R.M.K. ENGINEERING COLLEGE
(An Autonomous Institution)
R.S.M Nagar, Kavaraipettai, Gummidipoondi Taluk, Thiruvallur District, Tamil Nadu- 601206

Affiliated to Anna University, Chennai / Approved by AICTE, New Delhi/Accredited by NAAC with A+ Grade / An ISO 9001:2015 Certified Institution / All the Eligible UG Programs are accredited by NBA, New Delhi

B.E. / B.TECH- ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
REGULATIONS – 2022
CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The B.Tech. Artificial Intelligence & Data Science Graduates of R.M.K. Engineering College will:

PEO 1. Apply the fundamental knowledge of basic sciences, mathematics, computer science, artificial intelligence, and data science to solve socially relevant problems.

PEO 2. Work in multi-disciplinary teams, communicate effectively, and develop world class solutions with the professional knowledge gained by lifelong learning.

PEO 3. Demonstrate ethics, values, integrity, and provide novel innovative solutions during their profession.

PEO 4. Pursue higher studies and research in the areas of Artificial Intelligence and Data Science.

PROGRAM OUTCOMES (POs)

After the successful completion of the program, the graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution ofcomplex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyzecomplex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineeringproblems and design system components or processes that meet the specifiedneeds with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering

solutions in societal and environmental contexts, and demonstratethe knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge andunderstanding of the engineering and management principles and apply theseto one's own work, as a member and leader in a team, to manage projects andin multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

After the successful completion of the program, the graduates will be able to:

After the successful completion of the program, the graduates will be able to:

1. Apply the fundamental principles of basic sciences and the knowledge gained from the core concepts of Artificial Intelligence and Data Science to analyze, design and solve complex real world problems.
2. Apply strong analytical skills using cutting edge technologies to solve business and engineering problems.
3. Excel in Artificial Intelligence and Data Science technologies for career enhancement as an entrepreneur and pursue higher education.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES(PEOs) WITH PROGRAMME OUTCOMES(POs)

A broad relation between the programme objective and the outcomes is given in thefollowing table

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	1	2	3	4	5	6	7	8	9	10	11	12
I	3	3	3	3	2	2	2	1	1	1	1	1
II	3	3	3	3	2	1	1	1	3	3	1	3
III	2	2	2	2	2	3	2	3	3	1	1	1
IV	3	3	3	3	2	2	2	3	3	3	2	1
I	3	3	3	3	2	2	2	1	1	1	1	1

MAPPING OF PROGRAM SPECIFIC OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Objectives and the outcomes is givenin the following table

PROGRAMME SPECIFIC OBJECTIVES	PROGRAMME OUTCOMES											
	1	2	3	4	5	6	7	8	9	10	11	12

I	3	3	3	3	3	3	2	1	1	1	1	2
II	3	3	3	3	3	3	2	1	1	1	1	2
III	2	2	2	2	3	2	2	2	3	2	3	3

Contribution **1: Reasonable** **2: Significant** **3: Strong**

MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES

A broad relation between the Course Outcomes and Programme Outcomes is given in the following table:

YEAR	SEMESTER	COURSE NAME	PROGRAM OUTCOMES											
			1	2	3	4	5	6	7	8	9	10	11	12
YEAR I	SEMESTER I	Matrices and Calculus	✓	✓	✓	✓	✓	✓	✓					✓
		Engineering Chemistry	✓	✓				✓	✓					✓
		Problem Solving using C++	✓	✓	✓					✓	✓	✓		✓
		Software Development Practices	✓	✓	✓		✓	✓		✓	✓	✓		✓
		Digital Principles and System Design	✓	✓	✓					✓	✓	✓		✓
		Computer aided Engineering Graphics	✓		✓		✓					✓		
		Product Development Lab-1												
		Induction Program						✓	✓	✓	✓	✓	✓	✓
	SEMESTER II	Transforms and Numerical Methods	✓	✓	✓	✓	✓	✓						✓
		Data Structures	✓	✓	✓					✓	✓	✓		✓
		Physics for Computer Science and Information Technology	✓	✓	✓	✓								
		Professional Communication									✓	✓		✓
		Java Programming	✓	✓	✓		✓			✓	✓	✓		✓
		Database Management System	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Product Development Lab - 2												
		Environmental Sciences and Sustainability (Non Credit)	✓	✓				✓	✓			✓		✓
		Yoga for Stress Management												

YEAR II	**SEMESTER III**	Mathematics III – Discrete Mathematics	✓	✓	✓	✓								
		UHV II						✓	✓	✓	✓	✓	✓	✓
		Computer Architecture	✓	✓	✓	✓				✓	✓	✓		✓
		Operating Systems	✓	✓	✓	✓	✓			✓	✓	✓		✓
		Data Science using Python	✓	✓	✓	✓	✓			✓	✓	✓		✓
		Design and Analysis of Algorithms	✓	✓	✓	✓	✓			✓	✓	✓		✓
		Aptitude and Coding Skills I	✓	✓							✓	✓		
		Internship/Seminar*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Value Education (Non Credit)												
	SEMESTER IV	Mathematics IV – Probability and Statistics	✓	✓	✓	✓								
		Big Data Analytics	✓	✓	✓	✓	✓			✓	✓	✓		✓
		Artificial Intelligence	✓	✓	✓					✓	✓	✓		✓
		Object Oriented Software Engineering	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Compiler Design	✓	✓	✓					✓	✓	✓		✓
		Professional Elective I												
		Aptitude and Coding Skills II	✓	✓							✓	✓		
		Mini Project and Design Thinking Practices Lab	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Communication Lab									✓	✓		✓
		Yoga/Personality												
YEAR III	**SEMESTER V**	Machine Learning	✓	✓	✓		✓			✓	✓	✓		✓
		Data Exploration and Visualization	✓	✓	✓		✓			✓	✓	✓		✓
		Reinforcement Learning	✓	✓	✓		✓			✓	✓	✓		✓
		Computer Networks	✓	✓	✓		✓			✓	✓	✓		✓
		Professional Elective II												

		Professional Elective III												
		Open Elective I												
		Advanced Aptitude and Coding Skills I	✓	✓	✓						✓	✓		
		Internship/Seminar*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Indian Constitution (Non Credit)	✓	✓							✓	✓		
	SEMESTER VI	Management Elective												
		Open Elective II												
		Professional Elective IV												
		Professional Elective V												
		Deep Learning and Neural Networks	✓	✓	✓		✓			✓	✓	✓		✓
		Computer Vision	✓	✓	✓		✓			✓	✓	✓		✓
		Advanced Aptitude and Coding Skills II	✓	✓							✓	✓		
YEAR IV	**SEMESTER VII**	Professional Ethics						✓	✓	✓	✓	✓	✓	✓
		Open Elective III												
		Open Elective IV												
		Professional Elective VI												
		Natural Language Processing	✓	✓	✓		✓			✓	✓	✓		✓
		Speech Processing	✓	✓	✓		✓			✓	✓	✓		✓
		MLOps	✓	✓	✓		✓			✓	✓	✓		✓
		Essence of Indian Knowledge Tradition (Non Credit)	✓	✓							✓	✓		
	SEMESTER VIII	Project Phase II	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

PROFESSIONAL ELECTIVES

SEM	COURSE NAME	PROGRAM OUTCOMES											
		1	2	3	4	5	6	7	8	9	10	11	12
SEMESTER V / SEMESTER VI	Information Extraction and Retrieval	✓	✓	✓					✓	✓	✓		✓
	Feature Engineering	✓	✓	✓					✓	✓	✓		✓
	Business Intelligence (Descriptive, Prescriptive & Predictive)	✓	✓	✓		✓			✓	✓	✓		✓
	Health Care Analytics	✓	✓	✓					✓	✓	✓		✓
	Optimization Techniques	✓	✓	✓					✓	✓	✓		✓
	Text and Speech Analytics	✓	✓	✓					✓	✓	✓		✓
	Image and Video Analytics	✓	✓	✓					✓	✓	✓		✓
	Web Technology	✓	✓	✓		✓			✓	✓	✓		✓
	MERN Full Stack Development	✓	✓	✓		✓			✓	✓	✓		✓
	UI/UX Design	✓	✓	✓		✓			✓	✓	✓		✓
	Microservices Architecture	✓	✓	✓		✓			✓	✓	✓		✓
	Web Frameworks	✓	✓	✓		✓			✓	✓	✓		✓
	Mobile Architecture and Development	✓	✓	✓		✓			✓	✓	✓		✓
	C# and .Net Programming	✓	✓	✓		✓			✓	✓	✓		✓
	Distributed Computing	✓	✓	✓		✓			✓	✓	✓		✓
	Cloud Foundations	✓	✓	✓		✓			✓	✓	✓		✓
	Cloud Architecting	✓	✓	✓		✓			✓	✓	✓		✓
	DevOps	✓	✓	✓		✓			✓	✓	✓		✓
	Machine Learning and Data Analytics on Cloud	✓	✓	✓		✓			✓	✓	✓		✓
	Cloud Security Foundations	✓	✓	✓		✓			✓	✓	✓		✓
	ML Foundations for NLP on Cloud	✓	✓	✓		✓			✓	✓	✓		✓

SEMESTER VII	Internet of Things	✓	✓	✓		✓			✓	✓	✓		✓
	Cryptography and Network Security	✓	✓	✓		✓			✓	✓	✓		✓
	Edge Computing	✓	✓	✓		✓			✓	✓	✓		✓
	Block Chain Technologies	✓	✓	✓		✓			✓	✓	✓		✓
	Digital and Mobile Forensics	✓	✓	✓		✓			✓	✓	✓		✓
	Cyber Physical Systems	✓	✓	✓		✓			✓	✓	✓		✓
	Vulnerability Analysis and Penetration Testing	✓	✓	✓		✓			✓	✓	✓		✓
	GPU Computing	✓	✓	✓		✓			✓	✓	✓		✓
	Edge Analytics	✓	✓	✓		✓			✓	✓	✓		✓
	Computational Neuroscience	✓	✓	✓		✓			✓	✓	✓		✓
	Graph Neural Networks	✓	✓	✓		✓			✓	✓	✓		✓
	Mixed Reality	✓	✓	✓		✓			✓	✓	✓		✓
	Intelligent Robots	✓	✓	✓		✓			✓	✓	✓		✓
	Quantum Computing	✓	✓	✓		✓			✓	✓	✓		✓
	Principles of Management	✓	✓	✓								✓	
	Total Quality Management	✓	✓	✓								✓	
	Professional Readiness for Innovation, Employability and Entrepreneurship	✓	✓	✓								✓	
	Resource Management Techniques	✓	✓	✓								✓	
	Supply Chain Management	✓	✓	✓								✓	
	Engineering Economics and Financial Accounting	✓	✓	✓								✓	
	Knowledge Management	✓	✓	✓								✓	

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I - VIII SEMESTER CURRICULUM

SEMESTER –I								
Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY COURSES WITH LABORATORY COMPONENT								
1	22MA101	Matrices and Calculus	BSC	5	3	0	2	4
2	22CH101	Engineering Chemistry	BSC	5	3	0	2	4
3	22CS101	Problem Solving using C++	ESC	5	3	0	2	4
4	22CS102	Software Development Practices	ESC	5	3	0	2	4
5	22EC101	Digital Principles and System Design	ESC	5	3	0	2	4
LABORATORY COURSES WITH THEORY COMPONENT								
6	22ME202	Computer aided Engineering Graphics	ESC	3	1	0	2	2
LABORATORY COURSES								
7	22ME111	Product Development Lab-1	EEC	2	0	0	2	1
MANDATORY COURSES								
8		Induction Program (Non Credit)	MC	3Weeks				
TOTAL				**30**	**16**	**0**	**14**	**23**

SEMESTER –II								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES WITH LABORATORY COMPONENT								
1	22MA201	Transforms and Numerical Methods	BSC	5	3	0	2	4
2	22CS201	Data Structures	ESC	5	3	0	2	4

3	22PH201	Physics for Computer Science and Information Technology	BSC	5	3	0	2	4
4	22HS101	Professional Communication	HSMC	4	2	0	2	3
5	22CS202	Java Programming	ESC	5	3	0	2	4
6	22IT202	Database Management System	PCC	5	3	0	2	4
LABORATORY COURSES								
7	22ME211	Product Development Lab - 2	EEC	2	0	0	2	1
MANDATORY COURSES								
8	22CH104	Environmental Sciences and Sustainability (Non Credit)	MC	2	2	0	0	0
AUDIT COURSES								
9		Yoga for Stress Management	AC	1	1	0	0	0
TOTAL				**34**	**20**	**0**	**14**	**24**

SEMESTER – III								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES								
1		Mathematics III – Discrete Mathematics	BSC	3	2	0	2	3
2		UHV II	HSMC	3	3	0	0	3
LAB INTEGRATED THEORY COURSES								

3	22CS302	Computer Architecture / Organization	ESC	4	2	0	2	3
4	22CS304	Operating Systems	PCC	4	2	0	2	3
5	22AI301	Data Science using Python	PCC	5	3	0	2	4
6	22CS303	Design and Analysis of Algorithms	PCC	4	2	0	2	3
EMPLOYABILITY ENHANCEMENT COURSES								
7	22CS311	Aptitude and Coding Skills I	EEC	2	0	0	2	1
8		Internship/Seminar*	EEC	2	0	0	2	1
AUDIT COURSES								
9		Value Education (Non Credit)	AC	1	1	0	0	0
			TOTAL	**28**	**16**	**0**	**12**	**21**

*2 weeks for one credit. Internship during 2 Semester Summer Vacation

SEMESTER – IV								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES								
1		Mathematics IV – Probability and Statistics	BSC	4	2	0	2	3
LAB INTEGRATED THEORY COURSES								
2	22AI401	Distributed Computing and Big Data	PCC	4	2	0	2	3

3	22AI402	Artificial Intelligence	PCC	5	3	0	2	4
4	22AI403	Object Oriented Software Engineering	PCC	4	2	0	2	3
5	22AI404	Automata Theory and Compiler Design	PCC	4	2	0	2	3
6		Professional Elective I	PEC	4	2	0	2	3
EMPLOYABILITY ENHANCEMENT COURSES								
7		Aptitude and Coding Skills II	EEC	2	0	0	2	1
8		Mini Project and Design Thinking	EEC	2	0	0	2	1
LABORTORY COURSES								
9		Communication Lab	HSMC	4	0	0	4	2
AUDIT COURSES								
10		Yoga/Personality	AC	1	1	0	0	0
			TOTAL	**33**	**15**	**0**	**18**	**23**

SEMESTER – V								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
LAB INTEGRATED THEORY COURSES								
1		Machine Learning	PCC	5	3	0	2	4
2		Data Exploration, Feature Engineering and Visualization	PCC	4	2	0	2	3
3		Reinforcement Learning	PCC	4	2	0	2	3
4		Computer Networks	PCC	4	2	0	2	3
5		Professional Elective II	PEC	4	2	0	2	3
6		Professional Elective III	PEC	4	2	0	2	3
THEORY COURSES								
7		Open Elective I	OEC	3	3	0	0	3
EMPLOYABILITY ENHANCEMENT COURSES								
8		Advanced Aptitude and Coding Skills I	EEC	2	0	0	2	1
9		Internship/Seminar*	EEC	2	0	0	2	1
MANDATORY COURSES								
10		Indian Constitution (Non Credit)	MC	3	3	0	0	0
			TOTAL	**35**	**19**	**0**	**16**	**24**

*2 weeks for one credit. Internship during 4 Semester Summer Vacation

SEMESTER – VI

Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1		Management Elective	HSMC	3	3	0	0	3
2		Open Elective II	OEC	3	3	0	0	3
LAB INTEGRATED THEORY COURSES								
3		Professional Elective IV	PEC	4	2	0	2	3
4		Professional Elective V	PEC	4	2	0	2	3
5		Deep Learning	PCC	5	3	0	2	4
6		Computer Vision	PCC	5	3	0	2	4
EMPLOYABILITY ENHANCEMENT COURSES								
8		Advanced Aptitude and Coding Skills II	EEC	2	0	0	2	1
			TOTAL	**26**	**16**	**0**	**10**	**21**

SEMESTER – VII								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
THEORY COURSES								
1		Professional Ethics	HSMC	2	2	0	0	2
2		Open Elective III	OEC	3	3	0	0	3
3		Open Elective IV	OEC	3	3	0	0	3
LAB INTEGRATED THEORY COURSES								
4		Professional Elective VI	PEC	4	2	0	2	3
5		Natural Language Processing	PCC	5	3	0	2	4
6		Speech Processing	PCC	4	2	0	2	3
LAB COURSE WITH THEORY COMPONENT								
7		MLOps	PCC	3	1	0	2	2
MANDATORY COURSES								
8		Essence of Indian Knowledge Tradition (Non Credit)	MC	3	3	0	0	0
			TOTAL	**27**	**19**	**0**	**8**	**20**

SEMESTER – VIII								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
EMPLOYABILITY ENHANCEMENT COURSES								
1		Project Work	EEC	16	0	0	16	8
			TOTAL	**16**	**0**	**0**	**16**	**8**

CREDIT SUMMARY

S. No.	Subject Area	Credits Per Semester								Credit Total	Percentage
		I	II	III	IV	V	VI	VII	VIII		
1	HSMC		3	3	2	-	3	2	-	10+3	7.92%
2	BSC	8	8	3	3	-	-	-	-	22	13.41%
3	ESC	15	8	4	-	-	-	-	-	27	16.46%
4	PCC	-	4	12	12	12	8	8	-	56	34.14%
5	PEC	-	-	-	3	6	6	3	-	18	10.98%
8	OEC	-	-	-	-	3	3	6	-	12	7.31%
7	EEC	-	1	2	2	2	1	-	8	16	9.76%
	Total	23	24	21	23	24	21	20	8	161+3	

HSMC – Humanities and Social Sciences including Management courses; **BSC** – Basic Science Courses; **ESC** – Engineering Science Courses including workshop, drawing, basics of electrical/mechanical/computer etc.; **PCC** – Professional Core Courses; **PEC** – Professional Elective Courses relevant to chosen specialization/branch; **OEC** – Open Subjects–Electives from other technical and/or emerging subjects **EEC** – Project Work, Seminar and Internship in Industry or elsewhere

ELECTIVE VERTICALS:

ADVANCED ANALYTICS									
Sl. No.	Course Code	Course Title	SEM	Category	Contact Periods	L	T	P	C
1		Information Extraction and Retrieval	IV	PEC	4	2	0	2	3
2		Optimization Techniques	V	PEC	4	2	0	2	3
3		Business Intelligence (Descriptive, Prescriptive & Predictive)	V	PEC	4	2	0	2	3
4		Health Care Analytics	V	PEC	4	2	0	2	3
5		Text and Speech Analytics	VI	PEC	4	2	0	2	3
6		Image and Video Analytics	VI	PEC	4	2	0	2	3

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NETWORKS									
Sl. No.	Course Code	Course Title	SEM	Category	Contact Periods	L	T	P	C
1		Internet of Things	IV	PEC	4	2	0	2	3
2		MERN Full Stack Development	V	PEC	4	2	0	2	3
3		Edge Computing	V	PEC	4	2	0	2	3
4		Microservices Architecture	VI	PEC	4	2	0	2	3
5		Mobile Architecture and Development	VI	PEC	4	2	0	2	3
6		Cyber Physical Systems	VII	PEC	4	2	0	2	3
7		Block Chain Technologies	VII	PEC	4	2	0	2	3

SECURITY									
Sl. No.	**Course Code**	**Course Title**	**SEM**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1		Information Theory for Cyber Security	IV	PEC	4	2	0	2	3
2		Cryptography and Network Security	V	PEC	4	2	0	2	3
3		Digital and Mobile Forensics	V	PEC	4	2	0	2	3
4		Vulnerability Analysis and Penetration Testing	VI	PEC	4	2	0	2	3
5		Malware Analysis	VI	PEC	4	2	0	2	3
6		Quantum Cryptography	VII	PEC	4	2	0	2	3

CLOUD COMPUTING									
Sl. No.	**Course Code**	**Course Title**	**SEM**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1		Cloud Foundations	IV	PEC	4	2	0	2	3
2		Cloud Architecting	IV	PEC	4	2	0	2	3
3		DevOps	V	PEC	4	2	0	2	3
4		Machine Learning and Data Analytics on Cloud	V	PEC	4	2	0	2	3
5		Cloud Security Foundations	VI	PEC	4	2	0	2	3
6		ML Foundations for NLP on Cloud	VI	PEC	4	2	0	2	3

ADVANCED TECHNOLOGIES									
Sl. No.	**Course Code**	**Course Title**	**SEM**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1		GPU Computing	IV	PEC	4	2	0	2	3
2		Edge Analytics	V	PEC	4	2	0	2	3
3		Computational Neuroscience	V	PEC	4	2	0	2	3
4		Graph Theory and Neural Networks	VI	PEC	4	2	0	2	3
5		Mixed Reality	VI	PEC	4	2	0	2	3
6		Intelligent Robots	VII	PEC	4	2	0	2	3
7		Quantum Computing	VII	PEC	4	2	0	2	3

MANAGEMENT ELECTIVE								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**

1		Principles of Management	HSMC	3	2	0	2	3
2		Total Quality Management	HSMC	3	2	0	2	3
3		Professional Readiness for Innovation, Employability and Entrepreneurship	HSMC	3	2	0	2	3
4		Resource Management Techniques	HSMC	3	2	0	2	3
5		Supply Chain Management	HSMC	3	2	0	2	3
6		Engineering Economics and Financial Accounting	HSMC	3	2	0	2	3

OPEN ELECTIVE – OFFERED TO OTHER DEPARTMENTS								
Sl. No.	**Course Code**	**Course Title**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1		Data Science using Python	OEC	3	3	0	0	3
2		Artificial Intelligence and Machine Learning	OEC	3	3	0	0	3
3		Reinforcement Learning	OEC	3	3	0	0	3
4		Business Intelligence	OEC	3	3	0	0	3
5		Natural Language Processing	OEC	3	3	0	0	3

SEMESTER – I

22MA101	MATRICES & CALCULUS (Common to All Branches)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- Explain the concepts of matrix algebra techniques needed for practical applications.
- Determine the curvature of the curves.
- Illustrate the simple applications of multivariable calculus and vector calculus.
- Elaborate the concept and application of multiple integrals.

UNIT I	MATRICES	15

Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

Theory : 9

Experiments using SCILAB:

1. Introduction to SCILAB through matrices and general syntax.
2. Finding the Eigenvalues and Eigenvectors.
3. Plotting the graph of a quadratic form.

Laboratory: 6

UNIT II	SINGLE VARIABLE CALCULUS	15

Curvature in Cartesian and Polar Co-ordinates – Centre and radius of curvature – Circle of curvature–Evolutes.

Theory: 9

Experiments using SCILAB:

1. Evaluating the radius of curvature.
2. Finding the coordinates of the center of curvature.
3. Tracing of Curves.

Laboratory: 6

UNIT III	MULTIVARIABLE CALCULUS	15

Partial derivatives (excluding Euler's theorem) – Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables.

Theory: 9

Experiments using SCILAB:

1. Evaluating the maxima of functions of several variables.
2. Evaluating the minima of functions of several variables.
3. Evaluation of Jacobians.

Laboratory: 6

UNIT IV	MULTIPLE INTEGRALS	15

Double integrals – Change of order of integration – Area enclosed by plane curves – Triple integrals – Volume of solids.

Theory: 9

Experiments using SCILAB:

1. Evaluating area under a curve.
2. Evaluating area using double integral..
3. Evaluation of volume by integrals.

Laboratory: 6

UNIT V	VECTOR CALCULUS	15

Gradient, divergence and curl (excluding vector identities) – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green's theorem in a plane and Gauss divergence theorem (Statement only) – Simple applications involving cubes and rectangular parallelopipeds.

Theory: 9

Experiments using SCILAB:

1. Evaluating gradient.
2. Evaluating directional derivative.
3. Evaluating divergent and curl.

Laboratory: 6

TOTAL: 75 PERIODS

OUTCOMES:

At the end of this course, the students will be able to:

CO1: Use the matrix algebra methods to diagonalize the matrix.
CO2: Determine the evolute of the curve.
CO3: Apply differential calculus ideas on the function of several variables.
CO4: Evaluate the area and volume by applying the concept of multiple integration.
CO5: Utilize the concept of vector calculus in evaluating integrals.

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCES:

1. M. K. Venkataraman, "Engineering Mathematics", Volume I, 4th Edition, The National Publication Company, Chennai, 2003.
2. SivaramakrishnaDass, C. Vijayakumari, "Engineering Mathematics", Pearson Education India, 4th Edition 2019.
3. H. K. Dass, and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Limited, 3rd Edition 2014.
4. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.
5. S.S. Sastry, "Engineering Mathematics", Vol. I & II, PHI Learning Private Limited, 4th Edition, New Delhi, 2014.

LIST OF EQUIPMENTS:

1. SCILAB- Open source

22CH101	ENGINEERING CHEMISTRY (Common to All Branches)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To understand the water quality criteria and interpret its applications in water purification.
- To gain insights into the basic concepts of electrochemistry and implement its applications in chemical sensors.
- To acquire knowledge on the fundamental principle of energy storage devices and relate it to electric vehicles.
- To identify the different types of smart materials and explore their applications in Engineering and Technology.
- To assimilate the preparation, properties and applications of nanomaterials in various fields.

UNIT I	WATER TECHNOLOGY	15

Sources of water –Impurities - Drinking water quality parameters –Hardness and its types, problems - Municipal water treatment and disinfection (chlorination- break-point chlorination,UV, Ozonation). Boiler troubles- Scales and sludges, Boiler feed water: Requirements - Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning). External treatment –Ion exchange demineralization - Principle, process and fouling. Desalination of brackish water: Reverse osmosis –principle-types of membranes, process and fouling.

(Theory-9)

Determination of total, temporary and permanent hardness of water by EDTA method.
Determination of chloride content of water sample by argentometric method.
Determination of alkalinity in water sample

(Laboratory-6)

UNIT II	ELECTROCHEMISTRY AND SENSORS	15

Introduction- Conductance- factors affecting conductance – Electrodes– origin of electrode potential – single electrode potential, standard electrode potential – measurement of single electrode potential –over voltage - reference electrodes (standard hydrogen electrode, calomel electrode)-ion selective electrode- glass electrode - Nernst equation (derivation),numerical problems, Electrochemical series and its applications.
Chemical sensors – Principle of chemical sensors – Breath analyzer– Gas sensors – CO2 sensors- Sensor for health care – Glucose sensor.

(Theory-9)

Determination of the amount of NaOH using a conductivity meter.
Determination of the amount of acids in a mixture using a conductivity meter.
Determination of the amount of given hydrochloric acid using a pH meter.

(Laboratory-6)

UNIT III	ENERGY STORAGEDEVICES AND ENERGYSOURCES	15

Batteries –Primary alkaline battery - Secondary battery - Pb-acid battery, Fuel cell - H2 – O2 fuel cell.
Batteries used in E- vehicle: Ni-metal hydride battery, Li-ion Battery, Li-air Battery
Nuclear Energy – Nuclear fission, fusion, differences, characteristics – nuclear chain reactions – light water nuclear reactor – breeder reactor.

(Theory-9)

Determination of single electrode potential of the given electrode.

Estimation of the iron content of the given solution using apotentiometer.
Determination of electrochemical cell potential (using different electrodes/ different concentrations of electrolytes)

(Laboratory-6)

UNIT IV	SMART MATERIALS FOR ENGINEERING APPLICATIONS	15

Polymers – Definition – Classification – smart polymeric materials - Preparation, properties and applications of Piezoelectric polymer - Polyvinylidene fluoride (PVDF), Electroactive polymer- Polyaniline (PANI) and Biodegradable polymer - Polylactic acid (PLA).
Polymer composites: Definition, Classification – FRP's – Kevlar.
Shape Memory Alloys: Introduction, Shape memory effect – Functional properties of SMAs – Types of SMA - Nitinol (Ni-Ti) alloys - applications.
Chromogenic materials:Introduction – Types - applications.

(Theory-9)

Determination of themolecular weight of polymer using Ostwald viscometer.
Application of polymeric fibers in 3D printing.

(Laboratory-6)

UNIT V	NANO CHEMISTRY	15

Introduction – synthesis – top-down process (laser ablation, chemical vapor deposition), bottom-up process (precipitation, electrochemical deposition) – properties of nanomaterials – types – nanotubes -carbon nanotubes, applications of CNT - nanocomposites – General applications of nanomaterials in electronics, information technology, medical and healthcare, energy, environmental remediation, construction and transportation industries.

(Theory-9)

Determination of concentration of $BaSO_4$ nanoparticles by conductometric titrations.
Preparation of ZnO nanocrystal by precipitation method.

(Laboratory-6)

TOTAL: 75 PERIODS

OUTCOMES:

At the end of this course, the students will be able to:

CO1: Interpret the water quality parameters and explain the various water treatment methods.
CO2: Construct the electro chemical cells and sensors.
CO3: Compare different energy storage devices and predict their relevance in electric vehicles.
CO4: Classify different types of smart materials, their properties and applications in Engineering and Technology.
CO5: Integrate the concepts of nano chemistry and enumerate its applications in various fields.

TEXT BOOKS:

1. P. C. Jain and Monika Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai PublishingCompany Pvt. Ltd., New Delhi, 2022.
2. SivasankarB., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2012.

REFERENCES:

1. S.S. Daraand S.S. Umare, "A Textbook of Engineering Chemistry",12thEdition, S.Chand&Company, NewDelhi, 2013.
2. V.R. Gowarikar, Polymer Science, 2nd edition, New Age International Publishers, 2021.
3. J. C. Kuriacose and J. Rajaram, "Chemistry in Engineering and Technology", Volume - 1&Volume -2, Tata McGraw-Hill Education Pvt. Ltd., 2010.
4. Geoffrey A. Ozin, Andre C. Arsenault and Ludovico Cademartiri, "Nanochemistry: A Chemical ApproachtoNanomaterials",2ndEdition,RSC publishers,2015.

5. PrasannaChandrasekhar,"Conductingpolymers,fundamentalsandapplications–Including Carbon Nanotubes and Graphene", Second Edition, Springer Science & Business Media, New York, 2019.
6. J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas and B. Sivasankar, "Vogel's Quantitative Chemical Analysis", 6th edition, Pearson Education Pvt. Ltd., 2019.

LIST OF EQUIPMENTS:

1. Conductivity meter – 20 Nos.
2. pH meter - 19 Nos.
3. Potentiometer - 20 Nos.

22CS101	PROBLEM SOLVING USING C++ (Common to All Branches)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To learn problem solving and programming fundamentals.
- To gain knowledge on pointers and functions.
- To apply the principles of object orientated programming.
- To understand operator overloading, inheritance and polymorphism.
- To use the functionalities of I/O operations, files build C++ programs using exceptions.

UNIT I	PROBLEM SOLVING AND PROGRAMMING FUNDAMENTALS	15

Computational thinking for Problem solving – Algorithmic thinking for Problem solving - Building Blocks - Problem Solving and Decomposition - Dealing with Error – Evaluation.
Overview of C – Data types – Identifiers – Variables – Storage Class Specifiers – Constants – Operators - Expressions – Statements – Arrays and Strings – Single-Dimensional – Two-Dimensional Arrays – Arrays of Strings – Multidimensional Arrays.

List of Exercises:

1. Write C/C++ programs for the following:
    a. Find the sum of individual digits of a positive integer.
    b. Compute the GCD of two numbers.
    c. Find the roots of a number (Newton's method)
2. Write C/C++ programs using arrays:
    a. Find the maximum of an array of numbers.
    b. Remove duplicates from an array of numbers.
    c. Print the numbers in an array after removing even numbers.
3. Write C/C++ programs using strings:
    a. Checking for palindrome.
    b. Count the occurrences of each character in a given word.

UNIT II	POINTERS AND FUNCTIONS	15

Pointers -Variables – Operators – Expressions – Pointers and Arrays – Functions - Scope Rules – Function Arguments – return Statement – Recursion – Structures – Unions – Enumerations.

List of Exercises:

1. Generate salary slip of employees using structures and pointers. Create a structure Employee with the following members:

   EID, Ename, Designation, DOB, DOJ, Basicpay

   Note that DOB and DOJ should be implemented using structure within structure.
2. Compute internal marks of students for five different subjects using structures and functions.

UNIT III	CLASSES AND OBJECTS	15

Concepts of Object Oriented Programming – Benefits of OOP – Simple C++ program - Classes and Objects - Member functions - Nesting of member functions - Private member functions - Memory Allocation for Objects - Static Data Members - Static Member functions - Array of Objects - Objects as function arguments - Returning objects - friend functions – Const Member functions - Constructors – Destructors.

List of Exercises:

1. Write a program Illustrating Class Declarations, Definition, and Accessing Class Members.
2. Program to illustrate default constructor, parameterized constructor and copy constructors.

UNIT IV	OPERATOR OVERLOADING, INHERITANCE AND POLYMORPHISM	15

Operator Overloading - Overloading Using Friend functions – Inheritance – Types of inheritance – Virtual Base Class - Abstract Class – Constructors in Derived Classes - member class: nesting of classes.

Pointer to objects – this pointer- Pointer to derived Class - Virtual functions – Pure Virtual Functions – Polymorphism.

List of Exercises:

1. Write a Program to Demonstrate the i) Operator Overloading. ii) Function Overloading.
2. Write a Program to Demonstrate Friend Function and Friend Class.
3. Program to demonstrate inline functions.
4. Program for Overriding of member functions.
5. Write C++ programs that illustrate how the following forms of inheritance are supported:
   a) Single inheritance b)Multiple inheritance c)Multi level inheritance d)Hierarchical inheritance.

UNIT V	I/O, FILES AND EXCEPTIONS	15

C++ Streams – Unformatted I/O - Formatted Console I/O – Opening and Closing File – File modes - File pointers and their manipulations – Templates – Class Templates – Function Templates - Exception handling.

List of Exercises:

1. Program to demonstrate pure virtual function implementation.
2. Count the number of account holders whose balance is less than the minimum balance using sequential access file.
3. Write a Program to Demonstrate the Catching of all Exceptions.
4. Mini project.

TOTAL: 45+30 = 75 PERIODS

OUTCOMES:

At the end of this course, the students will be able to:

CO1: Solve problems using basic constructs in C.

CO2: Implement C programs using pointers and functions.
CO3: Apply object-oriented concepts and solve real world problems.
CO4: Develop C++ programs using operator overloading and polymorphism.
CO5: Implement C++ programs using Files and exceptions.

TEXT BOOKS:

1. Herbert Schildt, "The Complete Reference C++", 4th edition, MH, 2015. (Unit 1 & 2)
2. E Balagurusamy,"Object Oriented Programming with C++", 4th Edition, Tata McGraw-Hill Education, 2008. (Unit 3, 4 & 5)

REFERENCES:

1. Karl Beecher,"Computational Thinking: A beginner's guide to problem-solving and programming", BCS Learning & Development Ltd, 2017. (Unit 1)
2. Nell Dale, Chip Weems, "Programming and Problem Solving with C++", 5th Edition, Jones and Barklett Publishers, 2010.
3. John Hubbard, "Schaum's Outline of Programming with C++", MH, 2016.
4. Yashavant P. Kanetkar, "Let us C++", BPB Publications, 2020
5. ISRD Group, "Introduction to Object-oriented Programming and C++", Tata McGraw-Hill Publishing Company Ltd., 2007.
6. D. S. Malik, "C++ Programming: From Problem Analysis to Program Design", Third Edition, Thomson Course Technology, 2007.
7. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01297200240671948837_shared/overview

LIST OF EQUIPMENTS:

1. Standalone desktops with C/C++ compiler (or) Server with C/C++ compiler.

22CS102	SOFTWARE DEVELOPMENT PRACTICES (Common to All Branches)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To discuss the essence of agile development methods.
- To set up and create a GitHub repository.
- To create interactive websites using HTML
- To design interactive websites using CSS.
- To develop dynamic web page using Java script.

UNIT I	AGILE SOFTWARE DEVELOPMENT AND Git and GitHub	15

Software Engineering Practices – Waterfall Model - Agility – Agile Process – Extreme Programming - Agile Process Models – Adaptive Software Development – Scrum – Dynamic Systems Development Method – Crystal – Feature Driven Development – Lean Software Development – Agile Modeling – Agile Unified Process – Tool set for Agile Process.

Introduction to Git –Setting up a Git Repository - Recording Changes to the Repository - Viewing the Commit History - Undoing Things - Working with Remotes -Tagging - Git Aliases - Git Branching - Branches in a Nutshell - Basic Branching and Merging - Branch Management - Branching Workflows - Remote Branches - Rebasing.

Introduction to GitHub – Set up and Configuration - Contribution to Projects, Maintaining a

Project – Scripting GitHub.

List of Exercises:

1. Form a Team, Decide on a project:
    a) Create a repository in GitHub for the team.
    b) Choose and follow a Git workflow
        - Each team member can create a StudentName.txt file with contents about themselves and the team project
        - Each team member can create a branch, commit the file with a proper commit message and push the branch to remote GitHub repository.
        - Team members can now create a Pull request to merge the branch to master branch or main development branch.
        - The Pull request can have two reviewers, one peer team member and one faculty. Reviewers can give at least one comment for Pull Request updating.
        - Once pull request is reviewed and merged, the master or main development branch will have files created by all team members.
2. Create a web page with at least three links to different web pages. Each of the web pages is to be designed by a team member. Follow Git workflow, pull request and peer reviews.
3. Form a Team, Decide on a project:
    c) Create a repository in GitHub for the team.
    d) Choose and follow a Git workflow
        - Each team member can create a StudentName.txt file with contents about themselves and the team project
        - Each team member can create a branch, commit the file with a proper commit message and push the branch to remote GitHub repository.
        - Team members can now create a Pull request to merge the branch to master branch or main development branch.
        - The Pull request can have two reviewers, one peer team member and one faculty. Reviewers can give at least one comment for Pull Request updation.
        - Once pull request is reviewed and merged, the master or main development branch will have files created by all team members.
4. Create a web page with at least three links to different web pages. Each of the web pages is to be designed by a team member. Follow Git workflow, pull request and peer reviews.

UNIT II	**HTML**	**15**

Introduction – Web Basics – Multitier Application Architecture – Cline-Side Scripting versus Server-side Scripting – HTML5 – Headings – Linking – Images – Special Characters and Horizontal Rules – Lists – Tables – Forms – Internal Linking – meta Elements – Form input Types – input and datalist Elements – Page-Structure Elements.

List of Exercises:

1. Create web pages using the following:
    - Tables and Lists
    - Image map
    - Forms and Form elements
    - Frames

UNIT III	**CSS**	**15**

Inline Styles – Embedded Style Sheets – Conflicting Styles – Linking External Style Sheets – Positioning Elements – Backgrounds – Element Dimensions – Box Model and Text Flow – Media Types and Media Queries – Drop-Down Menus – Text Shadows – Rounded Corners – Colour – Box Shadows – Linear Gradients – Radial Gradients – Multiple Background Images – Image Borders – Animations – Transitions and Transformations – Flexible Box Layout Module – Multicolumn Layout.

List of Exercises:

1. Apply Cascading style sheets for the web pages created.

UNIT IV	**JAVASCRIPT BASICS**	**15**

Introduction to Scripting – Obtaining user input – Memory Concepts – Arithmetic – Decision Making: Equality and Relational Operators – JavaScript Control Statements – Functions – Program Modules – Programmer-defined functions – Scope rules – functions – Recursion – Arrays – Declaring and Allocating Arrays – References and Reference Parameters – Passing Arrays to Functions – Multidimensional arrays.

List of Exercises:

1. Form Validation (Date, Email, User name, Password and Number validation) using JavaScript.

UNIT V	**JAVASCRIPT OBJECTS**	**15**

Objects – Math, String, and Date, Boolean and Number, document Object – Using JSON to Represent objects – DOM: Objects and Collections – Event Handling.

List of Exercises:

1. Implement Event Handling in the web pages.

Mini Projects-Develop any one of the following web applications (not limited to one) using above technologies.

a. Online assessment system
b. Ticket reservation system
c. Online shopping
d. Student management system
e. Student result management system
f. Library management
g. Hospital management
h. Attendance management system
i. Examination automation system
j. Web based chat application

TOTAL: 75 PERIODS

OUTCOMES:

At the end of this course, the students will be able to:

CO1: Apply agile development methods in software development practices.
CO2: Set up and create a GitHub repository.
CO3: Develop static and dynamic webpages using HTML.
CO4: Design interactive personal or professional webpages using CSS.

CO5: Develop web pages using Java script with event-handling mechanism.

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw Hill International Edition, Nineth Edition, 2020.
2. Scott Chacon, Ben Straub, "Pro GIT", Apress Publisher, 3rd Edition, 2014.
3. Deitel and Deitel and Nieto, "Internet and World Wide Web - How to Program", Pearson, 5th Edition, 2018.

REFERENCES:

1. Roman Pichler, "Agile Product Management with Scrum Creating Products that Customers Love", Pearson Education, 1 st Edition, 2010.
2. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2011.
3. Stephen Wynkoop and John Burke, "Running a Perfect Website", QUE, 2nd Edition, 1999.
4. Chris Bates, "Web Programming – Building Intranet Applications", 3rd Edition, Wiley Publications, 2009.
5. Gopalan N.P. and Akilandeswari J., "Web Technology", Second Edition, Prentice Hall of India, 2014.
6. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview
7. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013094421427470336209 9_shared/overview

LIST OF EQUIPMENTS:

Systems with either Netbeans or Eclipse

Java/JSP/ISP Webserver/Apache

Tomcat / MySQL / Dreamweaver or

Equivalent/ Eclipse, WAMP/XAMP

22EC101	DIGITAL PRINCIPLESAND SYSTEMS DESIGN (Common to All Branches)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To acquire the knowledge in Digital fundamentals and its simplification methods.
- To familiarize the design of various combinational digital circuits using logic gates.
- To realize various sequential circuits using flip flops.
- To interpret various clocked sequential circuits.
- To elucidate various semiconductor memories and related technology.
- To build various logic functions using Programmable Logic Devices.

UNIT I	BOOLEAN ALGEBRA AND LOGIC GATES	9

Review of number systems-representation-conversions, Review of Boolean algebra- theorems, sum of product and product of sum simplification, canonical forms, min term and max term, Simplification of Boolean expressions-Karnaugh map,Implementation of Boolean expressions using logic gates and universal gates.

List of Experiments:

1. Implementation of Boolean expression using logic gates.

UNIT II	COMBINATIONAL LOGIC CIRCUITS	9

Design of combinational circuits - Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/De-mux, Parity Generator/Checker

List of Experiments:

1. Design of adders
2. Design ofsubtractors.
3. Design of binary adder using IC7483
4. Design of Multiplexers &Demultiplexers.
5. Design of Encoders and Decoders.
6. Implementation of a boolean function using a multiplexer.

UNIT III	SEQUENTIAL CIRCUITS	9

Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Asynchronous and Synchronous Counters Design - Shift registers, Universal Shift Register

List of Experiments:

1. Design and implementation of 3 bit ripple counters.
2. Design and implementation of 3 bit synchronous counter
3. Design and implementation of shift registers

UNIT IV	SYNCHRONOUSSEQUENTIAL CIRCUITS DESIGN	9

Design of clocked sequential circuits - Moore/Mealy models, state minimization, state assignment, circuit implementation

UNIT V	MEMORY AND PROGRAMMABLE LOGIC DEVICES	9

Basic memory structure ROM: PROM – EPROM – EEPROM –RAM – Static and dynamic RAM – Programmable Logic Devices: Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Implementation of combinational logic circuits using PLA, PAL.

TOTAL: 75 PERIODS

OUTCOMES:

At the end of this course, the students will be able to:

CO1: Implement digital circuits using simplified Boolean functions.
CO2: Realize Combinational circuits for a given function using logic gates.
CO3: Demonstrate the operation of various counters and shift registers using Flip Flops.
CO4: Analyze Synchronous Sequential circuits.
CO5: Summarize the various types of memory devices.
CO6: Design the Combinational circuits using Programmable Logic Devices.
CO7: Perform practical exercises as an individual and / or team member to manage the task in time.
CO8: Express the experimental results with effective presentation and report.

TEXT BOOKS:

1. M. Morris Mano and Michael D. Ciletti, Digital Design, With an Introduction to the Verilog HDL, VHDL, and System Verilog, 6th Edition, Pearson, 2018.
2. S.Salivahanan and S.Arivazhagan,Digital Circuits and Design, 5th Edition, Oxford University Press, 2018.

REFERENCES:
1. A.Anandkumar, Fundamental of digital circuits, 4th Edition, PHI Publication,2016.
2.WilliamKleitz, Digital Electronics-A Practical approach to VHDL, Prentice Hall International Inc, 2012.
3.CharlesH.Roth, Jr. andLarry L. Kinney, Fundamentals of Logic Design, 7th Edition, Thomson Learning, 2014.
4.Thomas L. Floyd, Digital Fundamentals, 11th Edition, Pearson Education Inc, 2017.
5.John.M Yarbrough, Digital Logic: Applications and Design, 1st Edition, Cengage India, 2006.
NPTEL LINK: https://nptel.ac.in/courses/108/105/108105132/

LIST OF EQUIPMENTS:

22ME202	COMPUTER AIDED ENGINEERING GRAPHICS (Common to All Branches)	L	T	P	C
		1	0	2	2

OBJECTIVES:

The Course will enable learners to:

- To help students understand universal technical drawing standards.
- To provide training on drafting software to draw part models.
- To demonstrate the concepts of orthographic and isometric projections.
- To use drawing skills for communicating concepts, ideas for engineeringproduct design.
- Use pictorial views to visualize and draw the isometric view of the objects.

UNIT I	INTRODUCTION TO CONVENTIONS IN ENGINEERING DRAWING AND CONIC SECTIONS	9

Introduction to Engineering Drawing - Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Conic curves - Ellipse, Parabola and Hyperbola by Eccentricity method.

(Theory - 3)

Drawing of a title block with necessary text, projection symbol and lettering using drafting software.
Drafting of Conic curves - Ellipse, Parabola and Hyperbola

(Laboratory - 6)

UNIT II	ORTHOGRAPHIC PROJECTION	9

Visualization concepts and Orthographic Projection - Layout of views – Orthographic Projection- Conversion of pictorial diagram into orthographic views.

(Theory - 3)

Drawing orthographic view of simple solids like Prism, Pyramids, Cylinder, Cone, etc, and dimensioning.
Drawing of orthographic views from the given pictorial diagram.

(Laboratory -6)

UNIT III	PROJECTION OF PLANES	9

Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method.

(Theory - 3)

Drawing of plane Surface inclined to HP.
Drawing of plane Surface inclined to VP.

(Laboratory -6)

UNIT IV	PROJECTION OF SOLIDS	9

Projection of simple solids like Prisms, Pyramids, Cylinder and Cone when the axis is inclined to HP by rotating object method.

(Theory - 3)

Drawing of simple solids like prism and pyramids when the axis is inclined to HP.
Drawing of simple solids like cylinder and cone when the axis is inclined to HP.

(Laboratory -6)

UNIT V	ISOMETRIC DRAWING	9

Principles of isometric view – Isometric view of simple solids – Prism, Pyramid, Cylinder and Cone.

(Theory - 3)

Drawing isometric projection of simple solids.
Modeling of 2D to 3D objects using drafting software.

(Laboratory -6)

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students will be able to:

CO1: Explain the various engineering standards required for drafting and explore knowledge in conic sections.
CO2: Draw the orthographic views of 3Dprimitive objects.
CO3: Describe the projection of plane surfaces by the rotating plane method.
CO4: Apply the projection concepts and drafting tools to draw projections of solids. **CO5:** Sketch the pictorial views of the objects using CAD tools.

TEXT BOOKS:

1. Natarajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 33rd Edition, 2020.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 15th Edition, 2019.

REFERENCES:

1. Bhatt N.D. “Engineering Drawing”, Charotar Publishing House, 53rd edition ,2019.
2. BasantAgarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 3rd Edition, 2019.
3. Engineering Drawing Practice for Schools and Colleges BIS SP46:2003 (R2008), Published by Bureau of Indian Standards (BIS), 2008.
4. Parthasarathy. N.S and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2019.
5. Gopalakrishna. K.R., Engineering Drawing Vol. 1 & 2, Subhas Publications, 27th Edition, 2017.

LIST OF EQUIPMENTS:

22ME211	PRODUCT DEVELOPMENT LAB - 1 (Common to All Branches)	L	T	P	C
		0	0	2	1

The students may be grouped into 3 to 4 and work under a project supervisor. The device/system/component/prototype Idea to be developed by the students and a final presentation to be done by the students about the idea generated at the end of the semester.

OBJECTIVES:

The Course will enable learners to:

- Understand the functionalities and limitation of various machine/equipment
- Demonstrate various operations that can be performed to machines
- Summarize the basic principles of machines to convert their ideas into products

I 1. Study of Manufacturing Processes (Carpentry, Plumbing, Machines and Welding).
2. Study of fundamental operations of 3D Printer and Scanner with Software.
3. Study of Smart Machining (CNC and Laser cutting) and Engraving Techniques.

II 1. Study of Fundamental of Circuit Design.
2. Study of PCB Milling Machine.
3. Study of Soldering and Desoldering.

III 1. Study of Computer Peripheral Devices (Processing Information Devices)

IV 1. Present the Product Idea Presentation - Phase – I.

TOTAL: 30 PERIODS

Note:

The students can select the prototype to be made of their choice after learning the above exercises.

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand the concept of manufacturing processes.

CO2: Describe the working of the machine element.

CO3: Discuss the various applications of engineering materials

CO4: Summarize the basics of core engineering concepts.

CO5: Describe the process for converting ideas into products

LIST OF EQUIPMENTS:

1. CNC Router – 1 No.
2. 3D Printer – 1 No.
3. 3D Scanner – 1 No.
4. Laser cutting Machine – 1 No.
5. Centre lathe – 2 Nos.
6. Arc welding transformer with cables and holders – 2 Nos.
7. Plumbing tools – 2 Nos.
8. Carpentry tools – 2 Nos.
9. Multimeter – 10 Nos.
10. Drilling Machine – 1 No.
11. Solder Stations 5 Sets
12. Desoldering Machine – 1 No.
13. PCB Milling Machine – 1 No.
14. Variable Power Supply – 1 No.
15. Electronic Components like Resistors, Transistors, Diode, Inductor, Capacitor, etc. – 10 Sets
16. Personal Desktop Computers – 30 Nos.

SEMESTER – II

22MA201	TRANSFORMS AND NUMERICAL METHODS (Common to CSE / IT / ADS / CSD)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- Introduce the concepts of Laplace transforms and Z-transforms.
- Illustrate the application of transforms in solving differential and difference equations.
- Explain the Numerical methods for handling algebraic and transcendental equations.
- Introduce the numerical techniques for interpolation, differentiation and integration.

UNIT I	LAPLACE TRANSFORMS	15

Laplace transforms – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions – Derivatives and integrals of transforms –Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transform – Convolution theorem (Statement only).

Theory: 9

Experiments using SCILAB:

1. Finding Laplace transform of a function.
2. Finding inverse Laplace Transforms.
3. Determine the input for given output function of Laplace Transform.

Laboratory: 6

UNIT II	Z – TRANSFORMS	15

Z-transforms – Elementary properties – Inverse Z-transforms – partial fractions method – residues method – Convolution theorem.

Theory: 9

Experiments using SCILAB:

1. Finding Z –transform of a sequence.
2. Finding convolution of two sequences.
3. Plotting the input and output function of Z transform.

Laboratory: 6

UNIT III	SOLUTION OF DIFFERENTIAL AND DIFFERENCE EQUATIONS	15

Solution of linear ordinary differential equation of second order with constant coefficients and first order simultaneous equations with constant coefficients using Laplace transform. Formation of difference equations – Solution of first and second order difference equations with constant coefficients using Z-transform.

Theory: 9

Experiments using SCILAB:

1. Solving second order Ordinary Differential Equation.
2. Finding the Laplace transform and its inverse of a function numerically.
3. Finding the Z-transform numerically

Laboratory: 6

UNIT IV	SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS	15

Solution of algebraic and transcendental equations by Newton Raphson method - Solution of linear system of equations – Gauss elimination method – Gauss Jordan method – Gauss Seidel Iterative method– Eigenvalues of a matrix by Power method.

Theory: 9

Experiments using SCILAB:

1. Finding the real roots of algebraic and transcendental equations using Newton Raphson method.
2. Finding the largest Eigenvalue by power method.
3. Solving system of linear equations using Gauss Seidel Method.

Laboratory: 6

UNIT V	NUMERICAL DIFFERENTIATION AND INTEGRATION	15

Finite differences – Forward and Backward differences – Interpolation – Newton's forward and backward interpolation formulae - Lagrange's interpolation for unequal intervals - Numerical Differentiation - Newton's and Lagrange's formulae - Numerical integration using Trapezoidal and Simpson's 1/3 rules – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

Theory: 9

Experiments using SCILAB:

1. Finding approximately the missing value using Lagrange interpolation.
2. Evaluating line integrals by trapezoidal rule.
3. Evaluating line integrals by Simpson's rule.

Laboratory: 6

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Determine Laplace transform and inverse transform of simple functions.

CO2: Determine Z- transform and inverse transform of simple functions.

CO3: Solve ordinary differential equations using Laplace transform and difference equations using Z-Transform.

CO4: Compute the solutions of algebraic, transcendental and the system of equations.

CO5: Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.

TEXT BOOKS:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES:

1. Erwin. Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Jain R.K. and Iyengar S. R. K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics", Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.
4. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.
5. Sastry S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

LIST OF EQUIPMENTS:
1. SCILAB - Open source

22CS201	**DATA STRUCTURES (Common to CSE / IT / ADS / CSD)**	**L**	**T**	**P**	**C**
		3	**0**	**2**	**4**

OBJECTIVES:

The Course will enable learners to:

- To understand the concepts of List ADT.
- To learn linear data structures – stacks and queues ADTs.
- To understand and apply Tree data structures.
- To understand and apply Graph structures.
- To analyze sorting, searching and hashing algorithms.

UNIT I	**LINEAR DATA STRUCTURES – LIST**	**15**

Algorithm analysis - running time calculations - Abstract Data Types (ADTs) – List ADT – array- based implementation – linked list implementation – singly linked lists - circularly linked lists - doubly-linked lists – applications of lists – Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

List of Exercises:

- Array implementation of List ADTs.
- Linked list implementation of List ADTs.

UNIT II	**LINEAR DATA STRUCTURES – STACKS, QUEUES**	**15**

Stack ADT – Stack Model - Implementations: Array and Linked list - Applications - Balancing symbols - Evaluating arithmetic expressions - Conversion of Infix to postfix expression - Queue ADT – Queue Model - Implementations: Array and Linked list - applications of queues - Priority Queues – Binary Heap – Applications of Priority Queues.

List of Exercises:

- Array implementation of Stack and Queue ADTs.
- Linked list implementation of Stack and Queue ADTs.
- Applications of List – Polynomial manipulations
- Applications of Stack – Infix to postfix conversion and expression evaluation.

UNIT III	**NON LINEAR DATA STRUCTURES – TREES**	**15**

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT– AVL Tree.

List of Exercises:

- Implementation of Binary Trees and operations of Binary Trees.
- Implementation of Binary Search Trees.
- Implementation of Heaps using Priority Queues.

UNIT IV	**NON LINEAR DATA STRUCTURES - GRAPHS**	**15**

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Applications of graphs – BiConnectivity – Euler circuits.

List of Exercises:

- Graph representation and Traversal algorithms.

UNIT V	**SEARCHING, SORTING AND HASHING TECHNIQUES**	**15**

Searching- Linear Search - Binary Search - Sorting - Bubble sort - Selection sort - Insertion sort – Hashing - Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

List of Exercises:

- Implement searching and sorting algorithms.

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Implement abstract data types for list.
CO2: Solve real world problems using appropriate linear data structures.
CO3: Apply appropriate tree data structures in problem solving.
CO4: Implement appropriate Graph representations and solve real-world applications.
CO5: Implement various searching and sorting algorithms.

TEXT BOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 4th Edition, Pearson Education, 2014.
2. Sartaj Sahni, "Data Structures, Algorithms and Applications in C++", Silicon paper publications, 2004.

REFERENCES:

1. Rajesh K. Shukla, "Data Structures using C and C++", Wiley India Publications, 2009.
2. Narasimha Karumanchi, "Data Structure and Algorithmic Thinking with Python: Data Structure and Algorithmic Puzzles", CareerMonk Publications, 2020.
3. Jean-Paul Tremblay and Paul Sorenson, "An Introduction to Data Structures with Application", McGraw-Hill, 2017.
4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in Java", Third Edition, Pearson Education, 2012.
5. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.
6. Ellis Horowitz, Sartaj Sahni, Dinesh P Mehta, "Fundamentals of Data Structures in C++", Second Edition, Silicon Press, 2007.
7. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013501578165051392105 84/overview

LIST OF EQUIPMENTS:

Systems with Linux/Ubuntu Operating System with gnu C++ compiler

22PH201	PHYSICS FOR COMPUTER SCIENCE AND INFORMATION TECHNOLOGY (Common to All Branches)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- Learn the fundamental concepts of Physics and apply this knowledge to scientific, engineering and technological problems.
- Make the students enrich basic knowledge in electronics and quantum concepts and apply the same in computing fields.

UNIT I	LASER AND FIBRE OPTICS	15

Population of energy levels – Einstein's A and B coefficients derivation - Resonant cavity - Optical amplification (qualitative) - Semiconductor lasers: homojunction and

heterojunction- Engineering applications of lasers in data storage (qualitative).
Fibre optics: Principle and propagation of light through optical fibre - V-number - Types of optical fibres (Material, refractive index and mode) - Losses in optical fibre - Fibre optic communication - Fibre optic sensors (pressure and displacement).

(Theory -9)

List of Experiments:

1. Determination of divergence of laser beam
2. Determination of acceptance angle and numerical aperture of an optical fibre

(Laboratory -6)

UNIT II	ELECTRON THEORIES OF MATERIALS	15

Classical free electron theory - Expressions for electrical conductivity and thermal conductivity - Wiedemann-Franz law - Success and failures of CFT- Effect of temperature on Fermi function- Density of energy states and average energy of electron at 0 K - Energy bands in solids.

(Theory -9)

List of Experiments

1. Determination of thermal conductivity of a bad conductor by Lee's disc method
2. Measurement of the internal resistance using potentiometer

(Laboratory -6)

UNIT III	SEMICONDUCTOR PHYSICS	15

Intrinsic Semiconductors – E-kdiagram-Direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors- Band gap determination-Extrinsic semiconductors - Carrier concentration in n-type and p-type semiconductors -Electrical conductivity of intrinsic and extrinsic semiconductors -Variation of Fermi level with temperature and impurity concentration - Hall effect and its applications.

(Theory -9)

List of Experiments

1. Bandgap determination of intrinsic semiconductor.
2. Determination of wavelength of semiconductor laser

(Laboratory - 6)

UNIT IV	INTRODUCTION TO NANO DEVICES AND QUANTUM COMPUTING	15

Introduction to nanomaterial -Electron density in a bulk material - Size dependence of Fermi energy - Quantum confinement - Quantum structures - Density of states in quantum well, quantum wire and quantum dot structures - Band gap of nanomaterial.
Quantum computing: Quantum states - classical bits - quantum bits or qubits - CNOT gate - multiple qubits - Bloch sphere - quantum gates - advantages of quantum computing over classical computing.

(Theory - 9)

List of Experiments

1. Synthesis of nanoparticles by sol-gel method
2. Determination of particle size using laser source

(Laboratory - 6)

UNIT V	MAGNETIC AND SUPERCONDUCTING MATERIALS	15

Introduction- Bohr magneton -magnetic dipole moment - origin of magnetic moments - types of magnetic materials-Ferromagnetism: Domain Theory - antiferromagnetism - ferrimagnetism - magnetic principle in computer data storage - Magnetic hard disc (GMR

sensor) - Introduction to spintronics.
Superconducting materials – properties, types of superconductors, applications – SQUID and MAGLEV trains - *superconducting qubits in quantum computing.*

(Theory -9)

List of Experiments

1. Determination of hysteresis loss using B-H loop
2. Determination of magnetic susceptibility of a paramagnetic liquid using Quincke's apparatus

(Laboratory -6)

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Discuss the basic principles of working of laser and their applications in fibre optic communication

CO2: Summarize the classical and quantum electron theories and energy band structures

CO3: Describe the conductivity in intrinsic and extrinsic semiconductors and importance of Hall effect measurements

CO4: Associate the properties of nanoscale materials and their applications in quantum computing

CO5: Interpret the properties of magnetic and superconducting materials and their applications in computer data storage

TEXT BOOKS:

1. **S.O. Kasap**,Principles of Electronic Materials and Devices, McGraw-Hill Education (Indian Edition) 2020.
2. **Jasprit Singh**, Semiconductor Devices: Basic Principles, Wiley (Indian Edition) 2007.
3. **Parag K Lala**, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition) 2020.

REFERENCES:

1. **R.P. Feynman**, The Feynman Lectures on Physics - Vol. II, The New Millennium Edition, 2012.
2. **M.A.Wahab**, Solid State Physics, 3rd Edition, Narosa Publishing House Pvt. Ltd., 2015.
3. **B.Rogers, J. Adams and S.Pennathur**,Nanotechnology: Understanding Small System, CRC Press, 2014.
4. **C.P. Williams,** Explorations in Quantum Computing, Springer-Verlag London, 2011.
5. **Wilson J.D. and Hernandez C.A.,** Physics Laboratory Experiments, Houghton Mifflin Company, New York 2005.
6. **Department of Physics,** Physics laboratory manual, R.M.K. Group of Institutions, 2021.

LIST OF EQUIPMENTS:		
1.	Semiconductor Laser	6 Nos.
2.	Determination of optical fibre parameters	6 Nos.
3.	Lee's disc apparatus	6 Nos.
4.	Potentiometer	6 Nos.
5.	Bandgap determination set up	6 Nos.
6.	Sol-gel synthesis	2 Nos.
7.	B-H loop set-up	5 Nos.
8.	Quincke's apparatus	2 Nos.

22HS101	PROFESSIONAL COMMUNICATION (Common to All Branches)	L	T	P	C
		2	0	2	3

OBJECTIVES:

The Course will enable learners to:

- Strengthen basic reading and writing skills.
- Comprehend listening contexts competently.
- Inculcate reading habit and develop effective reading skills.
- Improve active and passive vocabulary.
- Acquire speech clarity with right pronunciation.
- Develop vocabulary of a general kind and enhance grammatical accuracy.
- Imbibe Content and Language Integrated Learning (CLIL).

UNIT I	FORMAL AND INFORMAL COMMUNICATION	12

Listening: Short Texts, Short Formal and Informal Conversations
Speaking: Self Introduction, Exchanging Personal Information
Reading: Practice in Skimming, Scanning and Predicting, Reading Comprehension
Writing: Free Writing, Hints Development
Grammar: Parts of Speech, Prepositions.
Vocabulary: Compound Nouns, Technical Words.

(Theory 6)

1. Familiarization of Vowel Sounds-Monophthongs, Diphthongs and Consonant Sounds
2. Listening to Formal Conversations in British and American Accents
3. Guided Writing

(Laboratory 6)

UNIT II	GRAMMAR AND LANGUAGE DEVELOPMENT	12

Listening: Telephonic Conversations.
Speaking: Sharing information of a personal kind - Greetings – Taking leave.
Reading: Short comprehension passages - Pre-reading and Post-reading (multiple choice questions shortquestions / open and close ended questions)
Writing: Instructions, Recommendations, Checklists
Grammar: Tenses, Framing 'Wh' & 'Yes' or 'No' questions
Vocabulary: Numerical Adjectives, Collocations

. (Theory 6)

1. Communication Etiquettes
2. Self -Introduction using SWOT Analysis

(Laboratory 6)

UNIT III	BASIC TECHNICAL WRITING AND STUDY SKILLS	12

Listening: Listening to longer texts and filling up the tables
Speaking: Asking about routine actions and expressing opinions

Reading: Short texts (Cloze Test)
Writing: Formal letters, E-mail writing, Interpretation of Charts and Graphs
Grammar: Cause and Effect expressions**,** Conditional Clauses
Vocabulary: Often misspelled and confusing words

(Theory 6)

Mechanics of Reading Skills
News Reading–Cloze Tests

(Laboratory 6)

UNIT IV	GROUP DISCUSSION AND JOB APPLICATIONS	12

Listening: Listening to recorded dialogues of conversations and completing exercises based on them
Speaking: Discussion on Social issues.
Reading: Reading text from magazines
Writing: Purpose Expressions, Letter of Application, Minutes of Meeting.
Grammar: Modal Verbs, Subject-Verb agreement
Vocabulary : Sequence Words

(Theory 6)

1. Group Presentation, Group Discussion: Do's and Don'ts of GroupDiscussion
2. Discussions on failure and success in interviews of famous personalities Spotting Errors

(Laboratory 6)

UNIT V	ART OF REPORTING	12

Listening: Listening to TED talks
Speaking: Debate & Presentations
Reading: Biographies
Writing: Definitions (Single line & Extended), Report Writing (Industrial visit, Accident and Feasibilityreports)
Grammar: Reported speech
Vocabulary : Verbal Analogies (Theory 6)
1. Writing based on listening to academic lectures and discussions
2. Leadership skills, Negotiation skills
3. Mechanics of Report Writing

(Laboratory 6)

LIST OF PROJECTS

1. Create a podcast on a topic that will be interesting to college students
2. Read and Review (Movie/Book/Technical Article)
3. Presentation on Social Issues
4. Submit a report on "Global English: A study"

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Comprehend conversations and short talks delivered in English
CO2: Participate efficiently in informal conversations and develop an awareness of the self and apply well-defined techniques
CO3: Read articles of a general kind in magazines and newspapers efficiently
CO4: Write short general essays, personal letters and E-mails in English CO5: Develop vocabulary of a general kind by enriching reading skills

TEXT BOOKS:

1. **Kumar, Suresh E, & Sreehari, P.** *Communicative English*. Orient Black Swan, 2007.
2. **Richards, Jack C.** Interchange Students' Book-2 New Delhi: CUP,2015.

REFERENCES:

1. **Bailey, Stephen.** Academic Writing: *A practical guide for students*. New York: Rutledge,2011.
2. **Dhanavel, S P.** English and Soft Skills, Volume Two, Orient Black Swan.
3. **Elbow, Peter.** *Writing Without Teachers*. London: Oxford University Press, 1973.
4. **Larsen, Kristine.** *Stephen Hawking*: *A Biography*, Greenwood: Publishing Group, 2005.
5. **Redston, Chris & Gillies Cunningham.** Face2Face (Pre- intermediate Students' Book &Workbook) Cambridge University Press, New Delhi: 2005.
6. Lewis, Norman. Word Power Made Easy, Latest Edition: Penguin Random House India: 2015

WEB REFERENCES:

1. Basics of Business Communication
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012688768083632128308_shared/overview
2. communicating to Succeed
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012686653619175424640_shared/overview
3. Business English
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012683227498151936279_shared/overview
   https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013267708367904768573/overview (lab support)
4. Business Writing
   https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012689477601009664 33_shared/overview
5. Email Etiquettes
   https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013294623865561088176 82_shared/overview
6. Email Writing Skills
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012689543630135296 66_shared/overview
7. Time Management
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012985921210736640721_shared/overview
8. Understanding Body Language
   https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012979737651445760246 89_shared/overview

9. ONLINE RESOURCES:
   https://infyspringboard.onwingspan.com/web/en/page/home

LIST OF EQUIPMENTS:

1.

22CS202	JAVA PROGRAMMING (Common to CSE / IT / ADS / CSD)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To explain object oriented programming concepts and fundamentals of Java
- To apply the principles of packages, interfaces and exceptions
- To develop a Java application with I/O streams, threads and generic programming
- To build applications using strings and collections.
- To apply the JDBC concepts

UNIT I	JAVA FUNDAMENTALS	15

An Overview of Java - Data Types, Variables, and Arrays – Operators - Control Statements – Class Fundamentals – Declaring objects – Methods – Constructors – this keyword – Overloading methods - Overloading constructors - Access Control – Static – Final

List of Exercises:

1. Develop a Java application to generate Electricity bill. You must use one super class called EB Bill and must have two sub classes namely Domestic Bill and Commercial Bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff

If the type of the EB connection is domestic, calculate the amount to be paid as follows:
First 100 units - Rs. 1 per unit
101-200 units - Rs. 2.50 per unit 201 -500 units - Rs. 4 per unit
> 501 units - Rs. 6 per unit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:
First 100 units - Rs. 2 per unit
101-200 units - Rs. 4.50 per unit 201 -500 units - Rs. 6 per unit
> 501 units - Rs. 7 per unit

2. Arrays Manipulations: (Use Methods for implementing these in a Class)

a. Find kth smallest element in an unsorted array
b. Find the sub array with given sum
c. Matrix manipulations – Addition, Subtraction, Multiplication
d. Remove duplicate elements in an Array
e. Accept an integer value N and print the Nth digit in the integer sequence 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and so on till infinity.

Example: The 11th digit in the sequence 12345678910111213…. is 0.

UNIT II	INHERITANCE, INTERFACES AND EXCEPTION HANDLING	15

Inheritance: Inheritance basics, Using super, Method Overriding, Using Abstract Classes, Using final with Inheritance - Package and Interfaces: Packages, Packages and member access, Importing Packages, Interfaces, Static Methods in an Interface – Exception Handling: Exception- Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions.

List of Exercises:

1. Develop a Java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages.

2. Develop a Java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
3. Design a Java interface for ADT Stack. Implement this interface using array and built-in classes. Provide necessary exception handling in both the implementations.
4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains the methods print Area () that prints the area of the given shape and Numberofsides() that prints the number of sides of the given shape.
5. Write a Java program to apply built-in and user defined exceptions.

UNIT III	MULTITHREADING, I/O AND GENERIC PROGRAMMING	15

Multithreaded Programming: Creating a Thread, Thread Priorities, Synchronization, Interthread Communication – I/O: I/O Basics, Reading Console Input, Writing Console Output, Reading and Writing Files – Generics: Introduction, Generic class, Bounded Types, Generic Methods, Generic Interfaces, Generic Restrictions.

List of Exercises:

1.Write a Java program to read and copy the content of one file to other by handling all file related exceptions.

UNIT IV	STRING HANDLING AND COLLECTIONS	15

Lambda Expressions - String Handling – Collections: The Collection Interfaces, The Collection Classes – Iterator – Map - Regular Expression Processing.

List of Exercises:

1.String Manipulation:

a. Reversing a set of words and count the frequency of each letter in the string.
b. Pattern Recognition - Find the number of patterns of form 1[0]1 where [0] represents any number of zeroes (minimum requirement is one 0) there should not be any other character except 0 in the [0] sequence in a given binary string.
c. Remove all the occurrences of string S2 in string S1 and print the remaining.
d. Find the longest repeating sequence in a string
e. Print the number of unique string values that can be formed by rearranging the letters in the string S.

2. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
3. Collections:

a. Write a program to perform string operations using ArrayList. Write functions for the following

i. Append - add at end
ii. Insert – add at particular index
iii. Search
iv. List all string starts with given letter

b. Find the frequency of words in a given text.

UNIT V	JDBC CONNECTIVITY	15

JDBC – DataSource, Configurations, Connection, Connection Pools, Driver Types, ResultSet, Prepared Statement, Named Parameter, Embedded SQL (Insert, Update, Delete, Join, union etc), ResultSet Navigation, Connection Close and Clean up.

List of Exercises:

- Mini Project (using JDBC)

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand the object oriented programming concepts and fundamentals of Java.
CO2: Develop Java programs with the packages, interfaces and exceptions.
CO3: Build Java applications with I/O streams, threads andgenerics programming.
CO4: Apply strings and collections in developing applications.
CO5: Implement the concepts of JDBC.

TEXT BOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, 2019.

REFERENCES:

1. Cay S. Horstmann, Gary Cornell, "Core Java Volume – I Fundamentals", 11th Edition, Prentice Hall, 2019.
2. Paul Deitel, Harvey Deitel, Java SE 8 for programmers, 3rd Edition, Pearson, 2015.
3. Steven Holzner, Java 2 Black book, Dream tech press, 2011.
4. Timothy Budd, Understanding Object-oriented programming with Java, Third Edition, Pearson Education, 2008.
5. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_29959473947367270000_shared/overview

LIST OF EQUIPMENTS:

1. Java and Eclipse / NetBeans IDE or Equivalent

22IT202	DATABASE MANAGEMENT SYSTEM (Common to CSE / IT / ADS / CSD)	L	T	P	C
		3	0	2	4

OBJECTIVES:

The Course will enable learners to:

- To understand the basic concepts of Data modeling and Database Systems.
- To understand SQL and effective relational database design concepts.
- To learn relational algebra, calculus and normalization.
- To know the fundamental concepts of transaction processing, concurrency control techniques, recovery procedure and data storage techniques.
- To understand query processing, efficient data querying and advanced databases.

UNIT I	DATABASE CONCEPTS	15

Concept of Database and Overview of DBMS - Characteristics of databases - Data Models, Schemas and Instances - Three-Schema Architecture - Database Languages and Interfaces -

Introductions to data models types - ER Model- ER Diagrams - Enhanced ER Model - reducing ER to table Applications: ER model of University Database Application – Relational Database Design by ER- and EER-to-Relational Mapping.

List of Exercises:

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements

UNIT II	STRUCTURED QUERY LANGUAGE	15

SQL Data Definition and Data Types – Constraints – Queries – INSERT, UPDATE, and DELETE in SQL - Views - Integrity Procedures, Functions, Cursor and Triggers - Embedded SQL - Dynamic SQL.

List of Exercises:

1. Database Querying – Simple queries, Nested queries, Sub queries and Joins
2. Views, Sequences, Synonyms
3. Database Programming: Implicit and Explicit Cursors

UNIT III	RELATIONAL ALGEBRA, CALCULUS AND NORMALIZATION	15

Relational Algebra – Operations - Domain Relational Calculus- Tuple Relational Calculus - Fundamental operations.

Relational Database Design - Functional Dependency – Normalization (1NF, 2NF 3NF and BCNF) – Multivalued Dependency and 4NF – Joint Dependencies and 5NF - De-normalization.

List of Exercises:

1. Procedures and Functions
2. Triggers

UNIT IV	TRANSACTIONS, CONCURRENCY CONTROL AND DATA STORAGE	15

Transaction Concepts – ACID Properties – Schedules based on Recoverability, Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Transaction Recovery – Concepts – Deferred Update – Immediate Update. Organization of Records in Files – Unordered, Ordered – Hashing Techniques – RAID – Ordered Indexes – Multilevel Indexes - B+ tree Index Files – B tree Index Files.

List of Exercises:

1. Exception Handling
2. Database Design using ER modeling, normalization and Implementation for any application
3. Database Connectivity with Front End Tools

UNIT V	QUERY OPTIMIZATION AND ADVANCED DATABASES	15

Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics.

Distributed Database Concepts – Design – Concurrency Control and Recovery – NOSQL Systems – Document-Based NOSQL Systems and MongoDB.

List of Exercises:

1. Case Study using real life database applications anyone from the following list

a) Inventory Management for a EMart Grocery Shop
b) Society Financial Management

c) Cop Friendly App – Eseva
d) Property Management – eMall
e) Star Small and Medium Banking and Finance

● Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.
● Apply Normalization rules in designing the tables in scope.
● Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features.
● Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.
● Ability to showcase ACID Properties with sample queries with appropriate settings

TOTAL: 75 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Map ER model to Relational model to perform database design effectively.
CO2: Implement SQL and effective relational database design concepts.
CO3: Apply relational algebra, calculus and normalization techniques in database design.
CO4: Understand the concepts of transaction processing, concurrency control, recovery procedure and data storage techniques.
CO5: Apply query optimization techniques and understand advanced databases.

TEXT BOOKS:

1. Elmasri R. and S. Navathe, "Fundamentals of Database Systems", Pearson Education, 7th Edition, 2016.
2. Abraham Silberschatz, Henry F.Korth, "Database System Concepts", Tata McGraw Hill , 7th Edition, 2021.

REFERENCES:

1. Elmasri R. and S. Navathe, Database Systems: Models, Languages, Design and Application Programming, Pearson Education, 2013.Raghu Ramakrishnan, Gehrke "Database Management Systems", MCGraw Hill, 3rd Edition 2014.
2. Plunkett T., B. Macdonald, "Oracle Big Data Hand Book" , McGraw Hill, First Edition, 2013
3. Gupta G K , "Database Management Systems" , Tata McGraw Hill Education Private Limited, New Delhi, 2011.
4. C. J. Date, A.Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2015.
5. Maqsood Alam, Aalok Muley, Chaitanya Kadaru, Ashok Joshi, Oracle NoSQL Database: Real-Time Big Data Management for the Enterprise, McGraw Hill Professional, 2013.
6. Thomas Connolly, Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation and Management", Pearson, 6th Edition, 2015.
7. Database Management System Part – 1
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0127580666728202 2456_shared/overview
8. Database Management System Part – 2
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012767300562919 4241_shared/overview
9. Online Resources:

https://infyspringboard.onwingspan.com/web/en/page/home
LIST OF EQUIPMENTS:
1. MySql and Eclipse / NetBeans IDE or Equivalent

22ME211	PRODUCT DEVELOPMENT LAB - 2 (Common to All Branches)	L	T	P	C
		0	0	2	1

The students may be grouped into a batch of strength 3 or 4 to work under a project supervisor. The student batches should study the device/system/component and will do literature review to develop prototype idea. Further at the end of the semester they will make a final presentation to exhibit the conceptual design skills and the process to develop a product.

OBJECTIVES:

The Course will enable learners to:

- Use the innovative design methodology to articulate the product concepts.
- Summarize the requisite Engineering Principles for transforming concepts into products.
- Conduct basic tests to extract the qualitative and quantitative performance factors.

List of Exercise/Experiments

1. Study of Basic Engineering Design Concepts.
2. Conduct a literature survey on the implementation of the design concepts.
3. Prepare the design concepts for an identified literature gap.
4. Present the Product Idea Presentation – Phase II.

TOTAL: 30 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand the working and capacity of various engineering systems.
CO2: Infer the outcomes in the product development process.
CO3: Perform basic engineering and material characterization tests.
CO4: Demonstrate the ability to provide conceptual design strategies for a product.
CO5: Implement the Science, Engineering, Technology and Mathematics (STEM) for product design.

LIST OF EQUIPMENTS:

22CH104	ENVIRONMENTAL SCIENCE AND SUSTAINABILITY (Common to All Branches)	L	T	P	C
		2	0	0	MC

OBJECTIVES:

The Course will enable learners to:

- To gain knowledge of the environment and various natural resources.
- To identify the Scientific and Technological solutions to pollution issues and waste management.
- To understand the significance of the conservation of biodiversity.
- To recognize the needs and benefits of sustainability and its management.
- To comprehend the effects of human population on the environment.

UNIT I	NATURAL RESOURCES	7

Definition, scope and importance of environment – need for public awareness. Introduction to natural resources - Types - Forest resources: Use and over-exploitation, deforestation and its impacts, Food resources: effects of modern agriculture, organic farming, Renewable energy sources - Solar, Wind, Geothermal, Tidal, OTE and Biomass.

Field activity -Tree plantation

UNIT II	POLLUTION AND WASTE MANAGEMENT	7

Pollution - Definition –causes, effects and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Noise pollution (e) Nuclear hazards - nuclear accidents and holocaust -Role of an individual in prevention of pollution –Case studies.

Waste management- Municipal solid wastes, e- waste, plastic waste.

Field study – Solid waste management of the institution

UNIT III	BIODIVERSITY AND ITS CONSERVATION	6

Biodiversity: types – values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species, extinct, rare, vulnerable species of India – conservation of biodiversity: In-situ and ex-situ method.

Field study – Biodiversity of the institution

UNIT IV	SUSTAINABILITY AND MANAGEMENT	5

Sustainability-concept, needs and challenges-Circular economy -Sustainable Development Goals- Concept ofCarbon footprint, Environmental Impact Assessment, Clean Development Mechanism, solutions.

Field study – Carbon footprint of the institution

UNIT V	HUMAN POPULATION	5

Introduction - Population growth, variation among nations,population explosion, Environment and human health – endemic/epidemic/pandemic– Role of information technology in environment and human health.

Case Study – Pandemics of 21st century

TOTAL: 30 PERIODS

OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Investigate and use conservational practices to protect natural resources.

CO2: Identify the causes of pollutants and illustrate suitable methods for pollution abatement.

CO3: Adapt the values of biodiversity and its conservation methods.

CO4: Recognize suitable sustainable development practices and apply it in day-to-day life.

CO5: Assess the impacts of human population and suggest suitable solutions.

TEXT BOOKS:

1. Anubha Kaushik and C.P. Kaushik, "Perspectives in environmental studies",New Age International Publishers,2nd edition, 2021.
2. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill, New Delhi, 2017.
3. Gilbert M.Masters, Introduction to Environmental Engineering and Science, 3rd edition, Pearson Education, 2014.
4. Erach Bharuch, Textbook of Environmental Studies for Undergraduate Courses, Third Edition, Universities Press(I) Pvt. Ltd., Hyderabad, 2021.

REFERENCES:

1. William P.Cunningham & Mary Ann Cunningham Environmental Science: A Global Concern, McGraw Hill, 14th edition, 2017.
2. Rajagopalan, R, Environmental Studies-From Crisis to Cure, Oxford University Press, 2015.
3. G. Tyler Miller and Scott E. Spoolman, ―Environmental Science, Cengage Learning India Pvt, Ltd., Delhi, 2014.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall, 2012.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning, 2015.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006 and subsequent amendments, 2022