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. – COMPUTER SCIENCE AND ENGINEERING
REGULATIONS – 2022
CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. Apply the principles and practices of Computer Science and Engineering encompassing Mathematics, Science and Basic Engineering and to employ the modern engineering tools effectively in their profession with their world class technical competence.
2. Possess expertise to function as members of multi-disciplinary teams and implement software technology solutions for real world problems of international standards and will be achievers at global level.
3. Excel in the field of software industry or in higher studies endowed with the spirit of innovation and entrepreneurship by evolving their professional knowledge on a lifelong basis.
4. Practice the profession with ethics, integrity, leadership and social responsibility with a good insight of the changing societal needs for the benefit of humanity.

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 of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs 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 and understanding 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:

1. Apply knowledge acquired from the basic hardware design and software core areas of Computer Science and Engineering for solving real world problems.
2. Apply cutting edge technologies and strong analytical skills to develop quality software in scientific and business applications for the betterment of society and Industry.
3. Employ modern computer languages, environments and platforms in creating innovative career paths to be an entrepreneur and with a zeal for higher studies.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

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

following 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	3	3	3	3	2	2	2	3	3	3	2	1
IV	2	2	2	2	2	3	2	3	3	1	1	1

MAPPING OF PROGRAM SPECIFIC OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Objectives and the outcomes is given in 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	2	1	1	1	3	3	1	3
II	3	3	3	3	2	2	1	2	3	3	2	3
III	3	3	3	3	2	2	2	2	3	3	2	3

Contribution   1: Reasonable   2: Significant   3: Strong

Year	Semester	Course	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
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	Discrete Mathematics	✓	✓	✓	✓								
		Universal Human Values II: Understanding Harmony						✓	✓	✓	✓	✓	✓	✓
		Advanced Java Programming	✓	✓	✓	✓					✓	✓	✓		✓

Year	Semester	Course	1	2	3	4	5	6	7	8	9	10	11	12
		Computer Organization and Architecture	✓	✓	✓	✓	✓			✓	✓	✓		✓
		Design and Analysis of Algorithms	✓	✓	✓	✓	✓			✓	✓	✓		✓
		Operating Systems	✓	✓	✓	✓	✓			✓	✓	✓		✓
		Product Development Lab - 3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Aptitude and Coding Skills I	✓	✓							✓	✓		
		Internship/Seminar*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Value Education (Non Credit)												
	SEMESTER IV	Microcontrollers and Embedded Systems	✓	✓	✓	✓	✓			✓	✓	✓		✓
		Probability and Statistics	✓	✓	✓	✓								
		Distributed and Cloud Computing	✓	✓	✓	✓	✓			✓	✓	✓		✓
		Web Development Frameworks	✓	✓	✓	✓	✓			✓	✓	✓		✓
		Artificial Intelligence	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Professional Elective I												
		Aptitude and Coding Skills II	✓	✓							✓	✓		
		Mini Project and Design Thinking Practices Lab	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Communication Lab									✓	✓		✓
		Yoga/Personality Development												
YEAR III	SEMESTER V	Computer Networks	✓	✓	✓		✓			✓	✓	✓		✓
		Theory of Computation	✓	✓	✓		✓			✓	✓	✓		✓
		Machine Learning	✓	✓	✓		✓			✓	✓	✓		✓
		Professional Elective II												
		Professional Elective III												
		Open Elective I												
		Advanced Aptitude and Coding Skills I	✓	✓	✓						✓	✓		
		Internship/Seminar*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Semester	Course												
	Indian Constitution (Non Credit)	✓	✓							✓	✓		
SEMESTER VI	Professional Ethics						✓	✓	✓	✓	✓	✓	✓
	Compiler Design	✓	✓	✓		✓			✓	✓	✓		✓
	Object Oriented Software Engineering	✓	✓	✓	✓	✓			✓	✓	✓		✓
	Professional Elective IV												
	Professional Elective V												
	Open Elective II												
	Advanced Aptitude and Coding Skills II	✓	✓							✓	✓		
SEMESTER VII	Cryptography and Cyber Security	✓	✓	✓	✓	✓			✓	✓	✓		✓
	Data Analytics	✓	✓	✓	✓	✓			✓	✓	✓		✓
	Professional Elective VI												
	Open Elective III												
	Open Elective IV												
	Professional Readiness for Innovation, Employability and Entrepreneurship	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Essence of Indian Knowledge Tradition (Non Credit)	✓	✓							✓	✓		
SEMESTER VIII	Project Work	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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B.E. - COMPUTER SCIENCE AND ENGINEERING
REGULATIONS – 2022
CHOICE BASED CREDIT SYSTEM
I - VIII SEMESTER CURRICULUM AND SYLLABI

SI. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
**SEMESTER – I**							
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	3 Weeks				
			TOTAL	30	16	0	14	23

SEMESTER – II								
SI. 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						
SI. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1	22MA301	Discrete Mathematics	BSC	3	3	0	0	3
2		Universal Human Values II: Understanding Harmony	HSMC	3	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENT								
3	22CS301	Advanced Java Programming	PCC	5	3	0	2	4
4	22CS302	Computer Organization and Architecture	ESC	4	2	0	2	3
5	22CS303	Design and Analysis of Algorithms	PCC	4	2	0	2	3
6	22CS304	Operating Systems	PCC	4	2	0	2	3
LABORATORY COURSES								
7	22ME311	Product Development Lab - 3	EEC	2	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES								
8	22CS311	Aptitude and Coding Skills I	EEC	2	0	0	2	1
9	22CS312	Internship and Seminar*	EEC	2	0	0	2	1
AUDIT COURSES								
10		Value Education (Non Credit)	AC	1	1	0	0	0
			TOTAL	30	15	0	16	22

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

SEMESTER – IV								
Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1		Microcontrollers and Embedded Systems	ESC	3	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENT								
2	22MA401	Probability and Statistics	BSC	4	2	0	2	3
3		Artificial Intelligence	PCC	5	3	0	2	4
4	22CS401	Distributed and Cloud Computing	PCC	4	2	0	2	3
5	22CS402	Web Development Frameworks	PCC	5	3	0	2	4
6		Professional Elective I	PEC	4	2	0	2	3
LABORATORY COURSES								
7		Communication Lab / Product Development Lab - 4	HSMC	4	0	0	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
8	22CS411	Aptitude and Coding Skills II	EEC	2	0	0	2	1
9	22CS412	Mini Project and Design Thinking Lab	EEC	2	0	0	2	1
AUDIT COURSES								
10		Yoga/Personality Development (Non Credit)	AC	1	1	0	0	0
			TOTAL	**34**	**16**	**0**	**18**	**24**

		SEMESTER – V						
SI. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1		Open Elective I	OEC	3	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENT								
2	22CS501	Computer Networks	PCC	5	3	0	2	4
3	22CS502	Theory of Computation	PCC	4	2	0	2	3
4		Machine Learning	PCC	5	3	0	2	4
5		Professional Elective II	PEC	4	2	0	2	3
6		Professional Elective III	PEC	4	2	0	2	3
EMPLOYABILITY ENHANCEMENT COURSES								
7	22CS511	Advanced Aptitude and Coding Skills I	EEC	2	0	0	2	1
8	22CS512	Internship and Seminar*	EEC	2	0	0	2	1
AUDIT COURSES								
9		Indian Constitution (Non Credit)	MC	3	3	0	0	0
			TOTAL	32	18	0	14	22

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

SI. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
SEMESTER – VI								
THEORY COURSES								
1		Open Elective II	OEC	3	3	0	0	3
2		Professional Ethics	HSMC	2	2	0	0	2
THEORY COURSES WITH LABORATORY COMPONENT								
3	22CS601	Compiler Design	PCC	5	3	0	2	4
4	22CS602	Object Oriented Software Engineering	PCC	5	3	0	2	4
5		Professional Elective IV	PEC	4	2	0	2	3
6		Professional Elective V	PEC	4	2	0	2	3
EMPLOYABILITY ENHANCEMENT COURSES								
7	22CS611	Advanced Aptitude and Coding Skills II	EEC	2	0	0	2	1
			TOTAL	**25**	**15**	**0**	**10**	**20**

SEMESTER – VII

Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1		Open Elective III	OEC	3	3	0	0	3
2		Open Elective IV	OEC	3	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENT								
3	22CS701	Cryptography and Cyber Security	PCC	5	3	0	2	4
4	20CS702	Data Analytics	PCC	5	3	0	2	4
5		Professional Elective VI	PEC	4	2	0	2	3
EMPLOYABILITY ENHANCEMENT COURSES								
6	22CS711	Professional Readiness for Innovation, Employability and Entrepreneurship	EEC	6	0	0	6	3
MANDATORY COURSES								
7		Essence of Indian Knowledge Tradition (Non Credit)	MC	3	3	0	0	0
			TOTAL	**29**	**17**	**0**	**12**	**20**

SEMESTER – VIII

Sl. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
EMPLOYABILITY ENHANCEMENT COURSES								
1	22CS811	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		2			10	7.98%
2	BSC	8	8	3	3					22	13.50%
3	ESC	14	8	3	3					28	15.34%
4	PCC		4	10	11	11	8	8		52	33.74%
5	PEC				3	6	6	3		18	11.04%
6	OEC					3	3	6		12	7.36%
7	EEC	1	1	3	2	2	1	3	8	21	11.04%
8	MC/AC										
Total		23	24	22	24	22	20	20	8	160+3	

HSMC - Humanities and Social Sciences including Management Course; BSC – Basic Science Course; ESC – Engineering Science Course; PCC – Professional Core Course; PEC – Professional Elective Course; OEC – Open Elective Course; EEC – Employability Enhancement Course; MC – Mandatory Course; AC – Audit Course.

ELECTIVE VERTICALS

SI. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
CYBER SECURITY								
1	22CS901	Ethical Hacking	PEC	4	2	0	2	3
2	22CS902	Social Network Security						
3	22CS903	Block Chain Technology	PEC	4	2	0	2	3
4	22CS904	Web Security	PEC	4	2	0	2	3
5	22CS905	Digital and Mobile Forensics	PEC	4	2	0	2	3
6	22CS906	Vulnerability Analysis and Penetration Testing	PEC	4	2	0	2	3
CLOUD COMPUTING								
1	22CS907	AWS Cloud Foundations	PEC	4	2	0	2	3
2	22CS908	Google Cloud Computing Foundations	PEC	4	2	0	2	3
3	22CS909	Cloud Architecting	PEC	4	2	0	2	3

4	22CS910	DevOps	PEC	4	2	0	2	3
5	22CS911	Machine Learning and Data Analytics in Cloud	PEC	4	2	0	2	3
6	22CS912	Cloud Security Foundations	PEC	4	2	0	2	3
FULL STACK DEVELOPMENT								
1	22CS913	UI/UX Design	PEC	4	2	0	2	3
2	22CS914	MERN Stack Development	PEC	4	2	0	2	3
3	22CS915	Mobile Architecture and Application Development	PEC	4	2	0	2	3
4	22CS916	C# and .Net Programming	PEC	4	2	0	2	3
5	22CS917	Micro Service Architecture	PEC	4	2	0	2	3
6	22CS918	Web Application Security	PEC	4	2	0	2	3
DATA SCIENCE								
1		Data Science using Python	PEC	4	2	0	2	3
2		Data Exploration Feature Engineering and Visualization	PEC	4	2	0	2	3
3		Health Care Analytics	PEC	4	2	0	2	3
4		Business Intelligence and Analytics	PEC	4	2	0	2	3
5		Text and Speech Analysis	PEC	4	2	0	2	3
6		Image and Video analytics	PEC	4	2	0	2	3
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING								
1		Soft Computing	PEC	4	2	0	2	3
2		Optimization Techniques	PEC	4	2	0	2	3
3		Reinforcement Learning	PEC	4	2	0	2	3
4	22CS919	Deep Learning and Neural Networks	PEC	4	2	0	2	3
5		Natural Language Processing	PEC	4	2	0	2	3
6		Applied AI	PEC	4	2	0	2	3
EMERGING TECHNOLOGIES								
1	22CS920	Internet of Things	PEC	4	2	0	2	3
2		GPU Computing	PEC	4	2	0	2	3
3		Edge Stream Analytics	PEC	4	2	0	2	3
4		Augmented and Virtual Reality	PEC	4	2	0	2	3
5		Computational Neuro Science	PEC	4	2	0	2	3
6	22CS921	Quantum Computing	PEC	4	2	0	2	3

B.E. CSE – Honors Degree

CYBER SECURITY

1	22CS901	Ethical Hacking	PEC	4	2	0	2	3
2	22CS902	Social Network Security	PEC	4	2	0	2	3
3	22CS903	Block Chain Technology	PEC	4	2	0	2	3
4	22CS904	Web Security	PEC	4	2	0	2	3
5	22CS905	Digital and Mobile Forensics	PEC	4	2	0	2	3
6	22CS906	Vulnerability Analysis and Penetration Testing	PEC	4	2	0	2	3
7	22CS812	Capstone Project	EEC	12	0	0	12	6

CLOUD COMPUTING

1	22CS907	AWS Cloud Foundations	PEC	4	2	0	2	3
2	22CS908	Google Cloud Computing Foundations	PEC	4	2	0	2	3
3	22CS909	Cloud Architecting	PEC	4	2	0	2	3
4	22CS910	DevOps	PEC	4	2	0	2	3
5	22CS911	Machine Learning and Data Analytics in Cloud	PEC	4	2	0	2	3
6	22CS912	Cloud Security Foundations	PEC	4	2	0	2	3
7	22CS812	Capstone Project	EEC	12	0	0	12	6

FULL STACK DEVELOPMENT

1	22CS913	UI/UX Design	PEC	4	2	0	2	3
2	22CS914	MERN Stack Development	PEC	4	2	0	2	3
3	22CS915	Mobile Architecture and Application Development	PEC	4	2	0	2	3
4	22CS916	C# and .Net Programming	PEC	4	2	0	2	3
5	22CS917	Micro Service Architecture	PEC	4	2	0	2	3
6	22CS918	Web Application Security	PEC	4	2	0	2	3
7	22CS812	Capstone Project	EEC	12	0	0	12	6

DATA SCIENCE

1		Data Science using Python	PEC	4	2	0	2	3
2		Data Exploration Feature Engineering and Visualization	PEC	4	2	0	2	3
3		Health Care Analytics	PEC	4	2	0	2	3
4		Business Intelligence and Analytics	PEC	4	2	0	2	3
5		Text and Speech Analysis	PEC	4	2	0	2	3
6		Image and Video analytics	PEC	4	2	0	2	3
7	22CS812	Capstone Project	EEC	12	0	0	12	6

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

1		Soft Computing	PEC	4	2	0	2	3
2		Optimization Techniques	PEC	4	2	0	2	3
3		Reinforcement Learning	PEC	4	2	0	2	3
4	22CS919	Deep Learning and Neural Networks	PEC	4	2	0	2	3
5		Natural Language Processing	PEC	4	2	0	2	3
6		Applied AI	PEC	4	2	0	2	3
7	22CS812	Capstone Project	EEC	12	0	0	12	6

EMERGING TECHNOLOGIES

1	22CS920	Internet of Things	PEC	4	2	0	2	3
2		GPU Computing	PEC	4	2	0	2	3
3		Edge Stream Analytics	PEC	4	2	0	2	3
4		Augmented and Virtual Reality	PEC	4	2	0	2	3
5		Computational Neuro Science	PEC	4	2	0	2	3
6	22CS921	Quantum Computing	PEC	4	2	0	2	3
7	22CS812	Capstone Project	EEC	12	0	0	12	6

B.E. CSE – Minor Degree

CYBER SECURITY

1	22CS901	Ethical Hacking	PEC	4	2	0	2	3
2	22CS902	Social Network Security	PEC	4	2	0	2	3
3	22CS903	Block Chain Technology	PEC	4	2	0	2	3
4	22CS904	Web Security	PEC	4	2	0	2	3
5	22CS905	Digital and Mobile Forensics	PEC	4	2	0	2	3
6	22CS906	Vulnerability Analysis and Penetration Testing	PEC	4	2	0	2	3
7	22CS812	Capstone Project	EEC	12	0	0	12	6

CLOUD COMPUTING

1	22CS907	AWS Cloud Foundations	PEC	4	2	0	2	3
2	22CS908	Google Cloud Computing Foundations	PEC	4	2	0	2	3
3	22CS909	Cloud Architecting	PEC	4	2	0	2	3
4	22CS910	DevOps	PEC	4	2	0	2	3
5	22CS911	Machine Learning and Data Analytics in Cloud	PEC	4	2	0	2	3

| 6 | 22CS912 | Cloud Security Foundations | PEC | 4 | 2 | 0 | 2 | 3 |
| 7 | 22CS812 | Capstone Project | EEC | 12 | 0 | 0 | 12 | 6 |

FULL STACK DEVELOPMENT

1	22CS913	UI/UX Design	PEC	4	2	0	2	3
2	22CS914	MERN Stack Development	PEC	4	2	0	2	3
3	22CS915	Mobile Architecture and Application Development	PEC	4	2	0	2	3
4	22CS916	C# and .Net Programming	PEC	4	2	0	2	3
5	22CS917	Micro Service Architecture	PEC	4	2	0	2	3
6	22CS918	Web Application Security	PEC	4	2	0	2	3
7	22CS812	Capstone Project	EEC	12	0	0	12	6

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:

Upon completion of the 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 STORAGE DEVICES AND ENERGY SOURCES	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:

Upon completion of the 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. Prasanna Chandrasekhar, "Conducting polymers, fundamentals and applications– 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++	L	T	P	C
	(Common to All Branches)	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 Exercise/Experiments:
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 Exercise/Experiments:
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 Exercise/Experiments:
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 Exercise/Experiments:
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 Exercise/Experiments:
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:
Upon completion of the 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_012972002406719488337_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 Exercise/Experiments:
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 Exercise/Experiments:
   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 Exercise/Experiments:
　　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 Exercise/Experiments:
　　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 Exercise/Experiments:

　　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:

Upon completion of the 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_013094421427470703362099_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 Exercise/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 Exercise/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 Exercise/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:

Upon completion of the 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 engineering product 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:

Upon completion of the 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

		L	T	P	C
22CS201	**DATA STRUCTURES** (Common to CSE, CSD, EEE, ECE, IT and ADS)	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 Exercise/Experiments:

• 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 Exercise/Experiments:
- 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 Exercise/Experiments:
- 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 Exercise/Experiments:
- 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 Exercise/Experiments:
- 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_01350157816505139210584/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
.
1. Communication Etiquettes
2. Self -Introduction using SWOT Analysis

(Theory 6)

(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_01

    2688768083632128308_shared/overview

2. communicating to Succeed

    https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01

    2686653619175424640_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_01268947760100966433_shared/overview

5. Email Etiquettes

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01329462386556108817682_shared/overview

6. Email Writing Skills

https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01268954363013529666_shared/overview

7. Time Management

https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012985

921210736640721_shared/overview

8. Understanding Body Language

https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_0129797

3765144576024689_shared/overview

9. ONLINE RESOURCES:

https://infyspringboard.onwingspan.com/web/en/page/home

LIST OF EQUIPMENTS:

1.

22CS202	JAVA PROGRAMMING (Common to All Branches Except CE)	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 Exercise/Experiments:
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 Exercise/Experiments:
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 Exercise/Experiments:
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 Exercise/Experiments:

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 Exercise/Experiments:

 • 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:
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 Exercise/Experiments:
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 Exercise/Experiments:
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 Exercise/Experiments:
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 Exercise/Experiments:
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 Exercise/Experiments:
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_0127580666 7282022456_shared/overview
8. Database Management System Part – 2
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0127673 005629194241_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