entrepreneurship/ Economics / Management Courses (EM)						2		2		4
Indian Knowledge System (IKS)			2							2
Value Education Course (VEC)				2	2					4
Research Methodology (RM)	Experiential Learning Courses (ELC)								2	2
Comm.Engg. Project (CEP)/Field Project(FP)						2				2
Project(PR)							2	2		4
Internship/OJT									12	12
Co-curricular Courses (CC)	Liberal Learning Courses (LLC)	2	2							4
Total Credits(Major)		21	23	20	24	21	23	24	17	173



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Second Year B. Tech. in Computer Engineering

Semester-III (w.e.f. 2026-27)

Course Category	Course Code	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme		Credits
			L	T	P		Max. Marks	Min. % for passing	
PCC	25UGCEPC301	Mathematics for Computer Engineering	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60	40	
	25UGCEPC302	Data Structure	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60	40	
	25UGCEPC303	Computer Architecture and Microprocessor	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60	40	
PCC	25UGCEPC304	Object Oriented Programming using Java	2			MSE	50	40	1
MDM	25UGCEMD305	MDM -I	2	-	-	ISE	20	40	3
						MSE	20		
						ESE	60	40	
OE	25UGCEOE306	Refer table	2	-	-	ISE	20	40	2
						MSE	20		
						ESE	60		
VSEC	25UGCEVS307	Universal Human Values	2	-	-	MSE	50	40	2
PCC Lab	25UGCEVE308L	Data Structures Laboratory	-	-	2	ISE	30	40	1
						ESE	20		
	25UGCEVE309L	Computer Architecture and Microprocessor Laboratory	-	-	2	ISE	30	40	1
						ESE	20		
	25UGCEVE310L	Object Oriented Programming using Java	-	-	2	ISE	30	40	1
						ESE	20		
			17	00	06		750		20
	Total Credits								20
	Total Marks								750
	Total Contact Hr.								23

ISE – In Semester Evaluation, ESE – End Semester Examination, MSE – Mid Semester Examination, L, T, P -Lecture, Tutorial, Practical hours per week.

CUMULATIVE CREDITS: 21+23+20 = 64



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List of Multidisciplinary Minor (MDM)-I Courses

Sr. No.	Minor	Course Code	Course name
01	Minor in Mechanical Engineering	25UGMEMD304	Manufacturing Processes
02	Minor in Civil Engineering	25UGCVMD30	
03	Computer Science and Engineering	25UGCEMD305	Data Structure
04	Minor in Electronics & Telecommunication Engineering	25UGETCMDM305	Electronic Devices & Circuits

List of Open Elective Courses

Students must take up three courses of 08 credits over semesters III to V

Course Code	Open Elective Sem-III (Credit-2)
25UGCEOE306A	Advance Excel
25UGCEOE306B	Entrepreneurship Development
25UGCEOE306C	E-Waste Management
25UGCEOE306D	Organizational Behavior

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Second Year B. Tech. in Computer Engineering
Semester-IV (w.e.f. 2026-27)

Course Code	Course Category	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme		Credits
			L	T	P		Max. Marks	Min. % for passing	
PCC	25UGCEPC401	Design and Analysis of Algorithms	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
	25UGCEPC402	Discrete Mathematics	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
	25UGCEPC403	Operating System	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
PEC	25UGCEPE404	Program Elective Course -I	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
MDM	25UGCEMD405	MDM-II	2	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
OE	25UGCEOE406	Refer Table	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
VEC	25UGCEVS407	Constitution of India	2			ISE	50	40	2
PCC Lab	25UGCEPC408L	Operating System Laboratory	-	-	2	ISE	30	40	1
						ESE	20		
	25UGCEPC409L	Python Laboratory	-	-	2	ISE	30	40	1
						ESE	20		
	25UGCEPC410L	Seminar	-	-	2	ISE	30	40	1
						ESE	20		
PEC Lab	25UGCEPE411L	PEC I Laboratory			2	ISE	30	40	1
						ESE	20		
Total			19	00	08	-	850	-	24
	Total Credits								24
	Total Marks								850
	Total Contact Hr.								27

ISE – In Semester Evaluation, ESE – End Semester Examination, MSE – Mid Semester Examination, L, T, P - Lecture, Tutorial, Practical hours per week.

CUMULATIVE CREDITS: 21+23+20+24 = 88



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Second Year B. Tech. in Computer Engineering

List of Multidisciplinary Minor (MDM)-II Courses

Sr. No.	Minor	Course Code	Course name
01	Minor in Mechanical Engineering	25UGMEMD404	
02	Minor in Civil Engineering	25UGCVMD40	
03	Computer Science and Engineering	25UGCEMD405	Design Analysis & Algorithm
04	Minor in Electronics & Telecommunication Engineering	25UGETCMD40	Applied Electronics

List of Open Elective II Courses

Course Code	Open Elective Sem-IV (Credit 3)
25UGCEOE406A	Innovators Toolkit
25UGCEOE406B	Digital Marketing
25UGCEOE406C	Engineering Economics
25UGCEOE406D	Corporate Management

List of Programmed Elective Courses (PEC) - I

Course Code	Course Name	Domain
25UGCEPE404A	Mobile Application Development	



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25UGCEPE404B	DevOps	
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Third Year B. Tech. in Computer Engineering Semester-V (w.e.f. 2026-27)

Course Code	Course Category	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme		Credit
			L	T	P		Max. Marks	Min. % for passing	
PCC	25UGCEPC501	Database Management System	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
	25UGCEPC502	Theory of Computations	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
	25UGCEPC503	Computer Networks	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
MDM	25UGCEMD504	MDM-III	2	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
OE	25UGCEOE505	Refer table	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
HSSM (EM)	25UGCEEM506	Economics & Management	3	-	-	ISE	20	40	2
						MSE	20		
						ESE	60		
PCCL	25UGCEPC507L	Database Management System Laboratory	-	-	2	ISE	30	40	1
						ESE	20	40	
PCCL	25UGCEPC508L	Prompt Engineering	-	-	2	ISE	50	40	1
CEP/FP	25UGCEFP509	Community Engagement Program	-	-	2	ISE	50	40	2
Total			17	00	6	-	750	-	21
Total Credits									21
Total Marks									750
Total Contact Hr.									23



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CUMULATIVE CREDITS: 21+23+20+24+21 = 109

List of Multidisciplinary Minor (MDM)-III Courses

Sr. No.	Minor	Course Code	Course name
01	Minor in Mechanical Engineering		
02	Minor in Civil Engineering		
03	Computer Science and Engineering		Python Programming
04	Minor in Electronics & Telecommunication Engineering		Analog & Digital Circuits

List of Open Elective III Courses

Course Code	Open Elective Sem-V (Credit 3)
25UGCEOE505A	Operational Research
25UGCEOE505B	Supply Chain
25UGCEOE505C	Cyber Security
25UGCEOE505D	

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Second Year B. Tech. in Computer Engineering**Semester-VI (w.e.f. 2026-27)****Third Year B. Tech. in Computer****Engineering Semester-VI (w.e.f. 2026-27)**

Course Category	Course Code	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme		Credit
			L	T	P		Max. Marks	Min. % for passing	
PCC	25UGCEPC601	Compiler Design	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
	25UGCEPC602	Machine Learning	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
	25UGCEPC603	Internet of Things	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
PEC	25UGCEPE604	Program Elective Course -II	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
	25UGCEPE605	Program Elective Course - III	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
MDM	25UGCEMD606	MDM -IV	2	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
PCC	25UGCEPC607L	Machine Learning Laboratory	-	-	2	ISE	30	40	1
						ESE	20	40	
	25UGCEPC608L	Internet of Things Laboratory	-	-	2	ISE	30	40	1
						ESE	20	40	
HSSM (AEC)	25UGCEAE609	General Aptitude	-	-	2	ISE	30	40	1
						ESE	20	40	
PR	25UGCEPR610	Project Phase -I	-	-	4	ISE	20	40	2
						MSE	40		
						ESE	40		
Total			17	-	10	-	800	-	23
	Total Credits								23
	Total Marks								850
	Total Contact Hr.								27

ISE – In Semester Evaluation, ESE – End Semester Examination, MSE – Mid Semester Examination, L, T, P - Lecture, Tutorial, Practical hours per week.

CUMULATIVE CREDITS: 21+23+20+24+21+23=132



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Second Year B. Tech. in Computer Engineering List of Multidisciplinary Minor (MDM)-IV Courses

Sr. No.	Minor	Course Code	Course name
01	Minor in Mechanical Engineering		Automobile Engineering
02	Minor in Civil Engineering		
03	Computer Science and Engineering		Database Management System
04	Minor in Electronics & Telecommunication Engineering		Microprocessors & Microcontrollers

List of Programmed Elective Courses (PEC) - II

Course Code	Course Name	Domain
25UGCEPE604A	Big Data Analytics	
25UGCEPE604B	Data Mining	

List of Programmed Elective Courses (PEC) - III

Course Code	Course Name	Domain
25UGCEPE605A	Software Engineering & Software Testing	
25UGCEPE605B	Computer Vision	

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Second Year B. Tech. in Computer Engineering**Final Year B. Tech. in Computer Engineering Semester-VII (w.e.f. 2027-28)**

Course Category	Course Code	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme		Credit
			L	T	P		Max. Marks	Min. % for passing	
PCC	25UGCEPC701	Artificial Intelligence	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
	25UGCEPC702	Cloud Computing	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
PEC	25UGCEPE703	Program Elective Course -IV	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
	25UGCEPE704	Program Elective Course -V	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
HSSM (EM)	25UGCEEM705	Employability and Skill Development	3	-	-	ISE	20	40	2
						MSE	20		
						ESE	60		
MDM	25UGCEMD706	MDM -V	3			ISE	20	40	2
						MSE	20		
						ESE	60		
PCC	25UGCEPC707L	Artificial Intelligence Lab	-	-	2	ISE	30	40	1
						ESE	20	40	
	25UGCEPC708L	Cloud Computing Lab	-	-	2	ISE	30	40	1
						ESE	20	40	
VSEC	25UGCEVS709	Full Stack Development	-	-	2	ISE	30	40	2
						ESE	20	40	
VSEC	25UGCEVS710	Data Analytics	2	-	-	ISE	20	40	2
						MSE	20	40	
						ESE	60		
PR	25UGCEPR711	Project Phase -II	-	-	4	ISE	20	40	2
						MSE	40		
						ESE	40	40	
Total			20	0	10	-	950	-	24
	Total Credits								23
	Total Marks								950
	Total Contact Hr.								30

ISE – In Semester Evaluation, ESE – End Semester Examination, MSE – Mid Semester Examination, L, T, P - Lecture,

Tutorial, Practical hours per week

CUMULATIVE CREDITS: 21+23+20+24+21+23+24=156

Department of Computer Engineering

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Second Year B. Tech. in Computer Engineering

List of Multidisciplinary Minor (MDM)-V Courses

Sr. No.	Minor	Course Code	Course name
01	Minor in Mechanical Engineering		Renewable Energy Sources
02	Minor in Civil Engineering		
03	Computer Science and Engineering		Software Engineering
04	Minor in Electronics & Telecommunication Engineering		VLSI & Embedded System

List of Programmed Elective Courses (PEC) - IV

Course Code	Course Name	Domain
25UGCEPE703A	Deep Learning	Machine Learning
25UGCEPE703B	Cyber Security & Ethical Hacking	Cyber Security

List of Programmed Elective Courses (PEC) - V

Course Code	Course Name	Domain
25UGCEPE704A	Block Chain Technology	
25UGCEPE704B	Augmented Reality & Virtual Reality	



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Second Year B. Tech. in Computer Engineering

Final Year

B. Tech. in Computer Engineering Semester-VIII (w.e.f. 2027-28)

Course Category	Course Code	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme Theory Course		Credit
			L	T	P		Max. Marks	Min. % for passing	
PEC	25UGCEPE801	Natural Language Processing (Self Learning Mode)	2	-	-	ISE	20	40	3
						MSE	20	40	
						ESE	60	40	
RM	25UGCERM802	Research Methodology (Self Learning Mode)	4	-	-	ISE	20	40	2
						MSE	20	40	
						ESE	60	40	
OJT	25UGCEOJ803	Internship (In House or External)	-	-	24	ISE	30	40	12
						MSE	90	40	
						ESE	180	40	
Total			06	00	24		500		17
	Total Credits								17
	Total Marks								500
	Total Contact Hr.								30

ISE – In Semester Evaluation, ESE – End Semester Examination, MSE – Mid Semester Examination, L, T, P - Lecture, Tutorial, Practical hours per week.

CUMULATIVE CREDITS: 21+23+20+24+21 +23+24+17 = 173



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Second Year B. Tech. in Computer Engineering

25UGCEPC301: Mathematics for Computer Engineering

[UNIT 1] Probability Theory

[8 Hours]

Definition of probability: classical, empirical, and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes' theorem of inverse probability, Properties of probabilities with proofs, Examples.

[UNIT 2] Random Variable and Mathematical Expectation

[8 Hours]

Discrete and Continuous Random Variables Probability distributions, Probability mass and density function, Mathematical expectation, Properties of expectation and variance Theoretical distribution: Binomial, Poisson, Normal

[UNIT 3] Statistical Method for Data Analysis

[7 Hours]

Types of Correlation, Karl Pearsons Correlation Coefficients, Spearman's rank Correlation Coefficients, Linear and Non-linear Regressions, Properties and theorems of Regression Coefficients

[UNIT 4] Hypothesis Testing

[7 Hours]

Types and properties of estimators, interval estimation, and confidence intervals for means and proportions, Hypothesis testing concepts, types of errors, significance levels, test types and apply z-test, t-test, and χ^2 -test.

[UNIT 5] Vector Spaces and Linear Algebra

[7 Hours]

Vector Spaces and Subspaces, Span and Linear Independence, Basis and Dimension, Orthogonality and Orthogonal Subspace, Orthogonal Bases

Text Books: 1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & Co. Pvt. Ltd., New Delhi.
3. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.

Reference Books: 1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York. 2. A Text Book of Engineering Mathematics by Peter O'Neil, Thomson Asia Pte Ltd., Singapore. 3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, McGraw-Hill Publishing Company Ltd., New Delhi. 4. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York.



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Second Year B. Tech. in Computer Engineering

25UGCEPC302: Data Structures

[UNIT 1] Introduction

[7 Hours]

Definition and classification of data structures, Abstract Data Types (ADTs), Overview of Array and Hash Table, Array operations: insertion, deletion, traversal, Hash Table: Hash function, Types of Hashing.

[UNIT 2] Stacks & Queues

[7 Hours]

Implementation of stacks using arrays and linked lists, Applications of stacks: expression evaluation, recursion, Implementation of queues: simple queue, circular queue, priority queue.

[UNIT 3] Linked List

[7 Hours]

Singly Linked List: Insertion, Deletion, Traversal, Searching. Doubly Linked List: Insertion, Deletion, Traversal, and Searching, Circular Linked List: Insertion, Deletion, and Traversal.

[UNIT 4] Trees & Graphs

[7 Hours]

Introduction to trees and binary trees, Binary Search Trees (BST): insertion, deletion, traversal, Balanced trees: AVL trees, B-trees, B+ trees, Red Black trees. Graph representations: adjacency matrix, adjacency list Graph traversal algorithms: Breadth-First Search (BFS), Depth-First Search (DFS), Shortest path algorithms: Dijkstra's algorithm.

[UNIT 5] Sorting & Searching Techniques

[7 Hours]

Sorting techniques: Insertion sort, bubble sort, quick sort, merge sort, heap sort, Searching techniques: linear search, binary search.

Textbooks:

1. "Fundamentals of Data Structures in C" by Ellis Horowitz, Sartaj Sahni, and Susan AndersonFreed.
2. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie.
3. "Data Structures and Algorithms" by Alfred V. Aho, John E. Hopcroft, and Jeffrey D. Ullman.

References:

1. "Data Structures Using C" by Reema Thareja.
2. "Data Structures through C" by Yashavant Kanetkar.
3. "Data Structures through C in Depth" by S.K. Srivastava and Deepali Srivastava.



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Second Year B. Tech. in Computer Engineering

25UGCEPC303: Computer Architecture & Microprocessor

[Unit 1] Fundamentals of Computer Architecture and Organization

[7 Hours]

Concept of Computer Architecture and Organization, Fundamental Functional Units of a computer, Computer Function and Interconnection, CPU structure and Function, Von Neumann Architecture, Performance Measures (Clock Cycle, CPU Execution Time, CPI, MIPS), Basic Organization of Computer System.

[Unit 2] Combinational Digital Circuits

[7 Hours]

Standard representation for logic functions, K-map representation, simplification of logic functions using Kmap, minimization of logical functions, Don't care conditions, Multiplexer, De-Multiplexer / Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, parity checker / generator.

[Unit 3] Sequential circuits and systems

[7 Hours]

1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J-K-T and D-types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple(Asynchronous) counters, synchronous counters, counters design using flip flops,

[Unit 4] Fundamentals of Microprocessors

[7 Hours]

Fundamentals of Microprocessor, Comparison of 8-bit, (8085) 16-bit (8086), and 32-bit microprocessors (80386), The 8086 Architecture: Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

[Unit 5] 8086 Instruction Set and Programming

[7 Hours]

8086 Instruction Set and Programming: Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing, Instruction timings, Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction, Assembly language programs, C language programs, Assemblers and compilers, Programming and debugging tools.

Text Books:

1. R. P. Jain, *Modern Digital Electronics*, McGraw Hill Education, 2009.
2. William Stallings, *Computer Organization and Architecture: Designing for performance*, Pearson Education, 11th Edition, 2019.

Reference Books:

1. John P. Hayes, *Computer Architecture and Organization*, McGraw-Hill Education, 3rd edition, 2012.
2. M. M. Mano, *Digital logic and Computer design*, Pearson Education India, 2016.
3. Kumar, *Fundamentals of Digital Circuits*, Prentice Hall India, 2016.
4. Douglas Hall, *Microprocessors and Interfacing*, McGraw-Hill Publication, Revised 2nd Edition.



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Second Year B. Tech. in Computer Engineering

Unit I: Java Fundamentals

(7 Hours)

Introduction to Java , Features of Java , JDK, JRE and JVM, Java Class Libraries, Java Development Environment, Structure of Java Program, Data Types, Variables, Input and Output (Scanner Class), Operators

Unit II: Methods, Classes and Objects

(7 Hours)

Methods in Java, Static Methods, Method Overloading, Classes and Objects, Constructors, Types of Variables, Access Modifiers, Packages, Importing Packages

Unit III: Control Statements, Arrays and Strings

(7 Hours)

Conditional Statements , Looping Statements, Break and Continue, Arrays, Passing Arrays to Methods, Command-Line Arguments, String Class, String Methods

Unit IV: Object-Oriented Programming Concepts

(7 Hours)

Inheritance, Super Class and Subclass, Method Overriding, Abstract Classes, Interfaces, Polymorphism, Final Keyword

Unit V: Exception Handling and JDBC

(7 Hours)

Exception Handling, Exception Hierarchy, try-catch-finally, throw and throws, User-defined Exceptions (Introduction)

JDBC: JDBC Architecture , JDBC Drivers, JDBC API, Connection with MySQL, Statement, Prepared Statement, ResultSet, CRUD Operations

Text Books:

1. Paul Deitel and Harvey Detail, Java: How to Program, Pearson's Publication, 9 thEdition.

Reference Books:

1. Joel Murach and Michael Urban, Murach's Beginning Java with Eclipse, Murach's Publication, 1st Edition, 2016. Doug Lowe, Java All-in-One For Dummies, Wiley Publication, 4th Edition, 2014.

2. Herbert Schildt, Java: The Complete Reference, McGraw-Hill Publication, 9th Edition.

3. Patrick Niemeyer, Daniel Leuck, Learning Java, O'Reilly Media, 4th Edition, 2013.

4. JavaScript: The Good Parts, Douglas Crockford, O'Reilly, ISBN: 9782744055973.



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Second Year B. Tech. in Computer Engineering

25UGCEMD305: Data Structure

UNIT I: Introduction to Data Organization

(5Hours)

Data, Information and Data Structures, Types of Data Structures (Linear and Non-linear), Abstract Data Types (Basic idea only), Arrays and Strings, Searching concepts (Linear Search), Introduction to Hashing (Concept only)

UNIT II: Stacks and Queues

(5Hours)

Stack operations, Queue operations, Circular Queue (Concept), Priority Queue (Applications), Expression evaluation (Basic), Recursion (Introduction only)

UNIT III: Linked Lists

(5Hours)

Need of Dynamic Data Structures, Singly Linked List, Doubly Linked List, Circular Linked List

UNIT IV: Trees and Graphs

(5Hours)

Tree terminology, Binary Tree (Basic), Binary Search Tree, Graph representation, BFS and DFS (Concept with animation), Shortest Path

UNIT V: Sorting and Engineering Applications

(5Hours)

Need of Sorting, Bubble Sort, Selection Sort, Insertion Sort, Merge Sort (Concept only), Binary Search Choosing appropriate Data Structure.

Textbooks:

1. "Fundamentals of Data Structures in C" by Ellis Horowitz, Sartaj Sahni, and Susan AndersonFreed.
2. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie.
3. "Data Structures and Algorithms" by Alfred V. Aho, John E. Hopcroft, and Jeffrey D. Ullman.

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3. "Data Structures through C in Depth" by S.K. Srivastava and Deepali Srivastava.



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Second Year B. Tech. in Computer Engineering

25UGCEOE306: Advance Excel

Unit I: Introduction to Microsoft Excel and Data Management (5Hours)

Introduction to Microsoft Excel (2019/2021/Microsoft 365), Excel Interface and Workbook Fundamentals, Worksheet and Workbook Management, Selecting Cells, Ranges, and Named Ranges, Cell Formatting and Number Formats, Tables and Structured References, Conditional Formatting, Data Validation (Number, Date, Time, Text, List), Sorting, Filtering, Advanced Filter, Flash Fill, Text to Columns, Remove Duplicates

Unit II: Advanced Functions and Formulae (5Hours)

Logical Functions: IF, Nested IF, IFS, AND, OR, NOT, TRUE, FALSE

Text Functions: LEFT, RIGHT, MID, LEN, SEARCH, FIND, SUBSTITUTE, REPLACE, EXACT, CONCAT, TEXTJOIN

Unit III: Date, Time, Statistical Functions and Data Analysis (5Hours)

Date & Time Functions: DATE, TODAY, NOW, WEEKDAY, NETWORKDAYS, EDATE, EOMONTH, HOUR, MINUTE

Statistical & Mathematical Functions: COUNTIF, COUNTIFS, SUMIF, SUMIFS, AVERAGEIF, AVERAGEIFS, ROUND, SUBTOTAL

Data Analysis Tools: Goal Seek, What-if Analysis, Scenario Manager, Data Tables, Solver (Introduction)

Unit IV: Data Visualization and Dashboard Development (5Hours)

Charts: Line, Bar, column, Pie, Area, Scatter, Combo Charts, Pivot Tables, Pivot Charts, Slicers, Sparklines, Dashboard Design Principles, Interactive Dashboard Creation.

Unit V: Automation Using Macros and Introduction to VBA (5Hours)

Introduction to Macros, Recording Macros, Running Macros, Editing Macros, Relative and Absolute References, Assigning Macros to Buttons, Macro Security, Introduction to VBA Editor, Variables, Message Box, Simple VBA Procedures, File Automation (Introduction).



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25UGCEVS307: Universal Human Values

Unit I: Introduction to Value Education: (5Hours)

Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity, the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity, Current Scenario, Method to Fulfill the Basic Human Aspirations.

Unit II: Harmony in the Human Being: (5Hours)

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to Ensure self-regulation and Health.

Unit III: Harmony in the Family and Society: (4Hours)

Harmony in the Family, the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Understanding Harmony in the Society, Vision for the Universal Human Order

Unit IV: Harmony in the Nature (Existence): (5Hours)

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.

Unit V: Implications of the Holistic Understanding – a Look at Professional Ethics: (5Hours)

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics- Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

Text Books:

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1.

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad



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25UGCEPC308L: Data Structures Laboratory

List of Experiments

1. Implementation of Array Operations (Insertion, Deletion, Searching).
2. Implementation of Hashing Techniques and Hash Tables.
3. Implementation of various operations on Stack.
4. Implementation of Application of Stack.
5. Implementation of various Operations on Queue.
6. Implementation of Singly linked list.
7. Implementation of Doubly Linked List.
8. Implementation of Circular Linked List.
9. Implementation of programs to represent graph and traverse the graph.
10. Implementation of Shortest Path Algorithm.
11. Implementation of Linear and Binary Search Tree.
12. Implementation of Insertion and Merge Sort.
13. Implementation of Quick and Heap Sort.
14. Design and Implementation of a Data Structure and Algorithm Based Management System

25UGCEPC309L: Computer Architecture and Microprocessor Laboratory



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List of Experiments

1. Verify Demorgan's Theorem for 2 variables
2. Design and implement a. Full Adder using basic logic gates.
3. Implementation of 4x1 multiplexer using Logic Gates.
4. To verify the truth tables of S-R; J-K; T and D type flip flops
5. Design, and Verify the 4- Bit Synchronous Counter.
6. To Perform Addition of Two 8 bit and 16-Bit Numbers
7. To Perform Subtraction of Two 8 bit and 16-Bit Numbers
8. Write a program to arrange given numbers in ascending order
9. Write a program to arrange given numbers in descending order.
10. Write an assembly language program to print a given string in reverse order.
11. Write an assembly language program to find the factorial of given number
12. Write an assembly language program to find the largest number from series of number.
13. Write an assembly language program to find the smallest number from series of number.



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25UGCEPC310L: Object Oriented Programming using Java Laboratory

List of Experiments

1. Java Program Structure
2. Methods and Method Overloading
3. Classes and Objects
4. Constructors
5. Arrays
6. String Operations
7. Inheritance
8. Interface Implementation
9. Exception Handling
10. JDBC Database Connectivity
11. CRUD Operations
12. Mini Project