

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES

DEVI AHILYA UNIVERSITY, INDORE

M. Tech. (CS) 5 Years

Syllabus

July-Dec' 2025

Semester I

Sub. Code	Subject Name	Category	L	T	P	C
CS-101	Mathematics – I (Calculus & Linear Algebra)	Basic Sciences	3	1	0	4
CS-102	Physics –I (Semi-conductor Physics)	Basic Sciences	3	1	0	4
CS-103	Communications Skills	Humanities & Management	3	1	0	4
CS-104	Digital Electronics	Engineering Sciences	3	1	0	4
CS-105	Problem Solving using C	Core Computer Science	3	1	0	4
CS-106	Digital Electronics Lab	Practical	0	0	4	2
CS-107	C Programming Lab	Practical	0	0	4	2
CS-108	Comprehensive Viva	Virtual	0	0	0	4
			Total			28

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES,

DEVI AHILYA UNIVERSITY, INDORE

M. Tech. (CS) 5 Years I SEMESTER

CS-101 Mathematics (Calculus & Linear Algebra)

Course Type: Basic Sciences

Course Credits: 4

Course Objective: To develop students' understanding of fundamental concepts in linear algebra and calculus, including matrix theory, vector spaces, eigen values, diagonalization, and integral/differential calculus, and to enable them to apply these concepts to solve mathematical and real-world engineering problems.

Course Outcomes: After completion of the course, student will;

CO1: Understand matrix operations, determinants, and solution methods for linear systems of equations. (Bloom's Level: Understand/Apply)

CO2: Apply concepts of vector spaces, basis, dimension, and rank-nullity theorem to solve linear algebraic problems. (Bloom's Level: Apply/Analyze)

CO3: Analyze eigenvalues, eigenvectors, diagonalization, and inner product spaces in relation to applications. (Bloom's Level: Analyze/Evaluate)

CO4: Evaluate definite and improper integrals, beta and gamma functions, and apply them to areas and volumes of revolution. (Bloom's Level: Apply/Evaluate)

Course Contents

Unit No	Title	Contents	Hr	(Q1) Targeted Levels of Blooms T.	(Q2) Content and Pedagogy	(Q3) Online Resources	(Q4) Assign./ Assessment/ Discussion

1	Matrices	Matrices, vectors, addition and scalar multiplication , Matrix multiplication ,linear systems of equation, linear independence, rank of matrix. LO: Students will understand properties of multiplication, identify conditions for solvability, and determine rank of matrices.	6	1, 2	1, 2 & 3*	1,2 & 3	Discussion on matrix multiplication, and rank of matrix Assignment: Solve a system of equations using matrix form and determine whether the coefficient matrix is of full rank.
2	Determinants	Determinants, Cramer's rule, inverse of a matrix, Gauss elimination and Gauss Jordan elimination. LO: Students will compute determinants and interpret their significance in geometry and invertibility.	6	1, 2	1, 2 & 3*	3	Discussion on most efficient methods for solving large linear systems and determinants Assignment: Solve the same system of equations using (i) Cramer's rule and (ii) Gauss-Jordan elimination, then compare the processes. Compute the

							determinant of a 3×3 matrix and interpret its meaning in terms of invertibility.
3	Vector Spaces-I	Vector space, Linear dependence of vectors, basis and dimension; Linear transformation, range and kernel of a linear map. LO: Students will grasp the concepts of linear independence, basis, and dimension of vector spaces.	4	1, 2, 3	1, 2 3 & 5*	4 & 5	Discussion on basis and dimension fundamental in understanding any vector space Assignment: Show that a given set of vectors forms a basis of $\mathbb{R}^3$ and find its dimension.
4	Vector Spaces-II	Rank and nullity, Inverse of a linear transformation, rank-nullity theorem, composition of linear maps, Matrix associated with a linear map. LO:	4	1, 2	1, 2 & 3*	6	Discussion on how does the rank-nullity theorem connect the algebraic properties of a linear transformation with its solution space? Assignment: For a given linear transformation, compute rank and nullity, and verify

							the rank-nullity theorem.
5	Vector Spaces-III	Symmetric, skew symmetric and orthogonal matrices, eigen bases. Diagonalization: Inner Product spaces. LO1: Students will evaluate properties of symmetric/orthogonal matrices and perform eigen decomposition. LO2: Students will diagonalize matrices and construct orthonormal bases in inner product spaces.	6	1, 2	1, 2 & 3/4*	7 & 8	Discussion on why are symmetric and orthogonal matrices so important in applications such as physics and computer graphics? Assignment: Find the eigen values and eigenvectors of a symmetric matrix and demonstrate diagonalization.
6	Integral Calculus	Evolutes and involutes; Evaluation of definite and improper integrals, beta and gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. LO: Students will evaluate improper integrals using special functions and apply definite integrals to geometry.	8	1, 2, 3	1, 2 & 3*	9	Discussion on how do beta and gamma functions extend the concept of factorials and integrals to continuous domains? Assignment: Evaluate an improper integral using gamma function and compute the volume

							of a solid of revolution.
7	Calculus	Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms, and L'Hospital's rule; Maxima and minima. LO: Students will approximate functions with series, apply theorems to real functions, and solve maxima/minima problems.	6	1, 2	2, 3 & 6*	10	Discussion on how does Taylor and Maclaurin series approximate in real-world functions, and where do Mean Value Theorem is apply in practice? Assignment: Expand e^x up to 4th degree using Maclaurin's theorem and find local maxima/minima of a given function.

* 1- Remember, 2- Understand, 3- Apply, 4- Analyze, 5- Evaluate, 6- Create

Reference Books

1. Gilbert Strang, Introduction to Linear Algebra, Wellesley Cambridge Press.
2. David C. Lay, Linear Algebra and Its Applications, Pearson.
3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley.
4. James Stewart, Calculus: Early Transcendentals, Cengage.
5. Thomas & Finney, Calculus and Analytic Geometry, Addison-Wesley.

Electronic Resources

1. MIT OCW Linear Algebra: <https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/>

2. Khan Academy: <https://www.khanacademy.org/math/linear-algebra>
3. Paul's Online Notes – Determinants: <https://tutorial.math.lamar.edu/Classes/LinAlg/Determinants.aspx>
4. NPTEL Linear Algebra Lectures: <https://nptel.ac.in/courses/111/106/111106051/>
5. Khan Academy – Vector Spaces: <https://www.khanacademy.org/math/linear-algebra/vectors-and-spaces>
6. MIT OCW – Null Space: <https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/resources/null-spaces/>
7. 3Blue1Brown – Eigenvectors/Eigenvalues: <https://www.youtube.com/watch?v=PFDu9oVAE-g>
8. MIT OCW – Gram-Schmidt: <https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/resources/orthogonalization/>
9. NPTEL Integral Calculus: <https://nptel.ac.in/courses/111/104/111104085/>
10. Khan Academy – Taylor & Maclaurin: <https://www.khanacademy.org/math/calculus-2/taylor-series>

CO-PO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4
PSO1	Algorithm development	✓	✓	✓	✓
	Computer Based Solution	✓			
	Application Development				
	Disciplinary Knowledge	✓	✓	✓	✓
PSO2	Programming Skill				
	Problem Solving/ Critical thinking	✓	✓	✓	✓
	Mathematical Analysis	✓	✓	✓	✓
PSO3	Financial Aspects				
	Modern Tools				
	Complex Problems solving	✓	✓	✓	✓
	Time Frame Analysis				
	Research Skills	✓	✓	✓	✓

**INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES,
DEVI AHILYA UNIVERSITY, INDORE
M. Tech. (CS) 5 Years I SEMESTER
CS-102 Physics-I (Semi-conductor Physics)**

Course Type: Basic Sciences

Course Credits: 4

Course Objective: To provide students with a comprehensive understanding of band theory, semiconductor physics, special diodes, transistors, FETs, and semiconductor fabrication techniques, enabling them to analyze, design, and apply electronic devices in real-world applications.

Course Outcomes – After completion of the course, student will;

CO1: Explain the fundamentals of band theory, energy band diagrams, Fermi level, and electrical properties of semiconductors.

CO2: Analyze the electrical conductivity, carrier concentration, mobility, and Hall effect in intrinsic and extrinsic semiconductors.

CO3: Demonstrate the working principles, VI characteristics, and applications of special diodes, BJTs, FETs, and MOSFETs.

CO4: Apply knowledge of semiconductor device fabrication processes (oxidation, diffusion, lithography, epitaxy) to explain the construction of P–N junction and advanced electronic devices.

Course Contents –

Unit No	Title	Contents	Hr	(Q1) Targeted Levels of Blooms T.	(Q2) Content and Pedagogy	(Q3) Online Resources	(Q4) Assign./ Assessment/Discussion

1	Band Theory of Solids - I	Introduction, Bloch theorem, E-k diagram, Kronig penny model, classification of solid based on electrical properties and energy band gap, band structure of semiconductors, type of semiconductors intrinsic and extrinsic semiconductor, majority and minority charge carrier, concentration of electrons and holes in intrinsic semiconductor derivation, law of mass action, relation between fermi level and energy gap LO1: Students will explain band theory and classify solids based on energy band structure	6	1,2 and 3*	1, 2, 5	1,2,3	Discussion on band structure and explain differences in electrical conductivity of materials Assignment: Derive carrier concentration in intrinsic semiconductors using law of mass action.
2	Band Theory of Solids - II	Relation between fermi level and Energy gap in an Intrinsic Semiconductor (derivation). Impurities label and fermi level in p type and n type semiconductor qualitative and derivation LO1: Students will understand Fermi level movement due to impurities in semiconductors.	6	1,2 and 3*	1, 2, 5	1,2,4	Discussion on doping affect on Fermi level in semiconductors Assignment: Show mathematically how the Fermi level shifts in p-type and n-type semiconductors.
3	Electrical conductivity of semiconductors	Electrical conductivity in an intrinsic semiconductor, variation of carrier concentration with temperature, conductivity of extrinsic semiconductor, minority carrier lifetime, mobility of	8	1,2,3 and 4*	2, 3, 5	1,2,3,4	Discussion on carrier mobility variation with temperature in semiconductors Assignment: Derive the

		current carrier, drift and diffusion (qualitative), the continuity equation (derivation), Hall effect, determination of Hall coefficient (derivation), application of Hall effect LO1: Students will evaluate conductivity mechanisms, derive continuity equation, and apply Hall effect					expression for Hall coefficient and explain its applications.
4	Special Diodes	Clipper, clamper, Zener Diode- VI characteristics, Zener diode as clipper, Tunneling Effect-Tunnel diode, Varactor Diode, point contact diode, Schottky Diode, PIN Diode LO1: Students will classify and analyze different diodes based on characteristics and applications.	6	1,2 and 3*	3, 4	1	Discussion on special diodes different in terms of their VI characteristics and applications Assignment: Plot and explain the VI characteristics of Zener and Tunnel diodes.
5	Transistors	Transistors, junction transistor type and their working, transistor current components, detailed study of current in transistor, common base (CB), common collector (CC), common emitter (CE) configuration, characteristic and its graphical analysis, current gain alpha and beta, relation between alpha and beta, load line, operating point, hybrid parameter transistor amplifier in common	6	1,2 and 3*	2, 3, 4	1	Discussion on different transistor configurations used in different applications Assignment: Draw and analyze CB, CC, and CE characteristics; derive relation between α and β .

		mode for both NPN and PNP transistor LO1: Students will interpret transistor characteristics and evaluate amplifier parameters.					
6	Field Effect Transistor (FET)	Construction of JFET, idea of channel formation, pinch-off voltage, transfer and output characteristics. MOSFET: MOS diode, basic construction of MOSFET and working, I-V characteristics, enhancement and depletion mode, complementary MOS (CMOS). LO1: Students will explain FET and MOSFET operations and compare their modes of operation.	4	1,2 and 3*	2, 3	1	Discussion on the significance of pinch-off voltage in JFET operation Assignment: Compare enhancement and depletion MOSFET characteristics with sketches.
7	Semiconductor or device fabrication	Oxidation, diffusion, ion implantation, lithography, thin film deposition technique, epitaxy, example - P-N junction device fabrication LO1: Students will describe fabrication techniques and demonstrate P-N junction fabrication process.	4	1,2 and 3*	2, 5	1,4	Discussion on why is fabrication processes like oxidation and lithography crucial for semiconductor devices. Assignment: Explain steps involved in fabricating a P-N junction with diagrams.

* 1- Remember, 2- Understand, 3- Apply, 4- Analyze, 5- Evaluate, 6- Create

Reference Books

1. Modern Physics, R. Murugeshan and Er. K. Shivaprasath, S. Chand, 2015

2. Semiconductor Device Fundamentals, Robert F. Pierret, Pearson Education
3. Electronic Devices and Circuits, S. Salivahanan and N. Suresh Kumar
4. Handbook of Electronics, Gupta and Kumar, Pragati Prakashan, Meerut
5. Solid State Physics, S. O. Pillai, New Age International Publishers

Electronic Materials, Web Sites etc

1. <https://youtube.be/k6ZxP9Yr02E>
2. <https://youtube.be/JA3sCmrv11M>
3. <https://youtube.be/mHAYQhz0ILE>
4. <https://youtube.be/N01BYteinzE>

CO-PO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4
PSO1	Algorithm development	✓	✓	✓	✓
	Computer Based Solution	✓			
	Application Development				
	Disciplinary Knowledge	✓	✓	✓	✓
PSO2	Programming Skill				
	Problem Solving/ Critical thinking	✓	✓	✓	✓
	Mathematical Analysis	✓	✓	✓	✓
PSO3	Financial Aspects				
	Modern Tools				
	Complex Problems solving	✓	✓	✓	✓
	Time Frame Analysis				
	Research Skills	✓	✓		✓

**INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES,
DEVI AHILYA UNIVERSITY, INDORE**

M. Tech. (CS) 5 Years I SEMESTER

CS-106D: Communication Skills

Course Type: Core

Course Credits: 4

Course Objective:

The objective of this course is to provide students with both theoretical foundations and practical exposure to communication and soft skills, preparing them for professional success. The course integrates traditional communication theories with applied training in etiquette, branding, interviews, and interpersonal development.

Course Outcomes – After completion of the course, student will:

CO1: Apply communication theories in personal and professional contexts.

CO2: Demonstrate etiquette in formal, digital, and workplace communication.

CO3: Build strong resumes, cover letters, and LinkedIn profiles for career branding.

CO4: Perform effectively in group discussions, interviews, and professional presentations.

CO5: Enhance interpersonal and self-awareness skills through Transactional Analysis and Johari Window.

Course Contents

Unit No	Title	Contents	Hr	Targeted Levels of Blooms T. (Q1)	Content and Pedagogy (Q2)	Online Resources (Q3)	Assignment/ Assessment/ Discussion (Q4)
1	Foundations of Communication & Self-Awareness	Definition, Process, Types, Barriers of Communication; Self-discovery & SWOT analysis; Growth mindset and	7	1,2	Lecture	1,2,3	Self-reflection activity

		professional confidence					
2	Verbal, Non-Verbal & Listening Skills	Non-verbal cues (body language, paralanguage, proxemics, haptics); Listening: Types, Barriers, Applications	6	1,2,3	Lecture	1,2,3	Listening role-play, peer-review on non-verbal cues activity
3	Communication Etiquette & Workplace Soft Skills	Formal etiquette (face-to-face, email, phone, online); Collaboration, conflict resolution, cultural sensitivity	6	1,2,3	Lecture	1,2,3	Role-plays, workplace simulation, written communication tasks
4	Professional Writing & Personal Branding	Resume, Cover Letter, Email, Report writing; LinkedIn profile building & digital presence	7	1,2,3,4	Lecture	1,2,3	Resume clinic, LinkedIn workshop
5	Group Discussions & Interview Mastery	GD skills & etiquette; Interview prep (behavioral, technical, telephonic, online); STAR technique	7	1,2,3,4	Lecture	1,2,3	Mock GDs & mock interviews
6	Public Speaking & Professional Presentations	Persuasion, storytelling, business presentations; Ethics in communication	6	1,2,3,4,5	Lecture	1,2,3	Elevator pitch & professional presentations
7	Interpersonal Communication & Self-Development	Transactional Analysis (Ego states, workplace application); Johari Window (feedback, teamwork); Time & stress management	6	1,2,3,4,5	Lecture	1,2,3	TA role-play, Johari Window peer activity

*** 1- Remember, 2- Understand, 3- Apply, 4- Analyze, 5- Evaluate, 6- Create**

Books and Reading

1. D. Fisher, Communication in Organizations, Jaico Publishing House, India.
2. S. Taylor, Communication for Business: A Practical Approach, Pearson Education.
3. William V. Ruch, Business Communication, Maxwell Macmillan, New York.

Online Resources:

<https://nptel.ac.in/courses/109104107>

<https://nptel.ac.in/courses/110105090>

https://onlinecourses.swayam2.ac.in/imb25_mg174/preview

CO-PO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4	C5
PSO1	Algorithm development					
	Computer Based Solution					
	Application Development					
	Disciplinary Knowledge	✓	✓	✓	✓	✓
PSO2	Programming Skill					
	Problem Solving/ Critical thinking	✓	✓	✓	✓	✓
	Mathematical Analysis					
PSO3	Financial Aspects					
	Modern Tools	✓	✓	✓	✓	✓
	Complex Problems solving					
	Time Frame Analysis	✓	✓	✓	✓	✓
	Research Skills	✓	✓		✓	✓

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES,

DEVI AHILYA UNIVERSITY, INDORE

M. Tech. (CS) 5 Years I SEMESTER

CS-104 Digital Electronics

Course Type: Engineering Sciences

Course Credits: 4

Course Objectives: To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits. To prepare students to perform the analysis and design of various digital electronic circuits.

Course Outcomes – After completion of the course, student will;

CO-1 Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.

CO-2 Understand and examine the structure of various number systems and its application in digital design

CO-3 Develop ability to understand, analyze and design various combinational and sequential circuits.

CO-4 Develop ability to identify basic requirements for a design application and propose a cost effective solution.

CO-5 Develop ability to identify and prevent various hazards and timing problems in a digital design. To develop skill to build, and troubleshoot digital circuits.

(**CO** is Course Outcome, **LO** is Learning Outcome and **PO** is Program Outcome)

Course Contents –

Unit No	Title	Contents	Hr	(Q1) Targeted Levels of Blooms T.	(Q2) Content and Pedagogy	(Q3) Online Resources	(Q4) Assign./ Assessment/Discussion

1	Number Systems and Codes - I	Number System, Binary, Octal, Hexadecimal, and Decimal Number System. Codes, Conversion of bases. Gray Code, Excess-3 code, cyclic code, weighted codes – BCD, ASCII, and EBCDIC Codes. LO1: Develop an understanding of number systems and codes. LO2: Learn code conversions.	4	1 and 2*	Book 1 and 2. (Lecture)	1	Discussion about Number System and operations
2	Number Systems and Codes - II	Binary addition and subtraction, signed and unsigned binary numbers, representation of negative numbers, 1's complement, 2's complement, arithmetic using 2's complement. LO1: Understand the concept of Binary arithmetic.	4	1 and 2*	Book 1 and 2. (Lecture)	1	Discussion about binary arithmetic
3	Boolean Algebra-I	Basic logic circuits: Logic gates (AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR and their truth tables), Universal Gates, Laws of Boolean algebra, De-Morgan's theorem, Min term, Max term,					Discussion on logic gates and Boolean algebra
4	Boolean Algebra-II	Standard and canonical representation (POS & SOP), Karnaugh Map, minimization of Boolean expressions using Karnaugh map, and don't care condition.	6	1 and 2*	Book 3 and 4(Lecture, and numerical)	1	Discussion on Boolean function and minimization techniques

		LO1: Able to represent Boolean expressions in standard and canonical form. LO2: Understand the concept Karnaugh map and learn its minimization.					
5	Combinational Logic Circuits	Half Adder, Full Adder, Half Subtractor, Full Subtractor, Full adder using half adder, BDC Adder. Carry Look ahead, Multipliers. Multiplexer/de- multiplexers, Encoders and Decoders. LO1: Learn the concept Adders, multiplexers, encoders, and decoders. LO2: Design Adders, multiplexers, encoders, and decoders .	8	1, 2 and 3*	Book 3 and 4 (Lecture, and numerical)	1	Discussion on Combinational Logic Circuits and implementations
6	Sequential Logic Circuits:	Sequential Logic Circuits: Latches, Edge Triggered Flip Flops: SR, D, JK, Master slave JK,. Excitation tables, conversion of Flip Flops. State Diagrams, counters and registers LO1: Perform operations on fuzzy	8	1, 2 and 3*	Book 3 and 4 (Lecture, and numerical)	1	Practice session Sequential Logic Circuits, working and design

		sets. LO2: Use fuzzy propositions and inferences to develop fuzzy logic systems.					
7	Digital Logic Families:	Parameters of Logic Families. Introduction to logic Families: DTL, RTL, TTL LO1: Understand the concept logic families.	6	1 and 2*	Book 1 and 2. (Lecture)	1	Discussion on Digital Logic Families working principle

* 1- Remember, 2- Understand, 3- Apply, 4- Analyze

Books and Reading

BOOKS:

1. Modern Digital Electronics By R.P.Jain, Fourth Edition, Tata McGraw-Hill Education
2. M . Morris Mano, “Digital Design”, Pearson Education Asia.

Reference Books:

1. Digital Logic & State Machine Design By David J. Comer, Third Indian Edition, Oxford University Press
2. Digital Logic and Computer Design By M Morris Mano, Fourth Edition, Prentice Hall Publication
3. Digital Principles and Applications By Malvino & Leach, Seventh Edition, McGraw-Hill Education
4. Modern Digital Electronics By R.P.Jain, Fourth Edition, Tata McGraw-Hill Education.
5. Digital Electronics: Principles and Integrated Circuits By A.K. Maini, Wiley India Publications
6. Digital Design M. Morris Mano and Michael D. Ciletti, Pearson Education

Online Reference:

1 <https://nptel.ac.in/courses/108105132>

CO-PO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4	C5
PSO1	Algorithm development			✓	✓	✓
	Computer Based Solution	✓	✓	✓	✓	✓
	Application Development			✓	✓	✓
	Disciplinary Knowledge	✓	✓	✓	✓	✓
PSO2	Programming Skill					
	Problem Solving/ Critical thinking	✓	✓	✓	✓	✓
	Mathematical Analysis	✓	✓	✓	✓	✓
PSO3	Financial Aspects					
	Modern Tools					
	Complex Problems solving					
	Time Frame Analysis					
	Research Skills				✓	✓

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES,

DEVI AHILYA UNIVERSITY, INDORE

M. Tech. (CS) 5 Years I SEMESTER

CS-105 Problem Solving using C

Course Type: Core Computer Science

Course

Credits: 4

Course Objective: To develop algorithmic thinking, programming skills in the C language and to equip students with the ability to translate their problem-solving skills into efficient C code.

Course Outcomes – After completion of the course, student will;

CO1: Develop ability to formulate and formalize problems, design algorithms and understand how to test and debug programs to ensure they function correctly.

CO2: Develop ability to translate algorithms into C code, testing, and debugging.

CO3: Learn and understand C language concepts including conditional branching, iteration, functions, recursion, arrays, pointers, and file handling.

CO4: Able to develop applications using C programming language.

Course Contents –

Unit No	Title	Contents	Hr	Targeted Levels of Blooms T. (Q1)	Content and Pedagogy (Q2)	(Q3) Online Resources	(Q4) Assign./ Assessment/Discussion
1	Introduction to Problem Solving	Understanding the problem-solving process using computers. Breaking down complex problems	6	1 and 2*	Book 1 and Book 2	1 & 2	Discussion problem solving concepts and learn to develop

		into smaller, manageable parts. Developing algorithms to solve arithmetic and logical problems.			(Lecture & illustration)		algorithms and flowcharts
2	Introduction to C Programming	Fundamentals of the C programming language. Data types, operators, and expressions in C. Input/output operations in C.	4	1, 2 and 3*	Book 1 and Book 2 (Lecture & illustration)	1 & 2	Introduction to syntax and programming elements of C programming language Assignment to develop simple C programs
3	Control Flow	Conditional statements (if, if-else, switch). Looping constructs (for, while, do-while). Nested loops and their applications.	10	1, 2 3, and 6*	Book 1 and Book 2 (Lecture, illustration, and implementation)	1 & 2	Discussion on conditional and looping constructs available in C along with program development Assignment to develop programs using different control and loop statements
4	Functions	Defining and calling functions. Function arguments and return values. Scope and lifetime of variables. Recursion in C.	8	1, 2, 3 and 6*	Book 1 and Book 2 (Lecture, illustration, and implementation)	1 & 2	Discussion on functions, recursion, scope, visibility, and lifetime. Assignment to develop programs using functions
5	Arrays & Pointers	Arrays: Declaring and initializing arrays. Working with one-dimensional and multi-dimensional arrays. Array manipulation and searching. Pointers: Understanding pointers	4	1, 2,3 and 6*	Book 1 and Book 2 (Lecture, illustration, and implementation)	1 & 2	Discussion on arrays and pointers, their need and usage. Assignment to develop programs using arrays and pointers

		and their usage. Pointer arithmetic. Dynamic memory allocation using pointers					
6	Structures & Union	Creating and using structures to group related data. Working with unions.	4	1, 2,3 and 6*	Book 1 and Book 2 (Lecture, illustration, and implementation)	1 & 2	Discussion on structures and unions and applicability in different types of problems
7	File Handling	Opening, reading, and writing files in C. File operations and error handling.	4	1, 2,3,4 and 6*	Book 1 and Book 2 (Lecture, illustration, and implementation)	1 & 2	Discussion on file handling operation in C and data storage. Assignment to develop application using various concepts of C studied so far

* 1- Remember, 2- Understand, 3- Apply, 4- Analyze, 5- Evaluate, 6- Create

Text Books and Reading

1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill .
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Electronic Materials, Web Sites etc

1. <https://nptel.ac.in/courses/106/104/106104123/>
2. [Course Homepage of CS101, Computer Programming](#)

CO-PO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4
PSO1	Algorithm development	✓	✓	✓	✓
	Computer Based Solution	✓	✓	✓	✓
	Application Development	✓	✓	✓	✓
	Disciplinary Knowledge	✓	✓	✓	✓
PSO2	Programming Skill	✓	✓	✓	✓
	Problem Solving/ Critical thinking	✓	✓	✓	✓
	Mathematical Analysis	✓	✓	✓	✓
PSO3	Financial Aspects				
	Modern Tools	✓	✓	✓	✓
	Complex Problems solving	✓	✓	✓	✓
	Time Frame Analysis				
	Research Skills				✓

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES,

DEVI AHILYA VISHWAVIDYALAYA, INDORE

M. Tech. (CS) I Semester

CS-106 Digital Electronics Lab

Number Systems & Codes

1. Convert given decimal numbers into binary, octal, and hexadecimal, and verify by reverse conversion.
2. Implement binary-to-Gray code and Gray-to-binary code conversion.
3. Implement BCD-to-Excess-3 and Excess-3-to-BCD conversion.
4. Write a program (or use circuit) to display ASCII codes for given characters.
5. Perform binary addition and subtraction using signed and unsigned numbers, verify with 1's and 2's complement.

Logic Gates & Boolean Algebra

6. Verify the truth tables of basic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR) using ICs or simulation.
7. Implement and verify Universal Gates (NAND, NOR) as basic gates.
8. Verify De Morgan's theorems using logic gates.
9. Implement Boolean expressions in standard SOP and POS forms using gates.
10. Simplify given Boolean expressions using K-map and implement the minimized circuit.

Combinational Circuits

11. Design and implement a Half Adder and Full Adder using logic gates.
12. Design and implement a Half Subtractor and Full Subtractor.
13. Implement a Full Adder using two Half Adders.
14. Design a BCD Adder using logic gates/ICs.
15. Implement and verify Multiplexers (4:1, 8:1) and Demultiplexers (1:4, 1:8).
16. Design and test Encoder and Decoder circuits.

Sequential Circuits

17. Design and verify the operation of SR, D, JK, and T Flip-Flops.
18. Implement a Master-Slave JK Flip-Flop and verify its truth table.
19. Design mod-n counters (up counter, down counter, decade counter).
20. Implement Shift Registers (SISO, SIPO, PISO, PIPO) and verify their operation.

**INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES,
DEVI AHILYA VISHWAVIDYALAYA, INDORE
M. Tech. (CS) I Semester
CS-107 C Programming Lab**

1. Write an algorithm and draw a flowchart to read two numbers and display their sum.
2. Write an algorithm and draw a flowchart to check whether a given number is even or odd.
3. Write an algorithm and draw a flowchart to find the larger of two numbers entered by the user.
4. Write an algorithm and draw a flowchart to calculate the area of a rectangle when length and breadth are given.
5. Write an algorithm and draw a flowchart to calculate simple interest ($SI = P \times R \times T / 100$).
6. Write an algorithm and draw a flowchart to check whether a number is positive, negative, or zero.
7. Write an algorithm and draw a flowchart to read a student's marks and print their grade:
Marks $\geq 90 \rightarrow$ Grade O
Marks $\geq 80 \rightarrow$ Grade A+
Marks $\geq 70 \rightarrow$ Grade A
Marks $\geq 60 \rightarrow$ Grade B+
Marks $\geq 50 \rightarrow$ Grade B
Marks $\geq 40 \rightarrow$ Grade C
Marks $\geq 35 \rightarrow$ Grade P
Marks $< 35 \rightarrow$ Fail
8. Write an algorithm and draw a flowchart to find the factorial of a given number.
9. Write an algorithm and draw a flowchart to print the first N natural numbers.
10. Write an algorithm and draw a flowchart to reverse a given integer number.

Basic Programs

1. Write a C Program to Check Whether a Character is an Alphabet or not.
2. Write a C Program to Compute Quotient and Remainder.
3. Write a C Program to Find the Size of int, float, double and char.
4. A number is called an Armstrong number if the sum of the cubes of the digits of the number is equal to the number. For example $153 = 1^3 + 5^3 + 3^3$. Write a C program that asks the user to enter a number and returns if it is Armstrong or not.
5. Write a C Program to Display Armstrong Number Between Two Intervals
6. Write a C Program to Make a Simple Calculator Using switch...case.
7. Write a C Program to Generate Multiplication Table.
8. Write a C Program to find all Roots of a Quadratic Equation.
9. Write a C Program to Convert Binary Number to Decimal and vice-versa.
10. Write a C Program to illustrate the use of break, continue & go to statement.
11. Write a C Program to count number of words in a sentence.
12. Write a C program that calculates the HCF and LCM of two numbers.
13. Write a C program to display and find the sum of the series $1 + 11 + 111 + \dots$ up to n. For eg. if $n = 4$, the series is: $1 + 11 + 111 + 1111$. Take the value of 'n' as input from the user.
14. Write a C program that reads a positive integer n and then prints the following pattern:

```
*****
_*****
*****
*****
*****
*****
****
***
**
*
```

15. Amicable numbers are found in pairs. A given pair of numbers is Amicable if the sum of the proper divisors (not including itself) of one number is equal to the other number and vice – versa. For example 220 & 284 are amicable numbers. Write a C program to check that the input pair of numbers is amicable.
16. A triangular number is one which can be represented by that number of pebbles in a symmetric triangle. The first five triangular numbers are 1, 3, 6, 10 and 15. Write a C function `int isTriangular(int n)` to test if a number 'n' is triangular or not. It should return 1 if it is triangular and 0 if not.
17. Write a C program to find the reverse of an integer number.
18. Take the price and quantity of items as an input. Write a program to calculate the sum of the prices. Write another C function to calculate the discount according to the following rules:
 - For total less than Rs.1000, discount is 5%.
 - For total greater than Rs.1000 but less than Rs.5000, discount is 10%.
 - For total greater than Rs.5000, discount is 15%.Print the individual item prices, total, discount and the final price.
19. Write a C program to calculate the volume of the following shapes: Cube, Cuboid, Sphere, Cylinder and Cone. Ask the user which one s/he wants to calculate, and take the appropriate required inputs. Then print the result.
20. Write a C program to check if a number has three consecutive 5s. If yes, print YES, else print NO.
21. Write a C program to print the following pattern:

a) 1

12

123

1234

12345

b) 1

22

333

4444

55555

22. Write a C program to accept 10 values in an integer array. Display the number of odd, even, and negative numbers.
23. Write a C program to accept the basic salary of an employee from the user. Calculate the gross salary on the following basis:
- | Basic | HRA | DA |
|-----------------|-----|-----|
| 1-4000 | 10% | 50% |
| 4001-8000 | 20% | 60% |
| 8001-12000 | 25% | 70% |
| 12000 and above | 30% | 80% |
24. Write a C function celsius() to convert degrees Fahrenheit to degrees Celsius. (The conversion formula is $^{\circ}\text{C} = 5/9 * (^{\circ}\text{F} - 32)$.)
Use it to print a Fahrenheit-to-Centigrade table for -40 to 220 degrees Fahrenheit, in increments of 10 degrees.
An Electricity board charges the following rates for use of electricity:
- For the First 200 units: Rs 1 per unit
 - For the next 100 units: Rs 1.5 per unit
 - Beyond 300 units: Rs 2 Per unit.
- Write a C Program to read no of unit consumed and print out total charge amount.
25. Write a C program, which will print two digit numbers whose sum of both digits is multiple of seven. e.g. 16, 25, 34 ...
26. Write a C program, that reads list of n integer and print sum of product of consecutive numbers.
Example: if n = 7 and numbers are 4, 5, 2, 5, 6, 4, 7 then output is $4*5 + 5*2 + 2*5 + 5*6 + 6*4 + 4*7 = 122$.
27. Write a C program to check whether a given string is palindrome or not.
28. Compute taxes for a given income with tax slab rates as follows:
- slab 1: 0 - 2500: 0%
 - slab 2: 2500 - 5000: 10%
 - slab 3: 5000 - 10000: 20%
 - slab 4: 10000+: 30%
- Write a program to calculate tax.
29. Input date, month and year from the user, and using switch case, display in worded format.
Example: input: d = 16, m = 7, y = 1992 output: 16th July, 1992

30. Find out the ugly prime number. The given number is ugly prime number if its prime factor contains only among 2, 3 or 5.

Example: $20 = 2 * 2 * 5$ is ugly prime number

$14 = 2 * 7$ is not ugly prime number

So write a C function which takes values from 1 to n and returns the number of ugly primes number in it.

Function

1. Write a program to swapping of two number using call by value.
2. Write a program to swapping of two number using call by address.
3. Write a program to addition of two number using functions.
4. Write a program to Display matrix using functions.
5. Write a program to find factorial of a number using function.
6. Write a program to find factorial of a number using recursive function.
7. Write a C Program to Find the Sum of Natural Numbers using Recursion
8. Write a C Program to Multiply two Matrices by Passing Matrix to a Function

One Dimensional array

1. Write a program to sort the element entered in a list (One dimensional array).
2. Write a program to find sum and count of even and odd numbers in an array.
3. Write a program to find all prime numbers and calculate and print their sum.
4. Write a program to reverse all elements of an array.
5. Write a program to find largest and smallest number in an array.
6. Write a program to display the first n terms of Fibonacci series using an array.
7. Write a C Program to check if a given matrix is an identity matrix.
8. Write a C Program to find transpose of a matrix.
9. Write a C Program to find subtraction of two matrices using function.
10. Write a C program to input n numbers in an array, calculate the sum of all even numbers and all odd numbers in the array and print the larger sum.

Example:

If the array contains the following elements:

2, 3, 3, 5, 4, 8, 7, 11, 2

The sum of all even elements is $2 + 4 + 8 + 2 = 16$

Sum of all odd elements is $3 + 3 + 5 + 7 + 11 = 29$

Therefore, the output should be 29.

11. Write a C program to take a list of n elements from the user. Store it in an array. Reverse the list.

Two dimensional array

1. Write a program to check whether a given matrix is a square matrix or not.
2. Write a program to find sum of diagonal elements in a matrix.
3. Write a program to find the addition of two matrices.
4. Write a program to find the multiplication of two matrices.
5. Write a program to find transpose of a given matrix.

String

1. Write a program to find the reverse of a given string.
2. Write a program to check whether given string is a palindrome or not.
3. Write a program to demonstrate the use of string functions.
4. Write a program to read and display the list of names.

Pointers

1. Write a C program to swap two numbers using pointers.
2. Input n integers into an array and display them using pointer notation.
3. Find the length of a string using pointers (without using `strlen()`).
4. Reverse a given string in place using pointers.
5. Write a program to count vowels and consonants in a string using pointers.

6. Find the sum of all elements of an array using pointers.
7. Write a program to find the largest and smallest element in an array using pointers.
8. Input n integers using malloc() and find their average.

Structure

1. Write a Program to add two distances which is in feet and inches.
2. Write a Program to Add Two Complex Numbers by Passing Structure to a Function.
3. Write a Program to Store Information of Students Using Structure.
4. Write a Program to illustrate the use of unions.
5. Write a C Program to show the functional difference between structure & union.
6. Write a C Program to illustrate the use of enumerated data types.

File Handling

1. Write a C program to take user input (string) and store it in a text file.
2. Read the contents of a text file and display them on the console.
3. Write a program to count the number of characters, words, and lines in a text file.
4. Copy the contents of one file into another file.
5. Append new data to an existing file.
6. Write a program to store student details (roll no, name, marks) in a file and then display them.
7. Merge the contents of two text files into a third file.

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES

DEVI AHILYA UNIVERSITY, INDORE

M. Tech. (CS) 5 Years

Syllabus

Jan-May' 2026

Semester II

Sub. Code	Subject Name	Category	L	T	P	C
CS-201	Mathematics – II (Differential Calculus)	Basic Sciences	3	1	0	4
CS-202	Chemistry and Environmental Sciences	Basic Sciences	3	1	0	4
CS-203	Engineering Drawing	Engineering Sciences	3	1	0	4
CS-204	Digital Computer Organization	Engineering Sciences	3	1	0	4
CS-205	Object Oriented Programming using C++	Core Computer Science	3	1	0	4
CS-206	Engineering Drawing Lab	Practical	0	0	4	2
CS-207	C++ Programming Lab	Practical	0	0	4	2
CS-208	Comprehensive Viva	Virtual	0	0	0	4
			Total			28

International Institute of Professional Studies, DAVV
M. Tech. (CS) 5 Years Semester II
CS-201 Mathematics – II (Differential Calculus)

Aim of the Course

To develop strong analytical foundations in differential calculus, ordinary and partial differential equations, and vector calculus for modeling and solving engineering and computational problems.

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

CO1: Analyze curves and their properties using differential calculus.

CO2: Solve ordinary differential equations of first and higher order with engineering applications.

CO3: Apply vector differentiation and integration techniques to interpret physical phenomena.

CO4: Formulate and solve partial differential equations occurring in engineering systems.

Course Contents

Unit No	Title	Contents	Hr	Targeted Levels of Blooms T. (Q1)	Content and Pedagogy (Q2)	(Q3) Online Resources	(Q4) Assign./ Assessment/Discussion
I	Sequences and Series	Convergence of sequence and series, test for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions.	6	1,2*		1-4	
II	Ordinary Differential Equations (ODE's) of first order - I	Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations. Applications of ODE's-Orthogonal trajectories, Newton's law of cooling. LO: Solve linear, Bernoulli's, exact, and reducible differential equations and apply them to real-life problems.	6	3, 4*	Text Book 1,2	1-4	Discuss the role of first-order differential equations in modeling physical systems. Assignment Solve application-based problems including Newton's law of cooling.
III	Ordinary Differential Equations (ODE's) of first order - II	Nonlinear differential equations: Introduction to general and singular solutions; Solvable for p only; Clairaut's equations, reducible to Clairaut's equations. Problems. LO: Understand and solve nonlinear	6	2, 3*	Text Book 1,2	1-4	Discuss the significance of singular solutions in differential equations. Assignment Solve problems involving general and singular

		differential equations including Clairaut's equations and singular solutions.					solutions of differential equations.
IV	Ordinary Differential Equations of higher order	Higher-order linear ODE's with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre homogeneous differential equations. Problems. LO: Solve higher-order linear differential equations using inverse operator and variation of parameters methods.	6	3, 4*	Text Book 1,2	1-4	Discuss applications of higher-order differential equations in engineering modeling. Assignment Solve numerical problems using variation of parameters technique.
V	Vector Differentiation	Scalar and vector fields. Gradient, directional derivative; curl and divergence-physical interpretation; solenoidal and irrotational vector fields. Problems. LO: Apply gradient, divergence, and curl to scalar and vector fields with physical interpretation.	4	2, 3*	Text Book 1,2	1-4	Discuss the physical meaning of divergence and curl in fluid flow. Assignment Solve problems related to divergence and curl of vector fields.
VI	Vector Integration	Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem and Stoke's theorem. Problems. LO: Evaluate line and surface integrals and apply Green's and Stokes' theorems to physical problems.	4	3, 4*	Text Book 1,2	1-4	Discuss engineering applications of vector integral theorems. Assignment Solve problems related to work done by a force and flux across a surface.
VII	Partial Differential Equations (PDE's)	Formulation of Partial Differential equations, Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients LO: Formulate and solve partial differential equations using standard solution techniques including Lagrange's method.	8	3, 4*	Text Book 1,2	1-4	Discuss the role of partial differential equations in modeling real-world phenomena. Assignment Solve problems based on Lagrange's linear partial differential equations.

* 1- Remember, 2- Understand, 3- Apply, 4- Analyze, 5- Evaluate, 6- Create
Text Books

1. B.S. Grewal: “*Higher Engineering Mathematics*”, Khanna publishers, 44 th Ed.2018
2. E. Kreyszig: “*Advanced Engineering Mathematics*”, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference Books:

1. V. Ramana: “Higher Engineering Mathematics”-McGraw-Hill Education, 11th Ed.
2. Srimanta Pal & Subodh C.Bhunia: “Engineering Mathematics”Oxford University press, 3rd Reprint, 2016.
3. N.P Bali and Manish Goyal: A text book of Engineering Mathematics” Laxmi Publications, Latest edition
4. C. Ray Wylie, Louis C. Barrett: “Advanced Engineering Mathematics” McGraw – Hill Book Co. New York, Latest ed.
5. Gupta C.B, Sing S.R and Mukesh kumar: Engineering Mathematics for Semester I and II, Mc-Graw Hill Education(India) Pvt.Ltd. 2015

Electronic Resources:

1. <http://.ac.in/courses.php?disciplineID=111>
2. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
3. <http://academicearth.org/>
4. VTU EDUSAT PROGRAMME-20

CO-PO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4
PSO1	Algorithm development				
	Computer Based Solution				
	Application Development				
	Disciplinary Knowledge	✓	✓	✓	✓
PSO2	Programming Skill				
	Problem Solving/ Critical thinking	✓	✓	✓	✓
	Mathematical Analysis	✓	✓	✓	✓
PSO3	Financial Aspects				
	Modern Tools				
	Complex Problems solving	✓	✓	✓	✓
	Time Frame Analysis				
	Research Skills	✓	✓	✓	✓

International Institute of Professional Studies, DAVV

M. Tech. (CS) 5 Years Semester II

CS-202 Chemistry and Environmental Sciences

Aim of Course: To make students familiar with the basic concepts of Chemistry and various environmental issues, focusing on sustainability, pollution control, biodiversity conservation, and ethical responsibility.

Course Objectives: After successful completion of the course, students will be able to:

- **CO1:** Understand fundamental concepts of polymers and their industrial applications.
- **CO2:** Explain the structure, functions, and energy flow within ecosystems and environmental cycles.
- **CO3:** Analyze environmental problems such as pollution, biodiversity loss, and global environmental issues.
- **CO4:** Apply environmental laws, ethical principles, and conservation strategies for sustainable development.

Unit No	Title	Contents	Hr	Targeted Levels of Blooms T. (Q1)	Content and Pedagogy (Q2)	(Q3) Online Resources	(Q4) Assign./ Assessment/Discussion
I	High Polymer	Introduction, types and classification of polymerization, Natural & Synthetic Rubber; Vulcanization of Rubber, Preparation, Properties & uses of the following- Polythene, PVC, PMMA, Teflon, Poly acrylonitrile, Nylon 6, Nylon 6:6, Terylene, Phenol formaldehyde Resin LO1: Define polymers and classify different types of polymerization. LO2: Explain the preparation, properties, and applications of synthetic and natural polymers.	4	1, 2 & 3*	Book 1, 3, 4	1, 2, 3 & 4	Discuss how polymer selection influences sustainability and environmental safety in modern industries. Assignment Prepare a comparative report on synthetic and natural polymers highlighting their preparation methods, properties, and industrial applications.
II	Ecosystem	Concept of an ecosystem. Structure and functions of an ecosystem. Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere, Cycles in Ecosystem – Water, Carbon, Nitrogen. Producers, consumers and decomposers. Energy flow in the ecosystem. Sources of Energy: Renewable & Non Renewable,	8	2, 3 & 4*	Book 1, 2, 5	1, 2, 3 & 4	Discuss the impact of excessive use of non-renewable energy resources on ecosystem stability. Assignment Draw and explain the

		Fossil fuel, Biomass, Geothermal, Hydrogen, Solar, Wind, hydal, nuclear energy LO1: Describe the structure and function of ecosystems and environmental segments. LO2: Explain biogeochemical cycles and energy flow in ecosystems.					structure of an ecosystem showing energy flow and major biogeochemical cycles.
III	Biodiversity & it's Conservation	Definition: genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels. India as a mega diversity nation. Hotspots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man -wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. LO1: Explain different levels and values of biodiversity. LO2: Analyze causes and impacts of biodiversity loss.	8	2, 3 & 5*	Book 1, 2	1, 2, 3 & 4	Discuss why biodiversity conservation is critical for sustainable human development. Assignment Write a case study on any one biodiversity hotspot in India focusing on threats and conservation measures.
IV	Environmental Pollution & Global Issues	Environmental Pollution: Definition, causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and nuclear hazards, Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Case studies. E-waste and plastic waste: recycling and reuse Disaster management: Floods, earthquake, cyclone and landslides.	8	2, 3 & 5*	Book 3, 4, 5	1, 2, 3 & 4	Discuss the role of individuals and governments in mitigating global environmental challenges. Assignment Analyze a real-life environmental pollution case and suggest suitable control and

		Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. LO1: Identify various types of environmental pollution and their effects. LO2: Analyze solid waste, e-waste, and plastic waste management techniques.					management strategies.
V	Air Pollution & Sound Pollution	Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, Green house effect, ozone layer depletion, acid Rain. Sound Pollution: Causes, controlling measures, effects of sound pollution LO1: Classify air and sound pollutants. LO2: Explain greenhouse effect, ozone depletion, and acid rain. LO3: Analyze the health and environmental impacts of air and noise pollution.	4	1, 2 & 3*	Book 1, 3	1, 2, 3 & 4	Discuss how urbanization contributes to increased air and sound pollution. Assignment Prepare a brief report on major air and noise pollutants in urban areas and their effects on human health.
VI	Water Pollution & Water Conservation	Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent. Water conservation: Rain water harvesting, watershed management .Resettlement and rehabilitation of people: its problems and concerns. LO1: Identify water pollutants and their adverse effects. LO2: Explain domestic and industrial wastewater treatment methods. LO3: Apply water conservation techniques such as rainwater harvesting and watershed management.	4	2, 3 & 4*	Book 2, 4	1, 2, 3 & 4	Discuss the need for rainwater harvesting in water-stressed regions of India. Assignment Study and explain any one wastewater treatment method and its importance in water conservation.

VII	Environmental Ethics & Environmental Protection	Ethics and moral values, ethical situations, objectives of ethics and its study. Environment Protection Act. -Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act .Wildlife Protection Act .Forest Conservation Act .Issues involved in enforcement of environmental legislation. Public awareness LO1: Explain ethical principles and moral values related to the environment. LO2: Interpret major environmental protection acts and legislation. LO3: Evaluate the role of public awareness and individual responsibility in environmental protection.	4	2, 3 & 5*	Book 1, 5	1, 2, 3 & 4	Discuss how ethical awareness can strengthen environmental protection efforts. Assignment Prepare a short note on the importance of environmental ethics and major environmental protection laws in India.
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* 1- Remember, 2- Understand, 3- Apply, 4- Analyze, 5- Evaluate, 6- Create

Text Book:

1. Deshwal, S. *Energy, Environment, Ecology and Society*, Dhanpat Rai & Co. Pvt. Ltd., New Delhi.
2. Rana, S. V. S. *Essentials of Ecology and Environment*, Prentice Hall of India (PHI), New Delhi.
3. De, A. K. *Environmental Chemistry*, New Age International Publishers, New Delhi.
4. Sharma, B. K. *Environmental Chemistry*, Goel Publishing House, Meerut.
5. Cunningham, W. P. and Cunningham, M. A. *Principles of Environmental Science: Inquiry and Applications*, McGraw-Hill Education.

E-Resources:

1. SWAYAM (MOE, Govt. of India) – Environmental Studies and Environmental Chemistry courses
<https://swayam.gov.in>
2. NPTEL (IITs & IISc) – Environmental Science, Polymer Chemistry, Ecology, Energy Resources
<https://nptel.ac.in>
3. e-PG Pathshala (UGC) – Modules on Environment, Biodiversity, Pollution, and Ethics
<https://epgp.inflibnet.ac.in>
4. National Digital Library of India (NDLI) – E-books, lecture notes, and research materials
<https://ndl.iitkgp.ac.in>

CO-PO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4
PSO1	Algorithm development				
	Computer Based Solution				
	Application Development				
	Disciplinary Knowledge	✓	✓	✓	✓
PSO2	Programming Skill				
	Problem Solving/ Critical thinking	✓	✓	✓	✓
	Mathematical Analysis				
PSO3	Financial Aspects				
	Modern Tools				
	Complex Problems solving				
	Time Frame Analysis				
	Research Skills	✓	✓	✓	✓

International Institute of Professional Studies, DAVV
M. Tech. (CS) 5 Years Semester II
CS-203 Engineering Drawing

Course Objectives (COs)

- CO1: Understand engineering drawing standards, tools, and conventions.
- CO2: Apply geometrical construction principles for technical drawings.
- CO3: Visualize and represent objects using orthographic and sectional views.
- CO4: Interpret and draw isometric and perspective projections.

Course Contents

Unit No	Title	Contents	Hr	Targeted Levels of Blooms T. (Q1)	Content and Pedagogy (Q2)	(Q3) Online Resources	(Q4) Assign./ Assessment/Discussion
I	Introduction to Engineering Drawing & Instruments	Importance of engineering drawing, BIS standards, instruments, lettering, dimensioning, scales. LO1: Explain the importance and applications of engineering drawing. LO2: Identify and use drawing instruments and BIS standards.	6	1, 2*	Book 1, 2	1-4	Discussion on need of standardization in engineering drawings Assignment Draw lettering styles, dimensioning examples, and one plain scale.
II	Geometrical Constructions	Polygons, conic sections, and engineering curves. LO1: Construct geometrical shapes and polygons accurately. LO2: Draw conic sections and engineering curves using standard methods.	6	2, 3*	Book 1, 3	1-4	Discussion on how conic sections are applied in engineering design Assignment Construct two conic sections and one engineering curve.
III	Orthographic Projections	First and third angle projections, projections of points, lines, and planes. LO1: Understand principles of	6	3, 4*	Book 1, 2	1-4	Discussion on importance of orthographic views in manufacturing Assignment Draw orthographic projections of given

		orthographic projection. LO2: Draw projections of points, lines, and planes.					points and lines
IV	Projections of Solids	Projections of cube, prism, pyramid, cone, and cylinder. LO1: Draw projections of solids with axes inclined to reference planes. LO2: Analyze the effect of inclination on projections.	6	3, 4*	Book 1, 4	1-4	Discussion on difficulties that arise while projecting inclined solids. Assignment Draw projections of any two solids with given inclinations.
V	Sections of Solids	Section planes, sectional views, true shape of sections. LO1: Draw sectional views and true shapes of sections. LO2: Apply correct hatching conventions in sectional drawings.	6	3, 4*	Book 2, 3	1-4	Discussion on preference of sectional views over hidden lines Assignment Draw sectional views of a solid cut by a plane.
VI	Isometric Projections	Isometric scale, isometric projection and views. LO1: Draw isometric views and projections of solids. LO2: Convert orthographic views into isometric drawings.	6	3, 6*	Book 1, 4	1-4	Discussion on how isometric drawings aid visualization Assignment Convert orthographic views into isometric projection.
VII	Perspective Projection	One-point and two-point perspective projections of solids. LO1: Draw one-point and two-point perspective views. LO2: Apply perspective drawings for realistic visualization.	4	2, 3*	Book 2,3		Discussion on real life applications of perspective drawings. Assignment Draw one-point perspective projection of a simple solid.

*** 1- Remember, 2- Understand, 3- Apply, 4- Analyze, 5- Evaluate, 6- Create**

Text Books

1. N. D. Bhatt & V. M. Panchal, Engineering Drawing, Charotar Publishing House.
2. K. L. Narayana & P. Kannaiah, Textbook of Engineering Drawing, Scitech Publications.
3. David Goetsch, Technical Drawing with Engineering Graphics, Pearson Education.
4. Raghuwanshi, Engineering Drawing, I. K. International Publishing House.

E-Resources

1. **NPTEL** – Engineering Drawing & Computer Graphics (IITs)
<https://nptel.ac.in>
2. **SWAYAM (MOE, Govt. of India)** – Engineering Graphics courses
<https://swayam.gov.in>
3. **National Digital Library of India (NDLI)** – E-books, lecture notes, solved problems
<https://ndl.iitkgp.ac.in>
4. **BIS (Bureau of Indian Standards)** – Drawing standards and conventions
<https://www.services.bis.gov.in>

CO-PO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4
PSO1	Algorithm development				
	Computer Based Solution				
	Application Development				
	Disciplinary Knowledge	✓	✓	✓	✓
PSO2	Programming Skill				
	Problem Solving/ Critical thinking	✓	✓	✓	✓
	Mathematical Analysis	✓	✓	✓	✓
PSO3	Financial Aspects				
	Modern Tools	✓	✓	✓	✓
	Complex Problems solving				
	Time Frame Analysis				
	Research Skills	✓	✓	✓	✓

International Institute of Professional Studies, DAVV
M. Tech. (CS) 5 Years Semester II
CS-204 Digital Computer Organization

Aim of the Course: To provide foundational and advanced knowledge of computer organization and system-level concepts, enabling students to understand internal hardware operations and their interaction with software for efficient computing system design.

Course Outcomes: After completion of the course, the student will be able to:

- **CO1:** Understand the functional organization of computers, including registers, buses, memory, and instruction execution cycles.
- **CO2:** Analyze register transfer operations, micro-operations, and instruction formats used in basic computer design.
- **CO3:** Explain input–output mechanisms; interrupt handling, DMA, and peripheral interfacing techniques.
- **CO4:** Apply control unit and microprogramming concepts to interpret and evaluate instruction execution and control logic.

Course Contents:

Unit No	Title	Contents	Hr	Targeted Levels of Blooms T. (Q1)	Content and Pedagogy (Q2)	(Q3) Online Resources	(Q4) Assign./ Assessment/ Discussion
I	Introduction to computer organization	Basic difference between computer organization and computer architecture, Von-Neumann architecture, computer components, interconnection structures, Bus interconnection LO:- To understand the basic concepts of computer organization and architecture.	6hrs	1 and 2*	Book 1, 2 (Lecture)	1-5	Computer Organization vs. Computer Architecture – Why both are essential for system design? Assignment Compare Von-Neumann and Harvard architectures with neat diagrams and real-world examples.
II	Register Transfer and Micro operations	Register transfer language, bus and memory transfers, arithmetic micro operations, logic micro operations, shift micro operations LO:- To understand the register transfer and bus and memory	6hrs	1 and 2*	Book 1, 2 (Lecture & programming exercises)	1-5	Role of Register Transfer Language (RTL) in understanding internal CPU operations. Assignment Explain arithmetic, logical, and shift micro-operations

		transfer micro operations.					with suitable examples and RTL notation.
III	Basic computer Organization and design	Instruction codes, stored program organization, computer registers, common bus system, memory-reference instruction LO:-To understand memory-reference instructions, input-output and interrupt.	5hrs	1, 2*	Book 1, 2 (Lecture & programming exercises)	1-5	Stored program concept and its impact on modern computing systems. Assignment Describe instruction codes and memory-reference instructions with execution steps and flow diagrams.
IV	Input-Output organization	I/O interface models of transfer, interrupt driven I/O, priority interrupt, DMA, I/O processor and serial communication, synchronous, asynchronous data transfer, strobe control, handshaking, working mechanism of peripherals: keyboard, mouse, scanners, video display, touch screen LO:-To know interface models of transfer and interrupt.	6hrs	1, 2, 3*	Book 1, 2 (Lecture & programming exercises)	1-5	Interrupt-driven I/O vs. DMA – Which is more efficient and why? Assignment Explain different I/O transfer modes and interrupt handling mechanisms with diagrams.
V	Control unit	Instruction word format, fetch and execution cycle, sequence of operation of control registers, control of arithmetic operations, microprogramming concepts LO:-To understand micro programming concepts.	8hrs	1, 2, 3*	Book 1, 2 (Lecture & programming exercises)	1-5	Hardwired control unit vs. Microprogrammed control unit. Assignment Describe the instruction execution cycle and microprogramming concepts with control signals.
VI	Memory Organization	Memory hierarchy, Main memory: RAM, ROM, cache memory, Cache mapping techniques (direct, associative, set-associative), Virtual memory concepts, Paging	4hrs	1, 2, 3*	Book 1, 2 (Lecture & programming exercises)	1-5	Cache memory and virtual memory – Performance vs. cost trade-offs. Assignment Explain cache mapping

		and segmentation, Performance metrics of memory systems. LO1: To understand memory hierarchy, cache organization, and virtual memory techniques for improving system performance.					techniques and paging with suitable examples and diagrams.
VII	Advanced Processor Concepts	Instruction pipelining, Pipeline hazards and solutions, RISC vs CISC architectures, Superscalar processors, Multicore processors, Parallel processing basics LO: To analyze advanced processor architectures and performance enhancement techniques in modern computing systems.	5 hrs	1, 2, 3, 4, 5, 6*	Book 1, 2 (Lecture & programming exercises)	1-5	RISC vs. CISC architectures in modern processors. Assignment Analyze instruction pipelining, pipeline hazards, and their solutions in detail.

* 1- Remember, 2- Understand, 3- Apply, 4- Analyze, 5- Evaluate, 6- Create

Text Books:

1. **M. Morris Mano**, *Computer System Architecture*, Pearson Education
2. **William Stallings**, *Computer Organization and Architecture*, Pearson Education
3. **Carl Hamacher, Zvonko Vranesic**, *Computer Organization*, McGraw Hill
4. **P. Pal Chaudhuri**, *Computer Organization and Design*, PHI Learning

Reference Books:

1. **John P. Hayes**, *Computer Architecture and Organization*, McGraw Hill
2. **David A. Patterson & John L. Hennessy**, *Computer Organization and Design*, Morgan Kaufmann
3. **Andrew S. Tanenbaum**, *Structured Computer Organization*, Pearson

E-Resources

- ☐ NPTEL – Computer Organization & Architecture
<https://nptel.ac.in>
- ☐ MIT OpenCourseWare – Computer Architecture
<https://ocw.mit.edu>
- ☐ GeeksforGeeks – Computer Organization
<https://www.geeksforgeeks.org>

☐ **TutorialsPoint – Computer Organization**

<https://www.tutorialspoint.com>

☐ **Stanford Online – Computer Systems**

<https://online.stanford.edu>

CO-PO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4
PSO1	Algorithm development				
	Computer Based Solution				
	Application Development				
	Disciplinary Knowledge	✓	✓	✓	✓
PSO2	Programming Skill				
	Problem Solving/ Critical thinking	✓	✓	✓	✓
	Mathematical Analysis	✓	✓	✓	✓
PSO3	Financial Aspects				
	Modern Tools				
	Complex Problems solving	✓	✓	✓	✓
	Time Frame Analysis				
	Research Skills	✓	✓	✓	✓

International Institute of Professional Studies, DAVV
M. Tech. (CS) 5 Years Semester II
CS-205 Object Oriented Programming using C++

Aim of the Course

To provide students with a strong foundation in object-oriented programming concepts using C++, enabling them to design, implement, and maintain efficient, reusable, and robust software systems for real-world applications.

Course Outcomes:

- **CO1:** Understand fundamental object-oriented programming concepts and C++ language basics
- **CO2:** Design and implement classes, objects, constructors, and destructors using C++.
- **CO3:** Apply inheritance and polymorphism to develop scalable and reusable software solutions.
- **CO4:** Implement file handling, exception handling, and templates for robust program execution.

Course Contents:

Unit No	Title	Contents	Hr	Targeted Levels of Blooms T. (Q1)	Content and Pedagogy (Q2)	(Q3) Online Resources	(Q4) Assign./ Assessment/ Discussion
I	Introduction	Principle of Object Oriented Programming, Object-Oriented Terminology, Basic concepts of OOP, Benefits of OOP, and applications of OOP. Introduction of C++: Tokens, Keywords, Identifier and constants, Operator, Data Type, Variable Manipulator, Expression and Control structure. LO1: Identify and articulate the advantages of using OOP, such as modularity, code reusability, maintainability, and scalability. LO2: Define key object-oriented terminology	6hrs	1 and 2*	Book 1, 2 (Lecture)	1-5	Discussion about programming paradigm and basics of programming

II	Classes in C++	Defining Classes in C++, difference between C structure and class, Classes and Encapsulation, Access specifiers, Member functions, defining member functions inside and outside the class, Instantiating and Using Classes, Array of objects, Static data members and member function. Function: Introduction to functions, Main function, Function Prototyping, inline function, friend function. LO1: Define a class with appropriate data members and member functions. Lo2: Identify the components of a function, including function signature, return type, parameters, and body.	6hrs	1 and 2*	Book 1, 2 (Lecture & programming exercises)	1-5	Discussion on comparing Structures with classes
III	Constructors and Destructors	Use of Constructors, characteristics of constructors, Types of constructor: default, parameterized and copy constructor, Constructor overloading, dynamic initialization of objects. Destructors-characteristics and uses, use of const keyword. LO: Distinguish between constructors and regular member functions. Application of constructors and destructors with their purposes	5hrs	1, 2 and 3*	Book 1, 2 (Lecture & programming exercises)	1-5	Assignment programs for understanding the concept of constructor and destructor

IV	Inheritance	Overview of Inheritance, Defining Base and Derived Classes, visibility mode, types of inheritance, Constructor and Destructor Calls, passing parameters to base class constructors, Virtual base classes LO: Implement various types of inheritance and real time applications	6hrs	1, 2, 3, 4, 5, 6*	Book 1, 2 (Lecture & programming exercises)	1-5	Practice programs for implementing inheritance
V	Polymorphism	Compile time v/s runtime polymorphism, Introduction to Function overloading. Operator Overloading, Working with Overloaded Operator Methods, Pointer and Virtual Function: Introduction of Pointer, Dynamic memory allocation, Pointers to object, this pointer, Pointers to derived classes, Virtual Functions, Pure virtual function, Abstract classes. LO: distinguish between compile time and runtime Polymorphism with their implementation details	8hrs	1, 2, 3, 4, 5, 6*	Book 1, 2 (Lecture & programming exercises)	1-5	Comparing early binding and late binding
VI	Console I/O	C++ stream classes, Unformatted Input and Output , managing output with manipulators Working with files in C++: classes for file stream operations, opening and closing a file, file opening modes. LO: Working with files and managing console input output	4hrs	1, 2, 3, 4, 5, 6*	Book 1, 2 (Lecture & programming exercises)	1-5	Programs for file handling
VII	Exceptions Handling and Templates	Basics of Exception handling, Exception handling mechanism. Templates: Template Overview,	5hrs	1, 2, 3, 4, 5, 6*	Book 1, 2 (Lecture &	1-5	Perform generic programming and implementing exception

		class template and function template, Standard Template Library Containers: Familiarize with the Standard Template Library (STL) and other C++ standard libraries to efficiently utilize pre-built data structures and algorithms. Understand the concept of exception handling to gracefully handle runtime errors and improve the robustness of the code. LO1: creating generic classes and functions to provide code reusability. LO2: Identify and handle the exceptions			programmin g exercises)		handling constructs.
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*** 1- Remember, 2- Understand, 3- Apply, 4- Analyze, 5- Evaluate, 6- Create**

Text Books:

1. The Complete Reference- C++, Tata Mcgraw Hill
2. E.Balagurusamy, Object-Oriented Programming with C++

Reference Books:

1. Robert Lafore, Object Oriented Programming in Turbo C++
2. Yashwant Kanitkar, Let us C++.

E-Resources

1. **NPTEL** – *Programming in C++ / Object Oriented Programming*
<https://nptel.ac.in>
2. **SWAYAM (MOE, Govt. of India)** – C++ and Object-Oriented Programming courses
<https://swayam.gov.in>
3. **GeeksforGeeks** – C++ **Programming**
<https://www.geeksforgeeks.org/c-plus-plus/>
4. **cplusplus.com** – Official C++ Reference and Tutorials
<https://www.cplusplus.com>

5. **LearnCpp** – Structured C++ learning resource

<https://www.learncpp.com>

CO-PO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4
PSO1	Algorithm development	√	√	√	√
	Computer Based Solution	√	√	√	√
	Application Development	√	√	√	√
	Disciplinary Knowledge	√	√	√	√
PSO2	Programming Skill	√	√	√	√
	Problem Solving/ Critical thinking	√	√	√	√
	Mathematical Analysis				
PSO3	Financial Aspects				
	Modern Tools	√	√	√	√
	Complex Problems solving	√	√	√	√
	Time Frame Analysis				
	Research Skills	√	√	√	√

International Institute of Professional Studies, DAVV
M. Tech. (CS) 5 Years Semester II
CS-206 Engineering Drawing Lab

Aim of the Course

To develop practical skills in engineering drawing by applying standard drawing techniques, visualization methods, and graphical representation of engineering components.

Course Outcomes (COs)

- CO1: Use drawing instruments and follow BIS standards accurately.
- CO2: Construct geometrical figures and engineering curves.
- CO3: Draw orthographic projections and projections of solids.
- CO4: Prepare sectional, isometric, and perspective drawings.

List of Experiments / Practical Exercises

Experiment No.	Title	Description
1	Drawing Instruments & Lettering	Introduction to drawing instruments, practice of single stroke lettering and dimensioning.
2	Scales	Construction of plain, diagonal, and vernier scales and their applications.
3	Geometrical Constructions	Construction of polygons and basic geometrical figures.
4	Conic Sections	Drawing ellipse, parabola, and hyperbola using standard methods.
5	Engineering Curves	Construction of cycloid, involute, and spiral.
6	Orthographic Projections	Projection of points, lines, and planes using first angle projection.
7	Projections of Solids	Projection of cube, prism, pyramid, cone, and cylinder with inclinations.
8	Sections of Solids	Sectional views and true shape of sections of solids.
9	Isometric Projections	Drawing isometric projections and views of simple solids.
10	Perspective Projection	One-point perspective projection of simple objects.

Tools / Software (Optional)

Drawing instruments, drawing sheets, mini drafter, AutoCAD / FreeCAD (introductory level).

International Institute of Professional Studies, DAVV
M. Tech. (CS) 5 Years Semester II
CS-207 C++ Programming Lab

Aim of the Course:

To provide hands-on experience in C++ programming and object-oriented concepts for developing efficient, modular, and reliable programs to solve real-world problems.

Course Outcomes: After successful completion of this course, the student will be able to:

CO1: Develop C++ programs using fundamental programming constructs such as arrays, functions, control structures, and pointers.

CO2: Apply object-oriented programming principles including **classes, objects, constructors, destructors, encapsulation, and abstraction** to design modular programs.

CO3: Implement **operator overloading, function overloading, and constructor overloading** to enhance program flexibility and usability.

CO4: Design and implement programs using **inheritance, polymorphism, and virtual functions** to model real-world problems.

List of Programs:

1.	Write a program to display the minimum, maximum, sum, search and average of elements of an array								
2.	Define a class student with the following specification Private members of class student admno integer sname 20 character Eng. Math, Science float total float Public member function of class student ctotal() a function to calculate eng + math + science with float return type. Takedata() Function to accept values for admno, sname, Eng, Maths, Science Showdata() Function to display all the data members on the screen								
3.	Define a class in C++ with following description: Private Members A data member Flight number of type integer A data member Destination of type string A data member Distance of type float A data member Fuel of type float A member function CALFUEL() to calculate the value of Fuel as per the following criteria <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Distance</td><td style="width: 50%;">Fuel</td></tr> <tr> <td><=1000</td><td>500</td></tr> <tr> <td>morethan1000and <=2000</td><td>1100</td></tr> <tr> <td>morethan2000</td><td>2200</td></tr> </table>	Distance	Fuel	<=1000	500	morethan1000and <=2000	1100	morethan2000	2200
Distance	Fuel								
<=1000	500								
morethan1000and <=2000	1100								
morethan2000	2200								

	Public Members A function FEEDINFO() to allow user to enter values for Flight Number, Destination, Distance & call function CALFUEL() to calculate the quantity of Fuel. A function SHOWINFO() to allow user to view the content of all the data members.
4.	Write a menu driven program to perform following: a) Input a matrix b) Display matrix c) Add two matrix d) Multiply two matrices e) Transpose a matrix
5.	Write a C++ program for calculating volume of sphere, cuboids and cylinder using function overloading.
6.	Write the definition for a class called complex that has floating point data members for storing real and imaginary parts. The class has the following member functions: voidset (float,float) to set the specified value in object voiddisp () to display complex number object complexsum (complex) to sum two complex numbers &return complex number 1. Write the definitions for each of the above member functions. 2. Write main function to create three complex number objects. Set the value in two objects and callsum()to calculate sum and assign it in third object. Display all complex numbers.
7.	Write the definition for a class called Rectangle that has floating point data members length and width. The class has the following member functions: void setlength(float) to set the length of data member void setwidth(float) to set the width data member float perimeter() to calculate and return the perimeter of the rectangle float area() to calculate and return the area of the rectangle void show() to display the length and width of the rectangle int sameArea(Rectangle) that has one parameter of type Rectangle. sameArea() returns1 if the two Rectangles have the same area, and returns 0 if they don't. 1. Write the definitions for each of the above member functions. 2. Write main function to create two rectangle objects. Set the length and width of the first rectangle to 5 and 2.5. Set the length and width of the second rectangle to 5 and 18.9. Display each rectangle and its area and perimeter. 3. Check whether the two Rectangles have the same area and print a message indicating the result. 4. Set the length and width of the first rectangle to 15 and 6.3. Display each Rectangle and its area and perimeter again. Again, check whether the two Rectangles have the same area and print a message indicating the result.
8.	Write a date class with data members' dd, mm, yy. Write a constructor and overload ++ operator, << operator and >> operator.

9.	Develop a mark sheet in C++ for university examination with following data: Students' name, Enrolment no, roll no, Theory marks in 5 subjects, Practical marks in five subjects, grade Overload << and >> operator. Grade should be calculated for each subject. Use Constructor overloading. Roll no should be auto generated.
10.	Write a menu driven program for addition, subtraction, display result of two distances (given in meter and centimeter) i. Overload '+' operator with member function ii. Overload '-' operator using friend function iii. Overload << and >> operator
11.	Create a class time with hours and minutes as its data members. Write a C++ program which has a member function to overload binary operator + to add two times. Also overload relational operator > to compare 2 times. It should also overload << (output) and >> (input) operator.
12.	Create an array class. Init dynamically allocate memory for integer array of size according to value passed to constructor, and write following methods i. Copy constructor ii. destructor iii. Overload [] operator. iv. Overload <<, >> operator.
13.	Define a class to represent a Bank Account. Include the following members: Data Members: i. Name of the depositor ii. Account number iii. Type of account iv. Balance amount in the account Member Functions: 1. To Input initial values 2. To deposit an amount 3. To withdraw an amount after checking the balance 4. To display name and balance iii. Also write constructor for this class that takes four arguments. It should also handle type of account as savings by default.
14.	Assume that a bank maintains two kinds of accounts called as saving account and current account. The saving account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below the level, a service charge is imposed. Create a class account that stores customer name, account number and type of account. From this derive the classes cur_acct and

	save acct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks: - Include constructor for all the three classes. - Accept deposit amount from the customer and update the balance. - Display the balance. - Compute and deposit interest. - Permit withdrawal and update the balance. Check for minimum balance, impose penalty, necessary and update the balance.
15.	An educational institution wishes to maintain a database of its employees. The database is divided into number of classes whose hierarchical relationships are shown in below figure. The figure also shows minimum information required for each class. Specify all the classes and define functions to create the database and retrieve individual information as and when required. <pre> graph TD staff["staff code name"] --> teacher["teacher subject publication"] staff --> typist["typist speed"] staff --> officer["officer grade"] typist --> regular["regular"] typist --> casual["casual daily wages"] </pre>
16.	Create a base class called shape. Use this class to store two double type values that could be used to compute the area of figures, Derive two specific classes called triangle and rectangle from the base shape .Add to the base class, a member function get_data() to initialize base class data members and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and Redefine this function in the derived class to suit their requirements. Using these three classes, design a program that will accept dimensions of a triangle or a rectangle interactively and display the area. Area of rectangle = x*y Area of triangle=$\frac{1}{2} \times x \times y$
17.	Write a program to read a list containing item name, item code and cost interactively and produce a three column output as shown below:

NAME	CODE	COST
Turbo C++	1001	250.95
C Primer	905	95.70
.....	...	
.....	...	
.....	...	

Note that the name and code are left justified and the cost is right-justified with a Precision of two digits. Training zeros are shown. Also fill the unused spaces with hyphens.

18.	Write a program to create a class EMP which have data member Name, Employee ID, contact number, address, year of joining and department in which he/she is working with Data member get and put. Create a database of minimum 300 employees. Store and retrieve information on the basis of above configuration.
19.	Create a class Inventory which performs the following operations on the files STOCK.DAT a. Adds a new item to the file b. Modifies the details of an item c. Displays the contents of the file
20.	Write a program to create a class EMP which have data member as Name, Employee ID, contact number, address, year of joining and department in which he/she is working with Member functions for getData() and putData ().Create a database of minimum 300employees. Store and retrieve information on the basis of above configuration.
21.	Write a function template for finding the minimum value contained in an array.
22.	Write a class template to represent a generic vector. Include member functions to perform the following tasks: a. To create the vector b. To modify the value of a given element c. To multiply by a scalar value d. To display the vector in the form (10,20,30.....)
23.	Write a program with following: a. A program to read two double type numbers from keyboard b. A function to calculate the division of the set of numbers c. A try block to throw an exception when a wrong type of data is keyed in d. Try block to detect and throw an exception if the condition “divide by zero” occurs e. Appropriate catch block to handle the exception thrown

INTERNATIONAL INSTITUTE OF PROFESSIONAL STUDIES

DEVI AHILYA UNIVERSITY, INDORE

M. Tech. (CS) 5 Years

Syllabus

July-Dec' 2026

Semester III

Sub. Code	Subject Name	Category	L	T	P	C
CS-301	Mathematics-III (Probability & Statistics)	Basic Sciences	3	1	0	4
CS-302	Data Structures and Algorithms	Core Computer Science	3	1	0	4
CS-303	Discrete Structures	Basic Sciences	3	1	0	4
CS-304	Computer Architecture	Core Computer Science	3	1	0	4
CS-305	Human Computer Interaction	Core Computer Science	3	1	0	4
CS-306	Data Structures and Algorithms Lab	Practical	0	0	2	2
CS-308	Comprehensive Viva	Virtual	0	0	0	4
			Total			26

International Institute of Professional Studies, DAVV
M. Tech. (CS) 5 Yrs. III Semester
CS-301 Mathematics-III (Probability and Statistics)

Course Type: Basic Sciences

Course Credits –4

Course Objectives: To develop a strong foundation in probability theory and statistical methods for data analysis, hypothesis testing, and decision-making in computing, data science, and research applications.

Course Outcomes –

CO1: Understand the Importance of Statistics Methods.

CO2: To develop, present and interpret the Estimation theory.

CO3: To calculate and apply Test of significance for small samples (Chi-square, t and F- statistics, t- distribution).

CO4: Analysis of variance and design of experiments: One -way and two- way

Course Content -

Unit No	Name	Contents	Hr	Targeted Levels of Blooms T. (Q1)	Content and Pedagogy (Q2)	(Q3) Online Resources	(Q4) Assign./ Assessment/Discussion
1	Introduction	Definition/Meaning and Scope of Statistics, Functions and Applications of Statistics, Role of Statistics in decision making process, Limitation of Statistics..	4	1,2*	Books 1,2,3	1,2,3	1. Presentation of data by frequency tables, diagrams and graphs, stem and leaf, partition values in excel. 2. Mode, median, partition values. 3. Problems on moments, skewness and kurtosis.

Learning Outcomes: - Develop concept of knowledge of Probability and Statistical Methods with the computer application.							
2	Estimation	Estimation: Unbiased-ness, consistency, efficiency and sufficiency , minimum variance unbiased estimator , Cramer-Rao inequality and its application , Maximum Likelihood estimator.	6	1,2,3,4*	Books 1	1,2,3	Estimation based assignment
Learning Outcome: - Learn the Multiple Parameters of estimation in computer software.							
3	Hypothesis	Testing of Hypothesis, Simple and Composite hypothesis, Test of significance for Samples, Test for single proportion and for difference of proportion. Test of significance for single mean , Test of significance for difference of means	6	2,3,4*	Books 1	1,2,3	Hypothesis based assignment
Learning Outcome: - Analyze and developed various hypothesis techniques based on sample and used for good project development.							
4	Test of significance for small samples	Concept of Chi-square, t and F- statistics, Test for Chisquare distribution, to test goodness of fit, to test independence of Attributes, to test the homogeneity of correlation coefficients. Test based on t-distribution: t-test for single mean, difference of means , paired t- test, t-test for testing significance of an observed sample correlation coefficient	6	2,3,4,5*	Books 1	1,2,3	Test significance assignment
Learning Outcome: - Analyze and developed various Tests of significance for small samples for Project development with hypothesis.							
5	F-distribution	Test based on F- distribution: Test for equality of population variance, Test for testing the significance of an observed multiple correlation coefficients. Non parametric test: sign- test, median test, run test, Wilcox on signed rank test	6	2,3,4,5*	Books 1	1,2,3	F-Distribution Assignment
Learning Outcome: - Analyze and developed various Parametric and non-parametric tests for							

small and big samples for Project development.							
6	Probability Distribution	Random variable, Types of Probability Distribution (discrete and Continuous-Binomial, Poisson, and Normal Distribution) and their applications in business.	6	1,2,3,4*	Books 1	1,2,3	Probability Distribution Assignment
Learning Outcome: - Analyze and develop various probability-based distributions based on samples for data analysis for samples.							
7	Analysis of variance and design of experiments:	Analysis of variance and design of experiments: One -way and two- way classification with one observation per cell, Design of experiments, completely randomized design randomized block design and Latin square design	6	2,3,4,5*	Books 1	1,2,3	Data analysis based assignment
Learning Outcomes: - Learn and analysis of variance and design of experiments based big data samples in a data analytics and data science projects							

***Bloom's Levels: 1-Remember, 2-Understand, 3-Apply, 4-Analyze, 5-Evaluate**

Books and Readings (Recommended books)

Text Book:

1. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, 12th Edition, Sultan Chand & Sons, New Delhi, 2020.

Reference Books:

2. S. C. Gupta and V. K. Kapoor, Fundamentals of Applied Statistics, 4th Edition, Sultan Chand & Sons, New Delhi, 2014.
3. A. M. Goon, M. K. Gupta and B. Dasgupta, An Outline of Statistical Theory, Volume I, 8th Edition, World Press Pvt. Ltd., Kolkata, 2008.
4. Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, 6th Edition, Academic Press, 2021.
5. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Probability and Statistics for Engineers and Scientists, 9th Edition, Pearson Education, 2017.
6. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, 7th Edition, Wiley, 2018.
7. Jay L. Devore, Probability and Statistics for Engineering and the Sciences, 10th Edition, Cengage Learning, 2021.

Electronic References:

1. [Swayam - NPTEL](#)
2. [Probability & Statistics — Open & Free – OLI \(cmu.edu\)](#)
3. [Probability and Statistics \(math.net\)](#)

CO-PO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4
PSO1	Algorithm development		✓	✓	✓
	Computer Based Solution	✓	✓	✓	✓
	Application Development		✓	✓	✓
	Disciplinary Knowledge	✓	✓	✓	✓
PSO2	Programming Skill				
	Problem Solving/ Critical thinking	✓	✓	✓	✓
	Mathematical Analysis	✓	✓	✓	✓
PSO3	Financial Aspects				✓
	Modern Tools		✓	✓	✓
	Complex Problems solving		✓	✓	✓
	Time Frame Analysis			✓	✓
	Research Skills		✓	✓	✓

Prepared by

Dr. Pradeep Kumar Jatav

Dr. NareshDembla

International Institute of Professional Studies, DAVV
M. Tech. (CS) 5 Yrs. III Semester
CS-302 Data Structures and Algorithms

Course Type: Core Computer Science

Course Credits: 4

Course Objective: To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.

Course Outcomes – After completion of the course, student will be able to:

CO1: Implement and use linear data structures such as arrays, linked lists, stack and queue.

CO2: Apply and analyze different Algorithms for sorting and searching data.

CO3: Implement non- linear data structures tree, graph and discuss their applicability.

CO4: Use an appropriate data structure and algorithm in context of solution of given problem.

Course Contents –

Unit No	Title	Contents	Hr	Targeted Levels of Blooms T. (Q1)	Content and Pedagogy (Q2)	Online Resources (Q3)	(Q4) Assign./ Assessment/Discussion
1	Introduction to	Introduction to C++, Introduction to Algorithms and its analysis, Definition of	4	1,2 and	B. No. 1	1,2,3	Discuss: Real world examples of different

	Data Structure	data structures and abstract data types, Classification of Data structures, Examples and real life applications, Data Structures: Arrays, Address calculation in a single and multi dimensional array, sparse matrices. LO1: Describe the different types of data structures along with their applications. LO2: Implement various operations on array data structure.		3*	B. No. 2 (Lecture, Programming)		types of data structure and applications Assign: Programs related to array
2	Sorting and Searching Algorithms	Introduction to Sorting, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Heap sort, Radix sort. Searching: Straight Sequential Search, Binary Search, Indexed Sequential Search, Hashing, Collision Resolution Techniques. LO1: Compare, implement and analyze different searching and sorting techniques.	8	1,2,3 and 4*	B. No. 1 B. No. 2 (Lecture, programming)	1,2,3	Discuss: Comparison of Sorting and Searching algorithm Assign : Write C++ programs to implement searching and sorting algorithms
3	Linked Lists	Basic concept, Implementation of Linked Lists, Circular implementation of Single linked Lists, Straight / circular implementation of doubly linked Lists. LO1: Apply and demonstrate implementation of single, doubly and circular linked list	6	1, 2 and 3*	B. No. 1 B. No. 2 (Lecture, programming)	1,2,3	Discuss: Applications of linked list in computer science and their pros and cons. Assign : Write & execute C++ programs

							to implement linked list
4	Stacks	Introduction to stack, static and Dynamic implementation of stack, Application: Infix, postfix, prefix representation, Mathematical expression Evaluation. LO1: Develop programs to implement stacks and its applications.	6	1, 2 and 3*	B. No. 1 B. No. 2 (Lecture, programming, problem solving)	1,2,3	Discuss: Applications of stacks in real world and computer science Assign : Write & execute C++ programs to implement stack and its applications
5	Queue	Introduction to queue, various operations on queue, Static and dynamic implementation of Queue, Circular queue, Double ended queue, Priority Queue. LO1: Illustrate static and dynamic implementation of different types of queue and their applicability	6	1, 2 and 3 *	B. No. 1 B. No. 2 (Lecture, discussion and programming)	1,2,3	Discuss: Applications of queue in real world and computer science Assign: Write & execute C++ programs to implement queue using array and linked list.
6	Trees	Definition of trees, Binary trees, Properties of Binary trees and Implementation, Binary Tree Traversal - preorder, post order, inorder traversal, Binary Search Trees, Threaded Binary trees, AVL Trees,	6	1, 2 and 3*	B. No. 1 B. No. 2 (Lecture,	1,2,3	Discuss: Applications of tree in real world and computer science

		Introduction to B Tree and B+ Tree. LO1: Compare and contrast different types of tree, their representation, and their applicability.			programs and discussion.)		Assign : Program to implement Binary Search Tree and questions related to tree traversals
7	Graphs	Introduction to Graph, Representation of graphs: Adjacency matrix, Adjacency List, Weighted Graph, Introduction to Graph Traversal: Breadth first Traversal and Depth first Traversal, Applications of graph. LO1: Describe different type of graph, its representation, traversal and applications.	4	1, 2 and 3*	B. No. 1 B. No. 2 (Lecture, discussion and numerical)	1,2,3	Discuss: Applications of graph in real world and computer science Assign : questions related to graph traversals and representation

* 1- Remember, 2- understand, 3- Apply, 4- Analyze

Books and Reading:

1. Data Structures through C++ by Yaswant Kanitkar, BPB Publication. (Text Book)
2. Data Structures using C and C++ by A. M. Tenenbaum, Yedidyah Langsam, Moshe J. Augentem, PHI Pub.
3. Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.
4. Fundamentals of Data structures by Ellis Horowitz & Sartaj Sahni, Pub, 1983,AW
5. Data Structures and Program Design in C By Robert Kruse, PHI,
6. Data Structure and the Standard Template library – Willam J. Collins, 2003, T.M.H

Electronic Resources

1. **NPTEL – Programming, Data Structures and Algorithms**
<https://nptel.ac.in>
2. **SWAYAM – Data Structures and Algorithms Courses**
<https://swayam.gov.in>
3. **Visualgo – Data Structure and Algorithm Visualizations**
<https://visualgo.net>
4. **GeeksforGeeks – Data Structures**
<https://www.geeksforgeeks.org/data-structures>
5. **Programiz – Data Structures and Algorithms**
<https://www.programiz.com/dsa>
6. **OpenDSA – Open Data Structures and Algorithms**
<https://opensa-server.cs.vt.edu>

CO-PO Mapping:

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4
PSO1	Algorithm development				
	Computer Based Solution	✓	✓	✓	✓
	Application Development	✓	✓	✓	✓
	Disciplinary Knowledge	✓	✓	✓	✓
PSO2	Programming Skill	✓	✓	✓	✓
	Problem Solving/ Critical thinking	✓	✓	✓	✓
	Mathematical Analysis		✓	✓	✓
PSO3	Financial Aspects				
	Modern Tools	✓	✓	✓	✓
	Complex Problems solving	✓	✓	✓	✓

	Time Frame Analysis		✓	✓	✓
	Research Skills		✓	✓	✓

International Institute of Professional Studies, DAVV
M. Tech. (CS) 5 Yrs. III Semester
CS-303: Discrete Structures

Course Type: Basic Sciences

Course Credits: 4

Course Objective: To develop a strong foundation in discrete mathematical structures and their applications in problem solving, algorithm design, and computer science.

Course Outcomes – After completion of the course, student will;

CO1: Acquire clarity of the fundamental concepts of Discrete Structure and manipulate basic concepts of sets, relations, and functions.

CO2: Apply logic, Boolean algebra, propositions and various principles of Combinatory Circuits to solve real world problems.

CO3: Interpret and solve recurrence relations and difference equations.

CO4: Explain graph theory concepts and apply them to solve practical problems. Utilize properties of trees and networks for algorithm design and analysis.

Course Contents –

Unit No	Title	Contents	Hr	Targeted Levels of Blooms	Content and Pedagogy	(Q3) Online Resources	(Q4) Assign./ Assessment/Discussion
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				T. (Q1)	(Q2)		
1	Overview of Set theory	Introduction, sets and elements, universal set and empty set, subsets, Multiset, Countable and uncountable sets, Venn diagrams, Set operations, Algebra of sets, Power sets, Partitions, Inclusion and exclusion, Mathematical induction, Ordered pair, Cartesian product, Computer representation of sets. LO1: Define Discrete Structure and explain various sets and its application.	6 Hrs	1 and 2*	Book 1 & Book 2 (Lecture)	1,2	Discussion regarding Discrete Structure uses with their real world applications
2	Relations	Introduction to relations, Pictorial representation of relations, Domain and range, Types of relations, n-ary relations, Composition of relations, Equivalence relations, Partially ordered relations. LO1: Classify & differentiate between relations with its types and also describe the types of composition relations.	6 Hrs	1 and 2	Book 1 & Book 3 (Lecture)	1,2	demonstrate the concepts of relations and types of studied till now
3	Functions	Introduction to functions, functions in terms of ordered pairs, Pictorial representation of functions, Types of functions: surjective, bijective, injective etc., Composition of relations, Recurrence relations with applications to algorithm analysis LO1: Analyze Recurrence relations with applications to algorithm. LO2: Demonstrate the Pictorial	4 Hrs	1, 2, 3 and 4*	Book 1 Book 2 & Book 3 (Lecture & illustration)	1,2	Assignment on Recurrence relations with applications to algorithm analysis

		representation of functions					
4	Logic and Boolean algebra	Logic: Propositions and logic operations, Existential and universal quantifiers, Tautologies, Contradiction, Contingency, Logical equivalence. Boolean algebra: Combinatorial circuits and their properties, Boolean functions and synthesis of circuits. LO1: Analyze Boolean algebra and Describe the properties of combinatorial circuits. LO2: Recognize logical equivalence and Identify tautologies, contradictions, and contingent statements. LO3: Determine logical equivalence between propositions using truth tables or logical rules.	6 Hrs	1, 2, 3 and 4	Book 1 Book 2 & Book 3 (Lecture & illustration)	1,2	Practical exercises on proposition, and logical operations. Hand on practice of Boolean Algebra and Combinatorial circuits
5	Lattices	Partially ordered sets, Chains and anti chains, Hasse diagrams, Lattice, Types of lattices, Sublattices, Some special lattices. LO1: Demonstrate partially ordered sets, chains, anti-chains, Hasse diagrams, lattices, types of lattices, sublattices, and special lattices in discrete mathematics.	6 Hrs	1, 2,3 and 4*	Book 1, Book 2 & Book 3 (Lecture and discussion)	1,2	Practical exercises on Hasse Diagram, Lattice and Types of lattices

6	Graph Theory-I	Definition and applications, Finite and infinite graphs, Incidence and degree, Isolated vertex, Pendent vertex, Types of graph, Subgraphs and isomorphic graph, Operations of graph, Paths, Cycles and connectivity, Eulerian and Hamiltonian graph, Planar graphs, Trees, Properties of trees, pendant vertices in a tree, distance and center, rooted and binary trees, spanning trees, fundamental circuits. LO1: Comprehend graph operations, properties of trees (e.g., pendant vertices, distance, center), rooted and binary trees, and fundamental circuits in graph theory.	6 Hrs	1 to 5*	Book 1	1,2	Graph Theory I related practice exercises
7	Graph Theory-II	Cut sets and their properties, connectivity and separability, Network flows, 1 and 2 isomorphism, Matrix representation of graphs: Incidence and adjacency matrices, Diagraphs and shortest path algorithms, Applications of graphs, General discussion. LO1: Demonstrate and apply cut sets and their properties, network connectivity and separability, network flows, graph isomorphism, matrix representations of graphs (incidence and adjacency matrices). LO2: Design diagraphs and create shortest path algorithms, applications of graphs in real world scenarios, and also engage in a general discussion of graph theory concepts.	6 Hrs	1 to 6*	Book 1, Book 2 & Book 3 (Lecture)	1,2	Graph Theory II related practice exercises

*** 1- Remember, 2- Understand, 3- Apply, 4- Analyze, 5- Evaluate, 6- Create**

Books and Reading

BOOKS:

1. Kenneth H. Rosen, Discrete Mathematics and Its Applications, 8th Edition, McGraw-Hill Education, New York, 2019.
2. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill Education, 1st Edition (Reprint), New Delhi, 2017.
3. C. L. Liu and D. P. Mohapatra, Elements of Discrete Mathematics, 4th Edition, McGraw-Hill Education (India), New Delhi, 2017.
4. Seymour Lipschutz and Marc Lipson, Schaum's Outline of Discrete Mathematics, 3rd Edition, McGraw-Hill Education, 2017.
5. Bernard Kolman, Robert C. Busby, and Sharon Cutler Ross, Discrete Mathematical Structures, 6th Edition, Pearson Education, 2018.
6. Susanna S. Epp, Discrete Mathematics with Applications, 5th Edition, Cengage Learning, 2019.
7. Norman L. Biggs, Discrete Mathematics, 3rd Edition, Oxford University Press, 2002.

Electronic References

1. NPTEL – Discrete Mathematics <https://nptel.ac.in>
2. SWAYAM – Discrete Mathematics Courses <https://swayam.gov.in>
3. MIT OpenCourseWare – Mathematics for Computer Science <https://ocw.mit.edu>
4. OpenDSA – Discrete Mathematics and Data Structures <https://opensa-server.cs.vt.edu>
5. GeeksforGeeks – Discrete Mathematics <https://www.geeksforgeeks.org/discrete-mathematics>

CO-PO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4
PSO1	Algorithm development	✓	✓	✓	✓
	Computer Based Solution	✓	✓	✓	✓
	Application Development		✓	✓	✓
	Disciplinary Knowledge	✓	✓	✓	✓
PSO2	Programming Skill				
	Problem Solving/ Critical thinking	✓	✓	✓	✓
	Mathematical Analysis	✓	✓	✓	✓
PSO3	Financial Aspects				✓
	Modern Tools		✓	✓	✓
	Complex Problems solving	✓	✓	✓	✓
	Time Frame Analysis			✓	✓
	Research Skills	✓	✓	✓	✓

International Institute of Professional Studies, DAVV
M. Tech. (CS) 5 Yrs. III Semester
CS-304 Computer Architecture

**Course Type: Core Computer Science
(Theory)**

Credits: 4

Aim of the Course

To develop a comprehensive understanding of modern computer architecture and organization, enabling students to analyze processor performance, memory hierarchy, instruction set architecture, parallel processing, and emerging architectural trends for designing efficient computing systems.

Course Outcomes

- CO1: Explain the fundamentals of computer architecture, computer organization, processor organization, and performance evaluation.
- CO2: Analyze memory hierarchy, cache organization, I/O systems, and instruction set architectures to improve system performance.
- CO3: Apply architectural concepts to evaluate CPU design, control units, pipelining, and instruction-level parallelism.
- CO4: Analyze modern processor architectures, multicore systems, and parallel computing techniques to solve complex computing problems.
- CO5: Evaluate emerging trends including GPU computing, ARM/RISC-V architectures, energy-efficient computing, and hardware security.

Course Contents

Unit	Title	Contents	Hr	Bloom's (Q1)	Content & Pedagogy (Q2)	Online Resources (Q3)	Assignment / Assessment (Q4)
I	Introduction	Evolution of computer architecture, organization vs architecture, von Neumann model, Moore's law, performance metrics (IPC, CPI, MIPS), Amdahl's law, buses, PCI. LO1: Explain architecture fundamentals. LO2: Evaluate processor performance using standard metrics.	6	1,2,3	Lecture, numerical problems	Books 1–4	Solve performance and Amdahl's law problems.
II	Processor Organization	CPU organization, registers, stack and accumulator organization, instruction cycle, interrupts, datapath overview.	5	1,2,3	Lecture, tutorials	Books 1–3	Prepare CPU datapath diagram.

		LO1: Explain processor organization. LO2: Compare register organizations.					
III	Memory Organization	Memory hierarchy, cache mapping, write policies, locality, virtual memory, RAID, modern memory technologies. LO1: Analyze memory hierarchy. LO2: Evaluate cache performance.	6	2,3,4	Lecture, numerical	Books 1–3	Cache mapping assignment.
IV	Instruction Set & I/O	Programmed, interrupt and DMA I/O, instruction formats, addressing modes, CISC vs RISC, ARM & RISC-V overview. LO1: Compare ISA designs. LO2: Apply addressing modes.	7	2,3,4	Lecture, case discussion	Books 1–4	ISA comparison report.
V	Control Unit	Micro-operations, hardwired and microprogrammed control, control signals. LO1: Differentiate control-unit implementations. LO2: Evaluate trade-offs.	5	2,3,4	Lecture	Books 1–2	Compare CU implementations.
VI	Instruction-Level Parallelism	Pipelining, hazards, forwarding, branch prediction, superscalar, VLIW, out-of-order execution. LO1: Analyze pipeline hazards. LO2: Evaluate ILP techniques.	8	2,3,4,5	Lecture, numericals	Books 1–3	Pipeline hazard exercises.
VII	Parallel Architectures	Flynn taxonomy, multicore, SIMD/MIMD, GPU basics, NUMA, cache coherence, energy-efficient computing, hardware security overview. LO1: Analyze parallel architectures. LO2: Evaluate emerging trends.	8	3,4,5	Seminar, case study	Books 1–4	Seminar on GPU/RISC-V or mini review.

*Bloom's Levels: 1-Remember, 2-Understand, 3-Apply, 4-Analyze, 5-Evaluate

Text Books

1. William Stallings, Computer Organization and Architecture: Designing for Performance, Pearson.
2. M. Morris Mano, Computer System Architecture, Pearson.

3. Carl Hamacher et al., Computer Organization and Embedded Systems, McGraw-Hill.
4. Govindarajalu, Computer Architecture and Organization, McGraw-Hill.

Reference Books

5. David A. Patterson and John L. Hennessy, Computer Organization and Design.
6. John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach.
7. Andrew S. Tanenbaum, Structured Computer Organization.

E-Resources

1. NPTEL – Computer Organization and Architecture (<https://nptel.ac.in>)
2. MIT OpenCourseWare – Computer Architecture
3. RISC-V International – <https://riscv.org>
4. ARM Education – <https://developer.arm.com>
5. Intel Developer Zone – <https://www.intel.com/content/www/us/en/developer/>

CO–PSO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4	C5
PSO1	Algorithm development	✓	✓	✓	✓	
	Computer Based Solution	✓	✓	✓	✓	✓
	Application Development		✓	✓	✓	✓
	Disciplinary Knowledge	✓	✓	✓	✓	
PSO2	Programming Skill		✓	✓	✓	✓
	Problem Solving/ Critical thinking		✓	✓	✓	✓
	Mathematical Analysis					
PSO3	Financial Aspects					
	Modern Tools		✓	✓	✓	✓
	Complex Problems solving		✓	✓	✓	✓
	Time Frame Analysis					
	Research Skills		✓	✓	✓	✓

International Institute of Professional Studies, DAVV
M. Tech. (CS) 5 Yrs. III Semester
CS-305 Human Computer Interface

Course Type: Core Computer Science

Course Credits: 4

Aim of the Course

To provide students with a strong foundation in Human-Computer Interaction (HCI) principles for designing usable, accessible, interactive and user-centered software systems.

Course Outcomes

- CO1: Explain human capabilities, human information processing and the fundamentals of HCI.
- CO2: Describe HCI models, interaction styles, GUI concepts and interface design principles.
- CO3: Apply user-centered design principles to develop effective user interfaces.
- CO4: Design screen layouts, navigation and interactive interfaces using usability guidelines.
- CO5: Analyze user requirements, task models and evaluate interface usability.
- CO6: Discuss interaction devices, software tools and emerging trends in HCI.

Course Contents

Unit	Title	Contents	Hr	Targeted Levels of Bloom's T. (Q1)	Content & Pedagogy (Q2)	Online Resources (Q3)	Assignment/Assessment/Discussion (Q4)
I	Introduction	Importance of UI, history of screen design, usability, UX, accessibility, benefits of good design. LO1: Explain HCI fundamentals. LO2: Differentiate UI, UX and usability.	6	1,2	Lecture & discussion	1–5	Compare interfaces of two applications.
II	Graphical	GUI concepts, direct	6	1,2,3	Lecture &	1–5	Heuristic evaluation of a

	User Interface	manipulation, web interfaces, interface characteristics, design principles, Nielsen heuristics. LO1: Apply interface principles. LO2: Evaluate GUI using heuristics.			case study		website.
III	Human-Centered Design Process	Human characteristics, cognitive models, task analysis, personas, interaction speeds, business functions. LO1: Analyze user needs. LO2: Develop personas and task models.	6	2,3,4	Lecture & exercises	1–5	Prepare personas and task analysis.
IV	Screen Designing	Design goals, layout, navigation, information presentation, typography, colour, responsive design. LO1: Design effective screens. LO2: Justify design choices.	8	2,3,4,5	Lecture & design exercises	1–5	Wireframe a mobile/web application.
V	Windows and Interaction	Windows, menus, dialogs, controls, icons, messages, multimedia, colour selection. LO1: Design consistent interaction components. LO2: Analyze interaction styles.	7	2,3,4,5	Lecture & practical	1–5	Redesign an existing interface.
VI	Software Tools & Interaction Devices	Figma/prototyping tools, keyboard, touch, voice, gesture, image/video displays, usability testing. LO1: Build prototypes.	6	2,3,4,5,6	Lecture & hands-on	1–5	Prototype and test a UI.

		LO2: Conduct usability testing.					
VII	Case Studies & Emerging Trends	Mobile GUI case studies, AI in HCI, VR/AR, ubiquitous computing, ethics, privacy, inclusive design. LO1: Evaluate modern HCI applications. LO2: Recommend interface improvements.	6	3,4,5,6	Seminar & case study	1–5	Case study presentation / mini project.

* Bloom's Taxonomy: 1-Remember, 2-Understand, 3-Apply, 4-Analyze, 5-Evaluate, 6-Create

Text Books

1. The Essential Guide to User Interface Design – Wilbert O. Galitz
2. Designing the User Interface – Ben Shneiderman et al.

Reference Books

3. Human–Computer Interaction – Alan Dix et al.
4. Interaction Design – Preece, Rogers & Sharp
5. User Interface Design – Soren Lauesen

E-Resources

6. NPTEL Human Computer Interaction – <https://nptel.ac.in>
7. Interaction Design Foundation – <https://www.interaction-design.org>
8. Nielsen Norman Group – <https://www.nngroup.com>
9. W3C Web Accessibility Initiative – <https://www.w3.org/WAI>
10. Figma Learn – <https://help.figma.com>

CO–PSO Mapping

	PROGRAM SPECIFIC OUTCOMES	C1	C2	C3	C4	C5	C6
PSO1	Algorithm development						
	Computer Based Solution	✓	✓	✓	✓	✓	✓
	Application Development		✓	✓	✓	✓	✓
	Disciplinary Knowledge	✓	✓	✓	✓	✓	✓
PSO2	Programming Skill		✓	✓	✓		✓
	Problem Solving/ Critical thinking	✓	✓	✓	✓	✓	✓
	Mathematical Analysis						
PSO3	Financial Aspects						
	Modern Tools			✓	✓	✓	✓
	Complex Problems solving		✓	✓	✓	✓	✓
	Time Frame Analysis			✓	✓	✓	✓
	Research Skills				✓	✓	✓

International Institute of Professional Studies, DAVV
M. Tech. (CS) 5 Yrs. III Semester
CS-306 Data Structures and Algorithms Lab

Course Type: Practical

Course Credits: 2

Course Objective:

To develop practical programming skills in implementing, analyzing, and applying fundamental data structures and algorithms using C++ for efficient problem solving and software development.

Course Outcomes

After successful completion of this laboratory course, the student will be able to:

CO1: Implement linear data structures such as arrays, linked lists, stacks, and queues using C++.

CO2: Develop programs for searching and sorting algorithms and compare their performance for different problem scenarios.

CO3: Implement non-linear data structures including trees and graphs, and perform standard traversal operations.

CO4: Analyze, debug, and optimize data structure implementations to solve computational problems efficiently.

CO5: Select and implement appropriate data structures and algorithms for real-world applications using good programming practices.

Array

1. Write a program to perform insertion in an array.
2. Write a program to delete an element from an array.
3. Search an element in an array using Linear Search.
4. Search an element using Binary Search.
5. Find the largest and smallest element in an array.
6. Reverse the elements of an array.
7. Merge two sorted arrays into a single sorted array.

Sorting Algorithms

8. Implement Bubble Sort.
9. Implement Selection Sort.
10. Implement Insertion Sort.
11. Implement Merge Sort.
12. Implement Quick Sort.

13. Implement Heap Sort.
14. Compare execution time of Bubble, Selection and Insertion Sort.

Linked List

15. Create and display a singly linked list.
16. Insert a node at the beginning of a linked list.
17. Insert a node at the end of a linked list.
18. Insert a node at a specified position.
19. Delete a node from the beginning.
20. Delete a node from the end.
21. Delete a node with a given value.
22. Reverse a singly linked list.
23. Count the number of nodes in a linked list.
24. Create and traverse a doubly linked list.
25. Implement a circular linked list.

Stack

26. Implement Stack using Array.
27. Implement Stack using Linked List.
28. Convert an infix expression to postfix.
29. Evaluate a postfix expression.
30. Check balanced parentheses using Stack.

Queue

31. Implement Queue using Array.
32. Implement Circular Queue.
33. Implement Queue using Linked List.
34. Implement Double Ended Queue (Deque).
35. Simulate a Printer Queue using Queue.

Trees

36. Create and traverse a Binary Tree (Preorder, Inorder, Postorder).
37. Implement Binary Search Tree (BST).
38. Search an element in BST.
39. Find the height of a Binary Tree.
40. Count leaf and internal nodes in a Binary Tree.
41. Find the minimum and maximum element in BST.
42. Perform insertion and deletion in BST.

Graphs

43. Represent a graph using Adjacency Matrix.
44. Represent a graph using Adjacency List.
45. Perform Breadth First Search (BFS).
46. Perform Depth First Search (DFS).
47. Count the degree of each vertex in a graph.

Integrated Applications

48. Implement a Student Record Management System using Linked List.
49. Develop a Menu-driven Data Structure Toolkit implementing Arrays, Stack and Queue operations.
50. Compare the performance of Linear Search and Binary Search for different input sizes and prepare a short report.