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MIT-WPU
॥ विद्यानिधिर्ददाति ॥

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

SYLLABUS

DR VISHWANATH KARAD

MIT - WORLD PEACE UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING AND TECHNOLOGY

B. Tech (Computer Science & Engineering)

BATCH 2023 – 2027

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For a UG course at MITWPU the actual credit distribution will be as below:

Course Basket	Credits Assigned
Program Major	48
Program Foundation	32
Program Electives	16
Program Capstone Project, Problem Based Learning, Seminar, and Internships	32
University Core	22
University Electives	12
Total	**162**

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Assessment Scheme:

Abbreviation	L-T-P-J-C: L-Lecture, T-Tutorial, P-Practical, J-Project, C-Total Credits. CCA1 - Class Continuous Assessment 1, MT - Mid Term Test, CCA2 - Class Continuous Assessment 2, LCA1 - Laboratory Continuous Assessment 1, LCA2 - Laboratory Continuous Assessment 2, LCA3 - Laboratory Continuous Assessment 3, TE - Term End Exam

Type of Course	Assessment Scheme Code	Description L-T-P-J-C	CCA1	MT	CCA2	LCA1	LCA2	LCA3	TE	Total
Theory Courses	TT1	All Theory (L, T) Only courses with TE exams	15	30	15	-	-	-	40	100
Theory Courses with Continuous Evaluation	TT2	All Theory (L, T) only courses without TE exams	35	30	35	-	-	-	-	100
Lab /Projects/ Internship/ Dissertation	PJ	All courses having P and J Components Only	-	-	-	33.33	33.33	33.33	-	100
Theory and Lab Course 1	TL1	2-0-2-0-4	7.5	15	7.5	10	10	10	40*	100
Theory and Lab Course 2	TL2	1-0-3-0-4	2.5	10	2.5	15	15	15	40*	100
Theory and Lab Course 3	TL3	3-0-1-0-4	10	25	10	5	5	5	40	100
Theory and Lab Course 4	TL4	2-0-1-0-3	10	20	10	6.67	6.67	6.67	40	100
Theory and Lab Course 5	TL5	1-0-2-0-3	5	10	5	13.33	13.33	13.33	40*	100
Theory and Lab Course 6	TL6	2-1-1-0-4	10	25	10	5	5	5	40	100
Theory and Lab Course 7	TL7	1-1-1-0-3	10	20	10	6.67	6.67	6.67	40	100

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* Term End Exams to be conducted anywhere within the MITWPU Campus subject to the following conditions:

1. All eligible students will be taking this exam in the same space and at the same time slot.
2. The time for Term End Exams will be a maximum of 3 hrs.
3. QP will be sent along with Invigilators by DoE.

PLEASE NOTE: IF ANY OF THE ASSESSMENT CODE COMBINATION AS APPLICABLE TO YOUR PARTICULAR PROGRAM IS NOT AVAILABLE IN THE ABOVE GIVEN CODES, PLEASE CONTACT WITH YOUR ASSOCIATE DEAN ACADEMICS TO HAVE IT INCLUDED FROM DEAN ACADEMICS INCORDINATION WITH THE CONTROLLER OF EXAMINATION.

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B. Tech. (First Year) (Computer Science Engineering) (2023-27)

Semester – I

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	MST1PF01A	Linear Algebra and Differential Calculus	PF	3				3	TT1
2	CHM1PF01A	Chemistry	PF	2		2		3	TL4
3	PHY1PF01A	Physics	PF	2		2		3	TL4
4	MEC1PM02A	Engineering Graphics	PF	2		2		3	TL4
5	MEC1PM01A	Ideas and Innovations in Manufacturing	PF			2		1	PJ
6	WPU1UC01A	Learning to Learn	UC	1				1	M
7	WPU1UC02A	Effective Communication	UC	1				1	M
8	WPU1UC04A	Environment and Sustainability	UC	1				1	M
9	WPU1UC05A	Critical Thinking	UC	1				1	M
10	WPU1UC06A	Digital Literacy	UC	1				1	M
11	YOG1UC01A	Yoga – I	UC			2		1	PJ
		Total:		14	0	10	0	19	

****Assessment Marks are valid only if Attendance criteria are met**

Weekly Teaching Hours: 24

L-Lecture, T-Tutorial, P-Practical, J-Project.

Total Credits: 19

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B. Tech. (First Year) (Computer Science Engineering) (2023-27)

Semester – II

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	CIV1PM01A	Engineering Mechanics	PF	2		2		3	TL4
2	CSE1PF01A	Programming and Problem Solving	PF	2		2		3	TL4
3	DBT1PF01A	Biology for Engineers	PF	2				2	TT1
4	MST1PF07A	Discrete Mathematics with Graph Theory	PF	3	--	--		3	TT1
5	CSE1PR01A	Foundations of Computer Architecture and System Design	PR	3	--	--	3	4	TL3
6	WPU1UC07A	Financial Literacy	UC	1				1	M
7	PCE1UC01A	Foundations of Peace	UC	2				2	TT1
8	YOG1UC02A	Yoga – II	UC			2		1	PJ
9	WPU1UC20A	Co-creation	UC				3	1	I
10	WPU1UC08A	Indian Knowledge System	UC	2				2	M
		Total:		**17**	**0**	**6**	**6**	**22**	

****Assessment Marks are valid only if Attendance criteria are met**

L-Lecture, T-Tutorial, P-Practical, J-Project.

Weekly Teaching Hours: 29

Total Credits: 22

Total First Year B.Tech. Credits: 19+22= 41

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B. Tech. (Second Year) (Computer Science Engineering) (2023-27)

Semester – III

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	CSE2PR01A	Object Oriented Concepts using C++	PR	1	--	--	3	2	PJ
2	MST2PF01A	Differential Equations and Transform Techniques	PF	3	1	--		4	TT1
3	CSE2PM01A	Data Structures	PM	3	--	--		3	TT1
4	CSE2PR02A	Data Structures Laboratory	PR	--	--	--	3	1	PJ
5	CSE2PR04A	Project Based Learning – I	PR	--	--	--	3	1	PJ
6	CSE2PM02A	Microprocessor, Microcontroller and Applications	PM	3	--	---		3	TT1
7		University Electives - I	UE	4	--	--		4	TT2
8	PCE2UC02A	Spiritual and Cultural Heritage: Indian Experience	UC	2	--	--		2	TT1
9	WPU2UC21A	Rural Immersion	UC	--	--	--	3	1	I
10	WPU2UC22A	Research Innovation Design Entrepreneurship(RIDE)	UC	--	--	--	3	1	I
				16	**1**	**0**	**15**	**22**	

****Assessment Marks are valid only if Attendance criteria are met**
L-Lecture, T-Tutorial, P-Practical, J-Project.

Weekly Teaching Hours: 32
Total Credits: 22

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B. Tech. (Second Year) (Computer Science Engineering) (2023-27)

Semester – IV

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	CSE2PM03A	Computer Networks	PM	3	--	-	--	3	TT1
2	CSE2PM06A	Computer Networks Laboratory	PM	-		2	-	1	PJ
3	MST2PF03A	Probability and Statistics	PF	3	1	--	--	4	TT1
4	CSE2PM04A	Database Management System	PM	3	--	-	--	3	TT1
5	CSE2PM07A	Database Management System Laboratory	PM	-		2	-	1	PJ
6	CSE2PM09A	Design and Analysis of Algorithms	PM	3	--	--		3	TT1
7	CSE2PR05A	Project Based Learning – II	PR	--	--	--	3	1	PJ
8		University Electives - II	UE	4	--	--	--	4	TT2
9	WPU2UC01A	Indian Constitution	UC	1				1	M
				17	**1**	**4**	**3**	**21**	-

Weekly Teaching Hours: 25
Total Credits: 21

****Assessment Marks are valid only if Attendance criteria are met**
L-Lecture, T-Tutorial, P-Practical, J-Project.

Total Second Year B.Tech. Credits: 22+21 = 43

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B. Tech. (Third Year) (Computer Science Engineering) (2023-27)

Semester – V

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1.	CSE3PM01A	Operating System	PM	3	--	-	--	3	TT1
2.	CSE3PM11A	Operating System Laboratory	PM	-		2	-	1	PJ
3.	CSE3PM02A	Internet of Things Laboratory	PM	--	--	2		1	PJ
4.		Program Elective -I	PE	3	--	2		4	TL3
5.	CSE3PE11A	A. Bigdata Technologies							
6.	CSE3PE21A	B. Computer Graphics and 3D Modelling							
7.	CSE3PE31A	C. Wireless and Mobile Networks							
8.	CSE3PE41A	D. Cloud Computing and DevOps							
9.	CSE3PE51A	E. Foundations of Digital IC Design							
10.	CSE3PM03A	Artificial Intelligence and Expert Systems	PM	3	--	-	--	3	TT1
11.	CSE3PM09A	Artificial Intelligence and Expert Systems Laboratory	PM	-	--	2	-	1	PJ
12.	CSE3PM12A	Software Engineering and Modelling	PM	3	--	--	--	3	TT1
13.	CSE3PR04A	Project Based Learning – III	PR	--	--	--	3	1	PJ
14.		University Elective-III	UE	4	--	--		4	TT2
15.	PCE3UC03A	Managing Conflicts Peacefully: Tools and Techniques	UC	2	--	--		2	TT1
				18	**0**	**8**	**3**	**23**	

****Assessment Marks are valid only if Attendance criteria are met**

L-Lecture, T-Tutorial, P-Practical, J-Project.

Weekly Teaching Hours: 29

Total Credits: 23

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B. Tech. (Third Year) (Computer Science Engineering) (2023-27)

Semester – VI

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	CSE3PR01A	Data Engineering and Data Visualization	PR	2	--	--	3	3	TL4
2	CSE3PM05A	Machine Learning	PM	3	--	-	--	3	TT1
3	CSE3PM10A	Machine Learning Laboratory	PM	-	--	2	-	1	PJ
4	CSE3PM06A	Theory of Computation	PM	3	--	--	--	3	TT1
5	CSE3PM07A	Full Stack Development Laboratory	PM	--	--	2	--	1	PJ
6		Professional Elective –II	PE	3	--	2	--	4	TL3
7	CSE3PE12A	A. Deep Learning							
8	CSE3PE22A	B. Augmented Reality and Virtual Reality							
9	CSE3PE32A	C. Cyber Laws and Cyber Crime							
10	CSE3PE42A	D. Parallel Programming							
11	CSE3PE52A	E. Fundamentals of VLSI Design							
12	CSE3PR02A	Mini Project using Java Programming	PR	--	--	--	3	1	PJ
12	CSE3PR03A	Seminar	PR	--	--	--	3	1	PJ
14	CSE3PR05A	Project Based Learning – IV	PR	--	--	--	3	1	PJ
15	WPU3UC23A	National Academic Immersion	UC	2	--	--		2	I
				13	**0**	**6**	**12**	**20**	

****Assessment Marks are valid only if Attendance criteria are met**

L-Lecture, T-Tutorial, P-Practical, J-Project.

Weekly Teaching Hours: 31

Total Credits: 20

Total Third Year B.Tech. Credits: 23+20 = 43

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B. Tech. (Final Year) (Computer Science Engineering) (2023-27)

Semester – VII

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	CSE4PR01A	Capstone Project	PR	--	--	--	18	6	PJ
2	CSE4PM01A	Information and Cyber Security	PM	2	--	2		4	TL4
3		Program Elective -III	PE	3	--	2		4	TL3
	CSE4PE13A	A. Cognitive Computing and Natural Language Processing							
	CSE4PE23A	B. Computer Vision							
	CSE4PE33A	C. Vulnerability Identification and Penetration Testing							
	CSE4PE43A	D. User Interface and User Experience Design							
	CSE4PE53A	E. Blockchain Technology							
4	CSE4PM04A	Distributed Computing	PM	2	--	2		3	TL4
5	CSE4PM03A	System Software and Compiler Design	PM	3	--	2		4	TL3
				10	--	**8**	**18**	**21**	

****Assessment Marks are valid only if Attendance criteria are met**

Weekly Teaching Hours: 36

L-Lecture, T-Tutorial, P-Practical, J-Project.

Total Credits: 21

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B. Tech. (Final Year) (Computer Science Engineering) (2023-27)

Semester – VIII

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1		Professional Elective -IV /MOOC	PE	3	--	2		4	TL3
	CSE4PE14A	A. Soft Computing							
	CSE4PE24A	B. Unmanned Ariel Vehicle(UAV) and Drone Technology							
	CSE4PE34A	C. Introduction to VLSI Design Verification and Testing							
	CSE4PE44A	D. 5G and Edge Computing							
	CSE4PE54A	E. Digital Design Automation							
2	CSE4PR02A	Internship	PR	--	--		30	10	PJ
				3	**0**	**2**	**30**	**14**	

****Assessment Marks are valid only if Attendance criteria are met**

Weekly Teaching Hours: 35

L-Lecture, T-Tutorial, P-Practical, J-Project.

Total Credits: 14

Total Final Year B.Tech. Credits: 21+ 14 = 35

Total B. Tech. Credits: 41+43+43+35 = 162

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B. Tech. (Computer Science Engineering) (2023-27)
Professional Elective Tracks

Semester	Course Code	Name of the Course	Type
V	CSE3PE11A	A. Bigdata Technologies	Program Elective - I
V	CSE3PE21A	B. Computer Graphics and 3D Modelling	Program Elective - I
V	CSE3PE31A	C. Wireless and Mobile Networks	Program Elective - I
V	CSE3PE41A	D. DevOps	Program Elective - I
V	CSE3PE51A	E. Foundations of Digital IC Design	Program Elective - I
VI	CSE3PE12A	A. Deep Learning	Program Elective - II
VI	CSE3PE22A	B. Augmented Reality and Virtual Reality	Program Elective - II
VI	CSE3PE32A	C. Cyber Laws and Cyber Crime	Program Elective - II
VI	CSE3PE42A	D. Parallel Programming	Program Elective - II
VI	CSE3PE52A	E. Fundamentals of VLSI Design	Program Elective - II
VII	CSE4PE13A	A. Cognitive Computing and Natural Language Processing	Program Elective - III
VII	CSE4PE23A	B. Computer Vision	Program Elective - III
VII	CSE4PE33A	C. Vulnerability Identification and Penetration Testing	Program Elective - III
VII	CSE4PE43A	D. User Interface and User Experience Design	Program Elective - III
VII	CSE4PE53A	E. Blockchain Technology	Program Elective - III
VIII	CSE4PE14A	A. Soft Computing	Program Elective - IV
VIII	CSE4PE24A	B. Unmanned Ariel Vehicle(UAV) and Drone Technology	Program Elective - IV
VIII	CSE4PE34A	C. Introduction to VLSI Design Verification and Testing	Program Elective - IV
VIII	CSE4PE44A	D. 5G and Edge Computing	Program Elective - IV
VIII	CSE4PE54A	E. Digital Design Automation	Program Elective - IV

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University Electives List

2023-27

University Elective-I (4 Credits)	University Elective-II (4 Credits)	University Elective-III (4 Credits)
CSE2UE11A Programming with C++	CSE2UE12A Web Development	CSE3UE13A User Interface Design
CSE2UE21A Programming with Python	CSE2UE22A Software Engineering Concepts	CSE3UE23A Introduction to Cyber Security
CSE2UE31A Programming with Java	CSE2UE32A Introduction to DBMS	CSE3UE33A Introduction to Artificial Intelligence

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COURSE STRUCTURE

Course Code	CSE1PF01A				
Course Category	Programming Foundation				
Course Title	Programming and Problem Solving				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	2	--	2	--	4
Credits	2	--	1	--	3
Assessment Schema Code	TL4				

Prerequisites:

- Introductory Knowledge of Computers.

Course Objectives:

1. **Knowledge:**
   i. To understand the problem solving framework and approaches.
2. **Skills:**
   i. To learn the Programming Language constructs.
3. **Attitude:**

To acquire programming skills for problem solving.

Course Outcomes:

After completion of this course students will be able to:

1. Develop efficient logic and algorithms for solving a problem.
2. Analyse the given problem and solve it using suitable programming constructs.
3. Apply programming skills for solving real world problems.

Course Contents:

Unit 1: Introduction of Computer System and Problem Solving:
Basics of Computers: Architecture, Processors, Memory, Number Systems, System Software - Operating system, Editor, Compiler, Assembler, Linker, Loader.

Unit 2: Introduction to Problem Solving:
Problem solving process/framework, Programming Paradigms: Imperative, Object Oriented, Functional and Logic programming. Characteristics of Programming Languages, Role of programming languages, need of studying programming languages.
Programming Design Tools: Algorithms, Pseudo-code and Flowchart, Case studies for Algorithm, Flowchart and Pseudocode. Top-Down and Bottom-Up design approach. Software Development Life Cycle.

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Unit 3: Fundamentals of C

Introduction to C: Fundamentals of C-Programming, Data types, Constants, Variables, Operators, Expression, Pre-processor directives. Data Input and Output.

Control Structures: Structure of C program, Coding conventions, Decision making, Control Structures- Iterative, break and continue statements. Array- Single and Multidimensional arrays. Strings.

Unit 4: Functions and File Handling in C

Structure – Structure and Array of structure, Union.

Functions in C: User defined and Library functions. Different parameter passing methods (Call by Value and Call by Reference), String Library Functions, Recursion.

Pointers: Lifetime of Variables, Scope Rules: Static and Dynamic scope. Pointers

File Handling in C: File, Types of Files, File operations.

List of Assignments:

1. Write an algorithm and draw a flowchart to log in to Gmail account.
2. Write an algorithm and draw a flowchart to find the largest number among three numbers.
3. Write a menu driven program in C to implement the basic arithmetic operations.
4. Write a program in C to perform basic operations such as addition of two matrices.
5. Write a menu driven program in C to perform all string operations. (In built functions)
6. Write a C function to compute the factorial of a number with and without recursion.
7. Write a C program to accept student details and display their result using an array of structures.
8. Write a C function to swap two numbers using pointers.
9. Write a C program to copy contents of one file to another using File handling.
10. Write a C program to print the month-by-month calendar for the given year.

Learning Resources:

Text Books/ Reference Books

1. Pradeep Sinha, Priti Sinha, "Computer Fundamentals", Eight edition, bpb publication.
2. Ramon Mata-Toledo, Pauline K. Cushman, "Introduction to Computer Science", Schaum's Outline series.
3. Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw Hill Professional.
4. Yashwant Kanetkar, "Let us C", Nineteenth edition, bpb publication.

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Supplementary Reading:

Web Resources:

Weblinks:

1. http://www.studytonight.com/c/overview-of-c.php
2. https://www.tutorialspoint.com/cprogramming
3. https://www.programiz.com/c-programming
4. https://www.cprogramming.com/

MOOCs:

1. https://archive.nptel.ac.in/courses/106/104/106104128/
2. https://archive.nptel.ac.in/courses/106/105/106105171/
3. https://nptel.ac.in/courses/106102066

Pedagogy:

- PowerPoint presentations
- Practical Demos
- Videos
- Online Classrooms
- Expert Lectures

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COURSE STRUCTURE

Course Code	MST1PF07A				
Course Category	Program foundation				
Course Title	Discrete Mathematics with Graph Theory				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	3	--	--	--	3
Credits	3	--	--	--	3
Assessment Schema Code	TT1				

Prerequisites: Basic Mathematics

Course Objectives:

1. To understand the logic for solving problems using set theory.
2. To acquire skills of using Graph Theory for modelling computer science problems
3. To learn relations and functions for solving relevant problems in computer science.
4. To apply Number Theory in Computer Application

Course Outcomes:

After completion of this course students will be able to:

1. Analyze and articulate the logic to solve problem using set theory.
2. Apply knowledge of relations and functions to solve relevant problems in computer science
3. Model computer science problems using Graph theory
4. Demonstrate the concepts and applications of Number Theory in Computer Science.

Course Contents:

Set Theory: Sets, Combinations of sets, Venn Diagrams, Finite and Infinite sets: Uncountable and Countable, Principle of inclusion and exclusion, Multisets, Cartesian Product and Power Set
Fuzzy sets, Basic concepts and types of Fuzzy sets, Operations on Fuzzy sets

Relations and Functions: Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Warshall's Algorithm to find transitive closure, Equivalence Relations, Partial Orderings - Chain, Anti chain and Lattices.

Function: surjective, injective and bijective functions, Inverse Functions and Compositions of Functions, Recursive Function.

Graphs: Graph and Graph Models, Graph Terminology and Types of Graph, Representing Graph and Graph Isomorphism, vertex and edge Connectivity, Eulerian and Hamiltonian, Single source shortest

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path- Dijkstra's algorithm, Planar Graph, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem, digraphs.

Trees: Introduction, properties of trees, Binary search tree, decision tree, prefix codes and Huffman coding, cut sets, Spanning Trees and Minimum Spanning Tree, Kruskal 's and Prim's algorithms, The Max flow- Min Cut Theorem.

Number Theory and Its Applications: Modular Arithmetic & its properties, The Euclidean Algorithm, Extended Euclidean algorithm, Solving Congruence equations, The Chinese Remainder Theorem, Fermat's Theorem, Primitive Roots and Discrete Logarithms.

Learning Resources:

1. Kenneth H. Rosen, —Discrete Mathematics and its Applicationsl, Tata McGraw-Hill, ISBN 978-0-07-288008-3, 7th Edition.
2. C. L. Liu, —Elements of Discrete Mathematicsl, TMH, ISBN 10:0-07-066913-9.
3. George J. Klir and Bo Yuan - Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall

Reference Books:

1. Bernard Kolman, Robert C. Busby and Sharon Ross, —Discrete Mathematical Structuresl, Prentice-Hall of India /Pearson, ISBN: 0132078457, 9780132078450.
2. Dr. K. D. Joshi, — Foundations of Discrete Mathematicsl, New Age International Limited, Publishers, January 1996, ISBN: 8122408265, 9788122408263

Supplementary Reading:

1. N. Biggs, "Discrete Mathematics", 2nd Edition, Oxford University Press
2. Data Structures – Seymour Lipschutz, Shaum's outlines, MCGraw – Hill Inc.

Web Resources:

1. https://learn.saylor.org/course/cs202
2. https://www.mooc-list.com/tags/discrete-mathematics

Web links:

1. https://www.tutorialspoint.com/discrete_mathematics/index.htm

MOOCs:

1. http://nptel.ac.in/courses/106106094/3
2. https://www.coursera.org/learn/discrete-mathematics

Pedagogy:

- Team Teaching
- Tutorials and class tests/assignments
- Audio- Video technique

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COURSE STRUCTURE

Course Code	CSE1PR01A				
Course Category	Project Based Learning				
Course Title	Foundations of Computer Architecture and System Design				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	3	--	--	3	6
Credits	3	--	--	1	4
Assessment Schema Code	TL3				

Prerequisites:

- Programming and Problem Solving (Co-Requisite)

Course Objectives:

By participating in and understanding all facets of this Course a student will be able:

1. Knowledge

i. To learn Boolean algebra and binary arithmetic
ii. To learn fundamentals of computer architecture and processor organization

2. Skill

i. To develop skills for designing and implementing digital logic circuits.
ii. To develop skills for designing and implementing computer functions.

3. Attitude

i. Appreciate that a designer requires creativity and analyzing multiple solutions for a given problem
ii. Appreciate need to work in collaborative manner with others in a team, planning and implementations.

Course Outcomes:

On completion of course, students will be able to

1. Recognize the functions and organization of various blocks of CPU.
2. Understand computer performance metric
3. Demonstrate concepts related to computer memory and I/O.
4. Identify and use the basic logic gates and solve logic equations with various reduction techniques of digital logic circuits.
5. Design and implement combinational logic circuits
6. Design and implement sequential logic circuits

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Course Contents:

Course Contents:

1. Computer Fundamental
2. ALU
3. Memory and IO
4. Combinational Logic Design
5. Sequential Logic Design

Laboratory Exercises:

1. String input and display.
2. Addition of two numbers
3. Implement ALU
4. Implement Booth's Algorithm
5. Code Conversion
6. Multiplexers
7. Asynchronous Counter
8. Mini Project

Learning Resources:

Text Books:

1. "Computer organization and architecture, designing for performance" by William Stallings, Prentice Hall, Tenth edition
2. "Modern Digital Electronics", R.P. Jain, Tata McGraw-Hill, Third Edition
3. "Digital Electronics, Principles, Devices and Applications", Anil K. Maini, Wiley, First Edition

Reference Books:

1. "Digital Design", M Morris Mano, Prentice Hall, Third Edition
2. "Computer organization", Hamacher and Zaky, Fifth Edition
3. "Microprocessors and interfacing-programming and hardware" Douglas V. Hall and SSSP Rao, McGraw-Hill, Third Edition

Web links:

1. Virtual Lab Simulator Link **http://vlabs.iitkgp.ac.in/coa/**
2. http://home.ustc.edu.cn/~louwenqi/reference_books_tools/Computer%20Organization%20and%20Architecture%2010th%20-%20William%20Stallings.pdf
3. https://ia801504.us.archive.org/7/items/digital-electronics.-principles-devices-and-applications-anil-k.-

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maini/Digital%20Electronics.%20Principles%2C%20Devices%20and%20Applications%20%28Anil%20K.%20Maini%29.pdf

MOOCs:

1. https://nptel.ac.in/courses/106/105/106105163/
2. https://nptel.ac.in/courses/117/106/117106086/

Pedagogy:

(You can add your own methods as applicable)

1. Power Point Presentation
2. Active learning
3. Project Based Learning

Module No.	Contents	Workload in Hrs Theory
1	**Computer Fundamental:** Organization and architecture, Structure and Function, Brief History of Computer, concept of embedded System and cloud computing. Types of computer units, Von Neumann & Harvard architecture, IAS Machine, Key characteristics of RISC & CISC, 8086 Architecture and programming model, Addressing mode of 8086.	9
2	**ALU:** Performance metric- Amdahl's law, Little's Law. Computer Components- Computer Components: Top-Level View, Basic Instruction Cycle with and without Interrupts. ALU: Block diagram, Arithmetic operations- addition, subtraction, Multiplication using Booth's algorithm and division using Restoring and non-restoring algorithm, Control Unit - Hardwired and Micro-programmed.	9
3	**Memory and I/O:** Memory: Memory hierarchy, primary and secondary storage, Concept of Cache Memory- Cache memory principles, Elements of cache design. IO Ports, I/O devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O , Direct Memory Access. Memo. Digital Logic: Boolean Algebra, Logic Gates, K map (SOP and POS) up to 4 variable..	9
4	**Combinational Logic Design:** Weighted and non-weighted codes, code conversion, Arithmetic circuits – Half adder, full adder, half subtractor, full subtractor, parallel adder, look ahead carry	9

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	generator. Multiplexers, de-Multiplexer and decoder. Implementing Boolean Functions using Multiplexers and Decoders.	
5	**Sequential Logic Design:** 1-bit Memory Cell, Flip flops, Conversion of flip flops, Design of ripple counters and synchronous counters, Modulus of the counter, sequence generator and detector. Shift registers, Applications of Shift registers (ring and twisted ring counters)	9

Sr. No	Laboratory assignments (Out of 1 to 7 conduct any 6 assignments)	Workload in Hrs Lab
0	Introduction to simulators.	2
1	Write Assembly language programme to input a string and display. (NASM/TASM)	2
2	Write Assembly language programme to perform addition of two numbers	2
3	Design and Simulate ALU (Virtual Laboratory)	2
4	Design & simulate Booth's Algorithm. (Virtual Laboratory)	2
5	Design and Implement 3 Bit Binary to Gray Code / Gray to Binary Converter	2
6	Design and implement combinational logic circuit using MUX (4:1)	2
7	Design and implement Asynchronous counter using IC 7476	2
8	Mini- Project	12

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COURSE STRUCTURE

Course Code	CSE2PR01A				
Course Category	PR				
Course Title	Object Oriented Concepts using C++				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	1	--	--	3	4
Credits	1	--	--	1	2
Assessment Schema Code	PJ				

Prerequisites:

Programming and Problem Solving

Course Objectives:

1. Knowledge

i. Learn object oriented paradigm and its fundamentals.

2. Skills

i. Understand Inheritance, Polymorphism and dynamic binding using C++.

ii. Study the concepts of Exception Handling and file handling using C++.

3. Attitude

i. Learn to apply advanced concepts to solve real world problems.

Course Outcomes:

After completion of this course students will be able to:

1. Understand the basic concepts of Object Oriented Programming to design an application (CL-2).
2. Make use of Inheritance and Polymorphism to develop real world applications. (CL-3)
3. Apply the concepts of exceptions and file handling to store and retrieve the data. (CL-3)
4. Develop an application using advance concepts. (CL-6)

Course Contents:

Unit 1: Introduction to Object Oriented Programming

Introduction to OOP, Fundamentals of object-oriented programming: Classes, Objects, methods, Data Abstraction, Data Encapsulation, Information hiding, Inheritance, Polymorphism. Benefits of OOP. Introduction to C++: Basics of C++, Class, Object, Array of objects, Data Members, Member Function, Access Specifiers, Function prototype, Passing and Returning object in Function, Constructor and destructor, Types of constructor, Objects and Memory requirements, Inline function, Friend function, Friend Class, Static members: variable and function.

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Unit 2: Inheritance and Polymorphism
Inheritance: Base and Derived Classes, Types of inheritance, protected: Data member and Member Function, Member Access Control, Inheriting Constructors and Destructors, Overriding Member Functions, Ambiguity in Multiple Inheritance, Virtual Base Class.
Polymorphism: Introduction to Polymorphism, Types of Polymorphism: Static polymorphism, Dynamic polymorphism. Function overloading, Operator Overloading, Pure Virtual Function, Abstract base Class. Case study/examples in C++.

Unit 3: Exception Handling and File IO Streams
Exception Handling: Introduction, Exception Handling Mechanism - try, catch and throw, Multiple Exceptions.
File and IO Streams: Stream and Files, Stream Classes, File Pointers, File I/O with Member Functions. Case study/examples in C++.

Unit 4: Advance Concepts of OOP
Templates: Introduction to Template, types of templates, Function Template. overloading Function templates, Class Template
STL: STL components, Containers - Sequence Containers and Associative Containers, Container Adapters, Application of Container: vector, list, Algorithms: searching and sorting. Introduction to iterator.

Laboratory Exercises / Practical:

1. Implements basic concept of object, classes, static members and friend functions in C++.
2. Implements constructors and destructors in C++.
3. Implement the concept of inheritance in C++.
4. Implement the concept of polymorphism and pure virtual function in C++.
5. Implement concept of exceptions handling in C++.
6. Implement file handling and File input output operations in C++.
7. Implement template in C++.
8. Implement concept of STL in C++.
9. Mini Project

Every student will carry out minimum *Eight Practical*/exercises based on the above units and submit the journal, which will be evaluated as part of continuous assessment.

Learning Resources:

Text books:

1. Robert Lafore, 'Object-Oriented Programming in C++', Fourth Edition, Sams Publishing, ISBN: 0672323087, ISBN-13: 978-8131722824
2. Deitel, "C++ How to Program", 10th Edition, Pearson Education, ISBN 13: 9780134448237.

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Reference Books:

1. Herbert Schildt, 'C++ The Complete Reference', Eighth Edition, McGraw Hill Professional, 2011, ISBN-13: 978-0072226805
2. Bjarne Stroustrup, 'The C++ Programming language', Seventh Edition, Pearson Education. ISBN: 9788131705216.
3. K. R. Venugopal, Rajkumar Buyya, T. Ravishankar, 'Mastering C++', Tata McGraw-Hill, ISBN 13: 9780074634547
4. E.Balaguruswamy, "Object-Oriented Programming with C++", 7th edition, Graw-Hill Publication, ISBN 10:9352607996 ISBN 13:9789352607990

Supplementary Reading:

1. Power Point Slides
2. Lab Manual
3. Question Bank
4. Practice Assignments

Web Resources:

1. https://www.springer.com/gp/book/9781852334505
2. https://www.ebookphp.com/object-oriented-programming-in-c-epub-pdf/
3. https://www.springer.com/gp/book/9781447133780

MOOCs:

1. https://www.coursera.org/learn/c-plus-plus-a
2. https://nptel.ac.in/courses/106/105/106105151/

Pedagogy:

1. PPTs
2. Practical Demos
3. Videos
4. Expert lectures

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COURSE STRUCTURE

Course Code	MST2PF01A				
Course Category	Program foundation				
Course Title	Differential Equations and Transform Techniques				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	3	1	--	--	4
Credits	3	1	--	--	4
Assessment Schema Code	TT1				

Prerequisites: Linear Algebra and **Differential** Calculus, Integral Calculus.

Course Objectives:

1. To learn linear differential equations and their applications in Engineering.
2. To learn partial differential equation and their applications.
3. To understand Laplace transform techniques and solve differential equations using Laplace transforms.
4. To understand Fourier transforms techniques and their applications.
5. To learn Z transforms for solving difference equations.

Course Outcomes:

After completion of this course students will be able to:

1. identify first order & higher order linear differential equations & solve these equations using various methods. (CL I & III)
2. understand the concept of partial differential equations used in boundary value problems (CL II & III)
3. solve heat equation & wave equation using the method of separation of variables CL III)
4. apply Laplace transform techniques to solve ordinary differential equations. (CL III)
5. apply Fourier transform techniques to solve differential equations involved in real life engineering problems. (CL III).
6. understand Z transforms concept with their properties for solving difference equations (CL II& III)

Course Contents:

Unit 1 Linear Differential Equation:

Review of first order differential equations, Linear Differential Equation of n^{th} order with constant coefficients, Method of variation of parameters, Cauchy's and Legendre's Differential Equations, Applications of Linear differential equations-mass spring systems and electrical circuits. (branch specific).

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Unit 2: Partial Differential Equations:

Basic concepts, Solution of Partial Differential equations, method of separation of variables for the solution of one- and two-dimensional Heat flow equations, Wave equation.

Unit 3: Laplace Transform:

Definition, Properties, Laplace Transform of standard functions, Laplace transform of some special functions, Inverse Laplace Transform, Applications of Laplace Transform for solving Ordinary differential equations.

Unit 4: Fourier Transform:

Introduction of Fourier series, half range sine & cosine series, Fourier Integral theorem, Fourier Sine and Cosine Transforms, Inverse Fourier Transform. Finite Fourier Transform, Applications of Fourier transforms to problems on one- and two-dimensional heat flow problems.

Unit 5: Z Transform:

Definition, Properties, Z- transform of standard sequences and their inverse, solution of difference equations.

Tutorial Exercises:

1. Linear Differential Equations solution by Shortcut method
2. General, Variation of Parameter methods
3. Applications of Linear Differential Equations.
4. Wave equation,
5. One dimensional Heat flow equations.
6. Two-dimensional Heat flow equations
7. Laplace transform of standard functions
8. Laplace transform of special functions
9. Inverse Laplace Transform
10. Solve ODE using Laplace transform
11. General Fourier transform
12. Fourier Sine and Cosine Transforms.
13. Applications of Fourier transforms to problems on one- and two-dimensional heatflow problems.
14. Problems on Z transforms-standard sequences
15. Inverse Z transform & solution of difference equation.

Note: Introduce Mathematical Software for few tutorials conduction. Tutorial shall be engaged in four batches (batch size of 15 students) per division.

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Learning Resources:

Reference:

1. Kreyszig Erwin, "Advanced Engineering Mathematics" 10th edition, Wiley Eastern Limited 2015.
2. Greenberg Michael D.,"Advanced Engineering Mathematics", 2nd edition, Pearson 2009.
3. Grewal B.S., "Higher Engineering Mathematics" ,43rd edition Khanna Publishers 2014

Supplementary Reading:

1. O' Neil Peter, "Advanced Engineering Mathematics", 8th edition, Cengage Learning2015.
2. Weber H.J. and Arfken G.B. "Mathematical Methods For Physicists" , 6th edition,Academic Press 2011.
3. Maurice D Weir,Joel Hass, Frank R Giordano, " Thomas' Calculus" , 14th edition,Pearson 2009.

Web Resources:

Weblinks:

1. Introduction to second order LDE https://www.youtube.com/watch?v=tGtCajxHoDw
2. Fourier Transform, Fourier Series, and frequency spectrum
3. https://www.youtube.com/watch?v=r18Gi8lSkfM

MOOCs: Online courses for self-learning: NPTEL, MIT OPEN COURSEWARE

1. https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/
2. https://ocw.mit.edu/courses/mathematics/18-03-differential-equations-spring-2010/video-lectures/lecture-9-solving-second-order-linear-odes-with-constant-coefficients/
3. http://nptel.ac.in/courses/111103021/18
4. https://ocw.mit.edu/courses/mathematics/18-02-multivariable-calculus-fall-2007/video-lectures/lecture-8-partial-derivatives/

Pedagogy:

- Team Teaching
- Tutorials and class tests/assignments
- Audio- Video technique

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COURSE STRUCTURE

Course Code	CSE2PM01A				
Course Category	Program Major				
Course Title	Data Structures				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	3	--	--	--	3
Credits	3	--	--	--	3
Assessment Schema Code	TT1				

Prerequisites:

Programming Foundations

Course Objectives:

1. Knowledge

i. Learn the data structure and its fundamental concept.

2. Skills

i. Understand the different Linear and nonlinear data structures such as Arrays, Stacks, Queues Trees and Graph.

ii. Study the different Sorting Techniques and concepts of Heap and Trees

3. Attitude

i. Learn how to apply Data Structures to solve Real-life Problems

Course Outcomes:

After completion of this course students will be able to:

1. To demonstrate the use of sequential data structures
2. To analyse different sorting algorithms so as to understand their applications
3. To develop skills for writing and analysing algorithms to solve domain problems
4. To choose appropriate non-linear data structures to solve a given problem

Course Contents:

UNIT 1 Introduction to Data Structures:

Data, Data Objects, Abstract Data types (ADT) and Data Structures, Types of data structures (Linear and Non-linear, Static and dynamic) Introduction to algorithms Analysis of Algorithms- Space complexity, Time complexity, Asymptotic notations-Big-O, Theta and Omega, Sorting: Types of Sorting-Internal and External Sorting, General Sort Concepts-Sort Order, Stability, Efficiency, and Number of Passes, Comparison Based Sorting Methods-Bubble Sort, Insertion Sort, Selection Sort, Shell Sort, Comparism of all sorting algorithm

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UNIT 2 Linear Data Structures: Arrays

Array as an Abstract Data Type, Sequential Organization, Storage Representation and their Address Calculation: Row major and Column Major, Multidimensional Arrays: Concept of Ordered List, Single Variable Polynomial: Representation using arrays, Polynomial as array of structure, Polynomial addition, Polynomial evaluation and Polynomial multiplication. Sparse Matrix: Sparse matrix representation using array, Sparse matrix addition, Transpose of sparse matrix- Simple and Fast Transpose, Time and Space trade-off.

UNIT 3: Stacks and Queues:

Stacks: Stack as an Abstract Data Type, Representation of Stack Using Sequential Organization, stack operations, Applications of Stack- Expression Conversion and Evaluation, Linked Stack and Operations, Recursion.
Queues: Queue as Abstract Data Type, Representation of Queue Using Sequential Organization, Queue Operations Circular Queue, Advantages of Circular queues, Linked Queue and Operations Deque-Basic concept, types (Input restricted and Output restricted), Application of Queue: Job scheduling.

UNIT 4: Linked List:

Linked List as an Abstract Data Type, Representation of Linked List Using Sequential Organization, Representation of Linked List Using Dynamic Organization, Types of Linked List: singly linked, Circular Linked Lists, Doubly Linked List, Primitive Operations on Linked List, Polynomial Manipulations-Polynomial addition. Generalized Linked List (GLL) concept, Representation of Polynomial using GLL.
Case Study: Garbage Collection

UNIT 5: Tree and Heap:

Tree- Basic Terminology, Binary Tree- Properties, Converting Tree to Binary Tree, Representation using Sequential and Linked organization, Binary tree creation and Traversals, Operations on binary tree. Binary Search Tree (BST) and its operations, threaded binary tree- Creation and Traversal of In-order Threaded Binary tree.
Heap- Heap as a priority queue, Heap sort.

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Learning Resources:

Text Books:

1. Fundamentals of Data Structures, E. Horowitz, S. Sahni, S. A-Freed, Universities Press
2. Data Structures and Algorithms, A. V. Aho,. J E. Hopperoft,. J D. UIlman, Pearson.

Reference Books:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth.
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, The MIT Press.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning), (Thirty First Edition), Pat Morin, UBC Press.

Supplementary Reading:

1. Aaron Tanenbaum, "Data Structures using C", Pearson Education.
2. R. Gilberg, B. Forouzan, "Data Structures: Apseudo code approach with C", Cenage Learning.

Web Resources:

Weblinks:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

MOOCs:

1. https://nptel.ac.in/courses/106103069

Pedagogy:

- Power point presentations
- Videos
- Co-teaching
- Systematic use of group work and project-based learning.

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COURSE STRUCTURE

Course Code	CSE2PR02A				
Course Category	Program Major				
Course Title	Data Structures Laboratory				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	--	--	3		1
Credits	--	--	3		1
Assessment Schema Code	PJ				

Prerequisites:

Programming Foundations

Course Objectives:

1. **Knowledge**
   i. Learn to implement Data structures concepts.

2. **Skills**
   i. Understand the implementation of different Linear and nonlinear data structures such as Arrays, Stacks, Queues Trees and Graph.
   ii. To Implement Different Sorting Techniques and concepts of Heap and Trees

3. **Attitude**
   i. Learn how to implement Data Structures to solve Real-life Problems

Course Outcomes:

After completion of this course students will be able to:

1. To Implement basic data structures such as arrays, linked lists, stacks, and queues in a programming language.
2. To Apply data structures to solve a real-world problem and present the solution
3. Demonstrate the ability to implement data structures in a chosen programming language

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Course Contents:

Laboratory Exercises / Practical:

Assignment No.	Contents	Workload in Hrs
		Lab
1	Write a program to create a student database using an array of structures. Apply sorting techniques (Bubble sort , Insertion Sort, Selection Sort).	02
2	Write a C program for sparse matrix realization and operations on it- Simple Transpose, Fast Transpose.	02
3	Implement stack as an ADT and apply it for different expression conversions (infix to postfix or infix to prefix (Any one), prefix to postfix or prefix to infix, postfix to infix or postfix to prefix (Any one)).	04
4	Queues are frequently used in computer programming, and a typical example is the creation of a job queue by an operating system. If the operating system does not use priorities, then the jobs are processed in the order they enter the system. Write a program for simulating job queue. Write functions to add job and delete job from queue.	02
5	Department of Computer Engineering has student's club named 'Pinnacle Club'. Students of second, third and final year of department can be granted membership on request. Similarly, one may cancel the membership of club. First node is reserved for president of club and last node is reserved for the secretary of the club. Write C program to maintain club member 's information using singly linked list. Store student PRN and Name. Write functions to: a) Add and delete the members as well as president or even secretary. b) Compute total number of members of club c) Display members d) sorting of two linked list e) merging of two linked list f) Reversing using three pointers	06
6	Implement binary tree and perform following operations: Creation of binary tree and traversal recursive and non-recursive.	04
7	Implement a dictionary using a binary search tree where the dictionary stores keywords & its meanings. Perform following operations: • Insert a keyword • Delete a keyword • Create mirror image and display level wise • Copy	04
8	Implement a threaded binary tree. Perform inorder traversal on the threaded binary tree.	02

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9	Read the marks obtained by students of second year in an online examination of a particular subject. Find the maximum and minimum marks obtained in that subject. Use heap data structure and heap sort.	02

Learning Resources:

Text Books:

1. Fundamentals of Data Structures, E. Horowitz, S. Sahni, S. A-Freed, Universities Press
2. Data Structures and Algorithms, A. V. Aho,. J E. Hopcroft, J D. Ullman, Pearson.

Reference Books:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth.
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, The MIT Press.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning), (Thirty First Edition), Pat Morin, UBC Press.

Supplementary Reading:

1. Aaron Tanenbaum, "Data Structures using C", Pearson Education.
2. R. Gilberg, B. Forouzan, "Data Structures: Apseudo code approach with C", Cenage Learning.

Web Resources:

Weblinks:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

MOOCs:

1. https://nptel.ac.in/courses/106103069

Pedagogy:

- Power point presentations
- Videos
- Laboratory Implementation

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COURSE STRUCTURE

Course Code	CSE2PR04A				
Course Category	Project				
Course Title	Project Based Learning – I				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	--	--	--	3	3
Credits	--	--	--	1	1
Assessment Schema Code	PJ				

Prerequisites: CSE1PR01A: Foundations of Computer Architecture and System Design

Course Objectives:

By participating in and understanding all facets of this Course a student will be able:

1. Impart knowledge about assembly language programs of 8086
2. To program assembly language programming of 8086 Microprocessor
3. To perform experiments on assembly language programming of 8051 Microcontroller.

Course Outcomes:

After completion of this course students will be able to:

1. Apply the fundamentals of assembly level programming of microprocessors and microcontroller.
2. Implement logical operations (Converting packed BCD to ASCII and ASCII to packed BCD), and Arithmetic Operations.
3. Ability to design and build functional prototype for real world applications.

Laboratory Exercises / Practical:

1. Write X86/64 ALP to add an array of N hexadecimal numbers.
2. Write an ALP to sort 8 bit numbers in ascending/descending order.
3. Write X86/64 ALP to display the contents of system registers GDTR and MSW.
4. Write X86/64 ALP to perform string operations (Concatenation, sub string, number of lines / words / character /spaces)
5. Write X86/64 ALP to simulate any one of the following Linux commands.
6. Linux Commands: 'cp', 'cat' Take file name from user as a command line
7. Write an 8051 Microcontroller program for Addition/Subtraction of two 8/16-bit numbers (Using Registers & Memory)
8. Write an 8051 Microcontroller program for block transfer.
9. Case Study on Timer Programming/Serial Programming

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10. Project Based Learning: Design and develop 8051 microcontroller based systems using Timer, Serial communication, Interfacing and programming of: ADC & DAC and Sensor, Interfacing 4x4 keyboard matrix, LCD, 7 segment display, Stepper Motor Interfacing.

Note:

1. Each student is required to perform a minimum of six practical exercises based on a specified list. The students are expected to document their activities in a journal. The submitted journal will be evaluated as part of continuous assessment.
2. A group of four students will collaborate on a Problem-Based Learning (PBL) activity. This activity is based on the eighth practical exercise. The group is required to submit a report along with a presentation. PBL activity will be assessed as part of the Lab Continuous Assessment.
3. Use Assembly Language Programming Tools: Operating System: Latest 64-bit Version and update of Microsoft Windows 7/ Windows 8 Operating System onwards or 64-bit Open source Linux or its derivative.
4. Programming Tools: Preferably using Linux equivalent or NASM 64x
5. Use EdSim 51/ Keil Simulator for implementation of assignments based on 8051 Microcontroller.

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COURSE STRUCTURE

Course Code	CSE2PM02A				
Course Category	Program Major				
Course Title	Microprocessor, Microcontroller and Applications				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	3	--	--	--	3
Credits	3	--	--	--	3
Assessment Schema Code	TT1				

Prerequisites:

CSE1PR01A: Foundations of Computer Architecture and System Design

Course Objectives:

By participating in and understanding all facets of this Course a student will be able:

1. To learn the architecture and programming of Pentium Microprocessor
2. To understand the operating modes and memory management mechanism of Pentium Processor.
3. To provide insight to protection and multitasking environment of Pentium Processor.
4. To understand the internal architecture of 8051 Microcontrollers.
5. To learn and implement the architectural Features of 8051 Microcontroller.

Course Outcomes:

After completion of this course students will be able to:

1. Describe the Pentium features, system architecture thoroughly and develop 80x86 Assembly language programs for various applications.
2. Illustrate the working of memory management unit in protected mode of Pentium.
3. Interpret the mechanism of Protection and Task Management in Pentium.
4. Demonstrate the knowledge of the 8051-microcontroller instruction set and addressing Modes.
5. Interpret the features of the 8051 Microcontroller for various applications.

Course Contents:

Unit 1: Pentium Architecture:

Evolution of Microprocessors: 8086 to Pentium, Pentium features, Pentium superscalar architecture – Pipelining, Branch prediction, Instruction and Data caches, The Floating-Point Unit: features, pipeline stages & data types, Pentium programmer's model, Register set, System registers, addressing modes, Instruction set.

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Unit 2: Pentium operating modes & Memory Management Unit:
Pentium Modes of Operation, Pentium Real address mode, Memory organization, Memory segments, Segment Registers, Logical to Physical address generation, Related instructions, protected mode: Segmentation unit support registers, Segment Memory descriptors, logical to linear address translations, Paging Unit: support registers, related data structures, linear to physical address translation

Unit 3: Pentium Processor: Protection and Task Management Mechanism:
Protection by segmentation, Privilege-levels, Rules of inter-privilege level transfer for data and code segments, Page level protection, Task Management, Support registers, related data structures, Task switching.

Unit 4: Introduction to Microcontroller 8051
Brief History, Classification of MCS-51family based on their features (8051, 8052, 8031, 8751, AT89C51), Pin configuration, Micro-controller 8051 architecture, 8051 Features, Programmer's Model-Register set, Register bank, addressing modes, Instruction set, Memory organization: on-chip and external memory components, Stack, power reset and clocking circuits, I/O port structure, Assembly Language Programming.

Unit 5: Application of Microcontroller 8051
Timer registers - Timer0, Timer1. Configuration of TMOD (Timer Mode), TCON (Timer Control) registers. Timer modes- Mode1, Mode2 programming, Serial port and programming, Concept of Interrupt, interrupt versus polling, Types of interrupts in 8051, SFRs details for Interrupt structure and programming, Interfacing and programming of: ADC & DAC and Sensor, interfacing 4x4 keyboard matrix, Interfacing 4x4 keyboard matrix.

Laboratory Exercises / Practical:

1. Write X86/64 ALP to add an array of N hexadecimal numbers.
2. Write an ALP to sort 8 bit numbers in ascending/descending order.
3. Write X86/64 ALP to display the contents of system registers GDTR and MSW.
4. Write X86/64 ALP to perform string operations (Concatenation, sub string, number of lines / words / character /spaces)
5. Write X86/64 ALP to simulate any one of the following Linux commands.
6. Linux Commands: 'cp', 'cat' Take file name from user as a command line
7. Write an 8051 Microcontroller program for Addition/Subtraction of two 8/16-bit numbers (Using Registers & Memory)
8. Write an 8051 Microcontroller program for block transfer.
9. Case Study on Timer Programming/Serial Programming
10. Project Based Learning: Design and develop 8051 microcontroller based systems using Timer, Serial communication, Interfacing and programming of: ADC & DAC and Sensor, Interfacing 4x4 keyboard matrix, LCD, 7 segment display, Stepper Motor Interfacing.

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Note:

1. Each student is required to perform a minimum of six practical exercises based on a specified list. The students are expected to document their activities in a journal. The submitted journal will be evaluated as part of continuous assessment.
2. A group of four students will collaborate on a Problem-Based Learning (PBL) activity. This activity is based on the eighth practical exercise. The group is required to submit a report along with a presentation. PBL activity will be assessed as part of the Lab Continuous Assessment.
3. Use Assembly Language Programming Tools: Operating System: Latest 64-bit Version and update of Microsoft Windows 7/ Windows 8 Operating System onwards or 64-bit Open source Linux or its derivative.
4. Programming Tools: Preferably using Linux equivalent or NASM 64x
5. Use EdSim 51/ Keil Simulator for implementation of assignments based on 8051 Microcontroller.

Learning Resources:

Text Books:

1. James Antonakos, "The Pentium Microprocessor", 2004, Pearson Education ISBN – 81-7808-545
2. The 8051 microcontroller: architecture, programming, and applications, Kenneth J. Ayala. p. cm. Includes index. ISBN 0-314-77278-2 (soft)

Reference Books:

1. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and McKinlay Rolin D., "The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson, 2nd Edition, 2006
2. Barry B. Brey, "The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, PentiumPro Processor, PentiumII, PentiumIII, Pentium IV, Architecture, Programming & Interfacing", Eighth Edition, Pearson Prentice Hall, 2009

Supplementary Reading:

Web Resource

1. https://www.intel.com/content/dam/www/public/us/en/documents/manuals/64-ia-32-architectures-software-developer-vol-3a-part-1-manual.pdf
2. https://www.cs.cmu.edu/~410/doc/intel-isr.pdf

MOOCs:

1. https://nptel.ac.in/courses/108/105/108105102/

Pedagogy:

- Power point presentations
- Videos
- Demonstrations
- Systematic use of group work and project-based learning.

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COURSE STRUCTURE

Course Code	CSE2PM03A				
Course Category	Program Major				
Course Title	Computer Networks				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	3	--	--	--	3
Credits	3	--	--	--	3
Assessment Schema Code	TT1				

Prerequisites: Basics of Computer, Hardware Basics, Programming skills in Java, Python

Course Objectives:

1. Understand the fundamental concepts of Networking
2. Describe different network architectures, such as client-server and peer-to-peer
3. Understand the role of protocols in ensuring communication between devices
4. Understand the OSI model and the TCP/IP protocol suite
5. Understand the concept of subnetting and its application in network design

Course Outcomes:

After completion of this course students will be able to:

1. Identify characterizing features of transmission techniques.
2. Recall and demonstrate working of flow control & error control protocols.
3. Select routing protocol to Develop fully-functional simulation to simulate it's working.
4. Define connection oriented & connectionless transport layer protocols & build working applications based on it.
5. Choose application layer protocol and make use of it in a suitable environment.

Course Contents:

Unit 1: Fundamentals of Networking and Data communication

Analog Transmission: Analog-to-Analog conversion, Digital-to-Analog conversion, Digital Transmission: Digital-to-Digital conversion (line coding, block coding, scrambling), Analog-to-Digital conversion (Pulse Code Modulation, Delta Modulation), Introduction to Inter Networking Devices and Intra Networking. Network Topologies, Types of Networks, Network Architectures, Transmission media's, OSI Model, TCP/IP Reference Model, Ethernet standards

Unit 2: Data Link Layer Services

Types of errors, Block coding, Error Control: Cyclic Redundancy Check (CRC) Code, Hamming Code, Checksum, sliding window Protocols: Selective Repeat (SR), sliding window Protocols: Go Back N (GBN), Channel allocation, Multiple Access Protocols: ALOHA, CSMA/CD, CSMA/CA, Ethernet Frame format

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Unit 3: Network Layer
Services, Switching Techniques: Datagram Approach, Virtual-Circuit Approach, Internet Protocol: Ipv4 & Ipv6, Classful Addressing, Classless Addressing, CIDR, Subnetting, NAT, ICMP, ARP, RARP, Routing Algorithms: Distance-Vector (DV) Routing, Link State (LS) Routing, Routing in Internet: RIP, OSPF, BGP

Unit 4: Transport Layer
Services, Multiplexing, demultiplexing, Sockets, UDP, RTP, TCP: Services, Features, Segment, TCP Connection (Three-Way Handshake), Flow control and buffering, Silly window syndrome, Congestion Control, Congestion Control (Leaky Bucket, Token Bucket), Quality of Service (QoS)

Unit 5: Application Layer
Dynamic Host Control Protocol (DHCP), Hypertext Transfer Protocol (HTTP), FTP, TELNET, SMTP, POP3, IMAP, MIME, Domain Name System (DNS), SNMP

Learning Resources:

Text Books:

1. Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw Hill.
2. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", 5th Edition, Prentice Hall.

Reference Books:

1. Olivier Bonaventure, "Computer Networking: Principles, Protocols and Practice", Second Edition, The Saylor Foundation.
2. Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach", 4th Edition, Elsevier Science

Laboratory Reference Books:

1. Michael Palmer and Terry Schmidt, "Hands-On Networking Fundamentals", Second Edition, Course Technology/Cengage Learning
2. Russ White and Ethan Banks, "Computer Networking Problems and Solutions", 3rd Edition, Pearson Education

Supplementary Reading:

Web Resources:

1. https://www.netacad.com/
2. https://www.wireshark.org/
3. https://www.ietf.org/

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Weblinks:

1. https://www.networking-forums.com/
2. https://www.ietf.org/
3. https://www.javatpoint.com/computer-network-tutorial

MOOCs:

1. https://archive.nptel.ac.in/courses/106/105/106105183/
2. https://archive.nptel.ac.in/courses/106/106/106106243/

Pedagogy:

(You can add your own methods as applicable)

- Co-teaching
- Power point presentations
- Videos
- Demonstrations
- Systematic use of group work and project-based learning.

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COURSE STRUCTURE

Course Code	CSE2PM06A				
Course Category	Program Major				
Course Title	Computer Networks Laboratory				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	--	--	2	--	2
Credits	--	--	1	--	1
Assessment Schema Code	PJ				

Course Outcomes:

After completion of this course students will be able to:

1. Identify characterizing features of transmission techniques.
2. Recall and demonstrate working of flow control & error control protocols.
3. Select routing protocol to Develop fully-functional simulation to simulate it's working.
4. Define connection oriented & connectionless transport layer protocols & build working applications based on it.
5. Choose application layer protocol and make use of it in a suitable environment.

Laboratory Experiments / Software based Practical:

Assignment No.	Contents	Workload in Hrs
		Lab
1	**Design a Network: (Use: Packet Tracer/GNS)** Design a simple network (LAN) with different topologies & test itusing PING utility.	02
2	**Perform PC-PC Connection in real time environment.** Connect two machines by using cross -over cable and test it using PING utility. Also share a Folder on LAN environment with READ/WRITE permission.	04
3	**Configure VLAN: (Use: Packet Tracer/GNS)** Design and configure a virtual LAN.	02

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4	**Implement Error Control Protocol: (Language:C/C++/Python/Java) unit 2** Write a program for error detection and correction codes usingHamming Codes	04
5	**Subnetting: (Language: C/C++/Python/Java)/Packet Tracer** Write a program to implement subnetting to find subnet mask	02
6	**Static and Dynamic NAT Configuration** Implement Static andDynamic NAT Configuration with Packet Tracer	04
7	**Configure Routing Protocol: (Use: Packet Tracer/GNS)** Set up a network - configure interfaces, IP addresses and routingprotocols (RIP,OSPF,EIGRP,BGP).	04
8	**Exploration-of-TCP-and-UDP-Communication (Use: Packet Tracer/GNS)**	04
9	**DHCP, DNS and Web Server configuration (Use: Packet Tracer/GNS)** Configure network using Dynamic Host Configuration Protocol (DHCP), DNA and Web server Use Ping utility to test connectivity.	04

Learning Resources:

Text Books:

1. Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw Hill.
2. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", 5th Edition, Prentice Hall.

Reference Books:

1. Olivier Bonaventure, "Computer Networking: Principles, Protocols and Practice", Second Edition, The Saylor Foundation.
2. Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach", 4th Edition, Elsevier Science

Laboratory Reference Books:

1. Michael Palmer and Terry Schmidt, "Hands-On Networking Fundamentals", Second Edition, Course Technology/Cengage Learning
2. Russ White and Ethan Banks, "Computer Networking Problems and Solutions", 3rd Edition, Pearson Education

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Supplementary Reading:

Web Resources:

1. https://www.netacad.com/
2. https://www.wireshark.org/
3. https://www.ietf.org/

Weblinks:

1. https://www.networking-forums.com/
2. https://www.ietf.org/
3. https://www.javatpoint.com/computer-network-tutorial

MOOCs:

1. https://archive.nptel.ac.in/courses/106/105/106105183/
2. https://archive.nptel.ac.in/courses/106/106/106106243/

Pedagogy:

(You can add your own methods as applicable)

- Co-teaching
- Power point presentations
- Videos
- Demonstrations
- Systematic use of group work and project-based learning.

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COURSE STRUCTURE

Course Code	MST2PF03A				
Course Category	Program foundation				
Course Title	Probability and Statistics				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	3	1	--	--	4
Credits	3	1	--	--	4
Assessment Schema Code	TT1				

Prerequisites: permutation and combination, set theory.

Course Objectives:

1. To understand the concepts of statistical summary measures.
2. To learn discrete and continuous probability distributions models.
3. To learn about parametric tests used in hypothesis testing.

Course Outcomes:

After completion of this course students will be able to:

1. Use statistical methodology and tools in the engineering problem-solving process. (CL III)
2. Understand the basic concepts of random variables for analyzing data specific to an experiment (CL IV)
3. Use knowledge of basic probability theory in related engineering problems. (CL III)
4. Analyze the given probabilistic model of the problem. (CL IV)
5. Use statistical tests in testing hypothesis on data construct confidence intervals on parameters for a single sample. (CL III)

Course Contents:

Unit 1 Basic Statistics:

Introduction to statistics, Measures of central tendency, measures of dispersion, coefficient ofvariation, moments, skewness and kurtosis

Unit 2: Random variables:

Introduction of random variables, distribution function for discrete and continuous random variables, cumulative distribution function, joint distribution and joint density function, mathematical expectation and variance.

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Unit 3: Correlation and Regression:

Least square approximation-fitting of straight-line, second-degree parabola and exponential fit, Correlation, rank correlation, Linear regression.

Unit 4:

Probability distributions:

Basic probability, conditional probability, independent events, Bayes' theorem, Standard discretedistributions- Binomial distribution, Poisson distribution, exponential distribution and Geometricdistribution. Standard continuous distribution- Normal distribution.

Unit 5:

Estimation and Testing of Hypothesis:

Sampling and estimation of parameters, Standard error, Statistical hypothesis, testing a hypothesis, oneand two tailed tests of Hypothesis, Type I and Type II errors, level of significance, Chi - Square test, Students t-test, F-test.

Tutorial Exercises:

1. Measures of central tendency and dispersion, Coefficient of variation
2. Moments, skewness and kurtosis
3. correlation
4. Least square approximation, regression.
5. Conditional probability, Baye's rule
6. Probability distribution functions
7. Expectation and variance, joint distribution and joint probability distribution
8. Binomial, Poisson
9. Geometric distribution and Exponential distributions
10. Normal distribution
11. Chi square test
12. Students t test
13. F- test

Two tutorials will be conducted using Mathematical Software. Tutorial shall be engaged in four batches (batch size of 15 students) per division.

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Learning Resources:

Reference:

1. Ross Sheldon M., "Introduction to Probability and Statistics for Engineers and Scientists",Fifth Edition, 2014.
2. Gupta S. C. and Kapoor V. K., "Fundamentals of Applied Statistics", Third Edition, S. Chandand Sons, New Delhi, 1987.

Supplementary Reading:

1. De Groot Morris H. and Schervish Mark J., "Probability and Statistics", Fourth Edition, Pearson New International Edition, 2010

Web Resources:

Weblinks:

1. https://nptel.ac.in/courses/111/105/111105041/#
2. https://nptel.ac.in/courses/111/102/111102098/

MOOCs: Online courses for self-learning: NPTEL, MIT OPEN COURSEWARE

1. https://archive.nptel.ac.in/courses/111/105/111105090/
2. https://www.udemy.com/course/probability-and-statistics-complete-course/

Pedagogy:

- Team Teaching
- Tutorials and class tests/assignments
- Audio- Video technique

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COURSE STRUCTURE

Course Code	CSE2PM04A				
Course Category	Program Major				
Course Title	Database Management System				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	3	--	--	--	3
Credits	3	--	--	--	3
Assessment Schema Code	TT1				

Prerequisites:

Data Structures, Discrete Structures

Course Objectives:

1. Understand the fundamental concepts of database management System
2. To provide a strong formal foundation in database concepts, DBMS architectures recent
   a. technologies and best industry practices.
3. To learn the SQL database system.
4. To program PL/SQL including stored procedures, stored functions, cursors and packages.
5. To design the database system for real world applications.
6. To access, modify, program and authenticate the database system.

Course Outcomes:

After completion of this course students will be able to:

1. Understand the different data models.
2. Implement relational database design from any data model.
3. Create database system for real world applications
4. Handle the transaction management system.

Course Contents:

Unit 1: Introduction to DBMS And Data Modelling

DBMS Vs File Systems, Database System Architecture, Database Architectures: Centralized, Client-Server, Parallel, Distributed, Data Abstraction, Data Independence, Data Definition and Data Manipulation Languages, Data Models, E-R diagram: Components of E-R Model, Conventions, Keys, EER diagram Components, Reduce E-R diagram into Tables

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Unit 2: Relational Database Design and Normalisation
Relational Model: Attributes, Tuple, Domain, CODD's rule Relational Integrity, Referential Integrities, Enterprise Constraints, Normalisation: 1NF, 2NF, 3NF, BCNF, Functional dependency, Decomposition Query Processing: Overview, Measures of Query cost, Selection and Join operations, Evaluation of Expressions.

Unit 3: Relational Algebra and Database Programming
Relational Algebra, Basic Operations, Relational calculus: Tuple Calculus, Domain Calculus, Introduction to SQL, Characteristics and advantages of SQL, SQL Data Types, DDL Commands, DCL Commands. SQL Queries: DML Queries with Select Query Clauses, Creating, Modifying, Deleting. Views: Creating, Dropping, Updating, Indexes, SQL DML Queries, Set Operations, Predicates and Joins, set membership, Grouping and Aggregation, Aggregate Functions, Nested Queries

Unit 4: Introduction to Programming in SQL(PL/SQL)
PL/SQL Concepts: Basic PL/SQL block, PL/SQL Functions and Procedures, Different modes in procedure, Difference between functions and procedures, Cursors, Database Triggers. Exception Handling in PL/SQL.Application of DBMS

Unit 5: Relational Database Design and Normalisation
ACID properties, transactions, schedules and concurrent execution of transactions, serializability: View, Conflict. Concurrency control lock-based protocol (simple, 2 phases: Rigorous 2 phase, Strict 2 phase), Cascade-less Schedule, Recoverable Schedule,
Deadlocks: Prevention Techniques (Wait Die, Wound Wait), Detection Techniques, Database Recovery: Failure classification Recovery and atomicity: Log-based recovery, Shadow paging.

Laboratory Exercises / Practical:

1. Case Study on ER and Conversion of ER into Tables
2. SQL- DDL commands (Create, Alter, Drop, Truncate Rename, Describe), DCL (Grant, Revoke)
3. SQL- DML (Insert, Update, Delete), SQL Select- Logical IN, Negation, NULL, Comparison Operators. Where Clause, Between AND, Exists, ALL, LIKE
4. SQL Queries on Joins (Inner, Outer, Natural, Self)
5. SQL Queries on: Functions-Single Row, Aggregate Functions, Data Sorting, Subquery, Group by-Having, Set Operations, View. TCL Commands
6. MySQL and JAVA Connectivity
7. PL/SQL Procedures and Functions
8. PL/SQL Triggers
9. PL/SQL Cursors
10. Mini Project

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Every student will carry out minimum *Six Practical*/exercises based on the above units and submit the journal, which will be evaluated as part of continuous assessment.

Learning Resources:

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts 6th Ed, McGraw Hill, 2010.
2. Elmasri R. and Navathe S.B., "Fundamentals of Database Systems", 4th Edition, Pearson Education.

Reference Books:

1. Ramakrishnan, R. and Gherke, J., "Database Management Systems", 3rd Ed., McGraw-Hill.
2. Connolly T, Begg C.,Database Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition

Laboratory Reference Books:

1. Ivan Bayross, "SQL, PL/SQL: The Programming Language of Oracle", 3rd Edition BPB Publication
2. Reese G., Yarger R., King T., Williums H, "Managing and Using MySQL", O'Reilly Media, Inc., ISBN: 9780596002114, 2nd Edition

Supplementary Reading:

Web Resources:

1. https://www.mysql.com/
2. https://dev.mysql.com/doc/refman/8.0/en/create-procedure.html
3. https://www.oreilly.com/library/view/managing-using/0596002114/

Weblinks:

1. https://www.db-book.com/db6/slide-dir/
2. https://www.mysqltutorial.org/
3. https://www.sqlshack.com/learn-mysql-the-basics-of-mysql-stored-procedures/

MOOCs:

1. https://nptel.ac.in/courses/106105175
2. https://www.coursera.org/learn/Database-management

Pedagogy: (You can add your own methods as applicable)

1. Coteaching
2. Power point presentations
3. Videos
4. Demonstrations
5. Systematic use of group work and project-based learning.

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COURSE STRUCTURE

Course Code	CSE2PM07A				
Course Category	Program Major				
Course Title	Database Management System Laboratory				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	--	--	2	--	2
Credits	--	--	1	--	1
Assessment Schema Code	PJ				

Prerequisites:

Data Structures, Discrete Structures

Course Objectives:

1. Understand the fundamental concepts of database management System
2. To provide a strong formal foundation in database concepts, DBMS architectures recent
3. technologies, and best industry practices.
4. To learn the SQL database system.
5. To program PL/SQL including stored procedures, stored functions, cursors, and packages.
6. To design the database system for real-world applications.
7. To access, modify, program, and authenticate the database system.

Course Outcomes:

After completion of this course, students will be able to:

1. Understand the ER and Relational data models.
2. Implement relational database design from any data model.
3. Create a database system for real-world applications
4. Handle the transaction management system.

Laboratory Exercises / Practical:

1. Case Study on ER and Conversion of ER into Tables
2. SQL- DDL commands (Create, Alter, Drop, Truncate Rename, Describe), DCL (Grant, Revoke)
3. SQL- DML (Insert, Update, Delete), SQL Select- Logical IN, Negation, NULL, Comparison Operators. Where Clause, Between AND, Exists, ALL, LIKE
4. SQL Queries on Joins (Inner, Outer, Natural, Self)
5. SQL Queries on: Functions-Single Row, Aggregate Functions, Data Sorting, Subquery, Group by-Having, Set Operations, View. TCL Commands
6. MySQL and JAVA Connectivity
7. PL/SQL Procedures and Functions
8. PL/SQL Triggers

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9. PL/SQL Cursors
10. Mini Project

Every student will carry out minimum *Six Practical*/exercises based on the above units and submit the journal, which will be evaluated as part of continuous assessment.

Learning Resources:

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts 6th Ed, McGraw Hill, 2010.
2. Elmasri R. and Navathe S.B., "Fundamentals of Database Systems", 4th Edition, Pearson Education.

Reference Books:

1. Ramakrishnan, R. and Gherke, J., "Database Management Systems", 3rd Ed., McGraw-Hill.
2. Connolly T, Begg C.,Database Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition

Laboratory Reference Books:

1. Ivan Bayross, "SQL, PL/SQL: The Programming Language of Oracle", 3rd Edition BPB Publication
2. Reese G., Yarger R., King T., Williums H, "Managing and Using MySQL", O'Reilly Media, Inc., ISBN: 9780596002114, 2nd Edition

Supplementary Reading:

Web Resources:

1. https://www.mysql.com/
2. https://dev.mysql.com/doc/refman/8.0/en/create-procedure.html
3. https://www.oreilly.com/library/view/managing-using/0596002114/

Weblinks:

1. https://www.db-book.com/db6/slide-dir/
2. https://www.mysqltutorial.org/
3. https://www.sqlshack.com/learn-mysql-the-basics-of-mysql-stored-procedures/

MOOCs:

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1. https://nptel.ac.in/courses/106105175
2. https://www.coursera.org/learn/Database-management

Pedagogy: (You can add your methods as applicable)

- Coteaching
- Power point presentations
- Videos
- Demonstrations
- Systematic use of group work and project-based learning.

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Dr. Vishwanath Karad
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COURSE STRUCTURE

Course Code	CSE2PM09A				
Course Category	Program Major				
Course Title	Design and Analysis of Algorithms				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	3	--	--	--	3
Credits	3	--	--	--	3
Assessment Schema Code	TT1				

Prerequisites:
Data Structures, Discrete Structures

Course Objectives:

1. To understand problem solving and problem classification.
2. To know the basics of computational complexity analysis of algorithms.
3. To provide students with foundations to deal with a variety of computational problems using different design strategies.
4. To understand the concept of nondeterministic polynomial algorithms.
5. To select and apply appropriate algorithm design strategies to solve real-world problems.

Course Outcomes:
After completion of this course students will be able to:

1. Calculate computational complexity using asymptotic notations for various algorithms.
2. Apply Divide &Conquer as well as Greedy approach to design algorithms
3. Understand and analyse optimization problems using dynamic programming.
4. Illustrate different problems using Backtracking and compare different methods of Branch and Bound strategy.
5. Classify P, NP, NP-complete, NP-Hard problems.

Course Contents:

Unit 1: Analysis of Algorithm: Efficiency- Analysis framework, asymptotic notations – big O, theta and omega.
Analysis of Non-recursive and recursive algorithms: Solving Recurrence Equations using Masters theorem and Substitution method.
Searching: Search Techniques-Sequential Search/Linear Search, Binary Search.
Unit 2: Divide and Conquer: introduction, Principle, control abstraction, Quick Sort, Merge sort, Large Integer multiplication/ Stressen matrix multiplication,

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Greedy strategy: Principle, control abstraction, Knapsack problem, Job sequencing with Deadlines, Huffman Encoding

Unit 3: Symbol Table-Representation of Symbol Tables- Static tree table and Dynamic tree table, Weight balanced tree - Optimal Binary Search Tree (OBST), OBST as an example of Dynamic Programming, Height Balanced Tree- AVL tree

Graph- Basic Terminology, Graphs (Directed, Undirected), Various Representations, Traversals & Applications of graph- Prim's and Kruskal's Algorithms, Dijsktra's Single source shortest path, Analysis complexity of algorithm, topological sorting.

Dynamic Programming: Principle of optimality, 0/1 Knapsack, Largest Common Subsequence, Multistage Graph problem (using Forward computation), Traveling Salesman Problem.

Unit 4: Backtracking: Recursive backtracking algorithm, Iterative backtracking method, 8-Queen problem, Hamiltonian Cycle, 0/1 Knapsack Problem
Branch –N -Bound: Branch–N-Bound method, Control abstractions for Least Cost Search, Bounding, FIFO branch and bound, LC branch and bound

Unit 5: Complexity Theory

Computational Complexity, NP, NP Complete, NP Hard

Hashing- Concepts-hash table, hash function, basic operations, bucket, collision, probe, synonym, overflow, open hashing, closed hashing, perfect hash function, load density, full table, load factor, rehashing, issues in hashing, hash functions- properties of good hash function, division, multiplication, extraction, mid-square, folding and universal, Collision resolution strategies- open addressing and chaining, Hash table overflow- open addressing and chaining.

Learning Resources:

Text Books:

1. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm" Third Edition, PHI
2. Horowitz, Sahni & Rajasekaran, "Fundamentals of Computer Algorithms", 2ND Edition. University Press.

Reference Books:

1. Gilles Brassard and Paul Bartley, "Fundamental of Algorithms", PHI, New Delhi.
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithms" Pearson Education
3. Parag Dave, Himanshu B Dave," Design and analysis of Algorithms",2/e Pearson
4. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani," Algorithms", 1 edition, McGraw-Hill Education;

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Supplementary Reading:

1. Jon Kleinberg, EvasTardos, "Algorithm Design", Pearson Education
2. S. Srihar , " Design and Analysis of Algorithm", Oxford University Press

Web Resources:

1. https://nptel.ac.in/courses/106106131/
2. https://nptel.ac.in/syllabus/106101060/
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/lecture-notes/

Web links:

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/lecture-videos/

MOOCs:

1. https://swayam.gov.in/nd1_noc19_cs47/preview
2. https://www.edx.org/course/algorithm-design-analysis-pennx-sd3x
3. https://www.coursera.org/specializations/algorithms

Pedagogy:

- Power Point Presentation
- Video Lectures
- Flipped Classroom Activity
- Think Pair & Share
- Model Based Learning
- Chalk and Board

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COURSE STRUCTURE

Course Code	CSE2PR05A				
Course Category	Program Major				
Course Title	Project Based Learning – II				
Teaching Scheme	Lectures	Tutorials	Laboratory / Practical	Project	Total
Weekly load hours	--	--	3		1
Credits	--	--	3		1
Assessment Schema Code	PJ				

Prerequisites: Programming Data Structures, Discrete Structures

Course Objectives:

1. To understand problem solving and problem classification.
2. To understand various algorithmic strategies to approach the problem solutions.
3. To build the logic to use appropriate data structure in logical and computational solution

Course Outcomes:

After completion of this course students will be able to:

1. To analyse the algorithmic solution for resource requirement and optimization.
2. To apply data statures for solving a problem of various domain.
3. To demonstrate the ability to applying different algorithmic strategies.

Laboratory Experiments / Software based Practical

Assignment No.	Contents	Workload in Hrs Lab
1	Write a program for Iterative and Recursive Binary Search and verify the time complexity. Write a program to perform quick/merge sort using Divide and Conquer strategy and verify the time complexity.	2
2	Consider a friend's network on Facebook social web site. Model it as a graph to represent each node as a user and a link to represent the friend relationship between them using adjacency list representation and perform DFS and BFS traversal on the above graph.	4

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3	Write a program for Minimum Spanning Trees using Greedy approach (Kruskal's / Prim's algorithm).	4
4	Write a program to implement AVL tree	2
5	Implement direct access file using hashing (linear probing with and without replacement) perform following operations on it a) Create Database b) Display Database c) Add a record d) Search a record e) Modify a record	4
6	Implement 0/1 Knapsack OR Traveling Salesperson problem using Dynamic Programming.	4
7	Write a program for Hamiltonian Problem OR N-Queen problem using Backtracking approach	4
8	Write a program for Huffman Coding OR 0/1 knapsack problem using Greedy approach.	4

Learning Resources:

Text Books:

1. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm" Third Edition, PHI
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1. Gilles Brassard and Paul Bartley, "Fundamental of Algorithms", PHI, New Delhi.
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3. Parag Dave, Himanshu B Dave," Design and analysis of Algorithms",2/e Pearson
4. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani," Algorithms", 1 edition, McGraw-Hill Education;

Supplementary Reading:

1. Jon Kleinberg, EvasTardos, "Algorithm Design", Pearson Education
2. S. Srihar , " Design and Analysis of Algorithm", Oxford University Press

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2. https://nptel.ac.in/syllabus/106101060/
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/lecture-notes/

Web links:

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/lecture-videos/

MOOCs:

1. https://swayam.gov.in/nd1_noc19_cs47/preview
2. https://www.edx.org/course/algorithm-design-analysis-pennx-sd3x
3. https://www.coursera.org/specializations/algorithms

Pedagogy:

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- Video Lectures
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- Think Pair & Share
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