



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 ENGINEERING AND TECHNOLOGY**

**B. Tech (Computer Science & Engineering)**

**BATCH 2024 – 2028**

## **PROGRAMME STRUCTURE**

### ***Preamble:***

The Computer Engineering and Technology is the most sought-after branch of Engineering in today's world. With the advancements in hardware and software technologies, there is huge scope for development of a wide range of applications. The Internet and allied technologies have connected the world cohesively offering immense opportunities at national and international levels. The students of MITWPU will be tomorrow's global leaders, researchers, entrepreneurs and change-makers. MITWPU has the objective to make them competent for global scenarios.

The B. Tech (CSE) curriculum offers a varied range of subjects that fall into the core, specialization and basic sciences categories. The programme also has provisions for pursuing Industry projects, Internships, Foreign and National study tours, Interdisciplinary Projects as a prudential aspect of the course curriculum. The value-based education is ensured by offering Peace related subjects and Yoga practice.

The curriculum is based on the theme of Continuous Evaluation. Theory and Laboratory components are given appropriate importance. The communication skills are enhanced through the component of Seminars. Industry exposure is given through Internships / Projects, and development of latest Technologies is achieved and enhanced through usage of latest Tools.

The curriculum will transform the students into winning personalities.

**Dr. Mangesh Bedekar**

Professor and Dean,  
School of Computer Science and  
Engineering

## *Vision and Mission of the Programme*

### **VISION**

To be an academic centre of excellence in Computer Science and Engineering to cater to societal needs.

### **MISSION**

- To create conducive environment for nurturing integrity, discipline and technical knowledge in emerging areas of computer science and engineering.
- To encourage students to work in trans-disciplinary domain in collaboration with industry and to inculcate research mindset.
- To develop globally competent graduates to provide solutions for societal problems.

## *Programme Educational Objectives*

The Computer Engineering and Technology Graduate will:

**PEO 1 Competent Professionals:** Identify and effectively solve real life problems with sustainable solutions.

**PEO 2 Multifaceted Professionals:** Exhibit technical knowledge, research aptitude and innovative mindset to excel in multidisciplinary domains.

**PEO 3 Ethical Professionals:** Pursue ethical values, leadership and interpersonal skills during their professional careers for well-being of society.

## *Programme Outcomes (POs)*

Computer Engineering and Technology Graduates will be able to:

- PO1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4 Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6 The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10 Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11 Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12 Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **Programme Specific Outcomes (PSOs)**

Computer Engineering and Technology Graduates will be able to:

**PSO 1** Analyse, design and develop computer-based systems to solve real life problems by applying knowledge of Computer Science and Engineering.

**PSO 2** Apply knowledge acquired through self-learning to implement computing systems in diverse domains of Computer Science and Engineering.

**PSO 3** Constructive mindful approach to architect innovative IT solutions with acumen for entrepreneurship, research and zest for higher studies.

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

<b>Course Basket</b>	<b>Credits Assigned</b>
Program Core	114
Program Electives	16
University Electives	24
University Electives	9
<b>Total</b>	<b>163</b>

**Assessment Scheme:**

<b>Abbreviation</b>	<b>L-T-P-J-C: L-Lecture, T-Tutorial, P-Practical, J-Project, C-Total Credits.</b> <b>CCA1 - Class Continuous Assessment 1,</b> <b>MT - Mid Term Test,</b> <b>CCA2 - Class Continuous Assessment 2,</b> <b>LCA1 - Laboratory Continuous Assessment 1,</b> <b>LCA2 - Laboratory Continuous Assessment 2,</b> <b>LCA3 - Laboratory Continuous Assessment 3,</b> <b>TE - Term End Exam</b>
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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 <b>with</b> TE exams	15	30	15	-	-	-	40	100
Theory Courses with Continuous Evaluation	TT2	All Theory (L, T) only courses <b>without</b> 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

\* 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.**



**B. Tech. (First Year) (Computer Science Engineering) (2024-28)**  
**Semester – I**

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	EMT11010	Linear Algebra and Differential Calculus	PC	3				3	TT1
2	CHM10010	Engineering Chemistry	PC	2		2		3	TL4
3	PHY10010	Engineering Physics	PC	2		2		3	TL4
4	MEC10020	Engineering Graphics	PC	2		2		3	TL4
5	MEC10010	Ideas and Innovations in Manufacturing	PC			2		1	PJ
6	UNC10010	Effective Communication	UC	1				1	M
7	UNC10030	Environment and Sustainability	UC	1				1	M
8	UNC10020	Critical Thinking	UC	1				1	M
9	YOG10010	Yoga – I	UC			2		1	PJ
10	UNC10040	Social Leadership Development Program	UC				3	1	I
11	PCE10010	Foundations of Peace	UC	2				2	TT1
<b>Total:</b>				<b>14</b>	<b>0</b>	<b>10</b>	<b>3</b>	<b>20</b>	

**Weekly Teaching Hours: 27**  
**Total Credits: 20**

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

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***B. Tech. (First Year) (Computer Science Engineering) (2024-28)***  
**Semester – II**

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	CIV10010	Engineering Mechanics	PC	2		2		3	TL4
2	CSE10010	Foundations of Programming	PC	2		4		4	PJ
3	EMT11140	Discrete Mathematics with Graph Theory	PC	3	--	--		3	TL1
4	CSE10020	Foundations of Computer Architecture and System Design	PC	3	--	--	3	4	TL3
5	UNC10050	Advanced Excel	UC	1				1	M
6	UNC10060	Financial Literacy	UC	1				1	M
7	YOG10020	Yoga - II	UC			2		1	PJ
8	UNC10070	Co-creation	UC				3	1	I
9	UNC10080	Indian Constitution	UC	1				1	M
10	UNC10090	Indian Knowledge System	UC	2				2	M
11	UNC10100	Sports	UC				3	1	M
<b>Total:</b>				<b>15</b>	<b>0</b>	<b>8</b>	<b>9</b>	<b>22</b>	

**Weekly Teaching Hours: 32**  
**Total Credits: 22**

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

**First Year Total Credits=20+22=42**

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**B. Tech. (Second Year) (Computer Science Engineering) (2024-28)**  
**Semester – III**

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	EMT22020	Calculus and Numerical Methods	PC	3	1	--		4	TT1
2	CSE20010	Data Structures	PC	3	--	--		3	TT1
	CSE20020	Data Structures Laboratory	PC	--	--	2		1	PJ
3	CSE20030	Project Based Learning – I	PC	--	--	--	3	1	PJ
4	CSE20040	Microprocessor, Microcontroller and Applications	PC	3	--	---		3	TT1
5		University Elective -I	UE	3	--	--		3	
6		University Elective -II	UE	3				3	
7	UNC10110	Research Innovation Design Entrepreneurship	UC				3	1	I
8	PCE10020	Spiritual and Cultural Heritage : Indian Experience	UC	2				2	TT1
		<b>Total</b>		<b>18</b>	<b>1</b>	<b>2</b>	<b>9</b>	<b>21</b>	

**Weekly Teaching Hours: 30**

**Total Credits: 21**

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

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**B. Tech. (Second Year) (Computer Science Engineering) (2024-28)**  
**Semester – IV**

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	CSE20050	Object Oriented Concepts using C++	PC	2	--	--	3	3	PJ
2	EMT22110	Probability and Statistics	PC	3	1	--	--	4	TT1
3	CSE20060	Database Management System	PC	3	--	-	--	3	TT1
	CSE20070	Database Management System Laboratory	PC	-		2	-	1	PJ
4	CSE20080	Design and Analysis of Algorithms	PC	3	--	--		3	TT1
5	CSE20090	Project Based Learning – II	PC	--	--	--	3	1	PJ
6		University Electives - III	UE	3	--	--	--	3	
7	UNC10120	Rural Immersion	UC				3	1	I
8	UNC10130	Life Transformation Skills	UC				3	1	I
9	CHE10030	Indian Knowledge System (Sci.& Tech.)	PC	2				2	TT2
		<b>Total</b>		<b>16</b>	<b>1</b>	<b>4</b>	<b>9</b>	<b>22</b>	

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

**Weekly Teaching Hours: 30**

**Total Credits: 22**

**Second Year Total Credits=21+22=43**

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**B. Tech. (Third Year) (Computer Science Engineering) (2024-28)**  
**Semester – V**

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	CSE20100	Computer Networks	PC	3	--	-	--	3	TT1
	CSE20110	Computer Networks Laboratory	PC	-		2	-	1	PJ
2	CSE20120	Internet of Things Laboratory	PC	--	--	2		1	PJ
3		Program Elective -I							
	CSE30010	A. Bigdata Technologies	PE	3	--	2		4	TL3
	CSE30020	B. Computer Graphics and 3D Modelling							
	CSE30030	C. Wireless and Mobile Networks							
	CSE30040	D. Cloud Computing and DevOps							
	CSE30050	E. Digital IC Design							
4	CSE30060	Artificial Intelligence and Expert Systems	PC	3	--	-	--	3	TT1
	CSE30070	Artificial Intelligence and Expert Systems Laboratory	PC	-	--	2	-	1	PJ
6	CSE20130	Software Engineering and Modelling	PC	3	--	--	--	3	TT1
7	CSE20140	Project Based Learning – III	PC	--	--	--	3	1	PJ
8	PCE10030	Managing Conflicts Peacefully: Tools and Techniques	UC	2				2	TT1
<b>Total</b>				<b>14</b>	<b>0</b>	<b>8</b>	<b>3</b>	<b>19</b>	

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

**Weekly Teaching Hours: 25**

**Total Credits: 19**

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## **B. Tech. (Third Year) (Computer Science Engineering) (2024-28)**

### **Semester – VI**

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	CSE20170	Operating System	PC	3	--	-	--	3	TT1
	CSE20180	Operating System Laboratory	PC	-		2	-	1	PJ
2	CSE30080	Data Engineering and Data Visualization	PC	2	--	--	3	3	TL4
3	CSE30090	Machine Learning	PC	3	--	-	--	3	TT1
	CSE30100	Machine Learning Laboratory	PC	-	--	2	-	1	PJ
4	CSE20150	Full Stack Development Laboratory	PC	--	--	2	--	1	PJ
5		Professional Elective –II							
	CSE30110	A. Deep Learning	PE	3	--	2	--	4	TL3
	CSE30120	B. Augmented Reality and Virtual Reality							
	CSE30130	C. Cyber Laws and Cyber Crime							
	CSE30140	D. Parallel Programming							
	CSE30150	E.VLSI Design							
6	CSE20160	Mini Project using Java Programming	PC	--	--	--	3	1	PJ
7	CSE30160	Seminar	PC	--	--	--	3	1	PJ
8	CSE30170	Project Based Learning – IV	PC	--	--	--	3	1	PJ
9	UNC10140	National Academic Immersion	UC	2				2	I
		<b>Total</b>		<b>13</b>	<b>0</b>	<b>6</b>	<b>12</b>	<b>21</b>	

\*\*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**

**Third Year Total Credits=19+21=40**

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## ***B. Tech. (Final Year) (Computer Science Engineering) (2024-28)***

### **Semester – VII**

S.No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs				Credits	Assessment Scheme Code
				L	T	P	J		
1	CSE30210	Theory of Computation	PC	3	--	--	--	3	TT1
2	CSE40010	Capstone Project	PC	--	--	--	18	6	PJ
3	CSE30180	Information and Cyber Security	PC	2	--	2		4	TL4
4		Program Elective -III	PE	3	--	2		4	TL3
	CSE40020	A. Cognitive Computing and Natural Language Processing							
	CSE40030	B. Computer Vision							
	CSE40040	C. Vulnerability Identification and Penetration Testing							
	CSE40050	D. User Interface and User Experience Design							
	CSE40060	E. Blockchain Technology							
5	CSE30190	Distributed Computing	PC	2	--	2		3	TL4
6	CSE30200	System Software and Compiler Design	PC	3	--	2		4	TL3
		<b>Total</b>		<b>13</b>	<b>--</b>	<b>8</b>	<b>18</b>	<b>21</b>	

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

**Weekly Teaching Hours: 36**

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

**Total Credits: 24**

## ***B. Tech. (Final Year) (Computer Science Engineering) (2024-28)***

### **Semester – VIII**

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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
	CSE40070	A. Soft Computing							
	CSE40080	B. Unmanned Ariel Vehicle(UAV) and Drone Technology							
	CSE40090	C. VLSI Design Verification and Testing							
	CSE40100	D. 5G and Edge Computing							
	CSE40110	E. Digital Design Automation							
2	CSE40120	Internship	PC	--	--		30	10	PJ
		<b>Total</b>		<b>3</b>	<b>0</b>	<b>2</b>	<b>30</b>	<b>14</b>	

**Weekly Teaching Hours: 35**

**Total Credits: 14**

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

**Final Year Total Credits=24+14=38**

**Total Credits: 42+44+42+35=163**

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**B. Tech. (Computer Science Engineering) (2024-28)**  
**Professional Elective Tracks**

Semester	Course Code	Name of the Course	Type
V	CSE30010	A. Bigdata Technologies	Program Elective - I
V	CSE30020	B. Computer Graphics and 3D Modelling	Program Elective - I
V	CSE30030	C. Wireless and Mobile Networks	Program Elective - I
V	CSE30040	D. DevOps	Program Elective - I
V	CSE30050	E. Digital IC Design	Program Elective - I
VI	CSE30110	A. Deep Learning	Program Elective - II
VI	CSE30120	B. Augmented Reality and Virtual Reality	Program Elective - II
VI	CSE30130	C. Cyber Laws and Cyber Crime	Program Elective - II
VI	CSE30140	D. Parallel Programming	Program Elective - II
VI	CSE30150	E. VLSI Design	Program Elective - II
VII	CSE40020	A. Cognitive Computing and Natural Language Processing	Program Elective - III
VII	CSE40030	B. Computer Vision	Program Elective - III
VII	CSE40040	C. Vulnerability Identification and Penetration Testing	Program Elective - III
VII	CSE40050	D. User Interface and User Experience Design	Program Elective - III
VII	CSE40060	E. Blockchain Technology	Program Elective - III
VIII	CSE40070	A. Soft Computing	Program Elective - IV
VIII	CSE40080	B. Unmanned Ariel Vehicle(UAV) and Drone Technology	Program Elective - IV
VIII	CSE40090	C. Introduction to VLSI Design Verification and Testing	Program Elective - IV
VIII	CSE40100	D. 5G and Edge Computing	Program Elective - IV
VIII	CSE40110	E. Digital Design Automation	Program Elective - IV

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## University Electives List

2024-28

<b>University Elective-I (3 Credits)</b>	<b>University Elective-II (3 Credits)</b>	<b>University Elective-III (3 Credits)</b>
CSE10030 Coding with C++	CSE10060 Web Technologies	CSE10090 Human Computer Interface
CSE10040 Python Programming	CSE10070 Software Engineering	CSE10100 Cyber Security
CSE10050 Java Programming	CSE10080 Basics of DBMS	CSE10110 Basics of Artificial Intelligence

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## COURSE STRUCTURE

<b>Course Code</b>	<b>CSE10010</b>				
<b>Course Category</b>	<b>Program Core</b>				
<b>Course Title</b>	<b>Foundations of Programming</b>				
<b>Teaching Scheme</b>	<b>Lectures</b>	<b>Tutorials</b>	<b>Laboratory / Practical</b>	<b>Project</b>	<b>Total</b>
<b>Weekly load hours</b>	<b>2hrs/wk</b>	<b>--</b>	<b>4hrs/wk</b>		<b>2+2=4</b>
<b>Credits</b>	<b>4</b>				
<b>Assessment Schema Code</b>	<b>PJ</b>				
<b><u>Prerequisites:</u></b>					
Introductory Knowledge of Computers.					
<b><u>Course Objectives:</u></b>					
<b>1. <u>Knowledge:</u></b>					
i. Learn programming skills and programming language constructs.					
<b>2. <u>Skills:</u></b>					
i. Understand the functions, arrays and structures using C language.					
ii. Understand file handling and pointers using C language.					
<b>3. <u>Attitude:</u></b>					
i. Learn to apply programming skills for solving real world problems.					
<b><u>Course Outcomes:</u></b>					
<b>After completion of the course the students will be able to: -</b>					
1. Develop efficient logic and algorithms for solving a problem.					
2. Analyze the given problem and solve it using suitable programming constructs.					
3. Apply programming skills for solving real world problems.					
<b><u>Course Contents:</u></b>					
<b>Introduction of Computer System and Problem Solving:</b>					
Basics of Computers: Architecture, Processors, Memory, Number Systems, Data Representation- Floating point, Char, String. System Software - Operating system, Editor, Compiler, Assembler, Linker, Loader.					
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.					

## **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:** Decision control statements, Selection/conditional branching Statements: if, if-else, nested if, if-elif-else statements. Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops, the break, continue, pass, else statement used with loops

Structure of C program, Coding conventions

## **Derived data types and Functions in C**

**Derived data types:** Array- Single and Multidimensional arrays, Structure – Structure and Array of structure, Union. Strings

**Functions in C:** User defined and Library Functions-String Library Functions. Different parameter passing methods (Call by Value and Call by Reference), Passing array to a function, Recursion.

## **Pointers and File handling in C**

**Pointers:** Lifetime of Variables, Scope Rules: Static and Dynamic scope. Pointers, Passing Pointers to function, Pointers and Arrays, Dynamic memory allocation and its application.

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

## **Fundamentals of Programming Language:**

Introduction: Characteristics of Programming Languages, Influencing Factors for the Evolution of Programming Language, Desirable Features and Design Issues. Brief Introduction to Programming Language Paradigms: Imperative, Object Oriented, Functional, Logic and Concurrent Programming

Syntactic Structure: Syntax, Semantics, Structure, Character Set Tokens, Sentence-Syntax and Semantics, Expression Notation, Grammar, Syntax Tree, Context Free Grammar, Translators

## **Laboratory Exercises:**

1. Write a program in C to check leap year.
2. Write a menu driven program in C to implement the basic arithmetic operations.
3. Write a program in C to generate multiplication tables.
4. Write a C Program to calculate salary of an employee given his basic pay (take as input from user). Calculate gross salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employee pay professional tax as 2% of total salary. Calculate net salary payable after deductions.
5. Write a program in C to perform basic operation such as addition, saddle point, inverse, magic square of two matrices.
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 array of structures.

8. To accept a student's five course marks and compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinguished. If aggregate is  $60 \geq$  and  $< 75$  then the grade of first division. If aggregate is  $50 \geq$  and  $< 60$ , then the grade is second division. If aggregate is  $40 \geq$  and  $< 50$ , then the grade is third division.
9. To check whether the input number is Armstrong number or not. An Armstrong number is an integer with three digits such that the sum of the cubes of its digits is equal to the number itself. Ex. 371.
10. To simulate a simple calculator that performs basic tasks such as addition, subtraction, multiplication and division with special operations like computing  $xy$  and  $x!$
11. To accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorial of number e) prime factors
12. To accept two numbers from user and compute smallest divisor and Greatest Common Divisor of these two numbers.
13. To accept a number from user and print digits of number in a reverse order.
14. To input binary number from user and convert it into decimal number.
15. To generate pseudo random numbers
16. To accept list of N integers and partition list into two sub lists even and odd numbers.
17. To accept the number of terms a finds the sum of sine series.
18. Write a C program that accepts a string from user and perform following string operations- i. Calculate length of string ii. String reversal iii. Equality check of two strings iii. Check palindrome ii. Check substring
19. Create Structure EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary). Define function members to compute a) total number of employees in an organization b) count of male and female employee c) Employee with salary more than 10,000 d) Employee with designation "Asst Manager"
20. Write a C function to swap two numbers with and without pointers.
21. Write a C program to copy contents of one file to another using File handling.
22. Write a menu driven program in C to perform all string operations. (In built functions).

### **Learning Resources:**

### **Reference Books:**

1. Pradeep Sinha, Priti Sinha, "Computer Fundamentals", Sixth 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", Fifteenth edition, bpb publication.

**Web Resources:****Web Links:**

1. <http://www.studytonight.com/c/overview-of-c.php>
2. <https://www.tutorialspoint.com/cprogramming>

**MOOCs:**

1. <http://nptel.ac.in/courses/106105085/2>
2. <http://nptel.ac.in/courses/106104074/1>
3. <https://nptel.ac.in/courses/106/105/106105171>
4. <https://nptel.ac.in/courses/106/106/106106212/>

**Pedagogy:**

1. Power point presentations
2. Practical Demos
3. Videos
4. Online Classroom
5. Expert Lectures

## COURSE STRUCTURE

<b>Course Code</b>	<b>EMT11140</b>				
<b>Course Category</b>	<b>Program Core</b>				
<b>Course Title</b>	<b>Discrete Mathematics with Graph Theory</b>				
<b>Teaching Scheme</b>	<b>Lectures</b>	<b>Tutorials</b>	<b>Laboratory / Practical</b>	<b>Project</b>	<b>Total</b>
<b>Weekly load hours</b>	<b>3</b>	-	-	-	<b>3</b>
<b>Credits</b>	<b>3</b>	-	-	-	<b>3</b>
<b>Assessment Schema Code</b>	<b>TL1</b>				
<b><u>Prerequisites:</u></b> Basic Mathematics					
<b><u>Course Objectives:</u></b>					
<ol style="list-style-type: none"> <li>1. To understand the logic for solving problems using set theory.</li> <li>2. To acquire skills of using Graph Theory for modelling computer science problems</li> <li>3. To learn relations and functions for solving relevant problems in computer science.</li> <li>4. To apply Number Theory in Computer Application</li> </ol>					
<b><u>Course Outcomes:</u></b>					
After completion of this course students will be able to:					
<ol style="list-style-type: none"> <li>1. Analyze and articulate the logic to solve problem using set theory.</li> <li>2. Apply knowledge of relations and functions to solve relevant problems in computer science</li> <li>3. Model computer science problems using Graph theory</li> <li>4. Demonstrate the concepts and applications of Number Theory in Computer Science.</li> </ol>					
<b><u>Course Contents:</u></b>					
<p><b>Set Theory:</b> 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</p> <p><b>Relations and Functions:</b> 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.</p> <p>Function: surjective, injective and bijective functions, Inverse Functions and Compositions of Functions, Recursive Function.</p> <p><b>Graphs:</b> 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 path- Dijkstra's algorithm, Planar Graph, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem, digraphs.</p>					

**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 Applications, Tata McGraw-Hill, ISBN 978-0-07-288008-3, 7<sup>th</sup> Edition.
2. C. L. Liu, —Elements of Discrete Mathematics, 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 Structures, Prentice-Hall of India /Pearson, ISBN: 0132078457, 9780132078450.
2. Dr. K. D. Joshi, — Foundations of Discrete Mathematics, New Age International Limited, Publishers, January 1996, ISBN: 8122408265, 9788122408263

**Supplementary Reading:**

1. N. Biggs, “Discrete Mathematics”, 2<sup>nd</sup> 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](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:**

1. Team Teaching
2. Tutorials and class tests/assignments
3. Audio- Video technique