



**PSGR
Krishnammal College for Women**



BACHELOR OF SCIENCE IN COMPUTER SCIENCE

PROGRAMME CODE: CS

CHOICE BASED CREDIT SYSTEM (CBCS) &

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

SCHEME OF EXAMINATION & SYLLABUS

(w.e.f 2026 onwards)

REGULATIONS 2026

Department of Computer Science

Vision

- To develop competent professionals with strong programming, analytical, and problem-solving skills in computer science, enabling them to design efficient computing solutions, adapt to emerging technologies, and contribute responsibly to technological innovation and societal development.

Mission

- To provide an industry-relevant curriculum that equips learners with strong programming, analytical, and problem-solving skills.
- To foster technical proficiency and innovation through exposure to emerging tools, technologies, and modern computing practices.
- To cultivate critical thinking, collaboration, and leadership, preparing graduates to tackle real-world challenges effectively.
- To develop socially responsible professionals capable of contributing to technological advancement and societal development.

Bachelor of Science in Computer Science
Programme Objectives, Outcomes and Mapping

Programme Educational Objectives (PEOs)

(Expected career and professional achievements of graduates within three to five years of completing the programme)

PEO1: Graduates will establish and advance in professional careers in computing and allied sectors, demonstrating competence, ethical responsibility, and a commitment to equity, inclusion, and dignity in diverse environments.

PEO2: Graduates will pursue higher education, research, and continuous lifelong learning to adapt to emerging technologies, enhance professional growth, and contribute to innovation and sustainable development.

PEO3: Graduates will exhibit leadership, teamwork, and entrepreneurial skills in developing innovative, socially relevant, and environmentally responsible computing solutions to address real-world challenges.

PEO4: Graduates will contribute to societal empowerment by applying computing knowledge to create inclusive solutions that benefit communities, especially the underprivileged, promoting equity and social well-being.

PEO5: Graduates will uphold professional ethics, human values, and environmental sustainability in their practices, fostering responsible decision-making and contributing to a just, inclusive, and sustainable society.

Programme Learning Outcomes (PLOs)

(Specific abilities, knowledge, and skills that graduates are expected to demonstrate upon Graduation)

- PLO1:** Apply foundational and advanced concepts of computer science to design and implement efficient computing solutions.
- PLO2:** Analyze computational problems using appropriate algorithms, data structures, and logical reasoning techniques.
- PLO3:** Evaluate and select suitable technologies, tools, and methodologies for solving real-world computing problems.
- PLO4:** Design innovative and sustainable computing solutions addressing societal and environmental challenges.
- PLO5:** Conduct basic research activities including problem identification, data collection, analysis, and interpretation.
- PLO6:** Communicate technical information effectively through oral, written, and digital formats in professional contexts.
- PLO7:** Collaborate effectively in multidisciplinary teams demonstrating responsibility, inclusiveness, and interpersonal skills.
- PLO8:** Demonstrate ethical practices and professional responsibility in computing, ensuring inclusivity and societal impact.
- PLO9:** Utilize digital tools and modern computing technologies for data analysis, problem-solving, and knowledge creation.
- PLO10:** Reflect on personal and professional practices to enhance self-directed and lifelong learning capabilities.

Programme Specific Outcomes (PSOs)

(Expected knowledge, skills, and competencies that graduates will acquire by the end of the programme)

PSO1: Develop and implement structured and object-oriented programs using appropriate programming paradigms and data structures for efficient problem-solving.

PSO2: Design and manage robust database systems and network infrastructures ensuring data integrity, security, and efficient communication.

PSO3: Apply software engineering principles and modern development practices to build, test, and deploy scalable software solutions in real-world environments.

PSO4: Utilize data science and artificial intelligence techniques to develop intelligent and data-driven applications for real-world problem-solving.

PSO5: Design and develop interactive web, mobile, and cloud-based applications integrating emerging technologies through projects and industry exposure.

SCHEME OF EXAMINATION

Sem	Part	Course Code	Course Title	Course Type	Hours/ Week	Credits	Examination			
							Duration in Hours	Maximum Marks		
								CA	ESE	TOTAL
I	I	TAM2601A	Tamil Paper I	AEC	4	3	3	25	75	100
		HIN2601A	Hindi Paper I							
		FRE2601A	French Paper I							
	II	ENG2601A	English Paper I	AEC	4	3	3	25	75	100
	III	CS26C01	Core I: Programming in C	DSC	5	3	3	25	75	100
		CS26C02	Core II: Computer Organization and Architecture	DSC	5	4	3	25	75	100
		CS26CP1	Core Practical I: C Programming Lab	DSC	4	3	3	15 ^{\$\$}	35 ^{\$\$}	50
		TH26A03	Generic Elective I: Numerical and Statistical Methods	MDC	6	5	3	25	75	100
	IV	NME26B1	Basic Tamil I	AEC	2	2	-	100*		100 [£]
		NME26A1	Advanced Tamil I							
NME26ES		Introduction to Entrepreneurship	VAC							
I - II	VI	NM26GAW	General Awareness	VAC	SS	-	-	-	-	-
I - II		COM26SER	Community Services 30 Hours	VAC	-	-	-	-	-	-
I - V		26BONL1 26BONL2 26BONL3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-
Semester I Total					30	23				650
II	I	TAM2602A	Tamil Paper II	AEC	4	3	3	25	75	100
		HIN2602A	Hindi Paper II							
		FRE2602A	French Paper II							
	II	ENG2602A	English Paper II	AEC	4	3	3	25	75	100
	III	CE26C03	Core III: Java Programming	DSC	5	3	3	25	75	100
		CS26C04	Core IV: Data Structures	DSC	4	3	3	25	75	100
CS26CP2		Core Practical II: Java and Data Structures Lab	DSC	5	3	3	15 ^{\$\$}	35 ^{\$\$}	50	

		PS26AP1	Generic Elective II: Discrete Mathematics	MDC	6	5	3	25	75	100
	IV	NME26B2	Basic Tamil II	AEC	2 [€]	Gr.		100*	-	100 [€]
		NME26A2	Advanced Tamil II							
		NM26UHR	Universal Human Values and Human Rights	VAC	2	2	-	100*	-	100
I - II	VI	NM26GAW	General Awareness	VAC	SS	Gr.	-	100*		100 [€]
I - II		COM26SER	Community Services 30 Hours	VAC	-	St.	-	-	-	-
I - V		26BONL1 26BONL2 26BONL3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-
Semester II Total					30	22				650
III	I	TAM2603A	Tamil Paper III	AEC	4	3	3	25	75	100
		HIN2603A	Hindi Paper III							
		FRE2603A	French Paper III							
	II	ENG2603A	English Paper III	AEC	4	3	3	25	75	100
		CS26C05	Core V: Operating System	DSC	5	4	3	25	75	100
		CS26C06	Core VI: Computer Networks	DSC	5	4	3	25	75	100
		CS26CP3	Core Practical III: DBMS Lab	DSC	5	3	3	15 ^{\$\$}	35 ^{\$\$}	50
		TH26A20	Generic Elective III: Optimization Techniques	MDC	4	3	3	25	75	100
		IV	NM26DRM	Disaster Risk Reduction and Management	SEC	3	3	-	100*	-
	NM26HAW		Health and Wellness	VAC	SS	1	-	100*	-	100
I - V	VI	26BONL1 26BONL2 26BONL3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-
Semester III Total					30	24				750
IV	I	TAM2604A	Tamil Paper IV	AEC	4	3	3	25	75	100
		HIN2604A	Hindi Paper IV							
		FRE2604A	French Paper IV							
	II	ENG2604A	English Paper IV	AEC	4	3	3	25	75	100
	III	CS26C07	Core VII: Software Engineering	DSC	4	3	3	25	75	100

		CS26C08	Core VIII: Cloud Computing	DSC	4	3	3	25	75	100
		CS26CP4	Core Practical IV: Python Programming Lab	DSC	5	3	3	15 ^{\$\$}	35 ^{\$\$}	50
		BP26A05	General Elective I: Business Accounting (or)	MDC	4	3	3	25	75	100
		AP26A01	General Elective I: Digital Marketing (or)							
		CS26A02	General Elective I: M-Commerce							
	IV	CS26SECE	Cloud and DevOps Tools Lab	SEC	3	3	-	100*	-	100
		NM26EII	Entrepreneurship and Innovation (IgniteX)	VAC	2	2	-	100*	-	100
		NM26EVS	Environmental Studies	VAC	SS	Gr.	-	100*	-	100 [€]
	V	26COACT	Co-Curricular Activities	VAC	-	1	-	100*	-	100
I – V	VI	26BONL1 26BONL2 26BONL3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-
Semester IV Total					30	24				850
V	III	CS26C09	Core IX: Web Design and Development	DSC	5	4	3	25	75	100
		CS26C10	Core X: Foundations of Data Science	DSC	5	4	3	25	75	100
		CS26C11	Core XI: Artificial Intelligence and Machine Learning	DSC	5	4	3	25	75	100
		CS26CP5	Core Practical V: Web Design and Development Lab	DSC	5	3	3	15 ^{\$\$}	35 ^{\$\$}	50
		CS26E01	Elective I: Internet of Things (or)	DSE	5	4	3	25	75	100
		CS26E02	Elective I: Virtual and Augmented Reality (or)							
		CS26E03	Elective I: Quantum Computing							
		CS26AC1	Advance Learner Course I: Block Chain Technology (or)	ACC	SS	5 [^]	3	25	75	100 [^]
		CS26AC2	Advance Learner Course I: Green Computing							

	IV	CS26SEP1	Data Science Tools Lab	SEC	3	3	-	100*	-	100
		NM26CS1	Cyber Security I	VAC	2	Gr.	-	100*	-	100 [€]
		CS26INST	Field work/ Institutional Training (21 Days)	VAC	-	2	-	100*	-	100
	VI	CS26COM	Comprehensive Examination	DSC	-	Gr.	-	100*	-	100 [€]
I – V	VI	26BONL1 26BONL2 26BONL3	Online Course I Online Course II Online Course III	ACC	-	Cr. ^ /St.	-	-	-	-
Semester V Total					30	24				650
VI	III	CS26C12	Core XII: Full Stack Web Development	DSC	5	4	3	25	75	100
		CS26C13	Core XIII: Software Testing	DSC	5	4	3	25	75	100
		CS26CP6	Core Practical VI: Full-Stack Web Development Lab	DSC	5	3	6	25 ^{\$\$}	35 ^{\$\$}	50
		CS26E04	Elective II: Agentic AI (or)	DSE	5	4	3	25	75	100
		CS26E05	Elective II: Natural Language Processing (or)							
		CS26E06	Elective II: Big Data Analytics							
		CS26PROJ	Project and Viva-voce	DSE	7	5	-	25	75	100
		CS26AC3	Advance Learner Course II: Collaborative Robotics (or)	ACC	SS	5^	3	25	75	100^
CS26AC4	Advance Learner Course II: Agile Methodologies									
	IV	CS26SEP2	Software Testing Tools Lab	SEC	3	3	-	100*	-	100
Semester VI Total					30	23				550
I – VI	Total					140 + Additional Credits				4100+ Marks for Additional Credit Courses

Hours of Instructions is inclusive of lectures, seminars, presentations, case-studies, etc

Course Code	Course Title	Hours			Credits
		Total	Lecture	Examination	
CS26C01	Core I: Programming in C	75	70	5	3

Preamble

- This course introduces the fundamentals of structured programming using the C language, emphasizing problem-solving and algorithmic thinking.
- It provides a strong foundation in programming constructs such as control structures, functions, arrays, pointers, and file handling.
- The course enables students to develop efficient programs and understand memory-level operations through pointers and dynamic data handling.
- It also prepares learners for advanced programming, data structures, and system-level courses by strengthening logical and computational skills.

Prerequisite

Basic understanding of computer fundamentals and logical reasoning. Familiarity with problem-solving approaches and algorithms. Ability to interpret simple computational problems.

Course Learning Outcomes (CLOs)

On the successful completion of the course, students will be able to,

CLO No	Course Learning Outcome	Bloom's Level
CLO1	Recall syntax, data types, operators, control structures, arrays, pointers, structures, and file concepts in C programming.	K1
CLO2	Explain the working of control structures, functions, arrays, pointers, structures, and file operations in C.	K2
CLO3	Apply programming constructs to develop solutions using loops, functions, arrays, structures, union, pointers and files	K3
CLO4	Analyze problems and design structured C programs using appropriate control flow and data structures.	K4
CLO5	Evaluate program efficiency, memory usage, and file handling techniques for optimized solutions.	K5

CLO6	Design modular and structured C programs integrating functions, pointers, structures, and file systems for real-world applications.	K6
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Unit-wise CLO Mapping

Unit	Coverage	Mapped CLOs
Unit I	C basics, tokens, data types, operators, input output, decision and looping	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Unit II	Functions, recursion, arrays, multidimensional arrays	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Unit III	Strings, pointers, pointer arithmetic, function pointers	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Unit IV	Structures, unions, enumerated data types	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Unit V	File handling, file operations, error handling	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6

Alignment of CLO with PLO

3 = High, 2 = Medium, 1 = Low, – = Not Applicable

CLO / PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CLO1	3	1	1	1	1	2	1	1	2	1
CLO2	3	2	2	1	1	2	1	1	2	1
CLO3	3	2	2	2	1	3	1	1	2	1
CLO4	3	3	3	2	2	2	1	1	2	1
CLO5	3	3	2	3	2	1	2	1	3	1
CLO6	3	2	3	3	2	3	1	1	3	2

Core I: Programming in C (CS26C01) (70 Hours)

Unit I

(14 Hours)

Introduction to C: Introduction -files used in a c program-C token-character set -keywords-identifiers-Basic datatypes-variables-constants-constants-input/outputs statement in C-Operators in C- Type Conversions and Type casting. Decision control and Looping: Conditional Branching Statements-Iterative Statements- Nested Loops-Break and Continue Statements-goto Statement.

Unit II

(14 Hours)

Functions: Functions Declaration/Function Proto Type-Function definition -Function Call-Return Statement-Passing Parameters to Functions-Scope of variables-Storage Class- Recursive Functions-Type Recursion. Arrays: Accessing the Element of an array-Storing values in Array-Operating on Arrays-Passing array to functions-Two dimensional Arrays-Operation on two dimensional arrays-Passing two-dimensional arrays to functions-Multi Dimensional Arrays.

Unit III

(14 Hours)

Strings: Introduction -operations on Strings -Miscellaneous string and character functions. Pointer-Introduction to Pointers -Declaring pointer variables-Pointer expressions and pointer arithmetic - Null Pointer-Generic pointer -Passing arguments to functions using pointers-Passing an array to function-Function pointer.

Unit IV

(14 Hours)

Structure, Union and Enumerated data Type: Introduction -Nested Structures-array structures-Structures and functions-Union-Array of union variables-union inside structures-structure inside unions -Enumerated data type.

Unit V

(14 Hours)

Files: Introduction to files-Using files in C -Reading files in C-Read Data from Files -Writing Data to files-Error handling during file operations-accepting for selecting a record -function for Selecting a Record randomly-deleting a file- renaming a file – Creating a temporary file.

*** Course Alignment with SDGs: 4**

Text Books

S.No	Authors	Title	Publishers	Year & Edition
1	Thareja, R.	Programming in C	Oxford University Press	2021 & 3 rd Edition

Reference Books

S.No	Authors	Title	Publishers	Year & Edition
1	Balagurusamy, E	Programming in ANSI C	McGraw Hill Education	2019
2	Kanetkar, Y	Let us C	BPB Publications	2020
3	Kalicharan, N	Learn to program with C: An introduction to programming using the C language	Apress	2022
4	Byron Gottfried	Programming with C	Tata McGraw Hill	2018, 4 th Edition

Related Online References

- NPTEL – Programming in C
- SWAYAM – Introduction to C Programming
- GNU C Documentation
- Learn-C.org

Pedagogy

- Lecture – Chalk and Talk
- Power Point Presentations
- Demonstrations
- Problem-based learning
- Peer learning
- Collaborative learning
- Hands-on practice

Course Code	Course Title	Hours			Credits
		Total	Lecture	Examination	
CS26C02	Core II: Computer Organization and Architecture	75	70	5	4

Preamble

- This course introduces the fundamental concepts of computer organization and architecture, focusing on how hardware components operate and interact.
- It provides insights into data representation, digital logic design, and the internal structure of processors.
- The course emphasizes understanding of memory hierarchy, input/output organization, and instruction execution.
- It also exposes students to emerging computing paradigms such as GPUs, quantum computing, and neuromorphic architectures.

Prerequisite

Basic understanding of number systems, Boolean algebra, and fundamental digital logic Concepts. Familiarity with basic computer components and their functions.

Course Learning Outcomes (CLOs)

On the successful completion of the course, students will be able to,

CLO No	Course Learning Outcome	Bloom's Level
CLO1	Recall fundamental concepts of number systems, data representation, Boolean algebra, logic gates, flip-flops, combinational circuits, register transfer operations, instruction formats, memory organization, input/output mechanisms, and emerging computing architectures.	K1
CLO2	Explain the working principles of digital circuits, including logic gates, Karnaugh maps, flip-flops, multiplexers, decoders, register transfer operations, instruction execution, memory hierarchy, input/output organization, and modern processor architectures.	K2

CLO3	Apply concepts of Boolean algebra, logic circuit design, micro-operations, instruction formats, addressing modes, and memory and input/output techniques to solve computational and hardware-related problems.	K3
CLO4	Analyze digital systems and computer architecture components, including combinational and sequential circuits, data flow in registers, instruction execution processes, memory hierarchy, and input/output mechanisms.	K4
CLO5	Evaluate the performance, efficiency, and design trade-offs of digital circuits, instruction execution mechanisms, memory organization, input/output systems, and processor architectures across various computing scenarios.	K5
CLO6	Design and interpret computing solutions by integrating digital logic, register-level operations, memory organization, and emerging technologies such as quantum computing and neuromorphic systems.	K6
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Unit-wise CLO Mapping

Unit	Coverage	Mapped CLOs
Unit I	Data representation, number systems, alphanumeric representation, logic gates, truth tables, Boolean algebra	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Unit II	Flip-flops, Karnaugh maps, combinational circuits, decoders, multiplexers, demultiplexers	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Unit III	Register transfer, bus and memory transfer, micro-operations, instruction formats	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Unit IV	Input output organization, asynchronous data transfer, DMA, memory hierarchy, cache memory, virtual memory	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Unit V	Processor architecture, CPU and GPU comparison, quantum computing, neuromorphic systems	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6

Alignment of CLO with PLO

3 = High, 2 = Medium, 1 = Low, – = Not Applicable

CLO / PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CLO1	3	1	1	1	1	2	1	1	2	1
CLO2	3	2	2	1	1	2	1	1	2	1
CLO3	3	2	2	1	1	3	1	1	2	1
CLO4	3	2	3	2	2	2	1	1	2	1
CLO5	3	3	2	3	2	1	2	1	3	1
CLO6	3	2	3	3	2	3	1	1	3	2

Core II: Computer Organization and Architecture (CS26C02) (70 Hours)

Unit I

(14 Hrs)

Data Representation: Data Types - Number Systems: Octal & Hexadecimal Numbers, Decimal Representation, Alphanumeric Representation. Logic Circuits: Gates - AND, OR, NOT, NAND, NOR Gates and Truth Tables - Boolean Algebra.

Unit II

(14 Hrs)

Flip Flops: SR, JK, D, T Flip Flops. Karnaugh Maps - Product of Sums Method - Sum of Products Method- Don't Care Condition - Decoders-Multiplexer -Demultiplexer.

Unit III

(14Hrs)

Register Transfer and Micro Operations: Register Transfer Language - Register Transfer-Bus and Memory Transfers - Arithmetic Micro Operations-Logic Micro Operations - Shift Micro Operation. Instruction Format: Three Address Instruction-Two Address Instruction-One Address Instruction-Zero Address Instruction.

Unit IV

(14Hrs)

Input / Output Organization: Input Output Interface - Asynchronous Data Transfer - DMA. Memory Organization: Memory Hierarchy - Main Memory - Cache Memory - Virtual Memory.

Unit V

(14 Hrs)

Case study: 32bit /64bit processor architecture, Next generation computer architecture: Introduction to Graphics Processing Units (GPU) -CPU and GPU difference - Quantum Computers – Neuromorphic chips.

* **Course Alignment with SDGs: 9**

Text Books

S.No	Author	Title	Publisher	Year & Edition
1	M Morris Mano	Computer System Architecture	Pearson Education	2017, 3rd Edition
2	Jim Ledin	Modern Computer Architecture and Organization	Packt Publishing	2020, 1st Edition

Reference Books

S.No	Author	Title	Publisher	Year & Edition
1	Yale N. Patt & Sanjay Patel	Introduction to Computing Systems	McGraw-Hill	2019, 3rd Edition
2	John L. Hennessy	Computer Architecture: A Quantitative Approach	Elsevier	2018, 6th Edition
3	William Stallings	Computer Organization & Architecture	Pearson	2022, 11th Edition

Related Online References

- Computer Organization and Architecture – NPTEL Course by Prof. Indranil Sengupta, IIT Kharagpur
- Digital Circuits and Systems – NPTEL Course by Prof. S. Srinivasan
- MIT Open Courseware – Computer Architecture Courses
- Coursera – Computer Organization and Architecture Courses

Virtual Lab Resources

- Virtual Labs – Digital Logic Design Lab (Simulation-based experiments on logic gates, flip-flops, K-maps, and combinational circuits)
- IIT Kharagpur Virtual Labs – Digital Electronics and Logic Design Experiments
- Amrita Virtual Labs – Digital Circuits Lab

Pedagogy

- Lecture – Chalk and Talk
- Power Point Presentations
- Demonstrations using digital logic simulation tools
- Group discussions
- Simulation-based learning (Virtual Labs)

Course Code	Course Title	Hours			Credits
		Total	Lecture	Examination	
CS26CP1	Core Practical I: C Programming Lab	60	57	3	3

Preamble

- This laboratory course provides hands-on experience in C programming, reinforcing theoretical concepts through practical implementation.
- It focuses on developing problem-solving skills using structured programming, arrays, functions, pointers, and file handling.
- The course enables students to design, debug, and test C programs for real-world scenarios such as data processing and system simulation.
- It also promotes logical thinking, coding standards, and effective use of development tools in a practical environment.

Prerequisite

Basic knowledge of computer operations and problem-solving skills. Students should be able to apply logical reasoning and represent solutions using algorithms and simple flowcharts.

Course Learning Outcomes (CLOs)

On the successful completion of the course, students will be able to,

CLO No	Course Learning Outcome	Bloom's Level
CLO1	Explain the fundamentals of C programming including constants, variables, data types, operators, and input/output operations.	K1
CLO2	Apply decision-making statements and looping constructs to develop structured programs for solving computational problems.	K2
CLO3	Implement one-dimensional, two-dimensional, and multidimensional arrays, and perform string manipulation using built-in and user-defined functions.	K3

CLO4	Analyze and develop modular programs using user-defined functions, recursion, structures, and arrays of structures, with proper understanding of scope and lifetime of variables.	K4
CLO5	Apply pointer concepts including pointer arithmetic and the use of pointers with arrays, strings, and functions for efficient data handling.	K5
CLO6	Develop programs to perform file operations such as reading, writing, appending, and error handling using file management techniques.	K6
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create		

Program-wise CLO Mapping

Program	Coverage	Mapped CLOs
Program 1	Formulate and implement programs that demonstrate the use of constants, variables, data types, and operators with structured input/output formatting for real-world data representation.	CLO1, CLO2, CLO3
Program 2	Design and validate decision-making solutions using conditional constructs for multi-criteria problems such as grading systems, eligibility validation, and business rules.	CLO1,CLO2, CLO3,CLO4
Program 3	Develop optimized iterative solutions using looping constructs for computational problems (factorial, Fibonacci, prime testing), including performance comparison and validation.	CLO1, CLO2, CLO3, CLO4, CLO5
Program 4	Model and analyze datasets using one-dimensional arrays to perform searching, sorting, and statistical computations with efficiency considerations.	CLO1, CLO2, CLO3, CLO4, CLO5
Program 5	Construct and evaluate solutions using two-dimensional arrays for matrix operations and multidimensional data representation in scientific and business applications.	CLO1, CLO2, CLO3, CLO4, CLO5
Program 6	Design and implement robust string processing systems using built-in and user-defined functions for validation, transformation, and pattern-based analysis.	CLO1, CLO2, CLO3, CLO4, CLO5

Program 7	Architect modular programs using user-defined functions with appropriate parameter passing mechanisms, return types, and scope management for reusable software components.	CLO1, CLO2, CLO3, CLO4, CLO5
Program 8	Develop and compare recursive and iterative solutions for problem-solving, analyzing trade-offs in terms of efficiency, memory usage, and readability.	CLO1, CLO2, CLO3, CLO4, CLO5
Program 9	Design complex data models using structures, arrays of structures, and nested structures for real-time applications such as student information or inventory systems.	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Program 10	Analyze and implement structured data processing systems involving aggregation, reporting, and relationship handling using advanced structure concepts.	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Program 11	Apply pointer concepts to manipulate memory dynamically, including address handling, dereferencing, and efficient data access techniques.	CLO1, CLO2, CLO3, CLO4, CLO5
Program 12	Integrate pointers with arrays, strings, and functions to develop optimized and memory-efficient solutions for complex programming tasks.	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Program 13	Design and implement file management systems to create, write, and append structured data with proper formatting and validation mechanisms.	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Program 14	Develop file processing applications to read, search, update, and copy data across files while ensuring data integrity and validation.	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Program 15	Construct comprehensive file-based analytical applications to process large datasets (character/word/line analysis) with robust error handling and efficiency considerations.	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6

Alignment of CLO with PLO

3 = High, 2 = Medium, 1 = Low, – = Not Applicable

CLO / PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CLO1	3	1	1	1	1	2	1	1	2	1
CLO2	2	3	1	1	1	1	1	1	2	1
CLO3	3	2	2	1	1	1	1	1	3	1
CLO4	3	2	3	2	2	1	1	1	2	1
CLO5	3	3	2	2	2	1	1	1	3	1
CLO6	3	2	2	2	2	2	1	1	3	2

Core Practical I: C Programming Lab (CS26CP1) (57 Hrs)

List of Programs

- Exercise using different data types
- Exercise using different operators
- Exercise to implement control structures
- Exercise using loop statements
- Exercise using arrays
- Exercise to explore built-in functions
- Exercise to create user defined function
- Exercise using structures and union
- Exercise using pointers
- Exercise to work with files

* Course Alignment with SDGs: 4

Pedagogy

The course will be delivered through a combination of hands-on practice and demonstrations.

- Demonstration of working environment / Tools / Software / Program

Course Code	Course Title	Hours			Credits
		Total	Lecture	Examination	
TH26A03	Generic Elective: Numerical and Statistical Techniques	90	85	5	5

Preamble

- This course introduces fundamental numerical and statistical techniques used for solving mathematical and real-life problems.
- It covers numerical methods for solving linear simultaneous equations, interpolation, differentiation and integration.
- The course also provides a foundation in statistical concepts such as correlation, regression and probability.
- In addition, students learn theoretical probability distributions including binomial, Poisson and normal distributions.
- The course develops analytical and computational skills required for quantitative analysis in various academic disciplines.

Prerequisite

Basic knowledge of elementary algebra, functions, and introductory statistics studied at the higher secondary level.

Course Learning Outcomes (CLOs)

On the successful completion of the course, students will be able to,

CLO No	Course Learning Outcome	Bloom's Level
CLO1	Define the fundamental concepts of numerical methods, correlation, probability and theoretical distributions.	K1
CLO2	Explain the principles of interpolation, numerical differentiation, numerical integration and correlation techniques.	K2

CLO3	Apply numerical methods and statistical techniques to solve simple mathematical and statistical problems.	K3
CLO4	Analyze relationships between variables using correlation, regression and probability concepts.	K4
CLO5	Evaluate suitable numerical or statistical methods for solving given quantitative problems.	K5
CLO6	Develop simple models or solutions using numerical and statistical techniques for real-world situations.	K6
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Alignment of CLO with PLO

3 = High, 2 = Medium, 1 = Low, – = Not Applicable

CLO / PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CLO1	3	1	1	1	1	2	1	1	2	1
CLO2	3	2	2	1	1	2	1	1	2	1
CLO3	3	2	2	1	1	3	1	1	2	1
CLO4	3	2	3	2	2	2	1	1	2	1
CLO5	3	3	2	3	2	1	2	1	3	1
CLO6	3	2	3	3	2	3	1	1	3	2

Unit-wise CLO Mapping

Unit	Coverage	Mapped CLOs
Unit I	Solution of linear simultaneous equations (Gauss elimination, Gauss Jordan, Gauss Seidel, Gauss Jacobi methods) and interpolation methods (Newton forward and backward).	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6

Unit II	Numerical differentiation, numerical integration (Newton–Cotes formulas, trapezoidal rule, Simpson’s rules) and Taylor series method.	CLO1, CLO2, CLO3, CLO4,CLO5, CLO6
Unit III	Skewness, correlation analysis, Karl Pearson’s coefficient, rank correlation, regression analysis.	CLO1, CLO2, CLO3, CLO4,CLO5
Unit IV	Probability concepts, probability calculation, theorems of probability and mathematical expectation.	CLO1, CLO2, CLO3, CLO4,CLO5,CLO6
Unit V	Theoretical distributions: Binomial, Poisson and Normal distributions.	CLO1, CLO2, CLO3, CLO4,CLO5, CLO6

Generic Elective: Numerical and Statistical Techniques (TH26A03) (85Hrs)

Unit I

(17 Hrs)

Solution of Linear Simultaneous Equations: Gauss elimination - Gauss Jordan - Gauss Seidel and Gauss Jacobi methods -simple problems. Interpolation: Newton Forward and Backward Interpolation Formulae.

Unit II

(17 Hrs)

Numerical Differentiation, Formulae for Derivatives: Newton’s Forward Difference - Newton’s Backward Difference, Numerical Integration: Introduction, Newton-Cotes Quadrature formulas: trapezoidal rule, Simpson’s 1/3 and 3/8 rules, Taylor’s series method.

Unit III

(17 Hrs)

Skewness - Correlation analysis: Introduction - Significance of the study of correlation - correlation and causation - Types of correlation - Methods of studying correlation - Graphic method - Karl Pearson’s coefficient of correlation - Coefficient of correlation and probable error - Coefficient of determination - Properties of the coefficient of the correlation - Rank correlation coefficient - Features of Spearman’s correlation coefficient, Regression analysis.

Unit IV

(16 Hrs)

Probability: Introduction - probability defined - Importance of the concept of probability - Calculation of probability - Theorems of probability (statements only) – Mathematical Expectation-Simple problems.

Unit V

(18 Hrs)

Theoretical Distributions: Binomial distribution - Poisson distribution and normal distribution (without derivations & proof).

Text Books

S.No.	Authors	Title	Publisher	Year & Edition
1	B.S. Grewal	Numerical Methods in Engineering and Science with Programs in C & C++	Khanna Publishers	2014 & 11 th edition
		Unit I: Chapter III & VII: 3.3, 3.4, 3.5 & 7.1-7.3 Unit II: Chapter VIII & X: 8.1, 8.2:(1,2), 8.4, 8.5:(I, II, III), 10.3		
2	S.P.Gupta	Statistical methods	Sultan Chand & Sons Publications	2005 & 43 rd Edition
		Unit III: Volume I: Chapter 9(till measures of skewness), 10, 11. (pg: 329-341, 377-412, 435-454) Unit IV: Volume-II Chapter 1(till Baye's theorem) (pg: 751-771) Unit V : Volume-II Chapter 2 (pg: 805-824, 826-834, 836-856)		

Reference Books

S.No.	Authors	Title	Publisher	Year & Edition
1	P.A.Navanitham	Business Mathematics And Statistics	Jai Publishing Company	2014
2	S.C Gupta and V.K. Kapoor	Fundamentals of Mathematical Statistics	Sultan Chand & Sons Publications	2001 & 10 th revised edition
3	P.Kandasamy, K.Thilagavathy and K.Gunavathy	Numerical Methods	S.Chand and company LTD	Reprint 2007
4	V.K.Kapoor	Fundamentals of Applied Statistics	Sultan Chand & Sons	2020 & 12 th revised edition

Related Online References

<https://nptel.ac.in/courses/111/107/111107105/>

(Lectures by Prof. Ameeya Kumar Nayak and Prof. Sanjeev Kumar, Department of Mathematics, Indian Institution of Technology Roorkee) Lecture 02 Gaussian elimination with partial pivoting Lecture 04 Jacobi and Gauss Seidel methods

Lecture 20 Newton's Forward Difference & Newton's Backward Difference Lecture 34 Simpsons 1/3rd rule and 3/8 rule

<https://nptel.ac.in/courses/111/106/111106112/>

(6 Lectures by Prof.G.Srinivasan, Department of Management Studies, Indian
Institution of Technology Madras)

Lecture 12 Probability

Lecture 13 Rules of probability Lecture 19 Binomial distribution Lecture 20 Poisson
distribution

Pedagogy

The course will be delivered using a combination of traditional and learner-centered teaching
methods, including:

- Lecture - Chalk and Talk
- PowerPoint presentations
- E-content and digital learning resources
- Numerical problem-solving exercises
- Group discussions
- Assignments
- Quizzes
- Peer learning activities
- Student seminars

Course Code	Course Title	Hours			Credits
		Total	Lecture	Examination	
NME23ES	Introduction to Entrepreneurship	30	30	-	2

Preamble

- To introduce the basic concepts and importance of entrepreneurship in economic and social development.
- To familiarize students with entrepreneurial traits, types of entrepreneurs, and the process of starting small enterprises.
- To provide awareness about entrepreneurship development programmes, institutional support, and financial assistance available for entrepreneurs.

Prerequisite

- Basic awareness of business activities, economic environment, and interest in entrepreneurial initiatives.

Course Learning Outcomes (CLOs)

CLO No	Course Learning Outcome	Bloom's Level
CLO1	Define the fundamental concepts, characteristics, and types of entrepreneurship and entrepreneurs.	K1
CLO2	Explain the role of entrepreneurship development programmes, institutional support systems, and government incentives for entrepreneurs.	K2
CLO3	Apply creative thinking and innovation techniques to identify entrepreneurial opportunities and solve business problems.	K3
CLO4	Analyze the significance of intellectual property rights and institutional support in promoting entrepreneurial ventures.	K4
CLO5	Evaluate different project ideas and assess their feasibility using basic project appraisal concepts.	K5
CLO6	Develop a basic project report for a small entrepreneurial venture based on identified opportunities.	K6

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Alignment of CLO with PLO

3 = High, 2 = Medium, 1 = Low, – = Not Applicable

CLO / PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CLO1	3	1	1	1	1	2	1	1	2	1
CLO2	3	2	2	1	1	2	1	1	2	1
CLO3	3	2	2	1	1	3	1	1	2	1
CLO4	3	2	3	2	2	2	1	1	2	1
CLO5	3	3	2	3	2	1	2	1	3	1
CLO6	3	2	3	3	2	3	1	1	3	2

Unit –CLO Mapping

Unit	Coverage	Mapped CLOs
Unit 1	Introduction to Entrepreneurship, factors, barriers, entrepreneurial traits and types, steps for starting small industries, MSMEs, social entrepreneurship	CLO1, CLO2
Unit 2	Entrepreneurship Development Programmes, institutional framework (IFCI, ICICI, IDBI, IRBI, EXIM Bank, NSIC, SIDBI, SFC, SIPCOT, TIIC), incentives and subsidies	CLO1, CLO2, CLO3, CLO4
Unit 3	Innovation, types of innovation, creative problem solving, incubators, angel investors, venture capital	CLO1, CLO2 CLO3, CLO4
Unit 4	Intellectual Property Rights – copyright, patents, trademarks, design and registration procedures	CLO1, CLO2, CLO3, CLO4
Unit 5	Project identification and classification, project formulation, project appraisal, project report presentation	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6

INTRODUCTION TO ENTREPRENEURSHIP - NME23ES (30 HRS)

Unit 1 (6hrs)

Entrepreneurship-Introduction-Factors-Barriers-Entrepreneurial Traits and Types- Steps for starting a Small Industry- MSMEs – Social entrepreneurship.

Unit 2 (6hrs)

Entrepreneurship Development Programmes-Institutional Framework (IFCI, ICICI, IDBI, IRBI, EXIM Bank, NSIC, SIDBI, SFC, SIPCOT AND TIIC) - Role of Incentives and Subsidies

Unit 3 (6hrs)

Innovation - Types –Role- Creative Problem Solving -Incubators - Angel Investors - Venture Capital.

Unit 4 (6hrs)

Intellectual Property- Meaning- Copy Right Registration- Patents- Trademark- Design and Procedure for registration.

Unit 5 (6hrs)

Project Preparation

Project identification and Classification - Project Formulation- Project Appraisal- Project Report Presentation.

Text Books

Sl. No.	Author(s)	Title of the Book	Publisher	Year of Publication & Edition
1.	Gupta. C.B and Srinivasan.N. P	Entrepreneurial Development	Sultan Chand and Sons	2020
2	Sauhari Vinnie and Bhushan Sudhashu	Innovation Management	Oxford	2014

Reference Books

Sl. No	Author(s)	Title of the Book	Publisher	Year of Publication & Edition
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1.	KolbBonitaM	Entrepreneurship for the creative and cultural industries	Routedge	2015
2.	P.T.Vijayashree & M.Alagammai	Entrepreneurship and Small Business Management	Margham	2020