



Learn Beyond

**KPR Institute of
Engineering and
Technology**

(Autonomous, Affiliated to Anna University)

CURRICULUM AND SYLLABI REGULATIONS – 2025 (REVISED)

**Department of
Computer Science and Engineering**

CONTROLLED COPY

I. Vision and Mission of the Institute

Vision

To become a premier institute of academic excellence by imparting technical, intellectual and professional skills to students for meeting the diverse needs of industry, society, the nation and the world at large

Mission

- Commitment to offer value-based education and enhancement of practical skills
- Continuous assessment of teaching and learning processes through scholarly activities
- Enriching research and innovation activities in collaboration with industry and institutes of repute
- Ensuring the academic processes to uphold culture, ethics and social responsibilities

II. Vision and Mission of the Department

Vision

To be a premier centre for education, dissemination of knowledge and research in the frontier areas of computer science and engineering to serve the community with moral values.

Mission

The mission of the department is to

- Provide holistic education incorporating the state-of-the-art technologies to produce successful professionals.
- Facilitate the students to pursue higher education and research in the areas related to Computer Science and Engineering.
- Promote strong collaborations with the industries and steer the students to nurture their interest in continuous learning to meet the changing needs of the society.

III. Program Educational Objectives (PEOs)

The Program Educational Objectives (PEOs) of the COMPUTER SCIENCE AND ENGINEERING (CS) represent major accomplishments that the graduates are expected to achieve after three to five years of graduation.

PEO1: Acquire knowledge and skills on cutting edge technologies in the field of computer science and engineering.

PEO2: Inculcate a passion for continuous learning through further studies and research in the field of computer science and engineering.

PEO3: Develop innovative ideas upholding the rich value systems to solve the changing technological needs.

IV. Program Outcomes (POs)

Graduates of the COMPUTER SCIENCE AND ENGINEERING will be able to

- PO1:** Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems
- PO2:** Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development (WK1 to WK4)
- PO3:** Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required (WK5)
- PO4:** Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions (WK8)

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 487

- PO5:** Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems (WK2 and WK6)
- PO6:** The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment (WK1, WK5, and WK7)
- PO7:** Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws (WK9)
- PO8:** Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams
- PO9:** Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
- PO10:** Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments
- PO11:** Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK8)

Knowledge and Attitude Profile (WK)

- WK1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences
- WK2:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline
- WK3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
- WK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
- WK5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area
- WK6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
- WK7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development
- WK8:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues
- WK9:** Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes

V. Program Specific Outcomes (PSOs)

Graduates of the COMPUTER SCIENCE AND ENGINEERING will be able to

- PSO1:** Solve complex engineering problems by building integrated systems across various domains of Computational Intelligence.

PSO2: Apply technical skills to produce solutions that meet the requirements of the emerging technologies in Computer Science and Engineering.

VI. PEO / PO Mapping

Following three levels of correlation should be used:

- 1: Low
- 2: Medium
- 3: High

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
PEO 1	3	3	3	3	2	2	2	2	3	3	2	2	2
PEO 2	3	3	3	-	-	2	2	2	3	3	3	2	3
PEO 3	3	3	3	3	-	2	2	1	3	3	3	1	3

VII. Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Sem	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
I	Professional Communication - I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Multivariable Calculus and Applications	✓	✓	-	-	-	-	-	-	-	-	-	✓	-
	Physics for Data Storage and Computing	✓	✓	✓	-	-	-	-	-	-	-	-	✓	-
	Engineering Chemistry	✓	✓	✓	-	✓	-	-	✓	✓	-	✓	✓	-
	C Programming	✓	✓	✓	✓	✓	-	-	-	-	-	✓	✓	-
	Essentials of Computing	✓	✓	✓	-	-	-	-	-	-	-	-	✓	-
	C Programming Laboratory	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	-
	Induction Program													
	Universal Human Values	-	-	-	-	-	✓	✓	✓	-	-	✓	-	-
	தமிழர் மரபு / Heritage of Tamils	-	-	-	-	-	-	✓	✓	-	✓	-	-	-
	Design Thinking	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓	-	-
	Professional Skill Development - I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
II	Professional Communication - II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Linear Algebra and Number Theory	✓	✓	-	-	✓	-	-	-	✓	-	✓	✓	✓
	Engineering Physics	✓	✓	✓	-	✓	-	-	✓	✓	-	-	✓	-
	Python Programming	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓
	Digital Electronics	✓	✓	✓	✓	-	-	-	-	✓	✓	✓	✓	✓
	Linux and Shell Scripting	✓	✓	✓	-	✓	-	-	-	✓	-	-	✓	-
	Makerspace	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-
	Python Programming Laboratory	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓
	Environmental Governance and Sustainability	✓	✓	-	-	-	✓	✓	-	✓	-	✓	-	-
	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	-	-	-	-	-	-	✓	✓	-	-	-	-	-
	Professional Skill Development - II	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

Sem	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
III	Probability and Statistical Modeling for Computing Systems	✓	✓	-	-	✓	-	-	-	-	-	-	✓	✓
	Computer Organization and Architecture	✓	✓	✓	✓	✓	-	-	-	-	-	✓	✓	✓
	Artificial Intelligence and Machine Learning	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	-
	Object Oriented Programming Using Java	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	-
	Data Exploration and Visualization	✓	✓	✓	✓	✓	-	✓	-	✓	✓	✓	✓	✓
	Data Structures	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	-
	Object Oriented Programming Using Java Laboratory	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓
	Artificial Intelligence and Machine Learning Laboratory	✓	✓	✓	✓	✓	-	-	-	-	✓	✓	✓	✓
	Essence of Indian Traditional Knowledge	-	✓	-	✓	-	-	✓	-	-	-	-	✓	✓
	Professional Skill Development - III	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IV	Discrete Mathematics	✓	✓	-	-	-	-	-	-	-	-	-	✓	✓
	Formal Languages and Automata Theory	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓
	Design And Analysis of Algorithms	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	-
	Database Management Systems	✓	✓	✓	✓	-	-	-	-	-	-	✓	✓	✓
	Operating Systems	✓	✓	✓	✓	-	-	-	-	-	-	✓	-	✓
	Database Management Systems Laboratory	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓
	Indian Constitution	-	-	-	-	-	✓	✓	✓	✓	-	-	-	-
	Professional Skill Development - IV	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Dr. S. Miruna Joe Amali
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 Professor & Head

Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407

Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering

KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407

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COMPUTER SCIENCE AND ENGINEERING
Regulations 2025
For the students admitted from 2025 onwards
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR I - VIII SEMESTERS



SEMESTER I

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25REN101	Professional Communication - I	HSMC	TwL	2	-	2	-	3
2	U25RMA101	Multivariable Calculus and Applications	BSC	T	3	1	-	-	4
3	U25RPH02	Physics for Data Storage and Computing	BSC	T	2	-	-	-	2
4	U25RCY01	Engineering Chemistry	BSC	TwL	2	-	2	-	3
5	U25RCSG01	C Programming	ESC	T	3	-	-	-	3
6	U25RCSG02	Essentials of Computing	PCC	T	2	-	-	-	2
7	U25RCSG03	C Programming Laboratory	ESC	L	-	-	2	-	1
Total									18
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
8	U25RMNC01	Induction Program	MNC	MNC	-	-	-	-	-
9	U25RMCC01	Universal Human Values	MCC	MCC	3	-	-	-	3
10	U25RMCC02	தமிழர் மரபு / Heritage of Tamils	MCC	Tamil Courses	1	-	-	-	1
11	U25RMCC03	Design Thinking	MCC	MCC	1	-	2	-	2
12	U25RMCC06	Professional Skill Development - I	MCC	MCC	-	-	-	-	1
Total									7

SEMESTER II

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25REN201	Professional Communication - II	HSMC	TwL	2	-	2	-	3
2	U25RMA201	Linear Algebra and Number Theory	BSC	TwL	3	-	2	-	4
3	U25RPH01	Engineering Physics	BSC	TwL	2	-	2	-	3
4	U25RCSG04	Python Programming	ESC	T	3	-	-	-	3
5	U25RECG03	Digital Electronics	ESC	TwL	3	-	2	-	4
6	U25RCSG05	Linux and Shell Scripting	PCC	TwL	1	-	2	-	2
7	U25RGE01	Makerspace	ESC	L	-	-	4	-	2
8	U25RCSG06	Python Programming Laboratory	ESC	L	-	-	2	-	1
Total									22
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
9	U25RMCC04	Environmental Governance and Sustainability	MCC	MCC	2	-	-	-	2
10	U25RMCC05	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	MCC	Tamil Courses	1	-	-	-	1

Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
 Arcore, Coimbatore - 641 069

No	Course Code	Title	Category	Type	L	T	P	J	C
11	U25RMCC07	Professional Skill Development - II	MCC	MCC	-	-	-	-	1
Total									4

SEMESTER III

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25MA301	Probability and Statistical Modeling for Computing Systems	BSC	TwL	2	-	2	-	3
2	U25CSG09	Computer Organization and Architecture	PCC	T	3	-	-	-	3
3	U25CSG10	Artificial Intelligence and Machine Learning	PCC	T	3	-	-	-	3
4	U25CSG11	Object Oriented Programming Using Java	PCC	T	3	-	-	-	3
5	U25ADG03	Data Exploration and Visualization	PCC	TwL	2	-	2	-	3
6	U25CSG12	Data Structures	PCC	TwL	2	-	4	-	4
7	U25CSG13	Object Oriented Programming Using Java Laboratory	PCC	L	-	-	2	-	1
8	U25CSG14	Artificial Intelligence and Machine Learning Laboratory	PCC	L	-	-	4	-	2
Total									22

MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)

9	U25MNC02	Essence of Indian Traditional Knowledge	MNC	MNC	1	-	-	-	-
10	U25RMCC08	Professional Skill Development - III	MCC	MCC	-	-	-	-	1
Total									1

SEMESTER IV

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25MA401	Discrete Mathematics	BSC	T	3	-	-	-	3
2	U25CS401	Formal Languages and Automata Theory	PCC	T	3	1	-	-	4
3	U25CSG15	Design And Analysis of Algorithms	PCC	T	3	1	-	-	4
4	U25CSG16	Database Management Systems	PCC	T	3	-	-	-	3
5	U25CSG17	Operating Systems	PCC	TwL	2	-	2	-	3
6	U25CSG18	Database Management Systems Laboratory	PCC	LwP	-	-	2	2	2
7	-	Open Elective I	OEC	T	1	-	4	-	3
					3	-	-	-	
					2	-	2	-	
Total									22

MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)

8	U25MNC03	Indian Constitution	MNC	MNC	1	-	-	-	-
9	U25RMCC09	Professional Skill Development - IV	MCC	MCC	-	-	-	-	1
Total									1

T - Theory, L - Laboratory, TwL - Theory with Laboratory, TwP - Theory with Project

Dr. S. MIRUNA JOE AMALI M.E., Ph.D.
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
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SEMESTER I

U25REN101	Professional Communication - I (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: HSMC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To develop professional communication skills for academic, technical and workplace environments
- To enhance the listening skills and facilitate effective pronunciation
- To enable students to communicate confidently in individual and team-based situations

COURSE OUTCOMES:

CO 1: Use appropriate vocabulary and grammatical structures in professional communication	Understand
CO 2: Communicate confidently in academic, social and workplace situations	Apply
CO 3: Develop reading and writing skills for technical and professional purposes	Apply
CO 4: Infer and present information using appropriate communication strategies	Analyze
CO 5: Demonstrate effective listening, presentation, and teamwork skills in professional contexts	Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 2	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 3	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 4	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 5	-	-	-	-	-	-	-	2	3	-	1	-	-

SYLLABUS:

UNIT I: FOUNDATIONS OF PROFESSIONAL COMMUNICATION

6 + 6

Verbal, Non-verbal and Digital Communication - Word chain - Professional Etiquette - Self-Introduction and Elevator Pitch - Growth Mindset and Workplace Communication - Cross-cultural Communication - Professional Terminology - AI-assisted Communication Tools

UNIT II: PROFESSIONAL READING AND WRITING

6 + 6

Reading Technical Articles - Error correction - Manuals and SOPs - Infographics and Data - Email Etiquette - Email Writing - AI-assisted Writing Tools - Ethical Use of AI - Verbal Analogy

UNIT III: LISTENING AND INTERPERSONAL COMMUNICATION

6 + 6

Listening Barriers - Note-taking Techniques - Listening for Problem Solving - Team Communication - Conflict Resolution - Workplace Discussions - Idioms and Phrases

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 087

UNIT IV: DIGITAL COMMUNICATION AND PRESENTATION SKILLS

Storytelling Techniques - Discourse markers, linkers and cohesive devices - Data Presentation - Presentation Anxiety Management - Digital Presentation Platforms - Branding - Commonly Confused Words

UNIT V: EMPLOYABILITY AND PROFESSIONALISM

Prefixes, Suffixes and Root Words - LinkedIn Profile - Interview Skills - Group Discussion Strategies - Art of Persuasion - Entrepreneurial Communication - AI in Future Workplace

LIST OF EXPERIMENTS

1. Self-Introduction
2. Group Presentation
3. Listening to TED Talks
4. Listening to Documentaries
5. Digital Profiling

CONTACT PERIODS:

Lecture: 30 Periods	Tutorial: - Periods	Practical: 30 Periods	Project: - Periods	Total: 60 Periods
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TEXTBOOKS:

1. Ashraf Rizvi, Effective Technical Communication, 3rd Edition, McGraw-Hill Education, 2023
2. Meenakshi Raman & Sangeeta Sharma, Technical Communication: Principles and Practice, 4th Edition, Oxford University Press, 2022
3. Sanjay Kumar & Pushp Lata, Communication Skills, 3rd Edition, Oxford University Press, New Delhi, 2018

REFERENCES:

1. Stephen E. Lucas, The Art of Public Speaking, 14th Edition, McGraw Hill Education, New York, 2023
2. Dale Carnegie, The Quick and Easy Way to Effective Speaking, Updated Edition, Simon & Schuster, New York, 2019
3. Matt Abrahams, Think Faster, Talk Smarter: How to Speak Successfully When You're Put on the Spot, Simon & Schuster, New York, 2024


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head
 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore

SEMESTER I

U25RMA101	Multivariable Calculus and Applications (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: BSC				
		L	T	P	J	C
		3	1	0	0	4

QP PATTERN: A

COURSE OBJECTIVES:

- To provide a comprehensive knowledge of multivariable calculus, including, partial derivatives integral calculus, and vector calculus
- For constructing more convenient for students to apply their calculus knowledge to their various fields of study
- To develop skills in solving first and second order linear differential equations for engineering applications

COURSE OUTCOMES:

- CO 1:** Explain the concepts of multivariable differential calculus, estimate the extreme values and Taylor's formula of two variable functions **Understand**
- CO 2:** Apply integral calculus to evaluate double integrals over various regions and compute area and volume using double integration **Apply**
- CO 3:** Apply vector calculus to compute directional derivative, divergence, curl, Green's, Stokes' and Gauss divergence theorems **Apply**
- CO 4:** Solve first order ordinary differential equations, model physical phenomena, determine appropriate methods for solving them, and interpret the results **Apply**
- CO 5:** Formulate second-order differential equations, solve the equations, and interpret the solutions for physical models **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	-	1	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	1	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	1	-
CO 4	3	2	-	-	-	-	-	-	-	-	-	2	-
CO 5	3	2	-	-	-	-	-	-	-	-	-	2	-

SYLLABUS:

UNIT I: DIFFERENTIAL CALCULUS

9 + 3

Functions of two variables – Partial derivatives – Total derivatives – Taylor's formula for functions of two variables – Extreme Values

UNIT II: INTEGRAL CALCULUS

9 + 3

UNIT II Double integrals – Over rectangles – Over general regions – Fubini's theorem (statement only), Area and Volume by double integration – Reversing the order of integration

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407

9 + 3

UNIT III: VECTOR CALCULUS

Differentiation in vector field – Gradient of a scalar field – Directional derivative – Divergence of a vector field – Curl of a vector field – Integration in vector field – Line integrals – Work– circulation and flux – Path independence – Conservative fields – Green's – Gauss divergence and Stoke's theorems

9 + 3

UNIT IV: FIRST ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS

Basic concepts of ordinary differential equations – Separable and exact differential equations – Integrating factors and first-order linear differential equations – Mathematical modelling of real-world problems

9 + 3

UNIT V: SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS

Homogeneous linear equations of second order – linearity principle – second order homogeneous equations with constant coefficients – Euler–Cauchy equation – Non-homogeneous linear second order-solution by variation of parameters

CONTACT PERIODS:

Lecture: 45 Periods	Tutorial: 15 Periods	Practical: - Periods	Project: - Periods	Total: 60 Periods
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TEXTBOOKS:

1. Thomas G. B. and Finney R. L., "Calculus and Analytic Geometry", Pearson Education, New Delhi, 2012
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Pvt Ltd, New Delhi, 2012

REFERENCES:

1. Wylie C. R. and Barrett L. C., "Advanced Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2013
2. Peter V.O Neil, "Advanced Engineering Mathematics", Cengage, New Delhi, 2010
3. Michael D. G, "Foundations of Applied Mathematics", Dover Publications, INC, New York, 2013
4. Gilbert Strang, "Calculus", Wellesley Cambridge Press, USA, 2017


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641010

SEMESTER I

U25RPH02	Physics for Data Storage and Computing (Common to AD, AM, CB, CS, IT, SC)	Category: BSC				
		L	T	P	J	C
		2	0	0	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the concepts of optical and optoelectronic materials and device applications
- To examine the principles and applications of magnetic and nano devices
- To understand the principles of quantum mechanics for computing and electronic circuits and to analyze next generation quantum electronics

COURSE OUTCOMES:

- CO 1:** Explain the properties and applications of optical materials, optical devices, and optical data storage systems **Understand**
- CO 2:** Describe the behavior of magnetic materials and the working of magnetic storage devices and sensors **Understand**
- CO 3:** Apply the principles of quantum confinement, tunneling, and single electron phenomena in nanodevices **Apply**
- CO 4:** Explain the concepts of quantum computing, qubits, and Bloch sphere representation **Understand**
- CO 5:** Apply the operation of quantum gates, quantum circuits, and quantum devices in quantum computing systems **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO 3	3	2	1	-	-	-	-	-	-	-	-	-	-
CO 4	2	1	-	-	-	-	-	-	-	-	-	1	-
CO 5	3	2	1	-	-	-	-	-	-	-	-	1	-

SYLLABUS:

UNIT I: OPTICAL MATERIALS AND DEVICES

6

Classification of optical materials – Carrier generations and recombination process – Absorption, emission and scattering of light in solids – Photodiode – Solar cell – OLED – Optical data storage techniques – Blue ray disc

UNIT II: MAGNETIC MATERIALS AND DATA STORAGE

6

Origin of magnetic materials – Classification of magnetic materials – Ferromagnetic theory – Hysteresis – Magnetic memory devices – Magnetic tape – GMR Sensor – Magnetic bubble memories – Magstripe

UNIT III: NANODEVICES

6

Introduction – Quantum confinement – Quantum structures: quantum wells, wires and dots – Band gap of nanomaterials – Tunneling – Single electron phenomena: Coulomb blockade – Single electron transistor – Resonant tunneling diode – Quantum cellular automata

UNIT IV: QUANTUM COMPUTING

6

Introduction to Quantum Computing – Moore's law and its limitations – Differences between Classical and Quantum computing – Concept of qubit and its properties – Representation of qubit by Bloch sphere – Single and Two qubits

UNIT V: QUANTUM CIRCUITS

6

Quantum devices – Qubit Gates, Single Qubit Gates: Quantum NOT Gate – Pauli – X, Y and Z Gates – Hadamard Gate – Phase Gate (or S Gate), T Gate – Multiple Qubit Gates (qualitative) – Quantum Chips

CONTACT PERIODS:

Lecture: 30 Periods	Tutorial: - Periods	Practical: - Periods	Project: - Periods	Total: 30 Periods
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TEXTBOOKS:

1. S O Pillai, "Solid State Physics", New Age International Private Limited, 8th Edition, 2018
2. Vishal Sahani "Quantum Computing", McGraw Hill Education, 2007

REFERENCES:

1. M.N. Avadhanulu, P.G. Kshirsagar, and T.V.S. Arun Murthy, "A Textbook of Engineering Physics", 11th edition, S. Chand Publishing, New Delhi, 2022
2. Quantum Computing – A Beginner's Introduction, Parag K Lala, Indian Edition, Mc GrawHill, Reprint 2020
3. https://onlinecourses.nptel.ac.in/noc21_cs103/preview

SEMESTER I & II

U25RCY01	Engineering Chemistry (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce the fundamentals, properties, industrial applications of polymeric materials and advanced energy storage devices
- To impart knowledge about corrosion prevention, surface treatment methods and nanomaterials
- To provide a basic understanding of semiconductor materials, microelectronics, quantum, computational chemistry and their applications

COURSE OUTCOMES:

- CO 1:** Apply the concepts of polymer materials and their properties in solving industrial and technological challenges **Apply**
- CO 2:** Interpret the performance of batteries, solar cells, and supercapacitors for their effective energy storage applications **Apply**
- CO 3:** Utilize suitable corrosion prevention methods, surface treatment techniques and nanomaterials for industrial requirements **Apply**
- CO 4:** Apply suitable semiconductor materials, microfabrication processes and display technologies for specific applications **Apply**
- CO 5:** Utilize quantum chemistry principles and AI-assisted techniques to model, visualize, and predict material properties **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	-	1	-	-	1	1	-	1	-	-
CO 2	3	2	1	-	1	-	-	1	1	-	1	-	-
CO 3	3	2	1	-	1	-	-	1	1	-	1	1	-
CO 4	3	2	1	-	1	-	-	1	1	-	1	-	-
CO 5	3	2	1	-	1	-	-	1	1	-	1	1	-

SYLLABUS:

UNIT I: POLYMERIC MATERIALS

6 + 6

Polymers – Introduction – Compounding – Compression, Injection – Smart Polymers – Temperature responsive (PNIPAM), pH responsive (PAA), Light responsive (Azobenzene), 3D Printable (PLA), flexible and wearable polymers (PDMS – E-skin, RFID) – Conductive Polymers (PEDOT) – Synthesis, working and applications – Biopolymers – Classification, PEG, Alginate Hydrogel – Synthesis and applications


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

UNIT II: ENERGY CONVERSION AND STORAGE

6 + 6

Batteries – Classification, LiFePO_4 – Construction, working and applications – Fuel Cells – Proton Exchange Membrane(PEM), Solid Oxide Fuel Cells (SOFC) – Green Hydrogen – Classification, production method, electrolysis – Organic photovoltaics – P3HT and PCBM – Working and applications – Solar Cells – Dye-Sensitized Solar Cells (DSSC), Supercapacitors – Electrostatic Double Layer– Working and application

UNIT III: CORROSION AND NANO SCIENCE

6 + 6

Types of corrosion – Factors influencing corrosion – Cathodic protection, Coatings – Galvanization, Epoxy, Polyurethane, Enamel, Superhydrophobic coatings – Process and applications. Surface treatments – Carburizing, Nitriding, Cyaniding – Process and applications. Nanomaterials – Introduction, 0D (Quantum dots), 1D (nanowire, nanorods and carbon nanotubes) 2D nanomaterials (MoS_2), Size effects and quantum confinement, Synthesis – Laser ablation and Chemical Vapour Deposition (CVD), Various applications of nanomaterials

UNIT IV: SEMICONDUCTOR AND DISPLAY TECHNOLOGY

6 + 6

Semiconductors – Perfluoropentacene, GaN – Characteristics and applications, Neuromorphic Materials – Phase-Change Memory and Memristors – Working and applications – Liquid Crystal Displays, OLED, QLED – Working and applications – Wafer Manufacturing – Purification – Czochralski and Float Zone methods – Photolithography and microfabrication

UNIT V: QUANTUM AND COMPUTATIONAL CHEMISTRY

6 + 6

Quantum Chemistry – Basics, quantum numbers, shapes of atomic orbitals, Molecular Orbital Theory – (H_2 , O_2 , N_2), Schrödinger equation (Derivation) – Qubits and Quantum Memory, Computational Chemistry – Molecular modeling – Basic Computational Methods – Software tools – iGemdock, Chem draw, Molview, Jmol – Introduction to AI and its role in the field of Chemistry

LIST OF EXPERIMENTS

1. Estimate the viscosity of a given polymer solution using an Ostwald viscometer and determine molecular weight of the given polymer
2. Synthesis of a polymer (Bakelite / polyaniline (PANI) and assess the physical properties of the polymer
3. Potentiometric determination and comparative study of EMF in different solutions
4. Determine maximum wavelength of absorption of a given solution to verify Beer's Law and to find unknown concentration of the given sample by Spectrophotometry / Colorimetry
5. Determination of corrosion rate of Iron and its prevention by electroplating / electroless plating
6. Synthesis of ZnO / TiO_2 / Ag nanoparticles and study of their photocatalytic degradation of Methylene Blue dye
7. Recovery of Copper from waste Printed Circuit Boards (PCBs) and quantitative determination of copper content
8. Measurement of electrical conductivity of solutions using a conductometric Sensor
9. Perform molecular docking using freely available online software to investigate the binding affinity a ligand with the protein
10. Construct the 2D structure of a given compound and generate its 3D molecular model using computational tools for visualization and structural analysis

CONTACT PERIODS:

Lecture: 30 Periods Tutorial: - Periods Practical: 30 Periods Project: - Periods Total: 60 Periods

TEXTBOOKS:

1. Wiley India Pvt. Ltd., "Engineering Chemistry", 2nd edition, Wiley India Pvt. Ltd., New Delhi, 2013
2. S.S. Dara and S.S. Umare, "A Textbook of Engineering Chemistry", 12th edition, Chand Publishing, New Delhi, 2024

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology

3. R.V. Gadag and A. Nityananda Shetty, "Engineering Chemistry", 3rd edition, I.K. International Publishing House, New Delhi, 2014

REFERENCES:

1. Fred W Billmeyer, "Textbook of Polymer Science", 4th edition, John Wiley & Sons, New York, 1999
2. Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen and Jack E. Lemons, "Biomaterials Science: An Introduction to Materials in Medicine", 4th edition, Academic Press, London, 2020
3. Kirby W Beard, Linden's "Handbook of Batteries", 5th edition, McGraw Hill, New York, 2019
4. John Larminie and Andrew Dicks, "Fuel Cell Systems Explained", 3rd edition, John Wiley & Sons, Chichester, 2012
5. Fontana M. G., "Corrosion Engineering", 3rd edition, McGraw-Hill Book Company, New York, 1986
6. V. Raghavan, "Materials Science and Engineering: A First Course", 6th edition, Prentice Hall of India, New Delhi, 2015
7. M.F. Ashby and D.R.H. Jones, "Engineering Materials" 2: An Introduction to Microstructures, Processing and Design, 4th edition, Elsevier, UK, 2012
8. Ira N Levine, "Quantum Chemistry", 7th edition, Pearson, Boston, 2013

SEMESTER I

U25RCSG01	C Programming (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: ESC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To enable students to understand the fundamentals of problem-solving and C programming, including algorithms, flowcharts, pseudocode, and the structure of a C program
- To develop programming skills using input/output operations, control structures, arrays, strings, functions, pointers, and dynamic memory allocation
- To introduce user-defined data types such as structures and unions for handling complex data effectively
- To familiarize students with file handling concepts and develop C-based solutions for real-world applications

COURSE OUTCOMES:

- CO 1:** Explain fundamental programming concepts, problem-solving techniques, and the basic structure of C Understand programs
- CO 2:** Develop C programs using input/output functions, operators, decision-making, and iterative control structures Apply
- CO 3:** Implement arrays and string handling concepts to solve data processing and real-world applications Apply
- CO 4:** Develop modular and efficient programs using functions, recursion, pointers, and dynamic memory allocation techniques Apply
- CO 5:** Apply user-defined data types and file handling operations to manage and process data effectively Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	2	-	-	-	-	-	-	-	-	-	1	-
CO 2	3	2	1	1	-	-	-	-	-	-	2	1	-
CO 3	3	2	1	1	-	-	-	-	-	-	2	1	-
CO 4	3	2	1	1	-	-	-	-	-	-	2	2	-
CO 5	3	2	1	1	1	-	-	-	-	-	2	2	-

SYLLABUS:

UNIT I: PROBLEM SOLVING APPROACHES AND C PROGRAMMING BASICS

10

Problem Solving Techniques: Problem Statement and Analysis – Problem Modelling – Identifying Input and Output Requirements – Algorithms – Flowcharts – Pseudocode for Solving Basic Scientific and Business Problems. Introduction to C: Characteristics of C – Structure of a C Program – Compiling and Executing C Program – Pre-processor Directives – Tokens – Character Set – Keywords – Identifiers – Constants – Variables – Operators – Data Types – Typecasting – Input/Output Statements in C

Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engg
KPR Institute of Engineering and Tech

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Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engg
KPR Institute of Engineering and Tech
Arasur, Coimbatore - 641 4

UNIT II: DECISION CONTROL AND LOOPING STATEMENTS

8

Conditional Statements: if Statement – if-else Statement – Nested if Statements – else-if Ladder – switch Statement. Looping Statements: while Loop – do-while Loop – for Loop – Nested Loops. Jump Statements: break Statement – continue Statement – goto Statement

UNIT III: ARRAYS AND STRINGS

9

Arrays: Declaration and Initialization – Accessing and Manipulating Array Elements – One-Dimensional Arrays – Two-Dimensional Arrays – Applications of Arrays. Strings: Declaration and Initialization of Strings – String Handling Functions – String Arrays

UNIT IV: FUNCTIONS AND POINTERS

9

Functions: Definition – Function Call – Function Prototype – Return Statement – Types of Functions – Recursive Functions – Command Line Arguments. Pointers: Declaration and Initialization – Pointer Arithmetic – Passing Arguments by Value and by Reference – Pointer to Pointer – Pointers and Arrays. Dynamic Memory Allocation: malloc(), calloc(), realloc(), free()

UNIT V: USER-DEFINED DATA TYPES AND FILE MANAGEMENT

9

Structures: Declaration and Initialization – Accessing Structure Members – Arrays of Structures – Nested Structures – Pointer to Structures. Unions – Storage Classes. Files: File Access Methods – File Modes – File Operations – File Pointers – Binary File Operations

CONTACT PERIODS:

Lecture: 45 Periods	Tutorial: - Periods	Practical: - Periods	Project: - Periods	Total: 45 Periods
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TEXTBOOKS:

1. Reema Thareja, "Computer Fundamentals and Programming in C", 3rd Edition, Oxford University Press, 2023
2. Brian W. Kernighan and Dennis Ritchie, "The C Programming Language", 2nd Edition, Pearson, 2015

REFERENCES:

1. Paolo Ferragina and Fabrizio Luccio, "Computational Thinking First Algorithms", Then Code", 1st Edition, Springer International Publishing, 2018
2. Paul Deitel and Harvey Deitel, "C How to Program", 7th Edition, Pearson Publication
3. Juneja, B. L and Anita Seth, "Programming in C", 1st Edition, Cengage Learning India Pvt. Ltd., 2011
4. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", 1st Edition, Oxford University Press, 2009


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

SEMESTER I

U25RCSG02	Essentials of Computing (Common to AD, AM, CB, CS, IT, SC)	Category: PCC				
		L	T	P	J	C
		2	0	0	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce the fundamentals of computing systems, computer organization, digital information representation, and operating systems
- To develop computational thinking and problem-solving skills using decomposition, abstraction, algorithms, flowcharts, and pseudocode
- To familiarize students with programming fundamentals, software development processes, programming environments, and language translation tools
- To provide an understanding of emerging computing technologies and their applications in solving real-world problems

COURSE OUTCOMES:

- CO 1:** Describe the fundamentals of computing systems, computer organization, memory, processors, operating systems, and emerging computing technologies **Understand**
- CO 2:** Apply computational thinking and problem-solving techniques using decomposition, abstraction, algorithms, flowcharts, pseudocode, variables, and operators **Apply**
- CO 3:** Explain programming environments, software development processes, language translation tools, and visual programming concepts **Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	2	3	1	-	-	-	-	-	-	-	-	1	-
CO 3	2	1	-	-	-	-	-	-	-	-	-	-	-

SYLLABUS:

UNIT I: COMPUTING FUNDAMENTALS

10

Introduction to Computing: Characteristics and Applications of Computers – Classification of Computers – Evolution of Computers – Basic Organization of a Computer – CPU, Memory and Storage Devices – Input and Output Devices – Operating Systems and their Functions. Computer Architecture and Emerging Technologies: Computer Memory and Processors – Basic Processor Architecture – Pipelining and Parallel Processing – Types of Processors – Emerging Trends in Computing: Artificial Intelligence, Quantum Computing and Quantum Communication

UNIT II: COMPUTATIONAL THINKING AND DIGITAL REPRESENTATION

10

Computational Thinking: Decomposition – Pattern Recognition – Abstraction – Algorithmic Thinking – Real-World Applications of Computational Thinking. Digital Representation of Information: Data Representation in Computers – ASCII and Unicode – Number Systems: Binary, Decimal and Hexadecimal – Binary Arithmetic Basics – Sequential and Parallel Processing Concepts

Computational Thinking Case Studies

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering

KPR Institute of Engineering and Technology

Arasur, Coimbatore - 641 021

UNIT III: PROGRAMMING ENVIRONMENTS AND SOFTWARE DEVELOPMENT**10**

Programming Languages and Software: Generations of Programming Languages – Classification of Programming Languages – Computer Software: System Software and Application Software – Open-Source and Proprietary Software. Language Translators and Development Tools: Compiler – Interpreter – Assembler – Linker – Loader – Overview of Software Development Process, Tools and Techniques. Visual Programming: Introduction to Visual Programming using Scratch/Turtle Environment – Developing Simple Programs using Blocks and Graphics

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 30 Periods

TEXTBOOKS:

1. Reema Thareja, "Fundamentals of Computers", Oxford University Press, 2020
2. David D. Riley and Kenny A. Hunt, "Computational Thinking for the Modern Problem Solver", 1st Edition, CRC Press, 2014
3. J. Glenn Brookshear and Dennis Brylow, "Computer Science: An Overview", 12th Edition, Pearson, 2015

REFERENCES:

1. V. Rajaraman and Neeharika Adabala, "Fundamentals of Computers", PHI Learning, 2014
2. Majed Marji, "Learn to Program with Scratch: A Visual Introduction to Programming with Games, Art, Science and Math", 1st Edition, No Starch Press, 2014
3. G. Venkatesh and M. Mukund, "Computational Thinking", 1st Edition, Notion Press, 2021
4. Chris Bernhardt, "Quantum Computing for Everyone", 1st Edition, MIT Press, 2019


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

SEMESTER I

U25RCSG03	C Programming Laboratory (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: ESC				
		L	T	P	J	C
		0	0	2	0	1

QP PATTERN: A

COURSE OBJECTIVES:

- To provide hands-on experience in problem solving and structured programming using the C programming language
- To develop programming skills using control structures, arrays, strings, functions, pointers, and dynamic memory management techniques
- To enable students to design and implement applications using user-defined data types and file handling concepts for real-world problems

COURSE OUTCOMES:

- CO 1:** Demonstrate problem-solving techniques, algorithms, flowcharts, and basic C programming constructs in program development Apply
- CO 2:** Develop C programs using input/output operations, decision-making statements, and iterative constructs Apply
- CO 3:** Demonstrate the use of arrays and strings for data processing and manipulation Apply
- CO 4:** Develop modular applications using functions, recursion, pointers, and dynamic memory management techniques Apply
- CO 5:** Develop applications using structures, unions, storage classes, and file handling operations for data management Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	1	-	-	-	-	-	-	1	1	-
CO 2	3	2	2	1	-	-	-	-	-	-	1	1	-
CO 3	3	2	2	1	-	-	-	-	-	-	1	1	-
CO 4	3	2	2	1	-	-	-	-	-	-	1	2	-
CO 5	3	2	2	1	-	-	-	-	-	-	1	2	-

LIST OF EXPERIMENTS

1. Design and implementation of algorithms, flowcharts, and pseudo code for basic problem-solving applications
2. Development of C programs demonstrating data types, operators, and formatted input/output operations
3. Implementation of decision-making applications using conditional statements and switch-case constructs
4. Development of iterative applications using looping and loop control statements
5. Design and implementation of console-based applications for real-world mathematical and logical problem solving
6. Implementation of one-dimensional array operations for searching, sorting, and statistical analysis
7. Development of matrix manipulation applications using two-dimensional arrays
8. Design and implementation of string processing applications using standard string handling functions
9. Development of modular applications using user-defined functions and recursive techniques

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

10. Implementation of applications demonstrating parameter passing mechanisms using call by value and call by reference
11. Development of applications using pointers, pointer arithmetic, and array-pointer relationships
12. Implementation of dynamic memory management applications using malloc(), calloc(), realloc(), and free()
13. Design and implementation of applications using structures, nested structures, unions, and storage classes
14. Development of file processing applications using text and binary file operations in C
15. Implementation of command-line and console-based applications integrating functions, pointers, structures, and file management concepts for real-world use cases

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 30 Periods

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson Education, 2015
2. Reema Thareja, "Computer Fundamentals and Programming in C", 3rd Edition, Oxford University Press, 2023
3. Yashavant Kanetkar, "Let Us C", 17th Edition, BPB Publications, 2023
4. Byron Gottfried, "Programming with C", 4th Edition, Schaum's Outline Series, McGraw Hill Education


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER I

U25RMNC01	Induction Program (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MNC				
		L	T	P	J	C
		3 Weeks				0

GUIDELINES:

Students come with diverse thoughts, backgrounds and preparations. It is important to assist them adjust in the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Keeping the above thought in mind AICTE proposes a 3-week induction program for the UG students entering the institution before the commencement of normal classes which will start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, set a healthy daily routine, create bonding in the batch as well as between faculty, develop awareness, sensitivity and understanding of the self, society at large, and nature. The following are the activities under the induction program in which the student should be fully and actively engaged throughout the entire duration of the program.

Physical Activity: To inculcate team spirit, competitiveness, group cohesion and bonding as well as physical & mental health, physical activities like team sports, yoga, physical exercises should be conducted daily during early morning & evening. Activities like gardening may also be encouraged.

Creative Arts: Every student should choose one skill related to arts /visual arts/ performing arts like painting, sculpture, pottery, music, dance etc. to develop a sense of aesthetics and also to enhance creativity. The student should pursue it daily for the duration of the program.

Universal Human Values: Universal Human Values module will help the student to explore oneself and experience the joy of learning, stand up to peer pressure, take decisions with courage, create awareness about the relationship with colleagues and supporting staff in the hostel and department, etc.

Literary: Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

Proficiency Modules: To establish the command over skills like English, a computer familiarity etc. these modules can be taught earlier so that when norm

CONTACT PERIODS:

Lecture: - Periods Tutorial: - Periods Practical: - Periods Project: - Periods Total: 0 Periods


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Dr. S
Professor & Head
Department of Computer Science and Engineering
Department of
KPR Institute of Engineering and Technology
KPR Institute of
Arasur, Coimbatore - 641 407.
Arasur, Coimbatore - 641 407.

SEMESTER I

U25RMCC01	Universal Human Values (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MCC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the significance of universal human values and their role in complementing technical, intellectual, and professional skills for holistic development.
- To apply a holistic perspective in addressing personal, societal, professional, and environmental challenges through ethical and value-based approaches.
- To demonstrate responsible citizenship, professional ethics, mutual respect, and sustainable practices that contribute positively to society, industry, and the environment.

COURSE OUTCOMES:

- CO 1:** Explain the significance of Universal Human Values and self-exploration in developing a holistic **Understand** perspective, enabling students to harmonize technical competence with ethical responsibility and value-based living.
- CO 2:** Differentiate the needs of the Self and the Body, and apply self-exploration to develop healthy habits, **Understand** value-based decision-making, and holistic well-being.
- CO 3:** Explain the concepts of natural acceptance, competence, and respect, and apply them to foster **Understand** harmonious relationships, resolve social conflicts, promote value education for children, and develop holistic perspectives for societal development.
- CO 4:** Demonstrate an understanding of the interconnectedness of existence and integrate holistic perspectives **Apply** into academic, professional, and societal contexts.
- CO 5:** Apply human values and professional knowledge to promote sustainable development, family harmony, **Apply** societal well-being, and responsible participation in nature.

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	3	3	-	-	-	3	-	-
CO 2	-	-	-	-	-	3	3	3	-	-	3	-	-
CO 3	-	-	-	-	-	3	3	-	-	-	3	-	-
CO 4	-	-	-	-	-	3	3	-	-	-	3	-	-
CO 5	-	-	-	-	-	3	3	3	-	-	3	-	-

SYLLABUS:

UNIT I: INTRODUCTION TO VALUE EDUCATION

9

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) – Understanding Value Education – Self-exploration as the Process for Value Education – Continuous Happiness and Prosperity – the Basic Human Aspirations – Happiness and Prosperity: Current Scenario – Method to Fulfil the Basic Human Aspirations. Self-Exploration Activity Topics: Sharing about Oneself – Exploring Human Consciousness

UNIT II: HARMONY IN THE HUMAN BEING

9

Understanding Human being as the Co-existence of the Self and the Body – Distinguishing between the Needs of the Self and the Body – The Body as an Instrument of the Self – Understanding Harmony in the Self – Harmony of the Self with the Body – Programme to ensure self-regulation and Health. Self-Exploration Activity Topics: Exploring the difference of Needs of Self and Body – Exploring Sources of Imagination in the Self – Exploring Harmony of Self with the Body

UNIT III: HARMONY IN THE FAMILY AND SOCIETY

9

Harmony in the Family – the Basic Unit of Human Interaction – 'Trust': the Foundational Value in Relationship – 'Respect': as the Right Evaluation – Other Feelings, Justice in Human-to-Human Relationship – Understanding Harmony in the Society – Vision for the Universal Human Order. Self-Exploration Activity Topics: Exploring the Feeling of Trust – Exploring the Feeling of Respect – Exploring Systems to fulfil Human Goal

UNIT IV: HARMONY IN THE NATURE/EXISTENCE

9

Understanding Harmony in the Nature – Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders – Realizing Existence as Co-existence at All Levels – The Holistic Perception of Harmony in Existence. Self-Exploration Activity Topics: Exploring the Four Orders of Nature – Exploring Co-existence in Existence

UNIT V: HARMONY ON PROFESSIONAL ETHICS : HOLISTIC UNDERSTANDING

9

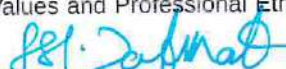
Natural Acceptance of Human Values – Definitiveness of (Ethical) Human Conduct – A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order – Competence in Professional Ethics – Holistic Technologies, Production Systems and Management Models: Typical Case Studies – Strategies for Transition towards Value-based Life and Profession. Self-Exploration Activity Topics: Exploring Natural Acceptance – Exploring Ethical Human Conduct – Exploring Humanistic Models in Education – Exploring Steps of Transition towards Universal Human Order

CONTACT PERIODS:

Lecture: 45 Periods	Tutorial: - Periods	Practical: - Periods	Project: - Periods	Total: 45 Periods
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TEXTBOOKS:

1. R R Gaur, R. Asthana, G P Bagaria, "A Foundation course in Human Values and Professional Ethics", 3rd Edition, Excel Books, New Delhi, 2024. ISBN 978-93-87034- 47-1
2. Prof. K. V. Subba Raju, "Success Secrets for Engineering Students", Smart Student Publications, 3rd Edition, 2013.
3. R R Gaur, R. Asthana, G P Bagaria, "Teachers Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCES:


Dr. S. NIRUNA JOE AMALI M.E., Ph.D
Professor & Head**Department of Computer Science and Engineering****KPR Institute of Engineering and Technology****Arasur, Coimbatore - 641 107**

1. Ivan Illich, "Energy & Equity", The Trinity Press, Worcester, and HarperCollins, USA, 1974.
2. E. F. Schumacher, "Small is Beautiful: a study of economics as if people mattered.", Blond & Briggs, Britain, 1973.
3. A Nagraj, "Jeevan Vidya ek Parichay", Divya Path Sansthan, Amarkantak, 1998.


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407
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SEMESTER I

U25RMCC02	தமிழர் மரபு / Heritage of Tamils (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

QP PATTERN: A

COURSE OBJECTIVES:

- Learn the extensive literature of classical Tamil
- Review the fine arts heritage of Tamil culture
- Realize the contribution of Tamils in Indian freedom struggle

COURSE OUTCOMES:

CO 1:	Understand the extensive literature of Tamil and its classical nature	Understand
CO 2:	Understand the heritage of sculpture, painting and musical instruments of ancient people	Understand
CO 3:	Review on folk and martial arts of Tamil people	Understand
CO 4:	Realization of Thina concepts, trade and victory of Chozha dynasty	Understand
CO 5:	Understand the contribution of Tamils in Indian freedom struggle, Self-esteem movement and siddha medicine	Understand

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 2	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 3	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 4	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 5	-	-	-	-	-	-	3	3	-	2	-	-	-

SYLLABUS:

UNIT I: LANGUAGE AND LITERATURE

3

Language Families in India - Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature – Management Principles in Thirukural – Tamil Epics and Impact of Buddhism & Jainism in Tamil Land – Bakthi Literature Azhwars and Nayanmars – Forms of minor Poetry – Development of Modern literature in Tamil – Contribution of Bharathiyar and Bharathidhasan

UNIT II: HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE

3

Hero stone to modern sculpture – Bronze icons – Tribes and their handicrafts – Art of temple car making – Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments – Mridhangam, Parai, Veenai, Yazh and Nadhaswaram – Role of Temples in Social and Economic Life of Tamils

UNIT III: FOLK AND MARTIAL ARTS

3

Tattooing, basket weaving, Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils

Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering

KPR Institute of Engineering and Technology

Arasur, Coimbatore - 641 407.

UNIT IV: THINAI CONCEPT OF TAMILS

3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram Concept of Tamils – Education and Literacy during Sangam Age – Ancient Cities and Ports of Sangam Age – Export and Import during Sangam Age – Overseas Conquest of Cholas

UNIT V: CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE

3

Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 15 Periods

TEXTBOOKS:

1. Jayanthi Ravikrishna K, Heritage of Tamils, Sri Krishna publications, First Edition, 2023
2. S. Priyadharshini, Heritage of Tamils, V. K. Publications

REFERENCES:

1. தமிழக வரலாறும் மக்களும் பண்பாடும் - கே. கே. பிள்ளை, உலகத் தமிழாராய்ச்சி நிறுவனம் (International Institute of Tamil Studies), C.P.T கேம்பஸ், சென்னை.
2. கணினித் தமிழ் - முனைவர். இல. சுந்தரம், விகடன் பிரசுரம், அண்ணொ சொல, .சன்னை, திசம்பர் 2016
3. கீழடி - 0வ0க நதிக்கரையில் சங்ககொல நகர நொகரிகம், .தொல்லியல் துறை .வளையீடு, தமிழ்நொடு அரசு, .சன்னை, ஆறொம் பதிப்பு 2020
4. Social Life of Tamils, Dr. K. K. Pillay, A joint publication of TNTB & ESC and RMRL (in print) University of Madras, Chennai, Second Edition 1975
5. The Contributions of the Tamils to Indian Culture, Dr.M.Valarmathi, International Institute of Tamil Studies, C.I.T Campus, Tharamani, Chennai, First Edition 1995


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

DR. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering

KPR Institute of Engineering and Technology

Arasur, Coimbatore - 641 407

SEMESTER I & II

U25RMCC03	Design Thinking (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MCC				
		L	T	P	J	C
		1	0	2	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- To Understand the basics of Design Thinking, its principles, processes, and tools used
- To empathize with stakeholders and frame problems using structured tools and techniques
- To generate ideas and present solutions effectively using design tools

COURSE OUTCOMES:

CO 1: Explain purpose and features of design thinking process	Understand
CO 2: Use required tools to empathize with the stockholders to identify the problem	Apply
CO 3: Comment the identified problem elaborately and clearly	Apply
CO 4: Develop a conceptual solution for a societal problem	Apply
CO 5: Present the identified solution to all the stakeholders	Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	1	1	-	1	1	2	-	-
CO 2	2	1	-	-	-	1	1	-	1	1	2	-	-
CO 3	2	1	1	-	-	1	1	3	1	1	2	-	-
CO 4	3	3	2	-	-	1	1	3	1	1	2	-	-
CO 5	3	2	-	-	-	1	1	3	3	1	2	-	-

SYLLABUS:

UNIT I: FUNDAMENTALS OF DESIGN THINKING

5 + 10

Introduction to Design Thinking: Definition, relevance, and applications – Design The Thinking – Personal Visualization, The Wheel of Life, and Balancing Priorities – Understanding and appreciating the concept of 'Design' – The 3 Laws of Design Thinking

UNIT II: THE EMPHATHIZE AND DEFINE STAGE

5 + 10

Understanding Stakeholders – Role of Empathy in Design Thinking – Tools: Persona, Journey Mapping, Stakeholder Mapping, CATWOE, Cartographic Perspective (LO), and Empathy Map – Case Study. Problem Framing and Reframing – Role of a Design Thinker – Tools: Five Whys, Anti-Pattern, Problem Paraphrasing, Introduction to LORD Skillset – Case Study

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT III: THE DIVERGENCE AND CONVERGENCE AND COMMUNICATION STAGE**5 + 10**

Ideation through Divergent and Convergent Thinking – Tools: Brainstorming, 10gm – 100gm–1000gm. Presenting Design Outcomes – Tools: 4Cs Framework – Case Study

LIST OF EXPERIMENTS

1. Design a solution for a societal problem that can be in line with sustainable development, thrust areas, industrial problems etc. under various themes like Health & Wellness: MedTech, Biotech, and HealthTech Agriculture & Rural: Agriculture, FoodTech, and Rural Development Green Energy: Renewable/Sustainable Energy and Clean and Green Technology Advanced Tech: Blockchain and Cyber Security, Robotics and Drones, and Space Technology Smart Infrastructure: Smart Automation, Smart Education, Smart Vehicles, Transportation and Logistics Daily Utility & Leisure: Fitness and Sports, Tourism, Disaster Management, Games, and Toys Sustainability & Smart Cities: waste-to-wealth, disaster management, or digital twin models for resource management

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Tim Brown, "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", 1st edition, New York, HarperCollins Publishers Ltd, New York, 2018
2. Idris Mootee, "Design Thinking for Strategic Innovation", 1st edition, John Wiley & Sons Inc, 2013

REFERENCES:

1. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009
2. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
3. Liedtka, Andrew King, Kevin Bennett, Book – "Solving Problems with Design Thinking – Ten Stories of What Works", Columbia Business School Publishing, 2013
4. Maurício Vianna, Ysmar Vianna, Isabel K. Adler, Brenda Lucena, Beatriz Russo, "Design thinking: Business Innovation", MJV Press, 2011
5. Burgelman, Christensen, and Wheelwright, "Strategic Management of Technology and Innovation", 5th Edition, McGraw Hill Publications, 2017


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER I

U25RMCC06	Professional Skill Development - I (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MCC				
		L	T	P	J	C
		15 Hours				1

COURSE OUTCOMES:

CO 1:	Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities	Apply
CO 2:	Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation	Apply
CO 3:	Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning	Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	1	3	1	-	-	2	2	-	1	3
CO 2	3	2	2	1	2	2	-	-	1	1	-	3	3
CO 3	3	2	2	1	-	2	2	3	3	3	2	-	2

GUIDELINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

CONTACT PERIODS:

Lecture: - Periods Tutorial: - Periods Practical: - Periods Project: - Periods Total: 0 Periods

Dr. S. MIRUNA JOE AMALI M.E., Ph.D.

Professor & Head

 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407

Dr. S. MIRUNA JOE AMALI M.E., Ph.D.

Professor & Head

 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

SEMESTER II

U25REN201	Professional Communication - II (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: HSMC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To strengthen advanced communication and interpersonal skills required for academic and professional success
- To integrate AI-enabled communication tools for content creation, presentations and professional documentation
- To prepare students for modern workplace communication in global and digital environments

COURSE OUTCOMES:

CO 1:	Apply advanced verbal, written and digital communication strategies in professional contexts	Apply
CO 2:	Analyze technical information and produce effective workplace documents	Analyze
CO 3:	Demonstrate negotiation, leadership and collaborative communication skills	Understand
CO 4:	Deliver impactful technical presentations and communicate innovative ideas effectively	Apply
CO 5:	Utilize AI-assisted communication tools ethically for professional growth and workplace productivity	Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 2	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 3	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 4	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 5	-	-	-	-	-	-	-	2	3	-	1	-	-

SYLLABUS:

UNIT I: TECHNICAL WRITING AND DOCUMENTATION

6 + 6

Technical Reports - Proposal Writing - Meeting Agenda and Minutes - Technical Instructions and Process Description - AI-assisted Technical Documentation - Technical Vocabulary

UNIT II: COGNITIVE PROFESSIONALISM

6 + 6

Critical Thinking Strategies - Problem-solving Communication - Case Study - Brainstorming Techniques - Collaborative Decision Making - One-word Substitutions

UNIT III: CAREER PLANNING

6 + 6

Self-Assessment Techniques - SWOT Analysis - Goal Setting - AI-assisted Documentation - Digital Content Writing - Collocations



Dr. S. MIRUNA JOE AMALI M.E., Ph.D.

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

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UNIT IV: CORPORATE COMMUNICATION AND NETWORKING**6 + 6**

Public Speaking - Welcome Address - Vote of Thanks - Anchoring and Event Hosting - Audience Engagement - Cloze tests - Discourse markers - linkers and cohesive devices

UNIT V: CRITICAL THINKING AND COLLABORATIVE PROBLEM SOLVING**6 + 6**

Problem-solving Techniques - Mind Mapping - Negotiation Skills - Book Review / Film Review - Podcast and Media Analysis - Critical Reading - Group Discussion

LIST OF EXPERIMENTS

1. Public Speaking
2. Group Discussion
3. Case Study
4. Blog Writing
5. Mind Mapping

CONTACT PERIODS:

Lecture: 30 Periods Tutorial: - Periods Practical: 30 Periods Project: - Periods Total: 60 Periods

TEXTBOOKS:

1. Ashraf Rizvi, Effective Technical Communication, 3rd Edition, McGraw Hill Education, 2023
2. Meenakshi Raman & Sangeeta Sharma, Technical Communication: Principles and Practice, 4th Edition, Oxford University Press, 2023
3. Sanjay Kumar & Pushp Lata, Communication Skills, 3rd Edition, Oxford University Press, New Delhi, 2018

REFERENCES:

1. Stephen E. Lucas, The Art of Public Speaking, 14th Edition, McGraw Hill Education, New York, 2023
2. Dale Carnegie, The Quick and Easy Way to Effective Speaking, Updated Edition, Simon & Schuster, New York, 2019
3. Matt Abrahams, Think Faster, Talk Smarter: How to Speak Successfully When You're Put on the Spot, Simon & Schuster, New York, 2024


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head
 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.



SEMESTER II

U25RMA201	Linear Algebra and Number Theory (Common to AD, AM, CB, CS, IT, SC)	Category: BSC				
		L	T	P	J	C
		3	0	2	0	4

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce the foundational concepts of linear algebra and number theory pertinent to algorithmic applications
- To develop the ability to model and solve computational problems using mathematical structures
- To impart in-depth theoretical concepts in practical scenarios through computational tools

COURSE OUTCOMES:

- CO 1:** Apply Gaussian elimination, Gauss–Jordan elimination, and LU decomposition methods to solve the systems of linear equations Apply
- CO 2:** Apply the concepts of vector spaces, subspaces, basis, and dimension in computational contexts Apply
- CO 3:** Determine eigenvalues, eigenvectors, and diagonalization of matrices for engineering applications Apply
- CO 4:** Apply number theoretic concepts such as divisibility, congruence, and modular arithmetic in computational problems Apply
- CO 5:** Implement cryptographic algorithms using modular arithmetic and RSA principles Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	-	-	2	-	-	-	1	-	1	2	-
CO 2	3	2	-	-	2	-	-	-	1	-	1	2	-
CO 3	3	2	-	-	2	-	-	-	1	-	1	3	1
CO 4	3	2	-	-	2	-	-	-	1	-	1	3	1
CO 5	3	2	-	-	2	-	-	-	1	-	1	3	-

SYLLABUS:

UNIT I: SYSTEMS OF LINEAR EQUATIONS

9 + 6

Systems of linear equations – Gaussian elimination – Gauss – Jordan elimination method – LU decomposition method – Consistency of linear systems and rank of a matrix

UNIT II: VECTOR SPACES

9 + 6

Definition and examples of vector spaces – subspaces – Linear independence – Basis and dimension of vector spaces – Linear transformations and matrix representation

UNIT III: EIGENVALUES AND EIGENVECTORS

9 + 6

Eigenvalues and eigenvectors – Characteristic equation– Diagonalization of matrices – Cayley–Hamilton theorem – Applications of eigenvalues and eigenvectors

S. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D.

Professor & Head

Department of Computer Science and Engin
KPR Institute of Engineering and Technol
Arasur, Coimbatore - 641 407.

UNIT IV: ELEMENTARY NUMBER THEORY**9 + 6**

Divisibility and prime numbers – Greatest common divisors – Euclidean algorithm and its applications – Congruence and modular arithmetic – Euler's Totient Function – Chinese Remainder theorem – Fermat's Little theorem

UNIT V: NUMBER THEORY IN CRYPTOGRAPHY**9 + 6**

Modular exponentiation – Modular inverse computations – Introduction to cryptography – RSA algorithm basics – Diffie-Hellman Key Exchange and Digital Signatures – Applications in secure communication

LIST OF EXPERIMENTS

1. Systems of Linear Equations – Solve systems of linear equations using Gauss–Jordan method – Implement LU decomposition method
2. Vector Space Computations – Determine linear independence and basis of vectors – Compute dimension and rank of matrices
3. Eigenvalues and Diagonalization (6) – Compute eigenvalues and eigenvectors of matrices – Perform matrix diagonalization
4. Number Theory Computations – Implement Euclidean algorithm for finding GCD – Solve congruence problems using the Chinese Remainder theorem
5. Cryptographic Applications – Implement modular exponentiation and modular inverse computations – Simulate RSA encryption and decryption

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 75 Periods

TEXTBOOKS:

1. Howard Anton, Chris Rorres, Anton Haul "Elementary Linear Algebra", Wiley India, New Delhi, 2019
2. Kenneth H. Rosen, Elementary Number Theory and Its Applications, 6th Edition, Pearson Education, 2011

REFERENCES:

1. David C. Lay, "Linear Algebra and Its Applications", 5th Edition, Pearson Education, 2015
2. Gilbert Strang, "Introduction to Linear Algebra", 6th Edition, Wellesley-Cambridge Press, 2023
3. Jeffrey Hoffstein, Jill Pipher and Joseph H. Silverman, "An Introduction to Mathematical Cryptography", Springer, 2014
4. David M. Burton, "Elementary Number Theory", 7th Edition, McGraw Hill, 2010


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

SEMESTER I & II

U25RPH01	Engineering Physics (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamental mechanical and thermal properties of solids and fluids for real-world engineering applications
- To explore advanced concepts in ultrasonic waves and their applications in imaging, testing, and sensing technologies
- To gain insights into semiconductor physics and photonics for their role in modern electronic and optical systems

COURSE OUTCOMES:

- CO 1:** Apply the stress-strain behavior concepts in engineering materials and structures Apply
- CO 2:** Apply principles of heat transfer and fluid mechanics to evaluate thermal systems and engineering applications Apply
- CO 3:** Demonstrate the operation of ultrasonic wave generation and detection techniques for industrial and biomedical applications Apply
- CO 4:** Analyze the electrical properties and carrier transport mechanisms in semiconductors and semiconductor devices Apply
- CO 5:** Demonstrate the principles of lasers and optical fibers in communication, sensing, and biomedical applications Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	-	1	-	-	1	1	-	-	-	-
CO 2	3	2	1	-	1	-	-	1	1	-	-	-	-
CO 3	3	2	1	-	1	-	-	1	1	-	-	1	-
CO 4	3	2	1	-	1	-	-	1	1	-	-	1	-
CO 5	3	2	1	-	1	-	-	1	1	-	-	1	-

SYLLABUS:

UNIT I: MECHANICAL PROPERTIES OF SOLIDS

6 + 6

Modulus of Elasticity – Stress-strain diagram – Poisson's ratio – Elastic and plastic deformation – Stress-strain behaviour in metals, polymers and ceramics – Bending Moment – Cantilever – Applications (GIRDERS, MEMS)

UNIT II: FUNDAMENTALS OF HEAT TRANSFER AND FLUIDS

6 + 6

Heat transfer – Thermal expansion – Heat conductivity – Lee's Disc method – Surface tension – Viscosity – Coefficient of viscosity using Poiseuille's flow experiment – Solar water heater – Microwave oven – Heat exchangers – Radiators – Cooling towers

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D.

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT III: ULTRASONICS AND ITS APPLICATIONS**6 + 6**

Properties of Ultrasonic waves – Production of ultrasonic waves – Piezoelectric Oscillator – Magnetostriction Oscillator – Velocity measurement of Ultrasonic waves – SONAR – Non-Destructive Testing – Ultrasound imaging – Ultrasonic scanning methods

UNIT IV: SEMICONDUCTOR PHYSICS**6 + 6**

Properties – Direct and Indirect bandgap-semiconductor – Intrinsic and extrinsic Semiconductors – Carrier concentration in n-type semiconductor – P-type semiconductor – Carrier Transport in Semiconductor – Hall effect – Ohmic contacts – Schottky diode

UNIT V: PHOTONICS**6 + 6**

Interaction of Radiation with Matter – Laser Characteristics – Population Inversion – CO₂ laser – Semiconductor Diode Laser – Laser applications – Total Internal Reflection – Structure and working principle of Optical fibre – Fiber optic Endoscopy – Fiber optic sensors

LIST OF EXPERIMENTS

1. Determine the moduli of elasticity of the given beams and evaluate them for different structural applications. (High/Medium/Low modulus)
2. Evaluate the shear moduli of the different materials and rank them for suitable applications with reference to their strength
3. Select the most effective thermal insulation material from mica, cardboard, and glass for optimal heat protection
4. Determine the Viscosity of Liquids Using Poiseuille's Method and Identify the Fastest-Flowing Liquid
5. Measure the speed of ultrasound in liquids and calculate their compressibility for different hydraulic purposes
6. Categorize the specified semiconducting materials according to their energy bandgap values
7. Determine a semiconducting material's Hall coefficient and identify its type
8. Determination of wavelength of given laser and the particle size of the given samples using diffraction method
9. Use an optical fiber to measure its light-gathering capacity and calculate the propagation angle
10. Calculate the surface tension of different liquids and examine how surfactants affect it
11. Determination of wavelength of various spectral lines by using spectrometer and grating
12. Determination of velocity of light passing through glass medium using spectrometer

CONTACT PERIODS:

Lecture: 30 Periods Tutorial: - Periods Practical: 30 Periods Project: - Periods Total: 60 Periods

TEXTBOOKS:

1. M.N. Avadhanulu, P.G. Kshirsagar, and T.V.S. Arun Murthy, "A Textbook of Engineering Physics", 11th edition, S. Chand Publishing, New Delhi, 2022
2. R.K. Gaur and S.L. Gupta, "Engineering Physics", 8th edition, Dhanpat Rai Publications, New Delhi, 2017

REFERENCES:

1. Harald Ibach and Hans Luth, "Solid State Physics: An Introduction", 4th edition, Springer Publications, 2020
2. Charles Kittel, revised by David Pines (Editor) "Introduction to Solid State Physics", 9th edition, Wiley & Sons, US, 2020
3. H.K. Malik and A.K. Singh "Engineering Physics" Publisher: McGraw Hill Education India, 2020
4. https://onlinecourses.nptel.ac.in/noc20_cy17/preview

Dr. S. Miruna Joe Amali M.E., Ph.D.
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER II

U25RCSG04	Python Programming (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: ESC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce the fundamental concepts of Python programming, including syntax, data types, operators, and input/output operations
- To develop problem-solving skills through the use of control structures, functions, recursion, and modular programming techniques
- To provide proficiency in Python collections, file handling, exception handling, and program organization using modules and packages
- To familiarize students with basic object-oriented programming concepts and the use of Python libraries for data analysis applications

COURSE OUTCOMES:

- CO 1:** Explain Python programming fundamentals, including data types, operators, input/output operations, and debugging techniques **Understand**
- CO 2:** Develop Python programs using decision-making statements, iterative constructs, functions, recursion, and variable scope concepts **Apply**
- CO 3:** Implement string processing and Python collections such as lists, tuples, sets, and dictionaries to solve computational problems **Apply**
- CO 4:** Develop modular Python programs using file handling, exception handling, modules, and packages **Apply**
- CO 5:** Develop simple object-oriented programs and apply NumPy and Pandas libraries for basic data analysis applications **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	2	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	2	1	1	-	-	-	-	-	-	2	1	-
CO 3	3	2	1	1	-	-	-	-	-	-	2	2	-
CO 4	3	2	1	1	-	-	-	-	-	-	2	2	-
CO 5	3	2	1	1	-	-	-	-	-	-	2	2	2

SYLLABUS:

UNIT I: PYTHON FUNDAMENTALS

Introduction to Python – Features and Applications of Python – Installing Python – Python Interpreter – Script and Interactive Modes – Identifiers and Keywords – Variables – Data Types – Type Conversion – Operators and Expressions – Input and Output Operations – Comments and Documentation – Error Types – Testing and Debugging Basics

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT II: CONTROL STRUCTURES AND FUNCTIONS

9

Conditional Statements – Nested Conditional Statements – Iterative Statements: while Loop and for Loop – Loop Control Statements – Functions – Function Definition and Invocation – Function Arguments and Return Values – Scope of Variables – Recursive Functions – Applications of Functions in Problem Solving

UNIT III: STRINGS AND PYTHON COLLECTIONS

9

Strings and String Operations – Lists and List Operations – List Comprehensions – Tuples and Tuple Operations – Sets and Set Operations – Dictionaries and Dictionary Operations – Packing and Unpacking

UNIT IV: FILE HANDLING, MODULES AND EXCEPTION HANDLING

9

Modules and Packages – Importing Modules – Built-in Functions – File Handling – Opening and Closing Files – Reading and Writing Files – File Methods – Exception Handling – try, except, else and finally Blocks – User Defined Exceptions

UNIT V: OBJECT-ORIENTED PROGRAMMING AND DATA ANALYSIS

9

Classes and Objects – Creating Classes and Objects – Constructors – Instance Variables and Methods – Introduction to NumPy – Creating Arrays – Array Operations – Indexing and Slicing – Introduction to Pandas – Series and DataFrames – Reading and Displaying Data – Simple Data Analysis Applications.

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Reema Thareja, "Python programming: Using problem solving approach", 1st Edition, Oxford Press, 2017
2. William McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, 2nd Edition, Shroff/O'Reilly Publication, 2017

REFERENCES:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
2. Ashok Namdev Kamthane and Amit Ashok Kamthane, "Programming and Problem Solving with Python", 2nd Edition, McGrawHill Education, 2018
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", 1st Edition, Pearson India Education Services Pvt. Ltd., 2016


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER II

U25RECG03	Digital Electronics (Common to CB, CS, IT, SC)	Category: ESC				
		L	T	P	J	C
		3	0	2	0	4

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamentals of digital logic circuits
- To design the combinational logic circuits
- To design the synchronous and asynchronous sequential circuits

COURSE OUTCOMES:

- CO 1:** Apply various reduction methods to simplify logic expressions
- CO 2:** Implement the combinational logic circuits using logic gates
- CO 3:** Examine the performances of latches and flip-flops
- CO 4:** Construct sequential logic circuits using flip-flops
- CO 5:** Design a counters using shift register and realize hazard free logic circuits

Apply

Apply

Analyze

Apply

Analyze

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	-	-	-	-	2	2	1	3	1
CO 2	3	2	1	1	-	-	-	-	2	2	1	3	2
CO 3	3	3	2	2	-	-	-	-	2	2	1	2	1
CO 4	3	3	1	1	-	-	-	-	2	2	1	3	2
CO 5	3	2	2	2	-	-	-	-	2	2	1	3	2

SYLLABUS:

UNIT I: BOOLEAN THEOREMS AND LOGIC REDUCTION

9 + 6

Number system – Complements – Boolean theorems – Codes – Logic gates – NAND and NOR gates – Representation of boolean expression – SOP, POS, canonical form – Simplification of logic functions using K-map, Quine McCluskey method

UNIT II: COMBINATIONAL LOGIC DESIGN

9 + 6

Adder-1 Bit adder/subtractor, parallel adder, 2's complement adder/subtractor – Implementation of combinational circuits – Multiplexers, decoders, encoders, demultiplexers – Code converters – Error detection and correction codes – Parity generator and checker

UNIT III: LATCHES AND FLIPFLOPS

9 + 6

Latches – NOR, NAND – Digital pulses – Clocked flip-flops – Master/Slave flip-flop – Asynchronous inputs – Flip-flop timing considerations – Conversion of flip-flop

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT IV: SEQUENTIAL CIRCUITS**9 + 6**

General model of sequential circuits – Mealy/Moore models, excitation table, state table, state diagram – Design of synchronous sequential circuits – Synchronous up/down counters, modulus counters – Asynchronous counter – Sequence detector

UNIT V: REGISTERS AND HAZARDS**9 + 6**

Shift registers – Universal shift register, Ring counter, Johnson counter – Hazards and Essential Hazards in logic circuits – Design of Hazard free circuits

LIST OF EXPERIMENTS

1. Characteristics of digital IC's
2. Implementation of combinational logic design using MUX IC's
3. Design and implementation of various data path elements (Adder/Subtractor)
4. Characteristics of flip-flop
5. Design and implementation of synchronous sequential circuit (Counters/ Shift registers)
6. Design and implementation of asynchronous mod counters
7. Design of real time clock using BCD-to-7 segment decoder

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 75 Periods

TEXTBOOKS:

1. M.Morris Mano, Michael D Ciletti, "Digital Design", 6th edition, Pearson, 2018
2. Charles H. Roth, Jr, Larry L. Kinney, " Fundamentals of logic design", 7th edition, Kluwer Academic Publishers, 2014

REFERENCES:

1. Thomas L.Floyd, "Digital Fundamentals", 11th edition, Prentice Hall, 2015
2. A.Anand Kumar, "Fundamentals of Digital Circuits", 2nd edition, PHI Learning, 2013
3. Ronald J Tocci, Neal S Widmer, Gregory L Moss, "Digital Systems Principles and Applications", 10th edition, Pearson, 2009
4. D. Donald Givone, "Digital Principles and Design", 4th edition, Tata McGraw Hill, 2008

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER II

U25RCSG05	Linux and Shell Scripting (Common to AD, AM, CB, CS, IT, SC)	Category: PCC				
		L	T	P	J	C
		1	0	2	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce Linux operating system and command-line interface
- To familiarize students with basic file handling and shell commands
- To enable students to write and execute shell scripts for automation

COURSE OUTCOMES:

- CO 1:** Understand and execute basic Linux commands
- CO 2:** Manage files, directories, and permissions in Linux
- CO 3:** Write and debug shell scripts to automate system tasks

Understand

Apply

Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	-	-	3	-	-	-	1	-	-	-	-
CO 2	3	3	2	-	3	-	-	-	2	-	-	1	-
CO 3	3	3	2	-	3	-	-	-	2	-	-	1	-

SYLLABUS:

UNIT I: INTRODUCTION TO LINUX ENVIRONMENT AND FILE MANAGEMENT

5 + 10

Introduction to Linux environment – Linux login process, terminal usage, Linux file system structure – Basic Linux commands such as ls, pwd, cd, clear, whoami, date and cal – File and directory handling concepts including creation, deletion and management of files – Directories using commands like mkdir, rmdir, touch, cat, cp, mv, rm, head, tail, more and less – File permissions and ownership concepts including read, write and execute permissions, chmod, chown, umask commands, symbolic and numeric modes of permission management

UNIT II: LINUX UTILITIES AND SYSTEM ADMINISTRATION COMMANDS

5 + 10

File searching – Filtering utilities in Linux including find, locate, grep, sort, uniq, cut, wc, diff and cmp commands – Process management and system monitoring concepts using ps, top, kill, nice, df, du, uptime, free, uname and who commands – Archiving and compression utilities including creation, extraction and management of archive files using tar, gzip, gunzip, zip, unzip and xz commands

UNIT III: SHELL SCRIPTING AND AUTOMATION

5 + 10

Introduction to shell scripting, writing and executing simple shell scripts, use of comments, variables, read and echo commands, arithmetic operations using expr and let – Decision-making statements in shell scripting including if, if-else, if-elif-else, test conditions, integer, string and file comparisons – Looping constructs such as for, while and until loops with break and continue statements – Advanced shell scripting concepts including user-defined functions, function declaration, calling, passing arguments, scope of variables, command line arguments using \$1, \$2, \$@ and \$# and automation of tasks such as backup and log monitoring

Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineer

KPR Institute of Engineering and Technolog

Arasur, Coimbatore - 641 407

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LIST OF EXPERIMENTS

1. Basic Linux Commands & File Management Introduction to Linux Environment - Login process, terminal, file system structure, basic commands: ls, pwd, cd, clear, whoami, date, cal
2. File and Directory Handling Commands: mkdir, rmdir, touch, cat, cp, mv, rm, head, tail, more, less
3. File Permissions and Ownership : Use of chmod, chown, umask, symbolic and numeric modes of permissions
4. Working with Linux Utilities File Searching and Filtering Use of find, locate, grep, sort, uniq, cut, wc, diff, cmp
5. Process Management and System Monitoring Commands: ps, top, kill, nice, df, du, uptime, free, uname, who
6. Archiving and Compression Utilities: Using tar, gzip, gunzip, zip, unzip, xz
7. Shell Scripting Basics Writing Simple Shell Scripts : Hello world, script execution, comments, variables, read, echo, expr, let
8. Conditional Statements in Shell Use of if, if-else, if-elif-else, test conditions, integer/string/file comparisons
9. Looping Constructs in Shell : for, while, until loops; loop control commands: break, continue
10. Advanced Shell Scripting: User-defined Functions in Shell Scripts: Declaring, calling functions, passing arguments, scope of variables
11. Command Line Arguments and Script Automation : Use of \$1, \$2, \$@, \$#, automating tasks like backup, log monitoring

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Richard Blum and Christine Bresnahan. "Linux Command Line and Shell Scripting Bible", 4th Edition, Wiley, 2020
2. Richard Blum and Christine Bresnahan. "Linux Command Line and Shell Scripting Bible", 4th Edition, Wiley, 2020

REFERENCES:

1. B.M. Harwani. "Unix and Shell Programming", 1st Edition, Oxford University Press, 2013
2. Michael Kerrisk. "The Linux Programming Interface", 1st Edition, No Starch Press, 2010

S.P. Subramanian
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering,
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER I & II

U25RGE01	Makerspace (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: ESC				
		L	T	P	J	C
		0	0	4	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- Apply fundamental fabrication, electrical, electronics, programming, and digital manufacturing techniques for engineering applications
- Develop practical skills in prototyping, automation, robotics, and emerging technologies through experiential learning activities
- Design and construct interdisciplinary engineering prototypes by integrating concepts from multiple engineering domains

COURSE OUTCOMES:

CO 1:	Fabricate simple components using basic mechanical engineering tools and additive manufacturing	Apply
CO 2:	Carry out electrical wiring installations applying safety measures in domestic applications	Apply
CO 3:	Interface electronic devices to develop functional engineering solutions	Apply
CO 4:	Illustrate the role of automation and artificial intelligence in engineering applications	Apply
CO 5:	Develop interdisciplinary engineering prototype addressing specific problems through teamwork and innovation	Create

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	-	-	3	-	-	3	2	-	2	-	-
CO 2	3	2	-	-	3	-	-	3	2	-	2	-	-
CO 3	3	2	-	-	3	-	-	3	2	-	2	-	-
CO 4	2	-	-	-	3	-	-	-	-	-	2	-	-
CO 5	3	3	2	1	3	2	2	3	3	2	2	-	-

LIST OF EXPERIMENTS

MODULE 1: FABRICATION AND MAKING SKILLS (10 Hours)

1. Welding procedure, selection & safety Measures - Hands-on session for preparing base material and joining of steel materials using arc welding
2. Study on basic pipe connections with different joining components.
3. Demo on laser cutting of acrylic boards and wire arc welding

MODULE 2: DIGITAL DESIGN AND RAPID PROTOTYPING (10 Hours)

4. 3D Modelling of simple components using software's
5. Fabrication of simple components / parts using 3D printers
6. Demonstration of assembly modelling of components

MODULE 3: AUTOMATION AND ROBOTICS (8 Hours)


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

7. Demonstration on mechatronics components/systems
8. Demonstration on basic robotics system
9. Demonstration on automobiles, performance measures
10. Demonstration on programmable logic control circuit

MODULE 4: ELECTRICAL PRACTICES (10 Hours)

11. Study on basic electrical installation tools, equipment and safety measures
12. Basic electrical wiring and connections such as soldering, fuses, earthing, miniature circuit breakers and switch wiring
13. Hands-on session of electrical connections for lightings, fans, calling bells etc
14. Hands-on session of electrical connections for motors and uninterruptible power supply

MODULE 5: ELECTRONICS AND EMBEDDED SYSTEMS (8 Hours)

15. Electronic components, equipment and safety measures
16. Interfacing of sensors and actuator with microcontrollers (Arduino)
17. Integration of electronic circuits with IoT system
18. Interfacing of components with printed circuit board

MODULE 6: ARTIFICIAL INTELLIGENCE (4 Hours)

19. Demonstration on artificial intelligence technologies
20. Demonstration on AR/VR technologies

MODULE 7: INTERDISCIPLINARY PROTOTYPE CHALLENGE (10 Hours)

21. Students work in teams to develop and demonstrate an interdisciplinary product/prototype for the problem identified

CONTACT PERIODS:

Lecture: - Periods Tutorial: - Periods Practical: 60 Periods Project: - Periods Total: 60 Periods

TEXTBOOKS:

1. Mikell P. Groover, "Fundamentals of Modern Manufacturing: Materials, Processes and Systems", 7th Edition, Wiley, 2020
2. Simon Monk, "Programming Arduino: Getting Started with Sketches", 3rd Edition, McGraw-Hill Education, 2022
3. Richard H. Barnett, "Introduction to Mechatronics and Measurement Systems", 6th Edition, McGraw-Hill Education, 2023
4. Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", Apress, 2016

REFERENCES:

1. Arduino Documentation – <https://www.arduino.cc>
2. Tinkercad Learning Portal – <https://www.tinkercad.com>
3. FreeCAD Documentation – <https://www.freecad.org>
4. Ultimaker Cura Resources – <https://ultimaker.com/software/ultimaker-cura>
5. ESP32 Documentation – <https://docs.espressif.com>

Dr. S. MIRUNA JOE AMALI M.E., Ph.D.

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.


Dr. S. MIRUNA JOE AMALI M.E., Ph.D.

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER II

U25RCSG06	Python Programming Laboratory (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: ESC				
		L	T	P	J	C
		0	0	2	0	1

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamental concepts of Python programming and problem-solving using Python language constructs
- To apply control structures, functions, strings, and Python collections for developing efficient applications
- To develop modular applications using file handling, exception handling, modules, and packages.
- To implement basic object-oriented programming concepts and utilize Python libraries for data analysis applications

COURSE OUTCOMES:

- CO 1:** Implement Python programs using basic language constructs, data types, operators, and input/output operations Apply
- CO 2:** Develop Python programs using decision-making statements, looping constructs, functions, and recursion Apply
- CO 3:** Implement applications using strings, lists, tuples, sets, and dictionaries for data processing and problem solving Apply
- CO 4:** Develop modular applications using file handling, exception handling, modules, and packages Apply
- CO 5:** Design applications using basic object-oriented programming concepts and Python libraries such as NumPy and Pandas Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	-	-	-	-	-	-	-	2	-
CO 2	3	2	1	1	-	-	-	-	-	-	-	3	-
CO 3	3	2	1	1	-	-	-	-	-	-	1	3	-
CO 4	3	2	1	1	-	-	-	-	-	-	1	3	1
CO 5	3	2	1	1	-	-	-	-	-	-	1	3	1

LIST OF EXPERIMENTS

1. Development of Python programs demonstrating variables, data types, operators, and input/output operations
2. Implementation of applications using conditional statements and nested conditional constructs
3. Development of iterative applications using for loops, while loops, and loop control statements
4. Design and implementation of console-based applications for mathematical and logical problem solving
5. Development of applications using user-defined functions and recursive functions
6. Implementation of string processing applications using Python string operations and methods
7. Development of applications using lists, tuples, sets, and dictionaries
8. Implementation of applications using list comprehensions and collection-based problem solving
9. Development of modular applications using built-in and user-defined modules
10. Implementation of file handling applications for reading, writing, and appending data

S.S. Sabharwal
Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology

Arasur, Coimbatore - 641 407

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11. Development of robust applications using exception handling and user-defined exceptions
12. Design and implementation of applications using classes, objects, constructors, and instance methods
13. Development of applications demonstrating inheritance and method overriding
14. Implementation of numerical computing applications using NumPy arrays and array operations
15. Development of simple data analysis applications using Pandas Series and DataFrames

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 30 Periods

REFERENCES:

1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd Edition, O'Reilly Media, 2016
2. Ashok Namdev Kamthane and Amit Ashok Kamthane, Programming and Problem Solving with Python, 2nd Edition, McGraw Hill Education, 2018

SEMESTER I & II

U25RMCC04	Environmental Governance and Sustainability (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MCC				
		L	T	P	J	C
		2	0	0	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- To provide basic concepts of ecosystem, biodiversity, atmospheric and hydrological processes
- To inculcate knowledge on the lithosphere, waste management practices, environmental laws and disaster management strategies
- To apply the principles of sustainable living and green technologies in alignment with the UN Sustainable Development Goals

COURSE OUTCOMES:

- CO 1:** Explain the role of biodiversity conservation and wildlife protection in addressing environmental issues Understand
- CO 2:** Apply pollution control methods, environmental laws, and water management practices for environmental protection Apply
- CO 3:** Implement sustainable waste management practices for efficient resource utilization Apply
- CO 4:** Explain the role of disaster management, governance, and IT tools in environmental and health sustainability Understand
- CO 5:** Employ sustainable practices and national environmental initiatives for sustainable development Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	3	2	-	1	-	1	-	-
CO 2	2	1	-	-	-	3	2	-	1	-	1	-	-
CO 3	2	1	-	-	-	3	2	-	1	-	1	-	-
CO 4	2	1	-	-	-	3	2	-	1	-	1	-	-
CO 5	3	1	-	-	-	3	2	-	1	-	1	-	-

SYLLABUS:

UNIT I: ENVIRONMENT AND BIODIVERSITY

6

Scope of Environmental Science – Ecology – Ecosystem – Classification, structure, productivity – Energy flow and nutrient cycles – Nitrogen cycle – Ecological succession – Biodiversity – Types and values of biodiversity – Biodiversity at Global, National and Local Levels – Bio-geographical Classification of India – India as a Mega-diversity Nation – Red Data Book – Hotspots of Indian Biodiversity – Endangered and endemic species – Conservation of biodiversity

Self - Learning & Case Studies – Species conservation projects in India – Species Reintroduction – National Biodiversity Action Plan 2015 – Role of International Union for Conservation of Nature (IUCN)

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT II: ATMOSPHERE AND HYDROSPEHERE

6

Atmosphere – Structure and composition – Earth's Albedo – Carbon cycle and oxygen cycle – Air Quality Standards – Air Pollution – Sources, effects and control measures – Indian Environmental Laws – Air Act 1981. Hydrosphere – Hydrosphere – Hydrological Cycle, Water Quality Parameters, Water Pollution – Sources, effects, and control measures - Water conservation – Rainwater harvesting, Dams, and watershed Management – Wastewater treatment, Ocean acidification, Blue economy, Water Act, 1974 and Environment Protection Act, 1986

Self - Learning & Case Studies – Clean Development Mechanism (CDM) – Greenhouse Gas Protocol – ISO 14064 – Jal Shakti Abhiyan – Implementation of CNG in NCT of Delhi – Taj Trapezium Case – Narmada River – Sardar Sarovar Project

UNIT III: LITHOSPHERE AND SOLID WASTE MANAGEMENT

6

Lithosphere – Structure of the lithosphere – Continental drift – Forest resources – Deforestation – Causes and effects – Agriculture – Effects of modern agriculture – Soil Pollution – Causes, effects and control measures. Solid Waste Management – Solid Waste – Sources, classification, and effects , Waste reduction strategies – Circular Economy and 5R Principles, Solid waste treatment, Disposal techniques, Refuse-Derived Fuel and Waste-to-Energy technologies, Biomedical, E-Waste and Hazardous waste management, Resource recovery – Environmental Standards and Waste Management Regulations (ISO 14001 and Waste Rules)

Self - Learning & Case Studies – Solid Waste Management rules, 2024 – Plastic Waste Management Rules (PWMR) – Degradation of Soil in Rajasthan – Indore's Waste Management System

UNIT IV: GLOBAL ISSUES, HUMAN WELFARE AND ROLE OF TECHNOLOGY

6

EIA- Concepts, stages – Land clearing projects – Environmental and social Impacts, Resettlement and Rehabilitation – Concepts and challenges – Disaster management – Floods, Landslides, Disaster management cycle and mitigation – Environmental Governance, Global Governance and Fundamental Human Rights – Importance. Human Population – Population growth, explosion and its challenges – Trends and variation among nations – Role of IT – Remote sensing, GIS and Google earth engine – Disease tracking and prediction using big data and AI (e.g., COVID-19 apps)

Self - Learning & Case Studies – Mission Amrit Sarovar – Beti Bachao Beti Padhao mission – Kerala Flood (2018) – Sterlite Copper Plant Case – Thoothukudi

UNIT V: SUSTAINABLE DEVELOPMENT AND GREEN PRACTICES

6

Sustainable Development – Concept, significance of sustainability – UN Sustainable Development Goals (UN SDGs) – Sustainability assessment – Carbon footprint, accounting, Carbon Neutrality – Net Zero Emissions – Carrying Capacity of the Earth – Carbon Sequestration and Carbon Capture – Blue Carbon and Green Carbon. Green Practices – Sustainable Agriculture – Green Energy – Biofuels, Green Hydrogen, Solar, wind and biomass Energy – Sustainable Transport – Electric Vehicles (EVs)

Self - Learning & Case Studies – National Solar Mission, Green India Mission – Ambikapur, Chhattisgarh – Zero Waste Model – Delhi Metro – Energy Efficiency and Sustainable Transport

CONTACT PERIODS:

Lecture: 30 Periods Tutorial: 30 Periods

Practical: - Periods

Project: - Periods Total: 30 Periods

Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering

in Institute of Engineering and Technology

Arasur, Coimbatore - 641 407.

TEXTBOOKS:

1. E. Bharucha, "Environmental Studies for Undergraduate Courses", 2nd edition, Hyderabad, University Press (India) Pvt. Ltd, 2005
2. R. Rajagopalan, "Environmental Studies: From Crisis to Cure", 3rd edition, New Delhi, Oxford University Press, 2016
3. R. R. Hiremath, "Sustainable Development", 1st edition, New Delhi, Himalaya Publishing House, 2008

REFERENCES:

1. Anubha Kaushik and C.P. Kaushik, "Environmental Studies" 6th edition, New Age International Publishers, New Delhi, 2018
2. Benny Joseph, "Environmental Studies", 3rd edition, New Delhi, McGraw Hill Education, 2017
3. M. Anji Reddy, "Textbook of Environmental Science and Technology", 3rd edition, BS Publications, 2019
4. R. B. Singh, "Disaster Management", 1st edition, New Delhi, Rawat Publications, 2006
5. V. Desai, "Environment and Sustainable Development" 1st edition, Mumbai, Himalaya Publishing House, 2009

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER II

U25RMCC05	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

QP PATTERN: A

COURSE OBJECTIVES:

- To learn weaving, ceramic and construction technology of Tamils
- To understand the agriculture, irrigation and manufacturing technology of Tamils
- To realize the development of scientific Tamil and Tamil computing

COURSE OUTCOMES:

CO 1:	Understand the weaving and ceramic technology of ancient Tamil people nature	Understand
CO 2:	Understand the construction technology, building materials in Sangam period and case studies	Understand
CO 3:	Infer the metal process, coin and beads manufacturing with relevant archeological evidence	Understand
CO 4:	Realize the agriculture methods, irrigation technology and pearl diving	Understand
CO 5:	Apply the knowledge of scientific Tamil and Tamil computing	Understand

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 2	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 3	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 4	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 5	-	-	-	-	-	-	3	3	-	2	-	-	-

SYLLABUS:

UNIT I: WEAVING AND CERAMIC TECHNOLOGY

3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries

UNIT II: DESIGN AND CONSTRUCTION TECHNOLOGY

3

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple) – Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo-Saracenic architecture at Madras during British Period

UNIT III: MANUFACTURING TECHNOLOGY

3

Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel, Copper and gold – Coins as source of history – Minting of Coins – Bead-making industries – Stone beads – Glass beads – Terracotta beads – Shell beads/ bone beads – Archeological evidences – Gem stone types described in Silappathikaram

S. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D.
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT IV: AGRICULTURE AND IRRIGATION TECHNOLOGY

3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society

UNIT V: SCIENTIFIC TAMIL & TAMIL COMPUTING

3

Development of Scientific Tamil – The role of journals in the development of scientific Tamil – Scientific Tamil vocabulary – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 15 Periods

TEXTBOOKS:

1. Tamils and Technology, K. Jayanthi Ravikrishna, Sri Krishna publications, Mahalakshmi Nagar, Velappanchavadi, First Edition 2023
2. Tamils and Technology, S. Priyadharshini, V. K. Publications

REFERENCES:

1. The Contributions of the Tamils to Indian Culture, Dr. M. Valarmathi, International Institute of Tamil Studies, C.I.T Campus, Tharamani, Chennai, First Edition 1995
2. Studies in the History of India with Special Reference to Tamil Nadu, Dr. K. K. Pillay, 1979

DR. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407


DR. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER II

U25RMCC07	Professional Skill Development - II (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MCC				
		L	T	P	J	C
		15 Hours				1

COURSE OUTCOMES:

- CO 1:** Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities Apply
- CO 2:** Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation Apply
- CO 3:** Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	-	3	1	-	-	2	2	-	1	3
CO 2	2	3	3	3	2	2	-	-	1	1	-	3	3
CO 3	-	-	3	-	-	2	2	3	3	3	2	-	2

GUIDLINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

CONTACT PERIODS:

Lecture: - Periods Tutorial: - Periods Practical: - Periods Project: - Periods Total: 0 Periods


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

SEMESTER III

U25MA301	Probability and Statistical Modeling for Computing Systems (Common to AD, AM, CB, CS, IT, SC)	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

PRE-REQUISITES:

- U25MA101 - Calculus and Differential Equations / U25RMA101 - Multivariable Calculus and Applications

COURSE OBJECTIVES:

- To provide in-depth statistical and probability theory knowledge
- To facilitate with students, use their understanding of statistical methods for data analysis and inference in their areas of study
- To provide the knowledge of time series component analysis in their area of study

COURSE OUTCOMES:

- CO 1:** Explain the probability concepts, and apply Bayes' rule to solve probabilistic problems and analyse discrete probability distributions **Understand**
- CO 2:** Define continuous random variables and interpret statistical data using appropriate continuous probability distributions **Apply**
- CO 3:** Illustrate and apply the concepts of two-dimensional random variables and compute covariance and correlation, and linear regression analysis **Apply**
- CO 4:** Obtain point and interval estimates, apply hypothesis testing involving means and Chi-square test for independence of attributes **Apply**
- CO 5:** Estimate the trend analysis, cyclical, seasonal and irregular variations of time series analysis in forecasting **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	1	-	-	-	-	-	-	2	-
CO 2	3	2	-	-	2	-	-	-	-	-	-	2	-
CO 3	3	2	-	-	2	-	-	-	-	-	-	2	-
CO 4	3	2	-	-	2	-	-	-	-	-	-	3	-
CO 5	3	2	-	-	2	-	-	-	-	-	-	3	2

SYLLABUS:

6 + 6

UNIT I: PROBABILITY AND DISCRETE RANDOM VARIABLES

Probability – Addition rule – Conditional probability – Baye's theorem – Discrete random variables – Mean and variance – Binomial and Poisson distributions

UNIT II: CONTINUOUS RANDOM VARIABLES

Continuous random variables – Probability density functions – Cumulative distribution functions – Mean and Variance – Uniform and Normal distributions

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Dr. S. MIRUNA JOE AMALI M.E., Ph.D.
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT III: JOINT PROBABILITY DISTRIBUTIONS**6 + 6**

Two dimensional discrete and continuous random variables – Marginal probability distribution – Independence, covariance – Correlation and linear regression analysis

UNIT IV: STATISTICAL INFERENCE**6 + 6**

Estimation – Point estimation, interval estimation – Determining the sample size in estimation – Hypothesis testing – Hypotheses concerning means – Large, small samples – Chi square test for independence of attributes

UNIT V: TIME SERIES AND FORECASTING**6 + 6**

Variations in Time Series – Trend Analysis – Cyclical Variation – Seasonal Variation – Irregular Variation – Time series analysis in forecasting

LIST OF EXPERIMENTS

1. Discrete Random Variables – Mean and Variance of discrete RVs. – Special discrete probability distributions
2. Continuous Random Variables – Mean and Variance of continuous RVs. – Special continuous probability distributions
3. Joint Probability Distributions – Marginal probability distributions. – Covariance and Correlation.
4. Inferential Statistics – Estimation theory – Testing of hypotheses
5. Time Series and Forecasting – Trend analysis in time series – Cyclic variation in forecasting

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. Douglas C. Montgomery and George C. Runger, "Applied Statistics and Probability for Engineers", Wiley India, New Delhi, 2018
2. Richard I Levin and David S Rubin, "Statistics for Management", Pearson Education, 2005

REFERENCES:

1. Richard A. Johnson, "Miller & Freund's Probability and Statistics for Engineers", Pearson Education, New Delhi, 2017
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, "Probability & Statistics for Engineers & Scientists", Pearson Education, New Delhi, 2016
3. Jay L. Devore, "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi 2020
4. Sheldon M Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Academic press, USA, 2020

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER III

U25CSG09	Computer Organization and Architecture (Common to AD, AM, CB, CS, IT, SC)	Category: PCC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To learn the basic structure and operations of a computer
- To learn the arithmetic and logic unit and implementation of fixed-point and floating-point arithmetic unit
- To learn the basic of pipelined execution
- To understand the memory hierarchies, cache memories and virtual memories
- To learn the different ways of communication with I/O devices

COURSE OUTCOMES:

- CO 1:** Describe the various parts of modern computer functional units, bus structure, addressing modes and Understand
Computer arithmetic Apply
- CO 2:** Use instruction execution steps including timing, control, and register transfer to solve datapath problems Apply
- CO 3:** Implement pipeline operations and hazard resolution methods to assess system performance Understand
- CO 4:** Explain the memory system components and their performance factors Understand
- CO 5:** Describe input output operations, interrupt handling and data transfer methods in computer systems

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	1	2	1
CO 2	3	2	1	1	-	-	-	-	-	-	1	2	1
CO 3	3	2	1	1	-	-	-	-	-	-	1	2	1
CO 4	2	1	-	-	1	-	-	-	-	-	1	2	1
CO 5	2	1	-	-	-	-	-	-	-	-	1	2	1

SYLLABUS:

9

UNIT I: INTRODUCTION

Evolution of computers – Structure of computers – Basic Operational Concepts–GPR based and stack-based organization – Bus Structures, Performance Measurement – Processor Clock, Basic Performance Equation, Clock Rate – Machine Instructions and Programs – Memory Location and Addresses, Memory Operation–Instructions and Instruction Sequencing – Addressing Modes

9

UNIT II: DATAPATH AND CONTROL

Fetching and Storing words – Register Transfer – Execution of instruction – Instruction codes – computer registers – computer instructions – timing & control –instruction cycle –memory reference instructions – Hard-wired Control – Micro programmed Control – Micro instruction – Microprogram sequencing

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT III: PIPELINING

9

Basic concepts of pipelining – the instruction pipeline – pipeline hazards – instruction level parallelism – Reduced Instruction Set – Computer principles – RISC versus CISC

UNIT IV: MEMORY SYSTEM

9

Basic Concepts – Semiconductor RAM Memories – Read Only Memories – Speed, Size, and Cost – Cache Memories – Mapping Functions – Replacement Algorithms – page mode access – interleaved access – Performance Considerations – Virtual Memories – Secondary Storage

UNIT V: INPUT/OUTPUT ORGANIZATION

9

Accessing I/O Devices – Interrupts – Interrupt Hardware – Enabling and Disabling Interrupts – Handling Multiple Devices – Controlling Device Requests – Exceptions – Direct Memory Access – Buses – Interface Circuits – Standard I/O Interfaces – PCI Bus – SCSI Bus, Bus – Arbitration schemes – USB

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", 5th Edition, Morgan Kaufmann Publishers, 2014
2. Carl Hamacher, Zvonko Vranesic, Safwat.Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", 6th Edition, McGraw Hill Education, 2012

REFERENCES:

1. William Stallings, "Computer Organization and Architecture: Designing for Performance", 10th Edition, Pearson Education, 2016
2. Nicholas P. Carter, "Computer Architecture and Organization", 2nd Edition, McGraw Hill Education, 2013

Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407



Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER III & V

U25CSG10	Artificial Intelligence and Machine Learning (Common to CS, IT)	Category: PCC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

PRE-REQUISITES:

- U25CSG05 - Computational Problem Solving using Python / U25RCSG04 - Python Programming

COURSE OBJECTIVES:

- To understand the fundamental concepts, history, applications, and problem-solving approaches of Artificial Intelligence
- To learn the basic principles of Machine Learning, data preprocessing techniques, and model evaluation methods
- To explore supervised learning algorithms for prediction and classification tasks
- To understand unsupervised learning techniques for clustering and dimensionality reduction
- To learn the architecture, learning process, and optimization techniques of Neural Networks

COURSE OUTCOMES:

- CO 1:** Summarize the evolution and scope of intelligent systems and explain the role of intelligent agents, search strategies, optimization techniques, and planning approaches in Artificial Intelligence **Understand**
- CO 2:** Apply data preprocessing techniques, statistical measures, and model validation methods to prepare datasets for machine learning applications **Apply**
- CO 3:** Develop and evaluate supervised learning models using regression and classification algorithms for predictive analytics **Apply**
- CO 4:** Analyze unlabeled datasets using clustering and dimensionality reduction techniques and evaluate the quality of discovered patterns using appropriate metrics **Analyze**
- CO 5:** Examine neural network architectures, learning algorithms, activation functions, and optimization techniques for intelligent system development **Analyze**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	-	1	-
CO 2	3	2	1	1	-	-	-	-	-	-	1	1	-
CO 3	3	2	1	1	-	-	-	-	-	-	1	1	-
CO 4	3	3	2	2	-	-	-	-	-	-	2	2	-
CO 5	3	3	2	2	-	-	-	-	-	-	2	2	-

SYLLABUS:

UNIT I: FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

Introduction to Artificial Intelligence – Definition, History, Applications and Case Studies – Intelligent Agents – Types of Agents – PEAS Description – Properties of Environment – Uninformed Search – Informed Search – Local Search and Optimization – Hill Climbing – Simulated Annealing – Genetic Algorithm – Constraint Satisfaction Problems – Map Coloring Problem – N-Queens Problem – Classical Planning – Air Cargo Problem – Spare Tire Problem – Block World Problem

Dr. S. MIRUNA JOE AMALI M.E.,
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT II: INTRODUCTION TO MACHINE LEARNING

9

Components of Learning – Types of Machine Learning – Data Objects and Attribute Types – Basic Statistical Descriptions of Data – Data Preprocessing – Standardization – Normalization – Missing Data Problem – Data Imbalance Problem – Cross Validation – Overfitting – Bias and Variance Trade-off

UNIT III: SUPERVISED LEARNING

9

Introduction to Supervised Learning – Types of Supervised Learning – Regression – Linear Regression – Logistic Regression – Classification – K-Nearest Neighbour Classifier – Naïve Bayes Classifier – Decision Tree – Random Forest – Support Vector Machine – Error Analysis – Evaluation Measures

UNIT IV: UNSUPERVISED LEARNING

9

Introduction to Unsupervised Learning – K-Means Clustering – Hierarchical Clustering – Case Studies – Dimensionality Reduction – Principal Component Analysis (PCA) – Cluster Validity and Evaluation Metrics – Silhouette Score – Davies-Bouldin Index – Elbow Method.

UNIT V: FUNDAMENTALS OF NEURAL NETWORKS

9

Introduction to Neural Networks – Perceptrons – Feedforward Algorithm – Multilayer Networks – Backpropagation Algorithm – Activation Functions – Sigmoid – Tanh – ReLU – Leaky ReLU – Softmax – Hyperparameter Tuning – Optimization Techniques

CONTACT PERIODS:

Lecture: 45 Periods	Tutorial: - Periods	Practical: - Periods	Project: - Periods	Total: 45 Periods
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TEXTBOOKS:

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, Pearson Education, 2022
2. Ethem Alpaydin, "Introduction to Machine Learning", 5th Edition, MIT Press, 2021

REFERENCES:

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 3rd Edition, O'Reilly Media, 2022
2. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006
3. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
4. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, "Deep Learning", MIT Press, 2016


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head
 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

SEMESTER III & IV

U25CSG11	Object Oriented Programming Using Java (Common to AD, AM, BM, CB, CS, EC, EE, IT, MI, SC)	Category: PCC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce object-oriented programming concepts and Core Java programming fundamentals
- To develop Java applications using classes, inheritance, polymorphism, interfaces, and exception handling mechanisms
- To provide programming skills in multithreading, collections framework, and file handling using Java APIs
- To enable students to develop modular and reusable Java applications using standard libraries and object-oriented design principles

COURSE OUTCOMES:

- CO 1:** Describe object-oriented programming concepts and Java fundamentals for developing simple applications **Understand**
- CO 2:** Develop Java applications using inheritance, polymorphism, abstract classes, interfaces, and packages **Apply**
- CO 3:** Develop Java programs incorporating exception handling and multithreading concepts **Apply**
- CO 4:** Develop Java applications using collections, generics, and related utility classes **Apply**
- CO 5:** Develop Java applications using file handling, stream processing, and object serialization techniques **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	1	1	-	-	-	-	-	-	-	2	-
CO 2	3	2	2	2	-	-	-	-	-	-	1	2	-
CO 3	3	2	2	2	-	-	-	-	-	-	2	3	-
CO 4	3	2	2	2	-	-	-	-	-	-	2	3	-
CO 5	3	2	2	2	-	-	-	-	-	-	2	3	-

SYLLABUS:

UNIT I: INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING AND JAVA BASICS

Procedure-Oriented vs Object-Oriented Java Features and Platform: JVM, JRE, JDK – Java Program Structure & Memory Layout – Classes and Objects – Static and non-static members, static and non-static Methods, Constructors – Access Modifiers, Abstraction and Encapsulation – Scanner and System classes

UNIT II: INHERITANCE AND POLYMORPHISM

Inheritance and types – Polymorphism: Method Overloading and Overriding – Abstract Classes and Methods – Interfaces. Java packages : Built in and user defined packages

Dr. S. Miruna Joe Amali M.E., Ph.D.
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407

Dr. S. Miruna Joe Amali M.E., Ph.D.
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407

UNIT III: EXCEPTION HANDLING AND MULTITHREADING

9

Exception Handling: try, catch, throw, throws, finally – Built in exception classes and User defined Exceptions – Multithreading: Thread Lifecycle, Creating Threads, Thread Class and Runnable Interface, Thread Priorities, Synchronization – Inter-thread Communication, Deadlock prevention

UNIT IV: COLLECTIONS FRAMEWORK AND GENERICS

9

Collections Framework – Generics and Type Safety – Wrapper Classes and Autoboxing/Unboxing – Interfaces and Classes: List, Set, Map, Queue – Implementations: ArrayList, LinkedList, HashSet, TreeSet, HashMap, TreeMap – Iterators – Comparator and Comparable Interfaces

UNIT V: JAVA I/O AND FILES

9

Java I/O Framework – Input and Output Streams – Readers and Writers – File I/O using File, FileReader, FileWriter, BufferedReader, BufferedWriter and Files – Console Input using Scanner and Console – Serialization and Deserialization – Object Streams

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, 2018
2. Cay S. Horstmann and Gary Cornell, "Core Java 2, Vol 1, Fundamentals", 11th Edition, Pearson Education, 2020

REFERENCES:

1. J. Nino and F. A. Hosch, "An Introduction to Programming and OO Design using Java", 1st Edition, John Wiley & Sons, 2018
2. Paul Deitel and Harvey Deitel, "Java SE 8 for Programmers", 3rd Edition, Pearson, 2015
3. E. Balagurusamy, "Programming with Java", 6th Edition, McGraw Hill Education, 2019


Dr. S. MIRUNA JOE AMALI M.E., Ph.D.
 Professor & Head
 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407

SEMESTER III

U25ADG03	Data Exploration and Visualization' (Common to AD, CS)	Category: PCC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

PRE-REQUISITES:

- U25CSG05 - Computational problem-solving using python / U25RCSG04 - Python Programming

COURSE OBJECTIVES:

- Introduce the core purpose of EDA, types of data, and statistical thinking that underpins exploration to analyze single and multi-variable relationships and visualize them meaningfully
- Teach handling and visualization of temporal, text and categorical, image data, introducing use of it in upcoming courses respectively
- Familiarize students with essential visualization tools, introduce design principles and storytelling which helps to present data clearly, and ethically in real-world scenarios

COURSE OUTCOMES:

- CO 1: Explain the principles, objectives, and scope of exploratory data analysis and identify appropriate statistical measures for different data types **Understand**
- CO 2: Apply univariate, bivariate, and multivariate EDA techniques using Python-based tools to summarize and interpret diverse datasets. **Apply**
- CO 3: Analyze time series, textual, and categorical datasets using appropriate preprocessing, transformation, and visualization techniques **Analyze**
- CO 4: Create interactive and meaningful data visualizations using modern libraries (Matplotlib, Seaborn, Plotly) and business intelligence tools (Power BI, Tableau) **Apply**
- CO 5: Design and present insightful dashboards and visual narratives that incorporate ethical visualization practices, accessibility, and storytelling principles **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	1	1	2
CO 2	3	2	1	1	3	-	-	-	-	-	2	2	2
CO 3	3	3	2	2	3	-	-	-	-	-	2	2	2
CO 4	3	2	1	1	3	-	-	-	2	-	3	2	3
CO 5	3	2	1	1	-	-	3	-	3	3	3	1	2

SYLLABUS:

UNIT I: FOUNDATION OF DATA AND ANALYSIS

Introduction to EDA – Types of Data – Measure of central tendency and dispersion: Mean, median, mode, variance, standard deviation, IQR, percentiles – Outlier and anomalies – Introduction to python for EDA – AI based EDA framework

6 + 6
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head
 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

UNIT II: UNIVARIATE, BIVARIATE, AND MULTIVARIATE ANALYSIS

6 + 6

Univariate analysis and visualization: Frequency tables, histograms, density plots, boxplots, violin plots – Bivariate analysis: Scatterplots, grouped bar plots, covariance, correlation coefficients – Multivariate analysis: Heatmaps, scatter matrix, pair plots; identifying trends and clusters – Dimensionality reduction: PCA – Feature selection, multicollinearity detection – Transformation

UNIT III: TIME SERIES, CATEGORICAL, TEXTUAL DATA EXPLORATION

6 + 6

Time series data: Components lag, autocorrelation. Examples: sales, climate, IoT – Visualization of time series – Categorical Data – Textual data – Overview of data cleaning and visualization for time series and textual data

UNIT IV: VISUALIZATION TOOLS AND BEST PRACTICES

6 + 6

History of Data Visualization: Classic visualizations – Python visualization libraries – Power BI and Tableau Basics – Introduction to D3.js – Chart selection and design guidelines – Color schemes and accessibility of the design

UNIT V: STORYTELLING, ETHICS, AND COMMUNICATION

6 + 6

Design insightful dashboards – Storytelling – Visual ethics and bias – Visual clarity and simplicity – Presentation visuals – Applications area

LIST OF EXPERIMENTS

1. Matplotlib Basics: Code simple charts from sample data (scatter, line, bar). Practice labeling axes and titles.
2. Statistical Plots: Use Seaborn to make histograms, boxplots, and scatterplots with regression lines. Detect outliers and describe distributions.
3. Data Cleaning in Python: Work with pandas to load datasets, identify/handle missing values and anomalous data points. Re-plot after cleaning to see impact.
4. Interactive Charts with Plotly: Build interactive scatter/line charts and dashboards using Plotly or Dash. Add tooltips and filters.
5. Tableau Workshop: Connect Tableau to a real-world multi-type, multivariable, and big dataset. Create a dashboard with charts.
6. Power BI Workshop: Integration with Excel/SQL to import data. Create an interactive dashboard, explain it like a story.
7. Geospatial EDA: Using packages like folium or Power BI's map visuals to handle spatial data.
8. D3.js Introduction: Use a simple HTML/JavaScript template. Load data (CSV/JSON) and make a basic D3 bar chart or force-directed graph to introduce web visuals.
9. Real-time Data Dashboards: Using live APIs (e.g., weather, finance) to build dashboards.
10. Storytelling & Presentation Practice: Students prepare a mini report/presentation on a small dataset. Focus on narrative flow and design. Feedback on clarity and engagement.
11. Final Project Work: Students choose an individual/group problem statement with various dataset, perform EDA, create visuals, and prepare a short presentation. (Projects should apply course tools and principles. They encourage creativity and personal interest – e.g. sports, social data.)

CONTACT PERIODS:

Lecture: 30 Periods

Tutorial: - Periods

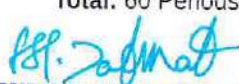
Practical: 30 Periods

Project: - Periods

Total: 60 Periods

TEXTBOOKS:

1. Claus O. Wilke, "Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures", O'Reilly Media, 2019


Dr. S. MIRUNA JOE AMALI, M.E., Ph.D
 Professor & Head
 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

2. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", 2nd Edition, O'Reilly, 2014
3. Tamara Munzner, "Visualization Analysis and Design", 1st edition, CRC Press, 2014
4. Stephanie D. H. Evergreen, "Effective Data Visualization: The Right Chart for the Right Data", 1st edition, SAGE Publications, 2016

REFERENCES:

1. Jyoti Gaikwad, AI-Based Exploratory Data Analysis, International Journal of Scientific Research in Computer Science, Engineering and Information Technology, April 2025, Vol. 11(2), DOI: 10.32628/CSEIT25112860.
2. Eric Pimpler, "Data Visualization and Exploration with R", GeoSpatial Training Services, 2017
3. Christian Tominski & Heidrun Schumann, "Interactive Visual Data Analysis", 1st edition, CRC Press, 2020
4. Alex C. Telea, Data Visualization: Principles and Practice, 1st edition, CRC Press, 2019
5. <https://learn.microsoft.com/power-bi> – Microsoft Power BI Documentation
6. <https://www.kaggle.com/learn/data-visualization> – Practical Visualization Exercises

Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & HeadDepartment of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER III

U25CSG12	Data Structures (Common to AM, CB, CS, IT, SC)	Category: PCC				
		L	T	P	J	C
		2	0	4	0	4

QP PATTERN: A

PRE-REQUISITES:

- U21CSG01 - Problem Solving and C Programming

COURSE OBJECTIVES:

- To appreciate the concepts of ADT and list operations
- To study linear data structures – stacks and queues
- To familiarize tree and Graph structures

COURSE OUTCOMES:

CO 1:	Demonstrate the implementation of list-based linear data structures in data organization applications	Apply
CO 2:	Utilize stack and queue data structures to solve expression evaluation and process-handling problems	Apply
CO 3:	Apply searching, sorting, and hashing techniques for efficient data organization and retrieval	Apply
CO 4:	Employ tree structures and algorithms for hierarchical data representation and processing	Apply
CO 5:	Use graph algorithms for traversal, shortest path, and minimum spanning tree problems	Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	1	-	-	-	-	-	-	1	1	-
CO 2	3	2	2	1	-	-	-	-	-	-	1	2	-
CO 3	3	2	2	1	-	-	-	-	-	-	1	3	-
CO 4	3	2	2	1	-	-	-	-	-	-	1	2	-
CO 5	3	2	2	1	-	-	-	-	-	-	1	2	-

SYLLABUS:

UNIT I: LINEAR DATA STRUCTURES – LIST

6 + 12

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list-based implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of linked list: Polynomial ADT, Radix sort, Multilist

UNIT II: LINEAR DATA STRUCTURES – STACKS, QUEUES

6 + 12

Stack ADT – Operations – Applications – Balancing Symbols-Evaluating arithmetic expressions – Conversion of Infix to postfix expression-Function Calls – Queue ADT – Operations – Circular Queue – DeQueue – Applications of queues.

UNIT III: SEARCHING, SORTING, AND HASHING TECHNIQUES

6 + 12

Sorting: Bubble sort – Insertion sort – Shell sort – Searching: Linear Search – Binary Search – Hashing – Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing

Dr. S. Miruna Joe Amali M.E., Ph.D.
 Professor & Head
 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

6 + 12

UNIT IV: NON-LINEAR DATA STRUCTURES – TREES

Tree ADT – Tree traversals – Binary Tree ADT – Expression trees – Binary search tree ADT – AVL Trees – Priority Queue – Binary Heap – Applications of trees

6 + 12

UNIT V: NON-LINEAR DATA STRUCTURES – GRAPHS

Introduction to Graph – Types of graph – Representation of graphs – Graph traversal : Breadth-first traversal – Depth-first traversal – Bi-Connectivity – Euler circuits – Topological Sort – Dijkstra's algorithm – Minimum spanning tree algorithms – Prims algorithm – Kruskal Algorithm

LIST OF EXPERIMENTS

1. Implement a music playlist where songs can be added, removed, or moved up/down dynamically using linked list
2. Create a stack to manage "Back" and "Forward" operations in a browser, or evaluate arithmetic expressions
3. Simulate customers arriving and being served at a bank counter using Queue ADT
4. Implement bubble sort and Insertion sort
5. Implement Shell sort algorithm
6. Implement Linear search and Binary search algorithms
7. Implement a hash function to Store and search books by ISBN or title efficiently
8. Represent a file system as a tree and allow insertion/deletion of folders/files and implement tree traversal for the same
9. Represent cities and roads as a graph and find shortest paths using Dijkstra's algorithm
10. Implement prims algorithm to find minimum spanning tree of a given graph

CONTACT PERIODS:

Lecture: 30 Periods	Tutorial: - Periods	Practical: 60 Periods	Project: - Periods	Total: 90 Periods
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TEXTBOOKS:

1. Reema Thareja, "Data Structures Using C", 1st edition, Oxford University Press, 2018
2. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, "Fundamentals of Data Structures in C", 2nd edition, University Press, 2017

REFERENCES:

1. R. Venkatesan and S. Lovelyn Rose, "Data Structures", 1st edition, Wiley, 2019
2. Seymour Lipschutz, "Data Structures with C", 4th edition, McGraw Hill Education, 2017



Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER III & IV

U25CSG13	Object Oriented Programming Using Java Laboratory (Common to AD, AM, BM, CB, CS, EC, EE, IT, MI, SC)	Category: PCC				
		L	T	P	J	C
		0	0	2	0	1

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamental concepts of object-oriented programming using Java for developing modular and reusable applications
- To apply inheritance, polymorphism, exception handling, and multithreading concepts in developing robust Java applications
- To develop collection-based and file-processing applications using Java I/O, generics, and collections framework for real-world problem solving

COURSE OUTCOMES:

- CO 1:** Implement the fundamental concepts of object-oriented programming, Java program structure, classes, objects, and encapsulation principles **Apply**
- CO 2:** Develop Java applications using inheritance, polymorphism, abstract classes, interfaces, and packages **Apply**
- CO 3:** Implement exception handling and multithreading mechanisms for developing reliable and concurrent applications **Apply**
- CO 4:** Utilize collections framework, generics, and sorting mechanisms for efficient data management and processing **Apply**
- CO 5:** Develop file handling and object persistence applications using Java I/O streams, serialization, and deserialization techniques **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	-	-	-	-	-	-	1	2	2
CO 2	3	2	1	1	-	-	-	-	-	-	1	2	2
CO 3	3	2	1	1	-	-	-	-	-	-	1	3	2
CO 4	3	2	1	1	-	-	-	-	-	-	1	2	2
CO 5	3	2	2	2	-	-	-	-	-	-	2	2	3

LIST OF EXPERIMENTS

1. Design and implementation of Java programs demonstrating classes, objects, constructors, and methods
2. Development of applications illustrating static and non-static members, access modifiers, abstraction, and encapsulation
3. Implementation of console-based applications using Scanner and System classes for input and output processing
4. Design and implementation of applications demonstrating inheritance and its various types
5. Development of applications illustrating compile-time and runtime polymorphism using method overloading and method overriding
6. Implementation of applications using abstract classes, interfaces, and dynamic method dispatch mechanisms
7. Design and development of modular Java applications using built-in and user-defined packages
8. Implementation of robust exception handling mechanisms using built-in and user-defined exceptions

Dr. S. Miruna Jof Amali
Dr. S. MIRUNA JOF AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering,
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

B.E. - CS - R2025 - CBCS

9. Development of multithreaded applications using Thread class and Runnable interface
10. Design and implementation of synchronized multithreaded applications with inter-thread communication
11. Development of applications demonstrating thread lifecycle management and deadlock prevention techniques
12. Implementation of generic collection-based applications using List, Set, Map, and Queue interfaces
13. Design of applications utilizing Comparator and Comparable interfaces for customized sorting operations
14. Development of file processing applications using Java I/O streams, readers, writers, and buffered streams
15. Implementation of object persistence mechanisms using serialization and deserialization techniques

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 30 Periods

REFERENCES:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, 2018
2. Cay.S.Horstmann and Gary Cornell, "Core Java 2, Vol 1, Fundamentals", 11th Edition, Pearson Education, 2020

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER III & V

U25CSG14	Artificial Intelligence and Machine Learning Laboratory (Common to CS, IT)	Category: PCC				
		L	T	P	J	C
		0	0	4	0	2

QP PATTERN: A

PRE-REQUISITES:

- U25RCSG04 - Python Programming

COURSE OBJECTIVES:

- To develop simple applications using Artificial Intelligence
- To build models using supervise learning algorithms
- To design applications using unsupervised learning and reinforcement learning algorithm.

COURSE OUTCOMES:

CO 1: Implement heuristic AI techniques for solving real world problems	Apply
CO 2: Create dataset and apply pre-processing techniques	Apply
CO 3: Implement supervised learning algorithms for real life applications	Apply
CO 4: Demonstrate the operations of ANN classifier and regression	Apply
CO 5: Develop clustering applications using unsupervised learning	Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	2	-	-	-	-	1	2	2	2
CO 2	3	2	1	1	2	-	-	-	-	1	2	2	2
CO 3	3	2	1	1	2	-	-	-	-	1	2	3	2
CO 4	3	2	1	1	2	-	-	-	-	1	2	3	2
CO 5	3	2	1	1	2	-	-	-	-	1	2	3	2

LIST OF EXPERIMENTS

1. Create a sample dataset and explore statistical operations using Pandas and visualize the results through plots
2. Implement uninformed search strategies for any real-world problem
3. Find optimal solution for a given problem using any local search algorithm
4. Propose an AI solution for a given Constraint Satisfaction problem
5. Take a sample dataset and apply suitable pre-processing techniques
6. Perform dimensionality reduction using Principal Component Analysis on a large dataset
7. Implement and demonstrate the working of Naive Bayesian classifier in a real-life application
8. Develop a prediction system using linear and logistic regression
9. Develop a classifier using Artificial Neural Network for any online expert system
10. Implement K-Means clustering algorithm for segmenting inputs of a business model

CONTACT PERIODS:

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

REFERENCES:

1. Oliver Theobald, "Machine Learning for Absolute Beginners", Independently Published, 3rd Edition, 2021
2. Sebastian Raschka, "Python Machine Learning" 2nd Edition, Packt Publishing, 2015


Dr. S. MIRUNA JOE AMALI M.E., Ph.D.
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER III

U25MNC02	Essence of Indian Traditional Knowledge (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

QP PATTERN: A

COURSE OBJECTIVES:

- Understand the Concept of culture in ancient, medieval and modern period.
- Know the need and importance of Indian languages and Literature.
- Understand the various religion and philosophy in various periods.

COURSE OUTCOMES:

CO 1: Understand Philosophy of Indian culture	Understand
CO 2: Distinguish the Indian languages and literature.	Understand
CO 3: Learn the philosophy of ancient, medieval and modern Indian	Remember
CO 4: Acquire the information about the fine arts in India	Apply
CO 5: Know the contribution of scientists different eras	Understand

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	2	-	1	-	-	3	-	-	-	-	1	1
CO 2	-	2	-	1	-	-	3	-	-	-	-	1	1
CO 3	-	2	-	1	-	-	3	-	-	-	-	1	1
CO 4	-	2	-	-	-	-	-	-	-	-	-	1	1
CO 5	-	2	-	1	-	-	3	-	-	-	-	1	1

SYLLABUS:

UNIT I: INTRODUCTION TO CULTURE

5

Culture, Civilization, Culture and heritage, General characteristics of culture, Importance of culture in human literature, Indian culture, Ancient India, Medieval India, Modern India

UNIT II: INDIAN LANGUAGES AND LITERATURE

5

Indian Languages and Literature-I: The role of Sanskrit, Significance of scriptures to current society, Indian philosophies, other Sanskrit literature, Literature of south India Indian Languages and Literature-II: Northern Indian Languages & literature, Temples and Temple types, Sculptors 's specialties, Temples Individualities Festivals and hopes

UNIT III: RELIGION AND PHILOSOPHY

5

Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (Selected Movements only)

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT IV: ARTS, SCIENCE, TECHNOLOGY & ENGINEERING IN INDIA

Indian painting, Handicrafts, Music, Divisions of Indian classical music, Modern Indian music, Dance and drama, Indian architecture (ancient, medieval and modern), Science and technology in India, Development of science in different periods, Sushruta and Charaka, sages of South India, herbal treatments, Surgery methods of healers, Yoga and pranayama practices, Herbal usages and medication-making methods.

UNIT V: EDUCATION SYSTEM IN INDIA

Education in ancient, Medieval and modern India, Aims of education, subjects, languages, science and scientists of Ancient India, Medieval India and Modern India

CONTACT PERIODS:

Lecture: 25 Periods	Tutorial: - Periods	Practical: - Periods	Project: - Periods	Total: 25 Periods
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TEXTBOOKS:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005.
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN: 978-8187276333, 2007.

REFERENCES:

1. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989.
2. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN: 9788120810990, 2014.
3. S. Narain, "Examinations in Ancient India", Arya Book Depot, 1993.
4. NCERT, "Position Paper on Arts, Music, Dance and Theatre", 2000.
5. B. Kumar Mohanta & Vipin Kumar Singh, "Traditional Knowledge System and Technology in India", 2012.


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER III

U25RMCC08	Professional Skill Development - III (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		15 Hours				
						1

COURSE OUTCOMES:

- CO 1:** Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities **Apply**
- CO 2:** Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation **Apply**
- CO 3:** Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	-	3	1	-	-	2	2	-	1	3
CO 2	2	3	3	2	2	2	-	-	1	1	-	3	3
CO 3	-	-	3	-	-	2	2	3	3	3	2	-	2

GUIDELINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

CONTACT PERIODS:

Lecture: - Periods Tutorial: - Periods Practical: - Periods Project: - Periods Total: 0 Periods

S. S. Miruna Jot Amali
Dr. S. MIRUNA JOT AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering,
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER IV

U25MA401	Discrete Mathematics (Common to AD, AM, CB, CS, IT, SC)	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To develop logical reasoning and combinatorial counting skills including recurrence relations and induction
- To introduce the concepts of algebraic structures and graph theory concepts with matrix representations
- To facilitate the students to use fundamental principles of discrete structures in their respective field

COURSE OUTCOMES:

CO 1:	Apply logical connectives, truth tables, and quantifiers to validate propositions	Apply
CO 2:	Apply counting principles and solve linear recurrence relations using mathematical induction	Apply
CO 3:	Classify algebraic structures (semigroups, monoids, groups) and analyse subgroup properties	Apply
CO 4:	Apply graph terminology, matrix representations, and identify Euler/Hamilton paths	Apply
CO 5:	Apply Boolean algebra and Karnaugh maps to minimize Boolean expressions	Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	-	-	-	-	-	-	-	-	-	1	2
CO 2	3	2	-	-	-	-	-	-	-	-	-	1	2
CO 3	3	2	-	-	-	-	-	-	-	-	-	1	2
CO 4	3	2	-	-	-	-	-	-	-	-	-	1	2
CO 5	3	2	-	-	-	-	-	-	-	-	-	2	2

SYLLABUS:

UNIT I: LOGIC AND PROOFS

Propositions – Logical connectives, truth tables, propositional equivalences – Tautology and contradiction – Predicates and quantifiers – Rules of inference – Methods of proofs

UNIT II: COMBINATORICS

Basics of counting – Sum rule, product rule – Pigeonhole principle – permutations and combinations – Recurrence relations – Linear homogeneous recurrence relations – Mathematical induction

UNIT III: ALGEBRAIC STRUCTURES

Relation and function – Types and properties, algebraic structures – Semigroups, monoids, groups, and abelian groups – Subgroups and their properties – Applications

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT IV: GRAPH THEORY

9

Introduction to graphs and graph models – Graph terminology and types of graphs, complete, bipartite and regular graphs – Matrix representation of graphs and adjacency matrix – Graph isomorphism – Connectivity, paths, circuits and connected components – Euler and Hamilton graphs

UNIT V: BOOLEAN ALGEBRA

9

Boolean algebra and basic postulates – Principle of duality – Canonical forms of Boolean expressions– Karnaugh map and Minimization techniques – Applications

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, Special Indian Edition, 2016
2. Tremblay, J.P. and Manohar, R. "Discrete Mathematical Structures with Applications to Computer Science", 7th Edition, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2011

REFERENCES:

1. Susanna S. Epp, "Discrete Mathematics with Applications", 4th Edition, Cengage Learning, 2011
2. Richard Johnsonbaugh, "Discrete Mathematics", 7th Edition, Pearson, 2013
3. Bernard Kolman, Robert C. Busby, and Sharon Cutler Ross, "Discrete Mathematical Structures", 6th Edition, Pearson, 2013
4. Oscar Levin, "Discrete Mathematics: An Open Introduction", 4th Edition, Chapman & Hall, 2025

Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER IV

U25CS401	Formal Languages and Automata Theory	Category: PCC				
		L	T	P	J	C
		3	1	0	0	4

QP PATTERN: A

PRE-REQUISITES:

- U21CSG10 - Data Structures

COURSE OBJECTIVES:

- To understand the concepts of finite automata and regular languages
- To analyze different types of grammars and context-free languages
- To study pushdown automata and their relationship with context-free grammars
- To explore Turing machines and models of computation
- To examine decidability, computability, and computational complexity

COURSE OUTCOMES:

- CO 1:** Construct finite automata to recognize regular languages
- CO 2:** Generate simplified context-free grammars for formal languages
- CO 3:** Formulate pushdown automata corresponding to context-free grammars and vice versa
- CO 4:** Develop computational models using Turing machines for language recognition
- CO 5:** Analyze undecidable problems and computational complexity classes

Apply

Apply

Apply

Apply

Analyze

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	1	-	-	-	-	-	-	1	3	2
CO 2	3	2	2	1	-	-	-	-	-	-	1	3	2
CO 3	3	2	2	1	-	-	-	-	-	-	1	3	2
CO 4	3	2	2	1	-	-	-	-	-	-	1	3	2
CO 5	3	3	2	2	-	-	-	-	-	-	1	2	1

SYLLABUS:

9 + 3

UNIT I: FINITE AUTOMATA

Introduction- Finite Automaton – DFA & NDFA – Finite Automaton with ϵ - moves – Equivalence of NFA and DFA – Equivalence of NDFA's with and without ϵ - moves – Regular Languages – Regular Expression – Equivalence of finite Automaton and regular expressions

9 + 3

UNIT II: GRAMMARS

Introduction – Types of Grammar – Context Free Grammars and Languages – Derivations and Languages – Ambiguity – Relationship between derivation and derivation trees – Simplification of CFG – Greiback Normal form, Chomsky normal form

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT III: PUSHDOWN AUTOMATA**9 + 3**

Pushdown Automata – Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Equivalence of Pushdown automata and CFL – pumping lemma

UNIT IV: TURING MACHINES**9 + 3**

Definitions of Turing machines – Models – Computable languages and functions – Techniques for Turing machine construction – Multi head and Multi tape Turing Machines – The Halting problem – Partial Solvability – Chomskian hierarchy of languages

UNIT V: UNSOLVABLE PROBLEMS AND COMPUTABLE FUNCTIONS**9 + 3**

Unsolvability Problems and Computable Functions – Primitive recursive functions – Recursive and recursively enumerable languages – Universal Turing machine P and NP completeness – Polynomial time reductions

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** 15 Periods **Practical:** - Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. Peter Linz and Susan H. Rodger, "An Introduction to Formal Languages and Automata", 7th edition, Jones & Bartlett Learning, 2023
2. John C. Martin, "Introduction to Languages and the Theory of Computation", 4th edition, McGraw-Hill, 2010
3. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computation", 2nd edition, PEA, 2001

REFERENCES:

1. E. V. Krishnamurthy, "Introduction to Theory of Computer Science", 2nd edition, EWP, 2023
2. K. L. P. Mishra and N. Chandrasekaran, "Theory of Computer Science (Automata, Languages and Computation)", 2nd edition, Prentice Hall India, 2023
3. Daniel I. A. Cohen, "Introduction to Automata Theory Languages and Computations", 2nd edition, Pearson Education Asia, 2023


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER IV

U25CSG15	Design And Analysis of Algorithms (Common to AM, CB, CS, IT, SC)	Category: PCC				
		L	T	P	J	C
		3	1	0	0	4

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamental concepts of algorithms and analyze their efficiency using asymptotic notations
- To study algorithm design techniques such as brute force and divide-and-conquer
- To develop solutions using dynamic programming and greedy methods
- To analyze graph algorithms, flow networks, and string matching techniques
- To explore backtracking, branch and bound methods, and complexity classes such as P and NP

COURSE OUTCOMES:

CO 1:	Analyze algorithm efficiency using asymptotic notations and mathematical analysis techniques	Analyze
CO 2:	Implement brute force and divide-and-conquer strategies to solve computational problems	Apply
CO 3:	Construct optimal solutions using dynamic programming and greedy algorithms	Apply
CO 4:	Utilize optimization techniques and graph-based algorithms to solve computational problems.	Apply
CO 5:	Investigate combinatorial optimization problems using backtracking and branch-and-bound techniques and assess NP-class problems	Analyze

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	1	-	-	-	-	-	-	1	2	-
CO 2	3	2	1	1	-	-	-	-	-	-	1	2	-
CO 3	3	2	1	1	-	-	-	-	-	-	1	2	-
CO 4	3	2	1	1	-	-	-	-	-	-	1	2	-
CO 5	3	2	2	1	-	-	-	-	-	-	1	2	-

SYLLABUS:

9 + 3

UNIT I: INTRODUCTION

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Nonrecursive algorithms

10 + 3

UNIT II: BRUTE FORCE AND DIVIDE & CONQUER

Brute Force: Selection sort, Bubble Sort, Sequential Search, String Matching, Closest - Pair and Convex - Hull Problems – Traveling Salesman Problem – Knapsack Problem – Assignment problem. Divide and conquer methodology: Merge sort – Quick sort – Binary search

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT III: DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE**9 + 3**

Dynamic Programming: Computing a Binomial Coefficient – Warshall's and Floyd's algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique Prim's algorithm – Kruskal's Algorithm – Dijkstra's Algorithm

UNIT IV: ITERATIVE IMPROVEMENT**8 + 3**

The Simplex Method – The Maximum Flow Problem – Maximum Matching in Bipartite Graph – Stable Marriage Problem – Local Search Heuristics: Hill Climbing

UNIT V: BACKTRACKING AND BRANCH & BOUND**9 + 3**

Limitations of Algorithm – Lower-Bound Arguments – Decision Trees – P, NP and NP – Complete Problems – Coping with the Limitations – Backtracking: n - Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem – Branch and Bound: Assignment problem – Knapsack Problem – Traveling Salesman Problem – Approximation Algorithms for NP Hard Problems

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** 15 Periods **Practical:** - Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. R. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd edition, Pearson Education Asia, 2019
2. A. A. Putambekar, "Design and Analysis of Algorithms", 1st edition, Technical Publications, 2015

REFERENCES:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms", 3rd edition, PHI Pvt. Ltd., 2015
2. Sara Baase and Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", 1st edition, Pearson Education Asia, 2016
3. A. V. Aho, J. E. Hopcroft and J. D. Ullman, "The Design and Analysis of Computer Algorithms", 1st edition, Pearson Education Asia, 2013


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

SEMESTER III & IV

U25CSG16	Database Management Systems (Common to AD, AM, CB, CS, IT, SC)	Category: PCC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamental concepts and architecture of database systems and design database schemas using appropriate data models
- To develop database applications using SQL and PL/SQL and apply database design principles such as normalization and transaction management
- To explore storage structures, indexing, and query optimization techniques and understand NoSQL database models for developing modern database applications using MongoDB

COURSE OUTCOMES:

	Understand
CO 1: Explain database fundamentals and design database schemas using the ER model	Apply
CO 2: Construct database applications and perform CRUD operations using SQL and advanced SQL features	Apply
CO 3: Implement normalization and transaction management techniques to ensure data integrity and consistency	Apply
CO 4: Utilize indexing, hashing, and query processing techniques to improve data retrieval efficiency	Apply
CO 5: Develop NoSQL database solutions using modern data models for data-driven applications	Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	1	2	2
CO 2	3	2	1	1	-	-	-	-	-	-	3	2	2
CO 3	3	2	1	1	-	-	-	-	-	-	3	2	2
CO 4	3	2	1	1	-	-	-	-	-	-	2	2	2
CO 5	3	2	1	1	-	-	-	-	-	-	2	2	3

SYLLABUS:

9

UNIT I: DATABASE CONCEPTS AND DATA MODELING

Introduction to DBMS – Database System Architecture – Levels of Abstraction – Views of data – Data Models – DBMS vs RDBMS – Relational Model: Relational Databases – Keys – Integrity Constraints – Relational Algebra – ER Model: Entities – Attributes – Relationships – ER diagrams – Mapping ER model to Relational tables

9

UNIT II: SQL FUNDAMENTALS

SQL: Data Types – Types of SQL Commands – Operators – Clauses – Aggregate Functions – Joins – Nested Queries – Set Operations – Condition Logic – Advanced SQL: Views – PL/ SQL: Functions – Cursor – Exception Handling – Stored Procedures – Triggers

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D.
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT III: DATABASE DESIGN AND PROCESSING

9

Normalization: Functional Dependencies – Lossy/Lossless Decomposition – Dependency preservation – 1NF, 2NF, 3NF – BCNF – 4NF, 5NF – Transaction: Transaction Concepts and States – ACID Properties – Schedules – Serializability – Concurrency control – Locking protocols – Deadlock – Transaction recovery

UNIT IV: DATABASE STORAGE AND INDEXING

9

RAID Levels – File Organization – Data dictionary Storage – Indexing and Hashing: Ordered Indices – B tree Index – B+ tree Index – Static Hashing – Dynamic Hashing – Querying Processing and optimization

UNIT V: NOSQL DATABASES

9

NoSQL: Need for NoSQL – Characteristics and Applications – CAP Theorem – BASE vs ACID – NoSQL vs SQL – Types of NOSQL: Key-Value database – Document database – Column-Oriented database – Graph Database – MongoDB: Data Model and Architecture – CRUD Operations – Indexing and aggregation

CONTACT PERIODS:

Lecture: 45 Periods Tutorial: - Periods Practical: - Periods Project: - Periods Total: 45 Periods

TEXTBOOKS:

1. A. Silberschatz, H. F. Korth and S. Sudarshan, "Database System Concepts", 7th edition, McGraw-Hill, 2019
2. Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", 8th edition, Pearson, 2026

REFERENCES:

1. Carlos Coronel and Steven Morris, "Database Systems: Design, Implementation and Management", 13th edition, Cengage Learning, 2021
2. Hector Garcia-Molina, Jeffrey D. Ullman and Jennifer Widom, "Database Systems: The Complete Book", 2nd edition, Pearson, 2009


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head
 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

SEMESTER IV

U25CSG17	Operating Systems (Common to AD, AM, CB, CS, IT, SC)	Category: PCC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To explore the structure, functions, and evolution of modern operating systems across various architectures and process management concepts
- To study memory and deadlock management techniques for efficient resource utilization
- To explore file systems, storage management, and modern virtualization technologies such as RAID, virtual machines, and hypervisors

COURSE OUTCOMES:

- CO 1:** Describe the structure, functions, and architectural models of modern operating systems Understand
- CO 2:** Utilize process management concepts such as scheduling, multithreading, synchronization, and Interprocess communication in solving computing problems Apply
- CO 3:** Describe deadlock conditions and strategies for detection, prevention, avoidance, and recovery Understand
- CO 4:** Utilize memory management techniques such as paging, segmentation, and memory-mapped files to manage and evaluate system memory effectively Apply
- CO 5:** Implement file system and storage management mechanisms, including disk scheduling, RAID, and virtualization concepts Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	-	-	1
CO 2	3	2	1	1	-	-	-	-	-	-	1	-	1
CO 3	2	1	-	-	-	-	-	-	-	-	-	-	1
CO 4	3	2	1	1	-	-	-	-	-	-	1	-	2
CO 5	3	2	1	1	-	-	-	-	-	-	1	-	2

SYLLABUS:

6 + 6

UNIT I: OPERATING SYSTEM OVERVIEW

Overview of Computer System – Memory Hierarchy – Cache Memory – Interrupts – Operating system overview – Objectives and functions – Evolution of Operating Systems – Architecture of Operating System: Monolithic, Layered, Microkernel, Modular – System Calls – System Programs – System Boot

6 + 6

UNIT II: PROCESS MANAGEMENT

Process concepts – Process Control Block (PCB) – Process lifecycle – Process scheduling and CPU scheduling algorithms – Threads and multithreading – Interprocess Communication (IPC) – Process synchronization and mutual exclusion – Classical synchronization problems – Synchronization mechanisms

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT III: DEADLOCK MANAGEMENT

6 + 6

Principles of Deadlock – Necessary conditions – Deadlock Detection – Resource allocation Graph – Deadlock Avoidance – Banker's algorithm – Deadlock Prevention – Deadlock Recovery – Real - world Case Study: Deadlock in Databases, Distributed Systems

UNIT IV: MEMORY MANAGEMENT

6 + 6

Main Memory – Contiguous Allocation – Fixed Partitioning – Swapping – Virtual Memory – Paging – Segmentation – Demand Paging – Page Replacement Algorithms – Modern Memory Concepts: Thrashing and Working Set Model – Memory-mapped Files

UNIT V: STORAGE MANAGEMENT

6 + 6

File System Structure – Allocation Methods – Free Space Management – Disk Structure – Disk Scheduling Algorithms – Swap Space Management – Modern Storage: SSDs vs HDD, RAID levels – Introduction to Virtualization: Virtual Machines and Hypervisors

LIST OF EXPERIMENTS

1. Introduction to UNIX Commands and Shell Programming
2. Implementation of Process Creation and Management using System Calls
3. Simulation of CPU Scheduling Algorithms (FCFS, SJF, Round Robin)
4. Implementation of Interprocess Communication using Pipes or Shared Memory
5. Process Synchronization using Semaphores (Producer–Consumer Problem)
6. Simulation of Deadlock Avoidance using Banker's Algorithm
7. Implementation of Page Replacement Algorithms (FIFO, LRU)

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th edition, John Wiley and Sons Inc., 2021
2. Andrew S. Tanenbaum and Herbert Bos, "Modern Operating Systems", 5th edition, Pearson Education, 2022

REFERENCES:

1. Maurice J. Bach, "The Design of the Unix Operating System", 3rd edition, Pearson Education, 2017
2. Ramaz Elmasri, A. Gil Carrick and David Levine, "Operating Systems: A Spiral Approach", 1st edition, Tata McGraw Hill, 2010
3. Achyut S. Godbole and Atul Kahate, "Operating Systems", 3rd edition, McGraw Hill Education, 2016


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head
 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology

Arasur, Coimbatore - 641 407.

SEMESTER III & IV

U25CSG18	Database Management Systems Laboratory (Common to AD, AM, CB, CS, IT, SC)	Category: PCC				
		L	T	P	J	C
		0	0	2	2	2

QP PATTERN: A

COURSE OBJECTIVES:

- To provide hands-on experience in creating and manipulating databases using SQL commands
- To practice database programming concepts including procedures, functions, triggers, and indexing
- To familiarize students with NoSQL databases and the development of simple database applications

COURSE OUTCOMES:

CO 1: Construct database schemas using Data Definition Language (DDL) commands	Apply
CO 2: Construct database schemas using Data Definition Language (DDL) commands	Apply
CO 3: Develop database programs using PL/SQL constructs such as procedures, functions, cursors, and triggers	Apply
CO 4: Build document-based databases and execute CRUD operations using MongoDB	Apply
CO 5: Develop a simple database application by integrating a programming language with a relational database	Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	2	-	-	-	2	2	2	2	2
CO 2	3	2	1	1	2	-	-	-	2	2	2	2	2
CO 3	3	2	1	1	2	-	-	-	2	2	2	3	2
CO 4	3	2	1	1	3	-	-	-	2	2	2	3	3
CO 5	3	2	1	1	3	-	-	-	2	2	2	3	3

LIST OF EXPERIMENTS

1. Design an ER Diagram for a real-world application (Library /Ecommerce/ College/ Bank / Hospital Management System)
2. Create the relational schema & Implement DDL with Integrity Constraints
3. Implementation of DML, DCL Commands
4. Implementation of Clauses and Operators
5. Implementation of Date and String Functions
6. Implementation of Aggregate Functions and Grouping Operations
7. Implementation of SQL Queries using Joins, Set Operations, and Views
8. Implementation of Functions and Procedures
9. Implementation of Triggers using PL/SQL
10. Implementation of Cursors and Exception Handling
11. Implement Indexing, query optimization techniques and simulate B Tree and B+ Tree
12. Create a database using MongoDB and perform CRUD operations
13. Develop a Database Application by integrating Java with MYSQL and perform CRUD operations



Dr. S. MIRUNA JOE AMALI M.E., Ph.D

Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** 30 Periods **Total:** 60 Periods

REFERENCES:

1. Rick Silva, "Database System Concepts Lab Manual", 1st Edition, McGraw Hill Education, 2016
2. Oracle Corporation, "Oracle Database PL/SQL Language Reference", Latest edition, Oracle Documentation, 2023
3. Paul DuBois, "MySQL Cookbook: Solutions for Database Developers and Administrators", 3rd edition, O'Reilly Media, 2014


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

SEMESTER IV

U25MNC03	Indian Constitution (Common to all programmes)	Category: MNC				
		L	T	P	J	C
		1	0	0	0	0

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the evolution and importance of the Constitution.
- To understand salient features of the Indian Constitution and philosophy of Fundamental Rights
- To gain the knowledge about the state government and local level administration

COURSE OUTCOMES:

- CO 1:** Understand the historical background of the Constitution making and its importance for building a democratic India Understand
- CO 2:** Understand the value of Fundamental Rights and Duties for becoming a good citizen of India Analyze
- CO 3:** Analyze the powers of the Central Government Understand
- CO 4:** Understand the role and responsibilities of State and Local Administration Apply
- CO 5:** Apply knowledge in strengthening constitutional institutions like Election Commission and UPSC for sustaining democracy

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	1	2	3	-	-	-	-	-
CO 2	-	-	-	-	-	1	2	3	-	-	-	-	-
CO 3	-	-	-	-	-	1	2	3	-	-	-	-	-
CO 4	-	-	-	-	-	1	2	3	-	-	-	-	-
CO 5	-	-	-	-	-	1	2	3	-	-	-	-	-

SYLLABUS:

5

UNIT I: HISTORICAL BACKGROUND OF INDIAN CONSTITUTION

Introduction to Indian Constitution: Constitution Meaning of the term, History of Making of the Indian Constitution, Evolution of the Indian Constitution, Drafting Committee (Composition and Working).

5

UNIT II: FEATURES OF INDIAN CONSTITUTION

Philosophy and salient features of the Indian Constitution, Citizenship, Fundamental Rights, Duties and their significance, Directive Principles of State Policy, Rights Protective Mechanisms in India; Right to Education Act 2009; Right to Information 2005.

5

UNIT III: UNION GOVERNMENT

Union Legislature (Parliament), Lok Sabha and Rajya Sabha (with Powers and Functions), Union Executive, President of India (with Powers and Functions), Prime Minister and Council of Ministers (with Powers and Functions), Cabinet and Council of Secretariat, Union Judiciary (Supreme Court).

Dr. S. Srinivasan
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

UNIT IV: STATE GOVERNMENT AND LOCAL ADMINISTRATION

5

Governor, Chief Minister and Council of Ministers, State Secretariat – Roles and Responsibilities, District Administration, Head, Municipalities – Mayor and Role of Elected Representatives, Panchayati Raj, Zila Panchayat – Roles and Responsibilities, Block Level and Village Level Organizational Hierarchy

UNIT V: CONSTITUTIONAL INSTITUTIONS

5

Election Commission of India – Powers and Functions, Electoral Process in India, Methods of Constitutional Amendments and their Limitations, Important Constitutional and gist Emergency Provisions. Case Studies.

CONTACT PERIODS:

Lecture: 25 Periods Tutorial: - Periods Practical: - Periods Project: - Periods Total: 25 Periods

TEXTBOOKS:

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India Pvt. Ltd., New Delhi.
2. Subash Kashyap, "Indian Constitution", National Book Trust.

REFERENCES:

1. M. Laxmikanth, "Indian Polity", McGraw Hill Education India, 2013.
2. M. P. Jain, "Indian Constitution Law," 7th Edition, Lexis Nexis, 2014.
3. Raj Kumar, "Ambedkar and Constitution", Commonwealth Publication Pvt. Ltd., New Delhi, 2011


Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head
 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
 Professor & Head
 Department of Computer Science and Engineering
 KPR Institute of Engineering and Technology
 Arasur, Coimbatore - 641 407.

SEMESTER IV

SEMESTER IV						
U25RMCC09	Professional Skill Development - IV (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		15 Hours				1

COURSE OUTCOMES:

- CO 1:** Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities **Apply**
- CO 2:** Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation **Apply**
- CO 3:** Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	-	3	1	-	-	2	2	-	1	3
CO 2	2	3	3	3	2	2	-	-	1	1	-	3	3
CO 3	-	-	3	-	-	2	2	3	3	3	2	-	2

GUIDELINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

CONTACT PERIODS:

Lecture: - Periods Tutorial: - Periods Practical: - Periods Project: - Periods Total: 0 Periods

Dr. S. Miruna Joe Amali
Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineer
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

Dr. S. Miruna Joe Amali

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head

Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

Dr. S. MIRUNA JOE AMALI M.E., Ph.D
Professor & Head
Department of Computer Science and Engineering
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641 407.

