



Dr. Vishwanath Karad

**MIT WORLD PEACE
UNIVERSITY** | PUNE

TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

SYLLABUS

**FACULTY OF ENGINEERING AND TECHNOLOGY
SCHOOL OF COMPUTER SCIENCE AND ENGINEERING**

DEPARTMENT OF COMPUTER ENGINEERING AND TECHNOLOGY

**B. Tech. Computer Science and Engineering
(Cybersecurity and Forensics)**

BATCH 2024-2028

PROGRAMME STRUCTURE

Preamble:

B. Tech. in Computer Science and Engineering (Cybersecurity and Forensics) is the most sought-after branch of Engineering in today's world. With the advancements in hardware and software technologies, there is huge demand for Cybersecurity professionals in industry. 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. in Computer Science and Engineering (Cybersecurity and Forensics) 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 seminar component. Industry exposure is given through internships / projects, and development of latest tools / technologies is cached through the components of "Add-on skills".

The curriculum will transform the students into winning personalities.

Program Director

Department of Computer Engineering and Technology

Dr. Mangesh Bedekar

Professor and Dean, School of CSE

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 transdisciplinary 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 program is designed with the objectives to nurture competent, multifaceted and Ethical Professionals. After completion of program Graduates will be able to –

PEO-1 Competent Professionals: Identify and effectively solve cybersecurity problems with sustainable solutions to ensure the protection of information technology assets.

PEO-2 Multifaceted Professionals: Exhibit technical knowledge of cybersecurity and forensics using 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 wellbeing of society.

Programme Outcomes

Computer Engineering and Technology Graduates will be able to:

- PO1 Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and cybersecurity to the solution of complex engineering and various forensics problems.
- PO2 Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering and forensics problems reaching substantiated conclusions using first principles of mathematics, engineering sciences and standard methods based on scientific approach.
- PO3 Design and Development of Solutions:** Design novel solutions of regular or complex engineering problems based on research outcomes 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 Investigation 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 for complex problems
- PO5 Modern tool usage:** Understand, select, and apply modern scientific techniques, resources, cybersecurity and forensics tools with an understanding of its merits and limitations.
- PO6 Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, cybersecurity, 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 and forensic practices.
- PO9 Individual and Team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10 Effective 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 Lifelong Learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs)

Computer Engineering and Technology Graduates will be able to:

PSO-I Evaluate the computer network and information security needs of an organization and assess cybersecurity risk management policies in order to adequately protect an organization's critical information and assets.

PSO-II Understand principles of computer science, cyber forensics and its applications in digital crime scenario, examine it and act according to the prevailing legal provisions.

PSO-III Constructive mindful approach to architect innovative cybersecurity 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:

Course Basket	Credits Assigned
Program Core	114
Program Electives	16
University Core	24
University Electives	09
Total	163

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
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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 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

* 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. CSE (Cybersecurity and Forensics) (First Year) (Batch 2024 – 2028)

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
			Total:	14	0	10	3	20	

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

Weekly Teaching Hours: 27

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

Total Credits: 20

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Program Director

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B. Tech. CSE (Cybersecurity and Forensics) (First Year) (Batch 2024 – 2028)

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.	CSF10010	Foundations of Programming	PC	2	--	4	--	4	PJ
3.	EMT11140	Discrete Mathematics with Graph Theory	PC	3	--	--	--	3	TT1
4.	CSF10020	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
Total:				15	0	8	9	22	

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

Weekly Teaching Hours: 32

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

Total Credits: 22

Total First Year B. Tech. Credits: 20+22 = 42

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B. Tech. CSE (Cybersecurity and Forensics) (Second Year) (Batch 2024 – 2028)
Semester – III

S. No.	Course Code	Name of 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.	CSF20010	Object Oriented Programming using C++	PC	1	--	--	--	1	TT1
3.	CSF20020	Data Structures	PC	3	--	--	--	3	TT1
4.	CSF20030	Data Structures Laboratory	PC	--	--	--	3	1	PJ
5.	CSF20040	Computer Networks	PC	3	--	--	--	3	TT1
6.	CSF20050	Computer Networks Laboratory	PC	--	--	2	--	1	PJ
7.	CSF20060	Project Based Learning – I	PC	--	--	--	3	1	PJ
8.	UNC10110	Research Innovation Design Entrepreneurship (RIDE)	UC	--	--	--	3	1	I
9.	PCE10020	Spiritual and Cultural Heritage: Indian Experience	UC	2	--	--	--	2	TT1
10.		University Electives – I	UE	3	--	--	--	3	
11.		University Electives – II	UE	3	--	--	--	3	
		Total:		18	1	2	9	23	

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

Weekly Teaching Hours: 30

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

Total Credits: 23

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B. Tech. CSE (Cybersecurity and Forensics) (Second Year) (Batch 2024 – 2028)
Semester – IV

S. No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs.				Credits	Assessment Scheme Code
				L	T	P	J		
1.	EMT22110	Probability and Statistics	PC	3	1	--	--	4	TT1
2.	CSF20070	Database Management System	PC	3	--	--	--	3	TT1
3.	CSF20080	Database Management System Laboratory	PC	--	--	2	--	1	PJ
4.	CSF20090	Operating System	PC	3	--	--	--	3	TT1
5.	CSF20100	Operating System Laboratory	PC	--	--	2	--	1	PJ
6.	CSF20110	Embedded Systems and Internet of Things Laboratory	PC	--	--	--	3	1	PJ
7.	CSF20120	Project Based Learning – II	PC	--	--	--	3	1	PJ
8.	UNC10120	Rural Immersion	UC	--	--	--	3	1	I
9.	UNC10130	Life Transformation Skills	UC	--	--	--	3	1	I
10.	CHE10030	Indian Knowledge System (Sci. & Tech.)	PC	2	--	--	--	2	TT2
11.		University Electives – III	UE	3	--	--	--	3	
		Total:		14	1	4	12	21	

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

Weekly Teaching Hours: 31

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

Total Credits: 21

Total Second Year B. Tech. Credits: 23+21= 44

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B. Tech. CSE (Cybersecurity and Forensics) (Third Year) (Batch 2024 – 2028)

Semester – V

S. No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs.				Credits	Assessment Scheme Code
				L	T	P	J		
1.	CSF30010	Information and Cyber Security	PC	3	--	2	--	4	TL3
2.	CSF20130	Design and Analysis of Algorithms	PC	3	--	--	--	3	TT1
3.	CSF30020	Artificial Intelligence and Machine Learning Techniques	PC	3	--	2	--	4	TL3
4.	CSF30030	Software Engineering and Project Management	PC	3	--	2	--	4	TL3
5.	CSF20140	Full Stack Development Laboratory	PC	--	--	2	--	1	PJ
6.	CSF20150	Project Based Learning – III	PC	--	--	--	3	1	PJ
7.	Program Elective–I		PE	3	--	2	--	4	TL3
	CSF20160	A. Bigdata Technologies							
	CSF20170	B. Data Privacy							
	CSF20180	C. Enterprise Infrastructure Security							
	CSF20190	D. Identity and Access Management							
8.	PCE10030	Managing Conflicts Peacefully: Tools and Techniques	UC	2	--	--	--	2	TT1
Total:				17	0	10	3	23	

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

Weekly Teaching Hours: 30

Total Credits: 23

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B. Tech. CSE (Cybersecurity and Forensics) (Third Year) (Batch 2024 – 2028)

Semester – VI

S. No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs.				Credits	Assessment Scheme Code
				L	T	P	J		
1.	CSF30040	Theory of Computation	PC	3	--	--	--	3	TT1
2.	CSF30050	Security Management, Cyber Laws and Ethics	PC	2	--	--	--	2	TT1
3.	CSF40010	Vulnerability Assessment and Penetration Testing	PC	3	--	2	--	3	TL3
4.	CSF40020	Digital Forensics and Investigation	PC	2	--	--	--	2	TT1
5.	CSF40030	Digital Forensics and Investigation Laboratory	PC	--	--	2	--	1	PJ
6.	CSF20200	Mini Project using Java Programming	PC	--	--	--	3	1	PJ
7.	CSF30060	Seminar	PC	--	--	--	3	1	PJ
8.	CSF30070	Project Based Learning – IV	PC	--	--		3	1	PJ
9.	Program Elective–II		PE	3	--	2	--	4	TL3
	CSF30080	A. Augmented Reality and Virtual Reality							
	CSF30090	B. Wireless and Mobile Device Security							
	CSF30100	C. Incident Response and Malware Analysis							
	CSF30110	D. Cyber Threat and Intelligence Management							
10.	UNC10140	National Academic Immersion	UC	2	--	--	--	2	I
Total:				15	0	6	9	20	

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

Weekly Teaching Hours: 30

Total Credits: 20

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

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B. Tech. CSE (Cybersecurity and Forensics) (Final Year) (Batch 2024 – 2028)

Semester – VII

S. No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs.				Credits	Assessment Scheme Code
				L	T	P	J		
1.	CSF40040	Capstone Project	PC	--	--	--	18	6	PJ
2.	CSF40050	Cloud Infrastructure and Security	PC	2	--	--	--	2	TT1
3.	CSF40060	Cloud Infrastructure and Security Laboratory	PC	--	--	--	3	1	PJ
4.	CSF30120	Blockchain Technology Concepts and Application	PC	2	--	--	--	2	TT1
5.	CSF30130	Blockchain Technology Laboratory	PC	--	--	2	--	1	PJ
6.	CSF30140	System Software and Compiler Design	PC	3	--	2	--	4	TL3
7.	Program Elective–III		PE	3	--	2	--	4	TL3
	CSF40070	A. High Performance Computing							
	CSF40080	B. Cyber Physical System Security							
	CSF40090	C. Data Science for Cybersecurity and Forensics							
	CSF40100	D. Risk Assessment and Security Policies							
Total:				10	0	6	21	20	

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

Weekly Teaching Hours: 37

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

Total Credits: 20

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B. Tech. CSE (Cybersecurity and Forensics) (Final Year) (Batch 2024 – 2028)

Semester – VIII

S. No.	Course Code	Name of the Course	Type	Weekly Workload, Hrs.				Credits	Assessment Scheme Code
				L	T	P	J		
1.	Program Elective–IV / MOOC		PE	3	--	2	--	4	TL3
	CSF40110	A. User Interface and User Experience Design							
	CSF40120	B. Security and Privacy in Social Media							
	CSF40130	C. Application and Web Security							
	CSF40140	D. Attack, Reporting and Documentation							
2.	CSF40150	Internship	PC	--	--	--	30	10	PJ
		Total:		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: 20 + 14 = 34

Total B. Tech. Credits: 42 + 44 + 43 + 34 = 163

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B. Tech. CSE (Cybersecurity and Forensics) (Batch 2024 – 2028)

Program Elective Tracks

Semester	Course Code	Name of the Course	Type
V	CSF20160	A. Bigdata Technologies	Program Elective - I
V	CSF20170	B. Data Privacy	Program Elective - I
V	CSF20180	C. Enterprise Infrastructure Security	Program Elective - I
V	CSF20190	D. Identity and Access Management	Program Elective - I
VI	CSF30080	A. Augmented Reality and Virtual Reality	Program Elective - II
VI	CSF30090	B. Wireless and Mobile Device Security	Program Elective - II
VI	CSF30100	C. Incident Response and Malware Analysis	Program Elective - II
VI	CSF30110	D. Cyber Threat and Intelligence Management	Program Elective - II
VII	CSF40070	A. High Performance Computing	Program Elective - III
VII	CSF40080	B. Cyber Physical System Security	Program Elective - III
VII	CSF40090	C. Data Science for Cybersecurity and Forensics	Program Elective - III
VII	CSF40100	D. Risk Assessment and Security Policies	Program Elective - III
VIII	CSF40110	A. User Interface and User Experience Design	Program Elective - IV
VIII	CSF40120	B. Security and Privacy in Social Media	Program Elective - IV
VIII	CSF40130	C. Application and Web Security	Program Elective - IV
VIII	CSF40140	D. Attack, Reporting and Documentation	Program Elective - IV

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B. Tech. CSE (Cybersecurity and Forensics)

(Batch: 2024-28)

University Electives List

University Elective-I (3 Credits)	University Elective-II (3 Credits)	University Elective-III (3 Credits)
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

COURSE STRUCTURE

Course Code	CSF10010				
Course Category	Program Core				
Course Title	Foundations of Programming				
Teaching Scheme	Lectures	Tutorials	Laboratory	Project	Total
Weekly load hours	2 hrs. / wk	--	4 hrs. / wk	--	2+4=6
Credits	2	--	2	--	4
Assessment Scheme Code	PJ				
<u>Prerequisites:</u>					
Computer Fundamentals					
<u>Course Objectives:</u>					
1. Knowledge					
i. Learn programming skills and programming language constructs.					
2. Skills					
i. Understand the functions, arrays and structures using C language.					
ii. Understand file handling and pointers using C language.					
3. Attitude					
i. Learn to apply programming skills for solving real world problems.					
<u>Course Outcomes:</u>					
After completion of the course the students will be able to					
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.					
<u>Course Contents:</u>					
Introduction of Computer System and Problem Solving					
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

Course Code					
Course Category	Program Core				
Course Title	Discrete Mathematics with Graph Theory				
Teaching Scheme	Lectures	Tutorials	Laboratory	Project	Total
Weekly load hours	3	--	--	--	3
Credits	3	--	--	--	3
Assessment Scheme 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 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 Applications, Tata McGraw-Hill, ISBN 978-0-07-288008-3, 7th 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”, 2nd Edition, Oxford University Press
2. Data Structures – Seymour Lipschutz, Schaum’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:

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