



PSGR
Krishnammal College for Women



BACHELOR OF SCIENCE IN COMPUTER SCIENCE WITH COGNITIVE SYSTEMS

PROGRAMME CODE: CG

CHOICE BASED CREDIT SYSTEM (CBCS) &

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK (LOCF)

SCHEME OF EXAMINATION & SYLLABUS

(w.e.f 2026 onwards)

REGULATIONS 2026

UNDERGRADUATE PROGRAMMES

(a) Qualification Descriptors

Aligned with NHEQF Level 6 (Bachelor's Degree Level).

A Bachelor's Degree signifies that a learner has completed a structured programme of study that develops disciplinary knowledge, professional competence, transferable skills and ethical values.

Graduates are expected to demonstrate:

- A systematic understanding of the discipline and its linkages with related fields
- Procedural and professional knowledge relevant to employment, higher education and public service
- Ability to identify problems, collect and analyze data, and develop evidence-based solutions
- Effective communication of academic and professional work
- Capacity for self-directed learning and adaptation to new contexts
- Ability to apply disciplinary knowledge and transferable skills in real-world contexts
- Development of employability skills relevant to professional careers

(b) Graduate Attributes (GAs)

GA Code	Graduate Attributes
GA1	Disciplinary Knowledge
GA2	Communication Skills
GA3	Critical Thinking
GA4	Problem Solving
GA5	Analytical Reasoning
GA6	Research-related Skills
GA7	Cooperation/Teamwork
GA8	Scientific Reasoning
GA9	Reflective Thinking
GA10	Information/Digital Literacy
GA11	Self-Directed Learning
GA12	Multicultural Competence
GA13	Moral and Ethical Awareness/Reasoning
GA14	Leadership Readiness
GA15	Lifelong Learning

(c) GAs – Written Measured

These GAs are directly measurable through written examinations, assignments, or structured theory evaluation.

GA	Attribute	Measure	Assessment Method
GA1	Disciplinary Knowledge	Strongly	Theory examinations, concept-based questions, structured problem solving
GA3	Critical Thinking	Strongly	Case analysis, reasoning questions
GA4	Problem Solving	Strongly	Application-oriented problems, scenario-based questions
GA5	Analytical Reasoning	Strongly	Data interpretation, logical analysis, numerical exercises
GA6	Research-related Skills	Partially	Research oriented questions, data interpretation, literature review writing
GA8	Scientific Reasoning	Partially	Evidence-based explanations, logical justification questions
GA9	Reflective Thinking	Limited	Short reflective writing responses
GA10	Information/Digital Literacy	Limited	Application of digital tools and information ethics

(d) GAs – Performance based

These require observation of behaviour, participation, skill demonstration, or real-time engagement.

GA	Attribute	Measure	Assessment Method
GA2	Communication Skills	Strongly	Presentations, seminars, viva voce, group discussions
GA7	Cooperation/Teamwork	Strongly	Group projects, peer evaluation, collaborative assignments
GA11	Self-Directed Learning	Limited	Independent assignment / Project work / Online learning task
GA12	Multicultural Competence	Partially	Group activities with diverse teams / Fieldwork / Community engagement, Participation in cultural activities,
GA13	Moral and Ethical Awareness/Reasoning	Partially	Behavioural observation methods, Reflective reports
GA14	Leadership Readiness	Limited	Team leadership in project, Event coordination
GA15	Lifelong Learning	Limited	Participation in value added courses, certification

Vision

To empower learners with strong computing knowledge and industry-relevant skills integrated with intelligent and emerging technologies, enabling the development of intelligent systems and the application of human-centred computational thinking to create innovative, ethical, and responsible digital solutions for real-world challenges in the evolving global technological society.

Mission

- To impart strong foundational knowledge in computing and intelligent systems through a curriculum integrating emerging digital tools
- To strengthen practical and industry-oriented learning through hands-on training in modern technologies, enabling students to solve real-world technological challenges
- To develop analytical thinking, computational competence and problem-solving abilities through practical applications, project-based learning and system development
- To promote innovation and research in intelligent computing, automation technologies, networking and advanced software systems
- To cultivate ethical values, teamwork, leadership and professional responsibility to contribute effectively to the global technology ecosystem

Bachelor of Science in Computer Science with Cognitive Systems

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 excel in computing and cognitive systems, pursuing careers in industry, academia, or entrepreneurship with competence and innovation.

PEO2: Graduates will engage in continuous learning, research, and higher studies in emerging technologies and intelligent systems.

PEO3: Graduates will apply computing knowledge ethically to create equitable, inclusive, and sustainable solutions for society.

PEO4: Graduates will develop intelligent, human-centred systems that address real-world challenges and empower communities.

PEO5: Graduates will demonstrate leadership, teamwork, and professional responsibility to contribute effectively in multidisciplinary and global contexts.

Programme Learning Outcomes (PLOs)

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

PLO1: Apply fundamental principles of computing, cognitive systems, and emerging technologies to analyze and solve real-world problems.

PLO2: Design, implement, and evaluate intelligent systems and software solutions addressing human-centred requirements.

PLO3: Conduct computational experiments and research investigations, interpreting results using scientific reasoning.

PLO4: Critically analyze problems and propose innovative, sustainable, and ethical solutions using computational and cognitive approaches.

PLO5: Communicate technical concepts effectively in oral, written, and visual forms to diverse audiences.

PLO6: Collaborate effectively in multidisciplinary teams to achieve shared goals, demonstrating leadership and professional responsibility.

PLO7: Integrate digital tools, data, and information resources to solve problems, analyze trends, and make informed decisions.

PLO8: Reflect on personal and professional growth, identifying learning needs to pursue continuous development.

PLO9: Demonstrate ethical, socially responsible, and inclusive behavior in professional and societal contexts.

PLO10: Engage in lifelong learning by applying acquired knowledge and skills to emerging technologies and global challenges.

PLOs with Bloom's Levels, Assessment Methods, and Graduate Attribute Mapping

PLO No	Programme Learning Outcome	Bloom's Level	Assessment Methods	Mapped GAs
PLO1	Apply fundamental principles of computing, cognitive systems, and emerging technologies to analyze and solve real-world problems.	K3-K4	CIA, Practical, Project, Case Study	GA1, GA4, GA5
PLO2	Design, implement, and evaluate intelligent systems and software solutions addressing human-centred requirements.	K5	CIA, Project, Practical, Seminar	GA1, GA4, GA10
PLO3	Conduct computational experiments and research investigations, interpreting results using scientific reasoning.	K5	Project, Internship, Seminar, Viva	GA6, GA8, GA5
PLO4	Critically analyze problems and propose innovative, sustainable, and ethical solutions using computational and cognitive approaches.	K5	Case Study, Project, Viva	GA3, GA13, GA4
PLO5	Communicate technical concepts effectively in oral, written, and visual forms to diverse audiences.	K3	Seminar, Report, Presentation	GA2, GA12
PLO6	Collaborate effectively in multidisciplinary teams to achieve shared goals, demonstrating leadership and professional responsibility.	K3-K4	Project, Group Assignment, Internship	GA7, GA14
PLO7	Integrate digital tools, data, and information resources to solve problems, analyze trends, and make informed decisions	K3-K4	Practical, Case Study, Project	GA10, GA5
PLO8	Reflect on personal and professional growth, identifying learning needs to pursue continuous development.	K4-K5	Seminar, Self-Assessment, Portfolio	GA9, GA11, GA15
PLO9	Demonstrate ethical, socially responsible, and inclusive behavior in professional and societal contexts.	K3-K4	Case Study, Project, Internship	GA13, GA12
PLO10	Engage in lifelong learning by applying acquired knowledge and skills to emerging technologies and global challenges.	K5-K6	Project, Seminar, Independent Study	GA15, GA11

Programme Specific Outcomes (PSOs)

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

PSO1: Utilize fundamental computing concepts and operating system principles to configure, manage, and optimize computer systems.

PSO2: Construct and implement efficient computer networks and infrastructure solutions to enable reliable communication and data exchange.

PSO3: Create and deploy software solutions using programming and scripting languages to solve practical computing problems.

PSO4: Apply virtualization, cloud computing, and database management techniques to design scalable and robust systems.

PSO5: Develop intelligent systems and AI/ML solutions to address real-world challenges in computing and cognitive domains.

PSO6: Design, test, and deploy software and mobile applications with professional practices, project management, and client-focused solutions.

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PSO Alignment with Core Courses and Skill Competencies

PSO No	Programme Specific Outcome	Supporting Core Courses	Skill Competency
PSO1	Utilize fundamental computing concepts and operating system principles to configure, manage, and optimize computer systems.	Operating Systems, Operating Systems Lab, Computer Organization and Architecture, Worksheets Lab	System configuration, OS management, hardware-software integration
PSO2	Construct and implement efficient computer networks and infrastructure solutions to enable reliable communication and data exchange.	Computer Networks, Infrastructure Management, Computer Networks Lab, Web Technology Lab	Network setup, troubleshooting, protocol application, infrastructure management
PSO3	Create and deploy software solutions using programming and scripting languages to solve practical computing problems.	Python Programming, Python Programming Lab, Java Programming, Java Programming Lab	Programming, software development, problem-solving, code optimization
PSO4	Apply virtualization, cloud computing, and database management techniques to design scalable and robust systems.	Virtualization and Cloud, Virtualization and Cloud Lab, DBMS Lab, Software Process Management, Big Data Analytics, Embedded Systems.	Cloud deployment, virtualization, database handling, system scalability
PSO5	Develop intelligent systems and AI/ML solutions to address real-world challenges in computing and cognitive domains.	Artificial Intelligence and Machine Learning, Web Application Development, Web Application Development Lab, Healthcare Information Systems, Internet of Things.	AI/ML application, model development, cognitive computing, decision-making
PSO6	Design, test, and deploy software and mobile applications with professional practices, project management, and client-focused solutions.	Software Testing, Mobile Application Development Lab, Client Relationship Management, Project and Viva Voce	Software testing, mobile app development, project management, client engagement, professional execution

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	CG26C01	Core I : Operating Systems	DSC	4	3	3	25	75	100
		CG26C02	Core II : Computer Organization and Architecture	DSC	3	3	3	25	75	100
		CG26CP1	Core Practical I : Operating Systems Lab	DSC	4	2	3	15 ^{\$\$}	35 ^{\$\$}	50
		CG26CP2	Core Practical II: Worksheets Lab	DSC	3	2	3	15 ^{\$\$}	35 ^{\$\$}	50
		TH26A03	Generic Elective I : Numerical and Statistical Techniques	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				700
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	CG26C03	Core III : Computer Networks	DSC	4	3	3	25	75	100
		CG26C04	Core IV : Infrastructure Management	DSC	3	2	3	25	75	100

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		CG26CP3	Core Practical III : Computer Networks Lab	DSC	3	2	3	15 ^{\$\$}	35 ^{\$\$}	50
		CG26CP4	Core Practical IV : Web Technology Lab	DSC	4	2	3	15 ^{\$\$}	35 ^{\$\$}	50
		TH26A11	Generic Elective II : Discrete Mathematics	MDC	6	5	3	25	75	100
		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				700
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
	III	CG26C05	Core V : Virtualization and Cloud	DSC	4	3	3	25	75	100
		CG26C06	Core VI : Python Programming	DSC	4	3	3	25	75	100
		CG26CP5	Core Practical V : Virtualization and Cloud Lab	DSC	3	2	3	15 ^{\$\$}	35 ^{\$\$}	50
		CG26CP6	Core Practical VI : Python Programming Lab	DSC	4	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 [*]	-	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				800
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	CG26C07	Core VII : Software Process Management	DSC	4	3	3	25	75	100

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		CG26C08	Core VIII : Java Programming	DSC	3	3	3	25	75	100
		CG26CP7	Core Practical VII : Java Programming Lab	DSC	3	3	3	15 ^{\$\$}	35 ^{\$\$}	50
		CG26CP8	Core Practical VIII : DBMS Lab	DSC	3	2	3	15 ^{\$\$}	35 ^{\$\$}	50
		CG26A01	Generic Elective IV: Cognitive and Problem Solving (OR)	MDC	4	3	3	25	75	100
		CG26A02	Generic Elective IV: Embedded Systems and Communication Technologies							
	IV	CG26SECE	DevOps Tools	SEC	3	3	-	100 [*]	-	100
		NM26EI	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	26BONL1 26BONL2 26BONL3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-
Semester IV Total					30	26				900
V	III	CG26C09	Core IX : Software Testing	DSC	4	3	3	25	75	100
		CG26C10	Core X : Intelligent Process Automation	DSC	4	3	3	25	75	100
		CG26C11	Core XI : Client Relationship Management	DSC	4	3	3	25	75	100
		CG26CP9	Core Practical IX : Digital Technology Lab	DSC	4	3	3	15 ^{\$\$}	35 ^{\$\$}	50
		CG26CP10	Core Practical X : Client Relationship Management Lab	DSC	4	3	3	15 ^{\$\$}	35 ^{\$\$}	50
	III	CG26E01	Elective I Data Mining (OR)	DSE	5	5	3	25	75	100
		CS26E02	Elective I Big Data Analytics (OR)							
		CG26E03	Elective I Computer Graphics							
		CG26AC1	Advance Learner Course I: Multimedia and its Applications (OR)	ACC	SS	5 [^]	3	25	75	100 [^]
		CG26AC2	Advance Learner Course I: Healthcare Information Systems							
		CG26SEP1	Software Testing Lab	SEC	3	2	-	100 [*]		100
		NM26CS1	Cyber Security I	VAC	2	Gr.	-	100 [*]	-	100 [£]
		CG26INST	Field work/ Institutional Training (21 Days)	VAC	-	2	-	100 [*]	-	100
	VI	CG26COM	Comprehensive Examination	DSC	-	Gr.	-	100 [*]	-	100 [£]

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I - V	VI	26BONL1 26BONL2 26BONL3	Online Course I Online Course II Online Course III	ACC	-	Cr. ^ /St.	-	-	-	-
Semester V Total					30	24				700
VI	III	CG26C12	Core XII : Web Application Development	DSC	5	4	3	25	75	100
		CG26CP11	Core Practical XI : Mobile Application Development Lab	DSC	5	3	3	15 ^{\$\$}	35 ^{\$\$}	50
		CG26CP12	Core Practical XII : Web Application Development Lab	DSC	5	3	3	15 ^{\$\$}	35 ^{\$\$}	50
		CG26E04	Elective II Artificial Intelligence and Machine Learning (OR)	DSE	5	4	3	25	75	100
		CS26E05	Elective II Social Network Analytics (OR)							
		CG26E06	Elective II Design and Analysis of Algorithms							
		CG26SEP2	Artificial Intelligence and Machine Learning Lab	SEC	3	2	-	100*		100
		CG26PROJ	Project and Viva Voce	DSE	7	5	3	25	75	100
		CG26AC3	Advance Learner Course II: Internet of Things (OR)	ACC	SS	5 [^]	3	25	75	100 [^]
		CG26AC4	Advance Learner Course II: Cryptography and Network Security							
Semester VI Total					30	21				500
I - VI	Total					140 + Additional Credits				4300+ Marks for Additional Credit Courses

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

List of Generic Elective Courses offered to other Programmes

(can choose any one of the courses as Generic Elective)

Semester	Course Type	Course Code	Course Title	Programmes
I	MDC – Generic Elective I	TH26A03	Numerical and Statistical Techniques	B.Sc Mathematics
II	MDC – Generic Elective II	TH26A11	Discrete Mathematics	B.Sc Mathematics
III	MDC – Generic Elective III	TH26A20	Optimization Techniques	B.Sc Mathematics
IV	MDC – Generic Elective IV	CG26A01	Cognitive and Problem Solving	B.Sc Psychology

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Symbols and Notations

Symbols	Notations
*	Course assessed through Internal Assessment (CIA) only
Gr.	Grade awarded based on CBCS grading system
St.	Course Status (Completed/Not Completed)
^	Advanced Learner Course, Online Courses – Additional Credit Courses
@	Course assessed through End Semester Examination (ESE) only
#	Open Book Examination
\$	Evaluation Pattern converted from 25:75:100 to 20:55:75 (CIA:ESE:Total) structure
\$\$	Evaluation Pattern converted from 25:75:100 to 15:35:50 (CIA:ESE:Total) structure
€	Hours per Week Outside Class Hours
£	Marks not considered for total; grade will be awarded

Abbreviation	Course Type
DSC	Discipline Specific Core Courses
DSE	Discipline Specific Elective Courses
MDC	Multidisciplinary Courses
AEC	Ability Enhancement Course
SEC	Skill Enhancement Course
VAC	Value Added Courses
ACC	Additional Credits Courses

Assessment and Evaluation Framework

Continuous Internal Assessment (CIA) – 25%

Component	Activities Included
Internal Tests	Periodic written tests
Assignments / Case Studies	• Written assignments • Case analysis reports • Article reviews • Literature review tasks • Data interpretation exercises • Policy analysis (Arts & Humanities) • Business case studies (Commerce & Management) • Lab-based analytical reports (Science)
Seminars / Presentations	• PowerPoint presentations • Poster presentations • Panel discussions • Group seminars • Viva voce • Digital presentations using multimedia tools • Peer evaluation rubrics
ICT-based Tasks	• Spreadsheet analysis • Accounting software / statistical software • Online quizzes • Simulation tools • E-content creation • Coding platforms (for relevant disciplines)
Projects / Field Reports	• Field surveys • Industry visits • Internship reports • Mini-projects • Laboratory experiments • Community-based research • Data collection & statistical analysis • Reflective journals

End Semester Examination (ESE) – 75%

Component	Description
Written Examination	3-hour written examination covering all CLOs
Cognitive Levels	Questions aligned with multiple Bloom's Taxonomy (K-levels)
Professional Conduct	Ethical and professional conduct during examination
Academic Compliance	Timely submission and participation as per regulations

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Assessment Components Aligned with Blooms Levels

EXAMINATION SYSTEM

Semester system will be followed. A semester consists of a minimum of 90 working days excluding the days of conduct of ESE. There will be Continuous Internal Assessment (CA) to evaluate the performance of students in each course and the End Semester Examination will be held at the end of every semester. Marks for ESE and CA with reference to the maximum marks for the courses will be as follows:

Max. Marks	CA	ESE
100	25	75
75	20	55
50	15	35

A. Bloom's levels are followed in question papers and aligned with CLOs and CA components.

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

B. Continuous Internal Assessment CA

The weightage assigned to various components of the CA is as follows

Undergraduate Programmes

a. Theory

AEC (Language, English), DSC (Core, Elective) & MDC (GE-Allied)

CA Components	Marks	K level
CIA Test	5 Marks (Conducted for 45 marks after 50 days – 3 units)	K1 to K6 as per QP Pattern
Model Exam	7 Marks (Conducted for 75 marks after 85 days - Each Unit 15 Marks)	
Seminar	4 Marks	K6
Assignment	4 Marks	K5
ICT (Quiz)	2 Marks	K2
Attendance	3 Marks (Attendance 75% - 80% - 1 Mark, 81% - 90% - 2 Marks, 91% - 100% - 3 Marks)	
Total	25 Marks	

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For Science allied courses with theory as 75 marks, the split-up is 20 marks as internal and 55 as external. Internal conducted for 25 and converted to 20 marks and external conducted for 75 and converted to 55 marks.

b. Practical

CA Components	Marks	K level
Lab Performance	7 Marks	K4
Internal Viva Voce	5 Marks	K4
Model Exam	10 Marks	K5
Attendance	3 Marks	
Total	25 Marks	

For practical courses with 50 marks as ESE, the split-up is 15 marks as internal and 35 as external. Internal conducted for 25 and converted to 15 marks and external conducted for 75 and converted to 35 marks.

c. Skill Enhancement Courses

Theory courses

CA Components	Marks	K level
Test I	30 Marks (Conducted for 45 marks and converted to 30 Marks – 3 Units)	K2 to K6 as per QP Pattern
Test II	50 Marks (Conducted for 75 marks after 85 days - Each Unit 15 Marks)	
Assignment	10 Marks	K5
Seminar	10 Marks	K6
Total	100 Marks	

Practical Courses

CA Components	Marks	K level
Practical exam	80 Marks (Practical Execution: 65 Marks, Record : 15 Marks)	K5
Lab Performance	10 Marks	K4
Internal Viva Voce	10 Marks	K4
Total	100 Marks	

Theory and Practical

CA Components	Marks	K level
Test I (Theory)	30 Marks (Conducted for 45 Marks and converted to 30 Marks)	K2 – K6
Test II (Practical)	50 Marks (Practical Execution: 40 Marks, Record : 10 Marks)	K5
Lab Performance	10 Marks	K4
Internal Viva Voce	10 Marks	K4
Total	100 Marks	

Theory and Project

CA Components	Marks	K level
Test I (Theory)	30 Marks (Conducted for 45 Marks and converted to 30 Marks)	K2 – K6
Project Examination	30 Marks	K5
Internal Viva Voce	40 Marks	K4
Total	100 Marks	

d. Project: Individual / Group Project

Components	Marks	K level
Continuous Internal Assessment (CA)	25 Marks	K3, K4, K6
End Semester Examination	75 Marks	K5, K6
Total	100 Marks	

Continuous Internal Assessment (CA)

CA Components	Marks	K level
I Review - Project Proposal Presentation	5 Marks	K3
II Review - Periodic Review-Progress Evaluation	10 Marks	K4
III Review - Project Report Draft Submission	10 Marks	K6
Total	25 Marks	

End semester examination

Components	Marks	K level
Evaluation of the Project Report	25 Marks	K6
Viva Voce	50 Marks	K5
Total	75 Marks	

e. Introduction to Entrepreneurship / Women Studies / Universal Human Values and Human Rights / Environmental Studies / Cyber Security I

CA Components	Marks	K level
ICT (Quiz)	50 Marks	K2
Assignment	25 Marks	K5
Project / Case study / Poster	25 Marks	K6
Total	100 Marks	

f. Entrepreneurship and Innovation (IgniteX)

CA Components	Marks	K level
ICT (Quiz)	50 Marks (3 Quizzes each quiz 25 marks, 75 marks converted to 50 marks)	K2
ICT (Pitch Deck Presentation)	20Marks	K6
Assignment	30 marks (30 Venture Activities)	K5
Total	100 Marks	

g. Advanced Tamil & Basic Tamil

Components	Marks	K level
CIA	25 Marks (conducted for 45 marks after 50 days)	K1 to K6 as per QP Pattern
Model	50 marks (conducted for 75 marks after 85 days)	
ICT (Quiz)	15Marks	K2
Assignment	10 Marks	K5
Total	100 Marks	

h. General Awareness / Comprehensive Examination / Co-Curricular Activities / Community Services

Course Title	Marks	K level
General Awareness	100	K3
Comprehensive Examination	100	K3
Co-Curricular Activities	100	K6
Community Services	St.	K6

i. Field Work / Institutional Training:

CAComponents	Marks	K level
Work diary	15 Marks	K3
Report	50 Marks	K6
Viva Voce	25 Marks	K5
Attendance	10 Marks	
Total	100 Marks	

j. Advance learner Course:

CAComponents	Marks	K level
Test 1	10 Marks (conducted for 45 marks after 50 days – 3 units)	K1 to K6 as per QP Pattern
Model Exam	15 Marks (Conducted for 75 marks after 85 days (Each Unit 15 Marks)	
Total	25 Marks	

C. Question Paper Pattern and Distribution of Marks for CA – UG

UG : Language, English, Core, Elective, Allied, ALC, Basic Tamil and Advanced Tamil - (First 3 Units)

Description	Marks	Number of questions in K level					
		K1	K2	K3	K4	K5	K6
<i>Questions from each unit comprising of</i>							
One question with a weightage of 2 Marks	3 X 2 = 6	1	2				
One question with a weightage of 5 Marks (Internal Choice at the same CLO level)	3 X 5 = 15			1	1	1	
One question with a weightage of 8 Marks (Internal Choice at the same CLO level)	3 X 8 = 24			1	1		1
Total	45 Marks						

Skill Enhancement Courses - UG

Description	Marks	Number of questions in K level					
		K1	K2	K3	K4	K5	K6
<i>Questions from each unit comprising of</i>							
One question with a weightage of 5 Marks (Internal Choice at the same CLO level)	3 x 5 = 15		1	1	1	1	1
One question with a weightage of 10 Marks (Internal Choice at the same CLO level)	3 x 10 = 30			2	1	1	1
Total	45 Marks						

D. Model /End Semester Examination – Question Paper Pattern and Distribution of Marks

UG : Language, English, Core, Elective, Allied, ALC, Basic Tamil & Advanced Tamil

Description	Marks	Number of questions in K level					
		K1	K2	K3	K4	K5	K6
<i>Questions from each unit comprising of</i>							
One question with a weightage of 2 Marks	5 x 2 = 10	2	3				
One question with a weightage of 5 Marks (Internal Choice at the same CLO level)	5 x 5 = 25			2	2	1	
One question with a weightage of 8 Marks (Internal Choice at the same CLO level)	5 x 8 = 40			2	1	1	1
Total	75 Marks						

ESE Practical Pattern (UG)

The End Semester Examination will be conducted for a maximum of 75 marks with a maximum 15 marks for the record and other submissions if any.

Practical Components	Marks	K level
Practical Execution	60 Marks	K5
Record	15 Marks	K2
Total	75 Marks	

Submission of Record note books for Practical Examinations

Submission of bonafide record note books is mandatory to appear for the practical examination. If a candidate is unable to submit the record note book on valid grounds, she may be permitted to appear for the practical examinations, provided the head of the department certifies that the candidate has performed the experiments prescribed for the course and she will be awarded zero (0) marks for record note book.

B.Sc Computer Science with Cognitive Systems – Scheme and Syllabus, 2026 Regulations
Rubrics for Assessments

Standard 4-Level Performance Scale

Level	Descriptor	Score Range (Illustrative)
Level 4	Excellent	80–100% of component marks
Level 3	Good	60–79%
Level 2	Satisfactory	40–59%
Level 1	Needs Improvement	Below 40%

1. Theory

End Semester Examination (ESE)

Section	K-Level	Criteria	Level 4 (Excellent)	Level 3 (Good)	Level 2 (Satisfactory)	Level 1 (Needs Improvement)
SEC A (Theory / Knowledge)	K1–K2	Knowledge recall & understanding	Thorough understanding across all required cognitive levels	Good understanding, minor gaps	Basic understanding, limited depth	Inadequate or incorrect understanding
SEC B (Application & Analysis)	K3–K5	Problem-solving, application of concepts, analytical reasoning	Accurately applies concepts, strong logical reasoning, handles problems independently	Mostly correct application, minor errors, reasonable reasoning	Partial application, procedural errors, limited reasoning	Unable to apply concepts, incorrect, poor reasoning
SEC C (Comprehensive / Higher-Order Tasks)	K3–K6	Analytical reasoning, creation, problem-solving, innovation	Clear logical reasoning, structured solutions, innovative or optimized solutions	Reasonable logic with minor gaps, mostly correct solutions	Limited reasoning, basic attempt at solution	Poor or no reasoning, incorrect or missing solutions

Continuous Internal Assessment (CIA)

Section	K-Level	Criteria	Level 4 (Excellent)	Level 3 (Good)	Level 2 (Satisfactory)	Level 1 (Needs Improvement)
SEC A (Theory / Knowledge)	K1–K2	Knowledge recall & understanding	Thorough understanding across all required cognitive levels	Good understanding, minor gaps	Basic understanding, limited depth	Inadequate or incorrect understanding
SEC B (Application & Analysis)	K3–K5	Problem-solving, application of concepts, analytical reasoning	Accurately applies concepts, strong logical reasoning, handles problems independently	Mostly correct application, minor errors, reasonable reasoning	Partial application, procedural errors, limited reasoning	Unable to apply concepts, incorrect, poor reasoning
SEC C (Comprehensive / Higher-Order Tasks)	K3,K4, K6	Analytical reasoning, creation, problem-solving, innovation	Clear logical reasoning, structured solutions, innovative or optimized solutions	Reasonable logic with minor gaps, mostly correct solutions	Limited reasoning, basic attempt at solution	Poor or no reasoning, incorrect or missing solutions

2. Internal Components – Other Activities

Component	K-Level	Criteria	Level 4	Level 3	Level 2	Level 1
Assignment	K5	Application & Problem Solving	Strong solutions, accurate	Mostly correct	Partial	Incorrect / missing
Seminar / Presentation	K6	Creation, Communication & Analysis	Insightful, professional, confident	Good, minor gaps	Basic	Poor / incomplete
ICT Quiz	K2	Knowledge & Application	Accurate & confident	Mostly correct	Basic	Incorrect
Attendance	—	Participation & Punctuality	Full attendance, punctual	Mostly present	Occasional	Poor / frequently absent

3. Practical**Continuous Internal Assessment (CIA)**

Component	Bloom's Level	Level 4 (Excellent)	Level 3 (Good)	Level 2 (Satisfactory)	Level 1 (Needs Improvement)
Model Practical (Converted to 10)	K5	Independent execution, accurate results, strong analysis, handles unexpected issues confidently	Minor errors, mostly accurate, guided problem-solving	Performs with guidance, partial understanding, limited analysis	Unable to perform, inaccurate results, no reasoning
Internal Viva	K4	Strong conceptual knowledge, clear reasoning, confident troubleshooting	Good understanding, minor gaps, can handle problems with guidance	Basic understanding, limited problem-solving	Weak knowledge, unable to respond or reason
Lab Performance	K4	Active participation, consistent improvement, skillfully applies concepts	Mostly regular participation, moderate improvement	Irregular, minimal improvement	Rarely participates, no skill growth
Attendance	—	Full attendance, punctual	Mostly present	Occasionally absent	Frequently absent

End Semester Practical Examination (ESE)

Component	Bloom's Level	Level 4 (Excellent)	Level 3 (Good)	Level 2 (Satisfactory)	Level 1 (Needs Improvement)
Practical Execution	K5	Accurate execution, proper procedure, precise results, handles unexpected issues confidently	Minor errors, mostly correct, can handle problems with help	Multiple errors, partial results, limited troubleshooting	Incorrect procedure, unable to execute, fails completely
Record Verification	K2	Complete experiments, accurate results, correct interpretation, neat & structured	Minor omissions, minor errors, mostly clear	Incomplete, errors present, basic clarity	Very incomplete, incorrect, untidy
External Viva	K4	Strong theoretical knowledge, clear understanding & application, confident reasoning	Good understanding, minor gaps, partial application	Basic knowledge, limited linkage to experiment	Weak knowledge, unable to explain or apply concepts

4. Projects**Continuous Internal Assessment (CIA)**

Component	Bloom's Level	Level 4 (Excellent)	Level 3 (Good)	Level 2 (Satisfactory)	Level 1 (Needs Improvement)
Project Proposal Presentation	K3	Clear, focused problem definition; well-defined objectives; feasible plan; confident presentation	Minor gaps in clarity or planning; mostly clear	Broad or partially defined problem; basic objectives; basic presentation	Vague/unclear problem; objectives missing; poor presentation
Periodic Review / Progress Evaluation	K4	Consistent, timely progress; correct application; identifies & resolves issues independently; systematic documentation; proactive	Minor delays, minor guidance needed, mostly updated documentation; moderately proactive	Irregular progress, partial application, needs support, basic documentation	Very limited progress, incorrect application, passive, poor documentation
Project Report Draft Submission	K6	Well-structured report; accurate understanding; adequate data; logical analysis; proper referencing & presentation	Minor structural or conceptual gaps; minor data issues; reasonable analysis; minor formatting issues	Basic structure; partial understanding; limited data; basic analysis; basic formatting	Poorly organized; incorrect understanding; insufficient data; no analysis; poor presentation

End Semester Examination (ESE)

Component	Bloom's Level	Level 4 (Excellent)	Level 3 (Good)	Level 2 (Satisfactory)	Level 1 (Needs Improvement)
Final Project Report Evaluation (External)	K6	Topic relevant & meaningful; accurate application of concepts; adequate & relevant data; logical analysis; effective problem-solving; professional formatting	Mostly relevant; minor conceptual errors; minor gaps in data; mostly logical; reasonable solutions; minor formatting issues	Moderately relevant; basic application; limited data; basic analysis; basic problem-solving; basic formatting	Poor relevance; incorrect application; insufficient data; weak analysis; no solution; poor formatting
External Viva Voce	K5	Thorough understanding; strong linkage to project; logical reasoning; confident & accurate responses; professional communication	Minor gaps in understanding or reasoning; mostly correct answers; acceptable communication	Basic understanding; limited linkage; basic reasoning; limited answers; basic communication	Weak understanding; no linkage; no reasoning; unable to respond; poor communication

SYLLABUS

FIRST SEMESTER

Course Code	Course Title	Hours			Credits
		Total	Lecture	Examination	
CG26C01	Core-1: Operating Systems	60	55	5	3

Preamble

- Operating Systems form the backbone of modern computing environments by managing hardware resources and enabling efficient interaction between users and computer systems
- This course introduces the fundamental concepts of operating systems with practical exposure to Windows 10, Windows Server 2019, and Linux environments
- Students learn system installation, configuration, server administration, storage management, and networking services such as DNS and DHCP
- The course also explores Active Directory, Group Policy management, and Linux command-based file management
- Through these topics, learners gain foundational knowledge required for system administration and infrastructure management

Prerequisite

Basic knowledge of computer fundamentals, hardware components, and familiarity with basic computer operations.

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 operating systems, hardware basics, Windows and Linux environments, system maintenance, and networking components..	K1
CLO2	Understand the architecture, features, and administrative functions of Windows 10, Windows Server 2019, and Linux operating systems including file systems and system tools.	K2
CLO3	Apply operating system administration techniques to install, configure, and manage disks, memory, networking (TCP/IP, DNS, DHCP), and Linux file operations.	K3
CLO4	Analyze system configurations including server roles, Active Directory, group policies, storage management (RAID), and process scheduling for efficient system performance.	K4
CLO5	Evaluate system security, resource management, backup strategies,	K5

	permissions, auditing, and network services across Windows and Linux environments.	
CLO6	Develop and implement basic system administration tasks using Linux commands, shell concepts, and vi editor along with configuring integrated OS environments.	K6
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Unit-wise CLO Mapping

Unit	Coverage	Mapped CLOs
Unit I	OS Overview, Hardware Basics, Windows 10 Installation, Disk Management, System Maintenance.	CLO1, CLO2, CLO3. CLO4, CLO5, CLO6
Unit II	Windows Server 2019 overview, Networking Preparation, Server Roles, Remote Management.	CLO1, CLO2, CLO3. CLO4, CLO5, CLO6
Unit III	Server Configuration, Processor Scheduling, Virtual Memory, Active Directory, FSMO roles.	CLO1, CLO2, CLO3. CLO4, CLO5, CLO6
Unit IV	Disk partitions, TCP/IP Networking, RAID, File Sharing, Permissions, DNS, DHCP, Group Policy.	CLO1, CLO2, CLO3. CLO4, CLO5, CLO6
Unit V	Linux OS Introduction, File Commands, VI Editor, Linux File Management.	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	2	1	1	1	1	1	2	1	1	1
CLO2	3	2	1	2	1	1	2	1	1	1
CLO3	3	2	2	2	1	2	3	1	1	2
CLO4	3	2	2	3	1	2	3	2	1	2
CLO5	2	2	2	3	1	2	2	2	3	2
CLO6	2	3	2	2	2	3	3	2	2	3

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Core-1: Operating Systems - CG26C01 **(55 Hrs)**

Unit I

11 hrs

Operating System Overview - Hardware Basics - Windows 10: Installing, Configuring and Deploying Windows 10 - System Maintenance: Hardware - Managing Disks and Drives - Automating Tasks and Activities.

Unit II

11 Hrs

Windows Server 2019 - Overview - Working with Windows Servers - Preparing Networking - Navigating Management Options - Managing Servers Remotely - Managing Roles and Features.

Unit III

11 Hrs

Configuring Server Settings: Server Naming - Managing Processor Scheduling - Allocating Virtual Memory - Active Directory - Understanding - Managing - Maintaining - ADFS - FSMO Roles - Backup and Storage.

Unit IV

11 Hrs

Deploying Windows Server 2019 - Preparing - Managing Disk Partitions - Implementing TCP/IP networking - Data storage - Partitioning and Optimizing Drives - RAID - Implementing File Sharing - Managing Permissions and Auditing. Group Policy Management - Group Policy for Administration - Print Services - DHCP: Implementing, Managing and Maintaining - DNS: Implementing, Managing and Maintaining.

Unit V

11 Hrs

Introduction to LINUX Operating System: Introduction - Overview and Features of LINUX - Linux File System Structure - Directory Structure - File Management Concepts - File Permissions and Ownership - Creating files using the vi editor: Text editors - The vi editor - Modes of vi editor - Basic Shell Concepts.

*** Course Alignment with SDGs: 4**

Text Books

S. No	Author	Title of the Book	Publisher	Year
1	Bott, Ed, and Craig Stinson	Windows 10 Inside Out (Unit I)	Microsoft Press	2020
2	William R Stanek	Windows Server 2019: The Administrator's Reference (Unit II, III, IV)	Create Space Independent Pub	2016
3	Richard Blum	Linux Fundamentals	Jones & Bartlett Learning	2023

Reference Books

S. No	Author	Title of the Book	Publisher	Year & Edition
1	Abraham Silberschatz, GregGagne, PeterBaer Galvin	Operating System Concepts	Wiley & Sons	2021
2	Kaiwan N Billimoria	Linux Kernel Programming	Packt Publishing Limited	2021

Related Online References

- <https://docs.microsoft.com/en-us/troubleshoot/windows-server>

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

Core-1: Operating Systems - CG26C01

Module No.	Topic	CLO level	K Level	No. of Hrs	Content Delivery Methods	Learning Methodology
Unit – I						
1	Operating System Overview	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Board, Chalk and Talk	Participatory Learning
2	Hardware Basics	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and Talk, PPT	Participatory Learning
3	Windows10:Installing, Configuring and Deploying Windows 10	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Guided Practice, PPT	Experiential Learning
4	System Maintenance	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	2	Chalk and talk	Participatory Learning
5	Hardware	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	2	Lecture Seminar /	Participatory Learning
6	Managing Disks and Drives	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	2	Demonstration, Lecture	Problem-based Learning
7	Automating Tasks and Activities	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	2	Demonstration	Experiential Learning

Unit – II

8	Windows Server 2019 Overview	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and Talk, PPT	Participatory Learning
9	Installing Windows Server 2019	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Lecture	Participatory Learning
10	Understanding the registry and services	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and Talk, PPT	Participatory Learning
11	Working with the registry and services	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and Talk, PPT	Participatory Learning
12	Understanding Windows Server initial configuration	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Lecture	Participatory Learning
13	Directory Services in Windows Server 2019	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Lecture	Participatory Learning
14	Understanding the AD infrastructure	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Lecture	Participatory Learning
15	Understanding DNS	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Brainstorming	Experiential Learning

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16	Understanding OUs and containers	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	2	Seminar	Experiential Learning
17	Understanding accounts and groups	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Case Study	Problem-based Learning
Unit – III						
18	Adding Roles to Windows Server 2019	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Lecture	Participatory Learning
19	Server roles and features	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Participatory Learning
20	Application Servers	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Lecture	Experiential Learning
21	Web Services, Remote Access	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Experiential Learning
22	File and Print Services	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and Talk, PPT	Problem-based Learning
23	Configuring Windows Server 2019	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Board, Chalk and Talk	Participatory Learning

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24	Group Policy in Windows Server 2019	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration	Experiential Learning
25	Managing GPOs	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT, Lecture	Participatory Learning
26	GPO configuration values	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Lecture	Experiential Learning
27	Processing GPOs	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Lecture	Participatory Learning
28	Types of GP editors	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Seminar	Participatory Learning
Unit – IV						
29	Virtualization with Windows Server 2019 - Server Virtualization	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Experiential Learning
30	Hyper- V Manager	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Lecture	Problem-based Learning
31	Storing Data in Windows Server 2019 - Storage Technologies	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Problem-based Learning

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32	Different storage types - Local storage and Network storage	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and Talk, PPT	Experiential Learning
33	Differentiating between block level storage and file- level storage	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Participatory Learning
34	Adaptor and controller types	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Lecture	Problem-based Learning
35	Serial Bus Technologies	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Participatory Learning
36	Storage Protocols	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Brainstorming	Participatory Learning
37	File sharing protocols	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Lecture	Experiential Learning
38	S2D – dedup, Storage Tiering	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Brainstorming	Participatory Learning
39	Managing storage with Server Manager and Windows PowerShell	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Lecture	Experiential Learning
Unit –V						

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40	Introduction to LINUX	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Brainstorming	Experiential Learning
41	LINUX- An Overview	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Discussion	Participatory Learning
42	Linux File System Structure	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Brainstorming	Problem-based Learning
43	Basic Linux Commands (Navigation)	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Hands on Training	Experiential Learning
44	File Handling Commands	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Lecture	Experiential Learning
45	File Permissions and Ownership	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Problem-based Learning
46	Advanced File Commands	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Flipped Class	Experiential Learning
47	Introduction to Text Editors	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Participatory Learning

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48	vi Editor – Basics and Editing Operations	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Seminar, PPT	Experiential Learning
49	Basic Shell Concepts	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	2	Demonstration, Lecture	Participatory Learning

Course Designers & Teaching–Learning Strategies

Course Code & Title	CG26C01, Core I: Operating Systems
Course Designers	Dr. J. Viji Gripsy
Teaching–Learning Strategies	Participatory Learning : 35 %
	Experiential Learning : 40 %
	Problem-based Learning : 25 %

Course Code	Course Title	Hours			Credits
		Total	Lecture	Examination	
CG26C02	Core II : Computer Organization and Architecture	45	40	5	3

Preamble

- Computer Organization and Architecture introduces the internal structure and operational principles of digital computer systems
- The course provides foundational knowledge of number systems, binary codes, digital logic gates, combinational and sequential circuits, which form the basis of modern computing hardware
- Students explore arithmetic circuits, flip-flops, registers, counters, and input–output organization used in processor communication
- The course also examines memory hierarchy, cache memory, and virtual memory techniques that improve system performance
- Through this course, learners gain a strong understanding of how hardware components interact to support efficient computation and system design

Prerequisite

Basic knowledge of computer fundamentals, elementary mathematics, and logical reasoning.

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, binary codes, logic gates, combinational and sequential circuits, I/O organization, and memory hierarchy.	K1
CLO2	Explain the principles of Boolean algebra, digital logic design, sequential circuits, input–output mechanisms, and memory organization techniques.	K2
CLO3	Apply digital logic and arithmetic techniques to design combinational circuits, perform binary operations, and implement basic I/O and memory operations.	K3

CLO4	Analyze the behavior of sequential circuits, registers, counters, I/O data transfer methods, and memory mapping techniques in computer systems.	K4
CLO5	Evaluate the performance and efficiency of memory hierarchy, cache organization, virtual memory, and I/O interfacing methods in system design.	K5
CLO6	Design and develop digital systems incorporating logic circuits, sequential components, I/O organization, and memory structures for efficient computer architecture.	K6
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Unit-wise CLO Mapping

Unit	Coverage	Mapped CLOs
Unit I	Number Systems, Binary Codes, Complements, Logic Gates.	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Unit II	Boolean Algebra, Karnaugh Maps, Canonical forms, Logic Simplification.	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Unit III	Adders, Subtractors, Flip-flops, Registers, Counters, Multiplexers.	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Unit IV	Input–Output Organization, Interrupts, DMA, I/O Processor Communication.	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Unit V	Memory Hierarchy, Cache Memory, Associative Memory, Virtual Memory.	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	2	2	1	2	1	1	2	1	1
CLO2	3	2	2	1	2	3	2	2	1	2

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CLO3	3	3	2	1	1	1	1	2	2	2
CLO4	2	3	2	2	2	1	2	1	2	1
CLO5	2	2	2	3	1	2	1	2	1	3
CLO6	2	1	2	1	1	2	1	2	3	2

Core II : Computer Organization and Architecture - CG26C02

(40 Hrs)

Syllabus

Unit I

7 Hrs

Number System and Gates :Number System and Binary Codes - Decimal, Binary, Octal, Hexadecimal–Binary addition, Multiplication, Division - Floating point representation, Complements, BCD, Excess3, Gray Code. Digital Logic: The Basic Gates- NOR, NAND, XOR Gates.

Unit II

8 Hrs

Combinational Logic and Sequential Circuits : Combinational Logic Circuits-Boolean algebra Demorgan's Theorems - Karnaugh map - Canonical form Construction and properties - Implicates - Don't care combinations - Product of sum, Sum of products, Simplifications

Unit III

8 Hrs

Arithmetic and Sequential Circuits :Half adder, Full adder, Parallel binary adder, BCD adder, Half subtractor, Full subtractor, Parallel binary subtractor. Sequential circuits: Flip-Flops: RS, D, JK, and T - Shift Registers - Decoder - Encoder - Multiplexers - DE multiplexers - Counters - Asynchronous Counter - synchronous Counter.

Unit IV

8 Hrs

Input - Output Organization: Input - output interface - I/O Bus and Interface - I/O Bus Versus Memory Bus - Isolated Versus Memory - Mapped I/O - Example of I/O Interface. Asynchronous data transfer: Strobe Control and Handshaking - Priority Interrupt: Daisy- Chaining Priority, Parallel Priority Interrupt. Direct Memory Access: DMA Controller, DMA Transfer. Input - Output Processor: CPU - IOP Communication.

Unit V

9 Hrs

Memory Organization: Memory Hierarchy - Main Memory - Associative memory: Hardware Organization, Match Logic, Read Operation, Write Operation. Cache Memory: Associative, Direct, Set-associative Mapping - Writing into Cache Initialization. Virtual Memory: Address Space and Memory Space, Address Mapping Using Pages, Associative Memory, Page Table, Page Replacement.

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Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Bishnu Charan Sarkar, Suvra Sarkar	Digital Electronics: Circuits and Systems	Sadhana Press	2018
2	M. Morris Mano	Computer System Architecture	PHI	2017

Reference Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	David A. Patterson, John L. Hennessy	Computer Organization and Design	Morgan Kaufmann / Elsevier	2020
2	Sajjan G.Shiva	Computer Organization, Design and Architecture	CRC Press	2025

Related Online References

- <https://nptel.ac.in/courses/106/103/106103068/>
- <http://www.nptelvideos.in/2012/12/digital-computer-organization.html>
- <http://brittunculi.com/foca/materials/FOCA-Chapters-01-07-review-handout.pdf>

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

Core II : Computer Organization and Architecture - CG26C02						
Module No.	Topic	CLO Level	K-Level	No. of Hrs	Content Delivery Methods	Learning Methodology
UNIT – I						
1	Number Systems Overview	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Interactive Lecture	Participatory Learning
2	Decimal, Binary, Octal, Hexadecimal Conversions	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Think–Pair–Share	Participatory Learning
3	Binary Arithmetic (Addition, Subtraction)	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Guided Practice	Experiential Learning
4	Binary Multiplication and Division	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and talk	Participatory Learning
5	Floating Point Representation	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Lecture, Seminar	Participatory Learning
6	Complements, BCD, Excess-3, Gray Code	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Lecture	Problem-based Learning

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7	Logic Gates (AND, OR, NOT, NAND, NOR, XOR)	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration	Experiential Learning
UNIT – II						
8	Boolean Algebra Basics	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and talk	Participatory Learning
9	De Morgan's Theorems	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Lecture, Seminar	Participatory Learning
10	Canonical Forms	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Lecture	Participatory Learning
11	Karnaugh Map Introduction	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration	Participatory Learning
12	K-Map Simplification (2-variable)	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and talk	Participatory Learning
13	K-Map Simplification (3 - 4 variable)	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Lecture	Participatory Learning
14	Implicants and Don't Care Conditions	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT / OER	Experiential Learning

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15	SOP and POS Simplifications	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Lecture	Experiential Learning
Unit – III						
16	Half Adder and Full Adder	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, Lecture	Participatory Learning
17	Parallel Binary Adder	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration	Experiential Learning
18	BCD Adder	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and talk	Experiential Learning
19	Half and Full Subtractor	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Lecture	Problem-based Learning
20	Parallel Binary Subtractor	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Participatory Learning
21	Flip-Flops (RS and D)	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration	Experiential Learning
22	Flip-Flops (JK and T)	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Hands on Training	Experiential Learning

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23	Shift Registers	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and talk	Participatory Learning
Unit – IV						
24	I/O Interface Basics	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration	Experiential Learning
25	I/O Bus vs Memory Bus	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and talk	Problem-based Learning
26	Isolated vs Memory-Mapped I/O	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Lecture	Problem-based Learning
27	Asynchronous Data Transfer	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Experiential Learning
28	Strobe and Handshaking	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration	Participatory Learning
29	Priority Interrupt (Daisy Chaining)	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Demonstration, PPT	Problem-based Learning
30	DMA Controller and Transfer	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Participatory Learning

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31	CPU-IOP Communication	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Brainstorming	Participatory Learning
Unit –V						
32	Memory Hierarchy	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Brainstorming	Experiential Learning
33	Main Memory Organization	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Discussion	Participatory Learning
34	Associative Memory Basics and Operations	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Brainstorming	Problem-based Learning
35	Cache Memory Overview	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Lecture	Experiential Learning
36	Mapping Techniques (Direct)	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Problem-based Learning
37	Mapping Techniques (Associative)	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Chalk and talk, Discussion	Participatory Learning
38	Mapping Techniques (Set-Associative)	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT	Participatory Learning

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39	Cache Write Policies	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	PPT, Brainstorming	Experiential Learning
40	Virtual Memory Basics	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	1	Lecture	Participatory Learning

Course Designers & Teaching–Learning Strategies

Course Code & Title	CG26C02, Core II: Computer Organization and Architecture
Course Designers	Dr. J. Rajeshwari
Teaching–Learning Strategies	Participatory Learning : 45 %
	Experiential Learning : 25 %
	Problem-based Learning : 30 %

Course Code	Course Title	Hours			Credits
		Total	Practical	Examination	
CG26CP1	Core Practical I : Operating Systems Lab	60	57	3	2

Preamble

- The Operating Systems Lab provides practical exposure to the installation, configuration, and administration of modern operating systems and server environments
- Students gain hands-on experience with Windows 10 and Windows Server 2019 using virtualization platforms
- The laboratory exercises focus on server roles, disk management, Active Directory configuration, network services such as DNS and DHCP, and file sharing mechanisms
- Through guided experimentation, learners develop the skills required for basic system administration and network infrastructure management
- The course also introduces students to practical troubleshooting and configuration techniques in real-world computing environments

Prerequisite

Basic knowledge of computer hardware, operating system fundamentals, and familiarity with basic computer operations.

Course Learning Outcomes

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

CLO No	Course Learning Outcome	Bloom's Level
CLO1	List the basic steps involved in installing and configuring Windows client and server operating systems in a virtual environment.	K1
CLO2	Explain the functions of server roles, disk partitioning methods, and network services such as DNS and DHCP.	K2
CLO3	Apply system administration procedures to install operating systems, configure server roles, and manage disk partitions.	K3
CLO4	Analyze server configurations including Active Directory setup, domain controller promotion, and network service implementation.	K4

CLO5	Evaluate administrative configurations such as group policies, network drive mapping, and server services for effective system management.	K5
CLO6	Design and deploy a basic server environment by configuring Active Directory, DNS, DHCP, and file sharing services in a virtual lab setup.	K6
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Unit-wise CLO Mapping

Unit	Coverage	Mapped CLOs
Programs 1–2	Installation of Windows 10 and Windows Server 2019 in virtual machines.	CLO1,CLO2, CLO3
Programs 3–4	Managing server roles and disk partitioning (MBR/GPT, volume creation).	CLO1,CLO2, CLO3
Programs 5–6	Installing Active Directory Domain Services and promoting server to domain controller.	CLO1,CLO2, CLO3
Programs 7–8	Implementing Group Policy and configuring DNS services.	CLO1,CLO2, CLO3,CLO4
Programs 9–10	Configuring DHCP and deploying IIS services.	CLO1,CLO2, CLO3,CLO4
Program 11	Network drive mapping, file sharing, and printer sharing.	CLO1,CLO2, CLO3,CLO4, CLO5,CLO6
Program 12	Implement Windows Server Backup and Restore	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	1	1	1	1	2
CLO2	3	1	2	1	1	1	2	1	1	1
CLO3	3	3	2	2	1	1	2	1	2	1
CLO4	2	2	3	3	1	1	1	1	1	1
CLO5	2	2	1	3	1	2	2	2	3	2
CLO6	2	3	2	2	2	1	2	1	1	3

Core Practical I : Operating Systems Lab - CG26CP1

(57 Hrs)

List of Programs

- Install client Windows 10 in virtual machine and naming the system
- Install Windows server 2019 in virtual machine as an administrator
- Managing roles and features of Windows server 2019
- Disk partitioning in MBR and GPT and creating new volume in disk
- Configure and install Active Directory Domain Service
- Promote the active directory server to domain controller and replication of Windows server
- Implementing group policy for administration in Windows server 2019
- Configuring, managing and installation of DNS in Windows server 2019
- Configuring, managing and installation of DHCP in Windows server 2019
- Configuration and deployment of IIS in Windows server 2019
- Mapping network drive for file sharing and printer sharing
- Implement Windows Server Backup and Restore

Pedagogy

- Demonstration of working environment / Software
- Hands-on Laboratory Practice
- Guided Experimentation
- Problem-Solving and Troubleshooting
- Collaborative Learning

Core Practical I : Operating Systems Lab - CG26CP1

Module No.	Topic	CLO Level	K Level	No. of Hrs	Content Delivery Methods	Learning Methodology
Practical Programs						
1	Install Windows 10 in Virtual Machine	CLO1, CLO2, CLO3	K1, K2, K3	5	Demonstration, Guided Practice	Participatory Learning
2	Install Windows Server 2019 in VM	CLO1, CLO2, CLO3	K1, K2, K3	4	Demonstration, Guided Practice	Participatory Learning
3	Managing Roles and Features	CLO1, CLO2, CLO3	K1, K2, K3	4	Hands on Training	Experiential Learning
4	Disk Partitioning (MBR/GPT)	CLO1, CLO2, CLO3	K1, K2, K3	5	Demonstration, Guided Practice	Experiential Learning
5	Install Active Directory Domain Services	CLO1, CLO2, CLO3	K1, K2, K3	5	Demonstration, Guided Practice	Participatory Learning
6	Promote Domain Controller & Replication	CLO1, CLO2, CLO3	K1, K2, K3	5	Hands on Training	Experiential Learning
7	Implement Group Policy	CLO1, CLO2, CLO3, CLO4	K1, K2, K3, K4	4	Demonstration, Guided Practice	Experiential Learning
8	Configure DNS Services	CLO1, CLO2, CLO3, CLO4	K1, K2, K3, K4	5	Demonstration, Guided Practice	Participatory Learning
9	Configure DHCP	CLO1, CLO2, CLO3, CLO4	K1, K2, K3, K4	5	Hands on Training	Experiential Learning

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10	Deploy IIS Services	CLO1, CLO2, CLO3, CLO4	K1, K2, K3, K4	5	Demonstration, Guided Practice	Experiential Learning
11	Network Drive, File & Printer Sharing	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	5	Demonstration, Guided Practice	Experiential Learning
12	Implement Windows Server Backup and Restore	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	5	Demonstration, Guided Practice	Experiential Learning

Course Designers & Teaching–Learning Strategies

Course Code & Title	CG26CP1, Operating Systems Lab
Course Designers	Dr. N. Prabhu
Teaching–Learning Strategies	Participatory Learning : 30 %
	Experiential Learning : 50 %
	Problem-based Learning : 20 %

Course Code	Course Title	Hours			Credits
		Total	Practical	Examination	
CG26CP2	Core Practical II : Worksheets Lab	60	57	3	2

Preamble

- This course provides practical exposure to Microsoft Excel automation using Visual Basic for Applications (VBA)
- It introduces students to the Excel object model including cells, ranges, worksheets, and workbooks
- The course enables learners to develop basic mathematical computations and automate spreadsheet operations using macros
- It develops programming skills using VBA constructs such as sequence, selection, repetition, and event handling
- The course also focuses on data analysis operations such as filtering, sorting, removing duplicates, and string manipulation using VBA procedures

Prerequisite

Basic knowledge of computer fundamentals, spreadsheet operations, and introductory programming concepts.

Course Learning Outcomes

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

CLO No	Course Learning Outcome	Bloom's Level
CLO1	Recall the fundamental concepts of Excel components such as cells, ranges, worksheets, and workbooks used in spreadsheet applications.	K1
CLO2	Explain the Excel object model including objects, properties, methods, and events used in VBA programming.	K2
CLO3	Apply VBA programming constructs to perform mathematical expressions and interactive input/output operations in Excel.	K3
CLO4	Analyze Excel data structures and develop macros using sequence,	K4

	selection, and repetition control structures.	
CLO5	Evaluate spreadsheet data using VBA procedures for sorting, filtering, and removing duplicate entries.	K5
CLO6	Design simple VBA-based automation solutions using string functions and macros for spreadsheet data processing.	K6
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Unit-wise CLO Mapping

Unit	Coverage	Mapped CLOs
Programs 1–2	Working with cells and mathematical expressions.	CLO1, CLO2, CLO3
Programs 3–4	Objects, properties, methods, and events and Interactive Input/ Output.	CLO1, CLO2, CLO3
Programs 5–6	Working with simple macros using sequence, selection and using VBA procedures for data analysis.	CLO1, CLO2, CLO3, CLO4
Programs 7–8	Macros using String and Date functions.	CLO1, CLO2, CLO3, CLO4
Programs 9–10	User defined functions and Error Handling.	CLO1, CLO2, CLO3, CLO4, CLO5
Program 11-12	Data visualization through charts and graphs and consolidating multiple sheets.	CLO1, CLO2, CLO3, CLO4, CLO5
Program 13-14	Creating user forms and import/export data.	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6
Program 15	Working with Files/Folders using VBA.	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	2	1	1	1	1	2
CLO2	3	2	2	1	2	1	2	1	1	1
CLO3	3	3	2	2	1	1	3	1	2	2
CLO4	2	2	3	3	1	2	2	2	1	2
CLO5	2	2	2	3	1	2	3	2	3	2
CLO6	2	3	2	2	2	2	3	2	2	3

Core Practical II Worksheets Lab - CG26CP2**(57 Hrs)****List of Programs**

- Working with cells, range, worksheets, and workbooks
- Basic mathematical expressions
- Objects, properties, methods, and events
- Interactive Input/Output, accessing excel formulas using VBA
- Working with simple macros using sequence, selection and repetition
- VBA procedures for data analysis (filter/sorting/removing duplicates)
- Simple macros using string functions
- Simple macros using date functions
- Simple macros using user-defined functions
- Error handling in VBA
- Data visualization through charts and graphs
- Consolidating multiple sheet
- Import / export data from different applications
- Creating user forms using ActiveX controls
- VBA programs to work with files /folders

Pedagogy

- Demonstration of working environment / Software
- Hands-on Laboratory Practice
- Guided Experimentation
- Problem-Solving and Troubleshooting
- Collaborative Learning

Core Practical II Worksheets Lab - CG26CP2

Module No.	Topic	CLO Level	K Level	No. of Hrs	Content Delivery Method	Learning Methodology
Practical Programs						
1	Cells, Range, Worksheets, Workbooks	CLO1, CLO2, CLO3	K1, K2, K3	3	Demonstration, Guided Practice	Participatory Learning
2	Basic Mathematical Expressions	CLO1, CLO2, CLO3	K1, K2, K3	4	Demonstration, Guided Practice	Participatory Learning
3	Objects, Properties, Methods, Events	CLO1, CLO2, CLO3	K1, K2, K3	4	Hands on Training	Experiential Learning
4	Interactive I/O and Excel Formulas using VBA	CLO1, CLO2, CLO3	K1, K2, K3	4	Demonstration, Guided Practice	Experiential Learning
5	Macros (Sequence, Selection, Repetition)	CLO1, CLO2, CLO3, CLO4	K1, K2, K3, K4	4	Demonstration, Guided Practice	Participatory Learning
6	VBA for Data Analysis (Filter/ Sort/ Remove Duplicates)	CLO1, CLO2, CLO3, CLO4	K1, K2, K3, K4	4	Hands on Training	Experiential Learning
7	Macros using String Functions	CLO1, CLO2, CLO3, CLO4	K1, K2, K3, K4	4	Demonstration, Guided Practice	Experiential Learning
8	Macros using Date Functions	CLO1, CLO2, CLO3, CLO4	K1, K2, K3, K4	4	Demonstration, Guided Practice	Participatory Learning
9	User-defined Functions	CLO1, CLO2, CLO3, CLO4, CLO5	K1, K2, K3, K4, K5	4	Hands on Training	Experiential Learning

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10	Error Handling in VBA	CLO1, CLO2, CLO3, CLO4, CLO5	K1, K2, K3, K4, K5	4	Demonstration, Guided Practice	Experiential Learning
11	Data Visualization (Charts/ Graphs)	CLO1, CLO2, CLO3, CLO4, CLO5	K1, K2, K3, K4, K5	4	Demonstration, Guided Practice	Experiential Learning
12	Consolidating Multiple Sheets	CLO1, CLO2, CLO3, CLO4, CLO5	K1, K2, K3, K4, K5	3	Demonstration, Guided Practice	Participatory Learning
13	Import/ Export Data	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	4	Hands on Training	Experiential Learning
14	User Forms with ActiveX Controls	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	3	Demonstration, Guided Practice	Experiential Learning
15	Working with Files/Folders using VBA	CLO1, CLO2, CLO3, CLO4, CLO5, CLO6	K1, K2, K3, K4, K5, K6	4	Demonstration, Guided Practice	Experiential Learning

Course Designers & Teaching–Learning Strategies

Course Code & Title	CG26CP2, Worksheets Lab
Course Designers	Mrs. J. Mythili
Teaching–Learning Strategies	Participatory Learning : 45 %
	Experiential Learning : 25 %
	Problem-based Learning : 30%

Course Code	Course Title	Hours			Credits
		Total	Lecture	Examination	
TH26A03	Generic Elective I: 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		

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
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
Unit V	Theoretical distributions: Binomial, Poisson and Normal distributions.	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	2	1	1	1	1	1	2	1	1	1
CLO2	3	2	1	2	1	1	2	1	1	1
CLO3	3	2	2	2	1	2	3	1	1	2
CLO4	3	2	2	3	1	2	3	2	1	2
CLO5	2	2	2	3	1	2	2	2	3	2
CLO6	2	3	2	2	2	3	3	2	2	3

Generic Elective I : 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)

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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

Module No.	Topic	CLOs	K Level	No. of Hours	Content delivery methods	Learning Methods
UNIT – I (17 Hrs)						
1	Solution of Linear Simultaneous Equations Introduction	CLO1	K1	1	Lecture – Chalk and Talk/ Group readings	Problem-based Learning
2	Gauss elimination Method	CLO1 CLO2 CLO3	K1 K2 K3	2	Spotters / Lecture Discussion	Experiential Participatory Learning
3	Gauss Jordan Method	CLO1 CLO2 CLO3	K1 K2 K3	3	Lecture – Chalk and Talk ,OER,Spotters	Problem-based Learning,Participatory,Experiential Learning
4	Gauss Seidel Method	CLO1 CLO3 CLO4	K1 K3 K4	3	Chalk and Talk ,Lecture , spotters	Experiential Learning, Participatory Learning
5	Gauss Jacobi method	CLO3 CLO4 CLO5	K3 K4 K5	2	Lecture – Chalk and Talk/Discussion	Participatory Learning ,Problem-based
6	Interpolation	CLO1 CLO2	K1 K2	1	OER	Participatory Learning
7	Newton Forward Interpolation Formulae	CLO2 CLO3 CLO4 CLO5	K2 K3 K4 K5	2	Lecture – Chalk and Talk/ Group readings	Problem-based Learning ,Participatory Learning

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8	Newton Backward Interpolation Formulae	CLO2 CLO3 CLO4 CLO6	K2 K3 K4 K6	3	Lecture – Chalk and Talk , Spotters	Participatory Learning , Problem based , Experiential Learning
UNIT – II (17 Hrs)						
9	Numerical Differentiation: Formulae for Derivatives	CLO1 CLO2	K1 K2	1	Lecture – Chalk and Talk/ Group readings	Problem-based Learning
10	Newton’s Forward Difference	CLO2 CLO3 CLO4	K2 K3 K4	2	Lecture – Chalk and Talk , Spotters	Participatory Learning , Experiential Learning
11	Newton’s Backward Difference	CLO2 CLO3 CLO4	K2 K3 K4	2	Lecture – Chalk and Talk , PPT , OER	Participatory Learning
12	Numerical Integration Introduction	CLO1	K1	2	Lecture – Chalk and Talk	Participatory Learning , Problem-based Learning
13	Newton-Cotes Quadrature formulas	CLO1 CLO2	K1 K2	2	Lecture – Chalk and Talk , Spotters	Problem-based Learning , Experiential Learning
14	Trapezoidal rule	CLO2 CLO3 CLO4 CLO5	K2 K3 K4 K5	2	Lecture – Chalk and Talk/ Group readings , OER	Problem-based , Experiential Learning
15	Simpson’s 1/3 rules	CLO2 CLO3 CLO4	K2 K3 K4	2	Lecture – Chalk and Talk , Spotters , Seminar	Problem-based , Experiential Learning
16	Simpson’s 3/8 rule	CLO2 CLO3 CLO4	K2 K3 K4	2	Lecture / Seminar	Experiential , Problem-based Learning

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17	Taylor's series method	CLO2 CLO3 CLO4, CLO6	K2 K3 K4 K6	2	Lecture / OER	Experiential ,Problem-based Learning
UNIT – III (18 Hrs)						
18	Skewness	CLO1 CLO2 CLO4	K1 K2 K4	1	Lecture – Chalk and Talk	Participatory Learning
19	Correlation analysis: Introduction	CLO2	K2	1	Lecture PPT	Participatory Learning
20	Significance of the study of correlation	CLO2	K2	1	Video / Observation	Experiential Learning
21	correlation and causation	CLO2	K2	1	Video / Observation	Experiential Learning
22	Types of correlation	CLO2 CLO3	K2 K3	1	Seminar / PPT	Participatory Learning
23	Methods of studying correlation	CLO2 CLO3	K2 K3	1	Lecture – Chalk and Talk	Problem-based Learning
24	Graphic method	CLO3 CLO4	K3 K4	2	Lecture – Chalk and Talk , Spotters	Participatory ,Experiential Learning
25	Karl Pearson's coefficient of correlation	CLO3 CLO4	K3 K4	2	Lecture – Chalk and Talk , Group readings	Participatory ,Problem-based Learning
26	Coefficient of correlation and probable error	CLO2 CLO3 CLO5	K2 K3 K5	1	Lecture PPT	Participatory Learning

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27	Coefficient of determination	CLO2 CLO3	K2 K3	1	Demonstration	Experiential Learning
28	Properties of the coefficient of the correlation	CLO2	K2	1	Lecture – Chalk and Talk/ Group readings	Problem-based Learning
29	Rank correlation coefficient	CLO3 CLO4	K3 K4	1	Lecture – Chalk and Talk/ Group readings	Problem-based Learning
30	Features of Spearman's correlation coefficient	CLO3 CLO4	K3 K4	2	Lecture – Chalk and Talk/ Group readings	Problem-based Learning
31	Regression Analysis	CLO2 CLO3 CLO4 CLO6	K2 K3 K4 K5	2	Lecture / Seminar ,PPT	Participatory ,Problem-based Learning
UNIT – IV (17 Hrs)						
32	Probability: Introduction, probability defined	CLO1 CLO2	K1 K2	3	Lecture – Chalk and Talk/ Group readings	Problem-based Learning
33	Importance of the concept of probability	CLO2	K2	1	Research article reading	Problem-based Learning
34	Calculation of probability	CLO2 CLO3	K2 K3	4	Lecture / Seminar ,Group readings , Demonstration	Participatory Learning, Problem-based , Experiential Learning
35	Theorems of probability (statements only)	CLO2 CLO3 CLO4 CLO5	K2 K3 K4 K5	7	Spotters / Lecture - Chalk and Talk ,Group readings ,PPT	Experiential Learning , Problem-based Learning , Participatory Learning

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36	Mathematical expectation	CLO2 CLO3 CLO6	K2 K3 K6	2	Lecture – Chalk and Talk/ Group readings , PPT	Problem-based Learning
UNIT – V (19 Hrs)						
37	Theoretical Distributions Introduction	CLO1	K1	1	Lecture – Chalk and Talk/ Group readings	Problem-based Learning
38	Binomial distribution	CLO1 CLO2 CLO3 CLO4 CLO5	K1 K2 K3 K4 K5	5	Lecture /PPT , Demonstration ,Spotters	Participatory , Experiential Learning , Problem-based Learning
39	Poisson distribution	CLO1 CLO2 CLO3 CLO4	K1 K2 K3 K4	4	Discussion ,Demonstration ,Lecture – Chalk and Talk/ Group readings	Participatory Learning, Experiential , Problem-based Learning
40	Normal distribution	CLO1 CLO2 CLO3 CLO4 CLO6	K1 K2 K3 K4 K6	9	Research article reading ,Lecture – Chalk and Talk/ Group readings , Spotters ,Demonstration	Problem-based Learning , Experiential Learning

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 Designers & Teaching–Learning Strategies

Course Code & Title	TH26A03, & Generic Elective :Numerical and Statistical Techniques
Course Designers	Dr.J.RejulaMercy , Dr.S.Deepa
Teaching–Learning Strategies	Participatory Learning : 31 %
	Experiential Learning : 26 %
	Problem-Based Learning : 43 %

Course Code	Course Title	Hours			Credits
		Total	Lecture	Examination	
NME26ES	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		

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,CLO2CLO3, 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

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	2	1	1	1	1	1	2	1	1	1
CLO2	3	2	1	2	1	1	2	1	1	1
CLO3	3	2	2	2	1	2	3	1	1	2
CLO4	3	2	2	3	1	2	3	2	1	2
CLO5	2	2	2	3	1	2	2	2	3	2
CLO6	2	3	2	2	2	3	3	2	2	3

Introduction to Entrepreneurship - NME26ES**(30 HRS)****Unit I****6 Hrs**

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

Unit II**6 Hrs**

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

Unit III

6 Hrs

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

Unit IV

6 Hrs

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

Unit V

6 Hrs

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
1.	KolbBonitaM	Entrepreneurship for the creative and cultural industries	Routledge	2015
2.	P.T.Vijayashree & M.Alagammai	Entrepreneurship and Small Business Management	Margham	2020