SREE SAKTHI ENGINEERING COLLEGE

(Autonomous)

Ooty Main Road, Karamadai, Coimbatore – 641 104

(Affiliated to Anna University & Approved by AICTE, Accredited by NAAC)

B. E. COMPUTER SCIENCE AND ENGINEERING

(CHOICE BASED CREDIT SYSTEM)

CURRICULUM & SYLLABI

REGULATIONS 2024

(For the students admitted from 2024 – 2025 onwards)

SREE SAKTHI ENGINEERING COLLEGE

Vision:

To be recognized as an international leader in engineering education, research and the application of knowledge to benefit society globally.

Mission:

To develop high quality technical education and personnel with a sound footing on basic engineering principles, technical and managerial skills, innovative research capabilities and exemplary professional conduct to lead and to use technology for the progress of mankind, adapting themselves to changing technological environment with the highest ethical values as the inner strength.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Vision:

To be a globally competent center for excellence in computer science education and research, empowering innovation in intelligent systems, secure digital infrastructure, and data-driven technologies to solve real-world problems.

Mission:

- To impart a strong foundation in computing principles, data structures, algorithms, and software engineering through experiential learning.
- To drive innovation in artificial intelligence, machine learning, cybersecurity, and cloud-native systems by integrating research and project-based learning.
- To cultivate ethical leadership, innovation mindset, and entrepreneurial skills tailored to the digital economy.
- To strengthen collaborations with IT industries, start-ups, and interdisciplinary research groups for scalable technology solutions.
- To support technology-driven entrepreneurship through structured incubation, mentorship, and product engineering platforms.

B. E. (DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

The 4-year rigorous B. E Computer Science and Engineering programme enables a graduate with the following

PEO	OBJECTIVE
I	To enable graduates to pursue higher education research.
II	Have a successful career in industries associated with us.
III	To ensure that graduates will have the ability and attitude to adapt to emerging technological changes.

B. E. (DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING)

PROGRAMME OUTCOMES (PO's)

On completion of the programme, the engineering graduate shall acquire the following

PO	GRADUATE ATTRIBUTE
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 analyse 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 modelling 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 demonstrate the 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 these to one's own work, as a member and leader in a team, to manage projects and in 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.

B. E. (DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING)

PROGRAMME SPECIFIC OUTCOMES (PSO's)

On successful completion of the **B.E. Computer science and engineering** degree programme, the engineering graduate shall exhibit the following

PSO	OBJECTIVE
1	To analyze , design and develop computing solution by applying foundational concepts of computer science and engineering.
2	To apply software engineering principle and practice for developing quality Software for scientific and business application.

Mapping of Programme Educational Objectives (PEO) and Programme Outcomes (PO):

PEO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
I	2	2	-	-	2	-	-	1	-	1	-	1	1	-
II	3	3	3	2	2	-	-	1	2	2	1	2	3	2
III	3	2	2	1	2	2	1	2	-	1	3	1	2	1

(1 – Low, 2 – Medium, 3 – High)

Mapping of Course Outcomes (CO) and Programme Outcomes (PO):

(1 – Low, 2 – Medium, 3 – High, “-“ – No Correlation)

Year	Sem	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
I YEAR	Semester I	24HSM101	Professional English I	1	1	1	1	1	1	1	1	1	2	1	1	-	-
		24BSC101	Matrices and Calculus	3	3	-	1	-	2	-	-	-	-	-	3	-	-
		24BSC103	Engineering Chemistry	3	2	2	1	-	2	1	-	-	-	-	1	-	-
		24ESC101	Basic Electrical and Electronics Engineering	2	2	1	-	-	-	-	1	-	-	-	2	-	-
		24ESC105	Python Programming	2	3	3	3	2	-	-	-	-	-	2	2	3	3
		24HSM102	Heritage of Tamils	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		24BSC122	Engineering Chemistry Laboratory	3	3	1	1	-	1	1	-	1	-	-	1	-	-
		24ESC122	Python Programming Laboratory	2	3	3	3	2	-	-	-	-	-	2	2	3	3
		24CDC101	Career Development Skills I	-	2	2	1	1	-	-	1	1	2	-	-	1	1
		24INP101	Induction Programme	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Semester II	24HSM103	Professional English II	1	2	1	1	1	1	1	1	1	2	1	1	-	-
		24BSC105	Statistics and Numerical Methods	3	3	1	1	1	-	-	-	2	-	2	3	-	-
		24BSC102	Engineering Physics	3	2	2	1	1	1	-	-	-	-	-	1	-	-
		24ESC103	Engineering Graphics	3	1	2	-	2	-	-	-	-	3	-	2	2	2
		24CSC101	Programming in C	2	2	2	1	2	1	1	1	2	-	3	2	2	2
		24HSM104	Tamils and Technology	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		24BSC121	Engineering Physics Laboratory	3	2	3	1	1	-	-	-	-	-	-	-	-	-
		24ESC121	Engineering Practices Laboratory	3	2	-	1	1	1	1	2	1	2	-	1	-	-
		24CSC121	Programming in C Laboratory	2	2	3	2	1	2	-	-	2	1	2	2	2	2
		24CDC102	Career Development Skills II	-	2	2	1	1	-	-	1	1	2	-	-	1	1

Year	Sem	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
II YEAR	Semester III	24BSC202	Discrete Mathematics	3	3	3	-	-	-	-	-	-	-	-	-	3	1
		24BSC207	Environmental Science and Sustainability	3	1	1	-	-	3	3	-	-	-	-	2	1	-
		24ESC213	Digital Principles and System design	3	2	1	1	2	-	-	-	-	-	-	-	2	3
		24CSC201	Data Structures	3	3	3	2	-	-	-	-	-	-	-	2	3	3
		24CSC202	Computer Architecture	3	2	2	1	1	1	-	-	-	-	-	1	2	2
		24CSC211	Object Oriented Programming	3	3	3	2	1	-	-	-	1	-	-	2	3	3
		24CSC221	Data Structures Laboratory	3	3	3	2	1	-	-	-	1	-	2	1	-	1
		24CDC201	Career Development Skills III	1	1	-	-	-	-	-	2	2	3	-	3	-	-
		24CDC221	Mini Project I	3	3	3	3	2	1	1	1	3	2	2	1	3	2
		24MAC***	Mandatory Course I*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Semester IV	24BSC206	Probability and Random Process	3	3	3	-	-	-	-	-	3	-	-	2	-	-
		24CSC203	Database Management Systems	3	3	3	2	3	-	-	-	-	-	-	2	3	3
		24CSC212	Computer Networks	3	3	3	2	3	-	-	1	-	1	-	2	3	3
		24CSC213	Compiler Design	3	3	3	2	3	-	-	1	-	-	-	2	3	3
		24CSC214	Design and Analysis of Algorithms	3	3	3	2	3	-	-	1	-	1	-	2	3	3
		24CSC222	Database Management Systems Laboratory	3	3	3	2	3	-	-	-	-	-	-	2	3	3
		24CDC202	Career Development Skills IV	1	1	-	-	-	-	-	2	2	3	-	3	-	-
		24CDC222	Mini Project II	3	3	2	3	2	1	1	1	3	2	2	1	3	2
		24MAC221	Summer Internship I	3	3	3	3	2	1	1	1	3	2	2	1	3	2

Year	Sem	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
III YEAR	Semester V	24CSC311	Operating Systems	3	3	3	2	3	-	-	-	-	1	-	2	3	3
		24CSC312	Artificial Intelligence and Machine Learning	3	3	3	3	2	1	-	-	1	-	1	2	3	3
		24CSC313	Internet Programming	3	2	3	3	3	-	-	-	1	3	3	1	3	3
		24**P***	Professional Elective I*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		24**P***	Professional Elective II*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		24**P***	Professional Elective III*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		24CDC301	Career Development Skills V	1	2	1	1	-	-	-	1	2	3	-	2	-	-
		24CDC321	Mini Project III	3	3	2	3	2	1	1	1	3	2	2	1	3	2
		24MAC***	Mandatory Course II*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Semester VI	24CSC314	Embedded Systems and IoT	3	3	3	3	2	-	1	-	1	1	2	3	3	3
		24CSP***	Professional Elective IV*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		24CSP***	Professional Elective V*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		24$$$***	Open Elective I*	-	-	-	-	-	-	-	-			-	-	-	-
		24HSM3**	Management Elective *	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		24CDC302	Career Development Skills VI	1	2	1	1	-	-	-	1	2	3	-	2	-	-
		24CDC323	Mini Project IV	3	3	2	3	2	1	1	1	3	2	2	1	3	2
		24MAC321	Summer Internship II	3	3	3	3	2	1	1	1	3	2	2	1	3	2
		24MAC***	Mandatory Course III*	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Year	Sem	Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
IV YEAR	Semester VII	24CSC411	Cloud Computing	3	3	3	3	3	1	-	-	-	-	-	1	3	3
		24CSC401	Object Oriented Software Engineering	2	3	2	3	-	-	-	-	-	2	3	2	3	2
		24HSM401	Professional Ethics and Human Values	1	2	1	-	-	3	3	3	2	1	2	1	1	1
		24$$$***	Open Elective II*	-	-	-	-	-	-	-	-			-	-	-	-
		24$$$***	Open Elective III*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		24CDC421	Career Development Skills VII	1	2	1	-	1	-	-	2	1	3	1	-	-	-
		24CDC422	Project Work Phase I	3	3	2	3	2	1	1	1	3	2	2	1	3	2
	Semester VIII	24CSP***	Professional Elective VI*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		24$$$***	Open Elective IV*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		24CDC423	Project Work Phase II	3	3	2	3	2	1	1	1	3	2	2	1	3	2

SREE SAKTHI ENGINEERING COLLEGE

B. E. COMPUTER SCIENCE AND ENGINEERING

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CURRICULUM STRUCTURE

CATEGORY	PROPOSED MINIMUM CREDITS
Foundation Core Courses (FCC)	
a) Humanities, Social Sciences and Management Courses (HSMC)	12
b) Basic Science Courses (BSC)	28
c) Engineering Science Courses (ESC)	17
Professional Core Courses (PCC)	57
Professional Elective Courses (PEC)	18
Open Elective Courses (OEC)	12
Employability Enhancement Courses (EEC)	21
Audit Courses (AC)	0
TOTAL MINIMUM CREDITS	**165**

COURSE TYPOLOGY

REFERENCE	COURSE TYPE
T	Theory
TP	Theory-cum-Practical
P	Practical

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Semester I

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24HSM101	Professional English I	HSMC	T	3	3	0	0	3
2	24BSC101	Matrices and Calculus	BSC	T	4	3	1	0	4
3	24BSC103	Engineering Chemistry	BSC	T	3	3	0	0	3
4	24ESC101	Basic Electrical and Electronics Engineering	ESC	T	3	3	0	0	3
5	24ESC105	Python Programming	ESC	T	3	3	0	0	3
6	24HSM102	Heritage of Tamils	HSMC	T	1	1	0	0	1
7	24BSC122	Engineering Chemistry Laboratory	BSC	P	4	0	0	4	2
8	24ESC122	Python Programming Laboratory	ESC	P	4	0	0	4	2
9	24CDC101	Career Development Skills I	EEC	T	1	1	0	0	1
10	24INP101	Induction Programme	-	-	-	-	-	-	-
Total					**26**	**17**	**1**	**8**	**22**

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Semester II

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24HSM103	Professional English II	HSMC	T	3	3	0	0	3
2	24BSC105	Statistics and Numerical Methods	BSC	T	4	3	1	0	4
3	24BSC102	Engineering Physics	BSC	T	3	3	0	0	3
4	24ESC103	Engineering Graphics	ESC	T	6	2	0	4	4
5	24CSC101	Programming in C	PCC	T	3	3	0	0	3
6	24HSM104	Tamils and Technology	HSMC	T	1	1	0	0	1
7	24BSC121	Engineering Physics Laboratory	BSC	P	4	0	0	4	2
8	24ESC121	Engineering Practices Laboratory	ESC	P	4	0	0	4	2
9	24CSC121	Programming in C Laboratory	PCC	P	4	0	0	4	2
10	24CDC102	Career Development Skills II	EEC	T	1	1	0	0	1
Total					**33**	**16**	**1**	**16**	**25**

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B. E. COMPUTER SCIENCE AND ENGINEERING

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Semester III

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24BSC202	Discrete Mathematics	BSC	T	4	3	1	0	4
2	24BSC207	Environmental Science and Sustainability	BSC	T	2	2	0	0	2
3	24ESC213	Digital Principles and System Design	ESC	TP	4	2	0	2	3
4	24CSC201	Data Structures	PCC	T	3	3	0	0	3
5	24CSC202	Computer Architecture	PCC	T	3	3	0	0	3
6	24CSC211	Object Oriented Programming	PCC	TP	5	3	0	2	4
7	24CSC221	Data Structures Laboratory	PCC	P	4	0	0	4	2
8	24CDC201	Personality Development and Professional Skills I	EEC	T	1	1	0	0	1
9	24CDC221	Mini Project I	EEC	P	2	0	0	2	1
10	24MAC***	Mandatory Course I*	MC	T	1	1	0	0	0
Total					**29**	**18**	**1**	**10**	**23**

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Semester IV

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24BSC206	Probability and Random Process	BSC	T	4	3	1	0	4
2	24CSC203	Database Management Systems	PCC	T	3	3	0	0	3
3	24CSC212	Computer Networks	PCC	TP	5	3	0	2	4
4	24CSC213	Compiler Design	PCC	TP	5	3	0	2	4
5	24CSC214	Design and Analysis of Algorithms	PCC	TP	5	3	0	2	4
6	24CSC222	Database Management Systems Laboratory	PCC	P	4	0	0	4	2
7	24CDC202	Personality Development and Professional Skills II	EEC	T	1	1	0	0	1
8	24CDC222	Mini Project II	EEC	P	2	0	0	2	1
9	24MAC221	Summer Internship I	MC	P	0	0	0	0	0
Total					**29**	**16**	**1**	**12**	**23**

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CURRICULUM & SYLLABI

Semester V

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24CSC311	Operating Systems	PCC	TP	5	3	0	2	4
2	24CSC312	Artificial Intelligence and Machine Learning	PCC	TP	5	3	0	2	4
3	24CSC313	Internet Programming	PCC	TP	5	3	0	2	4
4	24**P***	Professional Elective I*	PEC	T	3	3	0	0	3
5	24**P***	Professional Elective II*	PEC	T	3	3	0	0	3
6	24**P***	Professional Elective III*	PEC	T	3	3	0	0	3
7	24CDC301	Analytical and Reasoning Skills I	EEC	T	1	1	0	0	1
8	24CDC321	Mini Project III	EEC	P	2	0	0	2	1
9	24MAC***	Mandatory Course II*	MC	T	3	3	0	0	0
Total					**30**	**22**	**0**	**8**	**23**

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Semester VI

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24CSC314	Embedded Systems and IoT	PCC	TP	5	3	0	2	4
2	24CSP***	Professional Elective IV*	PEC	T	3	3	0	0	3
3	24CSP***	Professional Elective V*	PEC	T	3	3	0	0	3
4	24$$$***	Open Elective I*	OEC	T	3	3	0	0	3
5	24HSM3**	Management Elective *	HSMC	T	2	2	0	0	2
6	24CDC302	Analytical and Reasoning Skills II	EEC	T	1	1	0	0	1
7	24CDC323	Mini Project IV	EEC	P	2	0	0	2	1
8	24MAC321	Summer Internship II	MC	P	0	0	0	0	0
9	24MAC***	Mandatory Course III*	MC	T	1	1	0	0	0
Total					**20**	**16**	**0**	**4**	**17**

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Semester VII

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24CSC411	Cloud Computing	PCC	TP	5	3	0	2	4
2	24CSC401	Object Oriented Software Engineering	PCC	T	3	3	0	0	3
3	24HSM401	Professional Ethics and Human Values	HSMC	T	2	2	0	0	2
4	24$$$***	Open Elective II*	OEC	T	3	3	0	0	3
5	24$$$***	Open Elective III*	OEC	T	3	3	0	0	3
6	24CDC421	Interview Skills	EEC	P	2	0	0	2	1
7	24CDC422	Project Work Phase I	EEC	P	4	0	0	4	2
Total					**22**	**14**	**0**	**8**	**18**

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Semester VIII

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24CSP***	Professional Elective VI*	PEC	T	3	3	0	0	3
2	24$$$***	Open Elective IV*	OEC	T	3	3	0	0	3
3	24CDC423	Project Work Phase II	EEC	P	16	0	0	16	8
Total					**22**	**6**	**0**	**16**	**14**

MANDATORY COURSES (Offered as Non-Credit Courses)

MANDATORY COURSES I, II, III

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P
1	24MAC001	Constitution of India	MC	T	1	1	0	0
2	24MAC002	Industrial Safety	MC	T	1	1	0	0
3	24MAC003	Entrepreneurship	MC	T	1	1	0	0
4	24MAC004	Film Appreciation	MC	T	1	1	0	0
5	24MAC005	Wellbeing with Traditional Practices - Yoga, Ayurveda and Siddha	MC	T	1	1	0	0
6	24MAC006	Introduction to Women and Gender Studies	MC	T	1	1	0	0
7	24MAC007	Elements of Literature	MC	T	1	1	0	0

MANDATORY COURSES INTERNSHIP I, II

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P
1	24MAC221	Summer Internship I	MC	P	0	0	0	0
2	24MAC321	Summer Internship II	MC	P	0	0	0	0

MANAGEMENT ELECTIVE COURSES

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24HSM401	Principles of Management	HSMC	T	2	2	0	0	2
2	24HSM402	Total Quality Management	HSMC	T	2	2	0	0	2
3	24HSM403	Engineering Economics and Financial Accounting	HSMC	T	2	2	0	0	2
4	24HSM404	Human Resource Management	HSMC	T	2	2	0	0	2
5	24HSM405	Knowledge Management	HSMC	T	2	2	0	0	2
6	24HSM406	Industrial Management	HSMC	T	2	2	0	0	2

PROFESSIONAL ELECTIVE COURSES

PROFESSIONAL ELECTIVE COURSES I, I, III

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24CSP001	Image processing	PEC	T	3	3	0	0	3
2	24CSP002	Graphics and Multimedia Systems	PEC	T	3	3	0	0	3
3	24CSP003	Advanced Java Programming	PEC	T	3	3	0	0	3
4	24CSP004	Wireless Sensor Networks	PEC	T	3	3	0	0	3
5	24ITP001	Blockchain Technology	PEC	T	3	3	0	0	3
6	24ITP002	Information Security	PEC	T	3	3	0	0	3
7	24ITP003	XML and Web Services	PEC	T	3	3	0	0	3
8	24AMP001	Pattern Recognition	PEC	T	3	3	0	0	3
9	24AMP002	Natural Language Processing	PEC	T	3	3	0	0	3
10	24AMP003	Text and Visual Analytics	PEC	T	3	3	0	0	3
11	24ADP001	Foundation of Robotics and Automation	PEC	T	3	3	0	0	3
12	24ADP002	Data Analysis in Cloud Computing	PEC	T	3	3	0	0	3
13	24CYP001	Fundamentals of Cyber Security	PEC	T	3	3	0	0	3
14	24CYP002	Ad-hoc Networks	PEC	T	3	3	0	0	3
15	24CYP003	Ethical Hacking	PEC	T	3	3	0	0	3

PROFESSIONAL ELECTIVE COURSES IV, V, VI

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24CSP305	UI/UX Design	PEC	T	3	3	0	0	3
2	24CSP306	Python Web Development	PEC	T	3	3	0	0	3
3	24CSP307	Software Quality Management	PEC	T	3	3	0	0	3
4	24CSP308	Web Mining	PEC	T	3	3	0	0	3
5	24CSP309	Distributed Systems	PEC	T	3	3	0	0	3
6	24ITP304	Software Testing Tools and Techniques	PEC	T	3	3	0	0	3
7	24ITP305	Mobile Computing	PEC	T	3	3	0	0	3
8	24ITP306	Mobile App Development	PEC	T	3	3	0	0	3
9	24AMP304	Deep Neural Networks	PEC	T	3	3	0	0	3
10	24AMP305	Generative Artificial Intelligence	PEC	T	3	3	0	0	3
11	24ADP303	Foundation of AR/VR	PEC	T	3	3	0	0	3
12	24ADP304	R Programming	PEC	T	3	3	0	0	3
13	24ADP305	Big Data Analytics	PEC	T	3	3	0	0	3
14	24ADP306	Large Language Models	PEC	T	3	3	0	0	3
15	24CYP304	Network Programming and Management	PEC	T	3	3	0	0	3
16	24CYP305	Cyber Forensics	PEC	T	3	3	0	0	3

OPEN ELECTIVE COURSES

OPEN ELECTIVES OFFERED BY DEPARTMENT OF CIVIL ENGINEERING

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24CEO001	Environment and Agriculture	OEC	T	3	3	0	0	3
2	24CEO002	Green Building Design	OEC	T	3	3	0	0	3
3	24CEO003	Geographical Information System	OEC	T	3	3	0	0	3
4	24CEO004	Climate Change and its Impacts	OEC	T	3	3	0	0	3
5	24CEO005	Disaster Management	OEC	T	3	3	0	0	3

OPEN ELECTIVES OFFERED BY THE PARENT DEPARTMENT (COMPUTER SCIENCE STREAMS)

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24CSO001	Generative AI	OEC	T	3	3	0	0	3
2	24CSO002	Game Programming	OEC	T	3	3	0	0	3
3	24CSO003	Neural Networks and Deep Learning	OEC	T	3	3	0	0	3
4	24CSO004	Introduction to Augmented Reality (AR) / Virtual Reality (VR)	OEC	T	3	3	0	0	3
5	24CSO005	High Speed Networks	OEC	T	3	3	0	0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24EEO001	Sustainable and Environmental Friendly HV Insulation System	OEC	T	3	3	0	0	3
2	24EEO002	Smart Grids	OEC	T	3	3	0	0	3
3	24EEO003	Hybrid Energy Technology	OEC	T	3	3	0	0	3
4	24EEO004	Introduction to PLC Programming	OEC	T	3	3	0	0	3
5	24EEO005	Flexible AC Transmission Systems	OEC	T	3	3	0	0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Sl. No	Course Code	Course Name	Category	Type	Contact Periods / Week	L	T	P	Credits
1	24ECO001	Introduction to Control Engineering	OEC	T	3	3	0	0	3
2	24ECO002	Semiconductor Manufacturing	OEC	T	3	3	0	0	3
3	24ECO003	Mechatronics	OEC	TP	4	2	0	2	3
4	24ECO004	Sensors and Actuators	OEC	T	3	3	0	0	3
5	24ECO005	Wireless Network	OEC	T	3	3	0	0	3

OPEN ELECTIVES OFFERED BY DEPARTMENT OF MECHANICAL ENGINEERING

Sl. No	Course Code	Course Name	Category	Type (T/P/TP)	Contact Periods / Week	L	T	P	Credits
1.	24MEO001	Drone Technologies	OEC	T	3	3	0	0	3
2.	24MEO002	Introduction to Six Sigma	OEC	T	3	3	0	0	3
3.	24MEO003	Sustainable Engineering	OEC	T	3	3	0	0	3
4.	24MEO004	Foundation Skills in Integrated Product Development	OEC	T	3	3	0	0	3
5.	24MEO005	Maintenance Engineering	OEC	T	3	3	0	0	3

SREE SAKTHI ENGINEERING COLLEGE

(Autonomous)

REGULATIONS 2024

CHOICE BASED CREDIT SYSTEM

B. E. COMPUTER SCIENCE AND ENGINEERING

CREDIT SUMMARY - SEMESTER BASIS

Category / Semester	I	II	III	IV	V	VI	VII	VIII	Total Credits
HSMC	4	4	-	-	-	2	2	-	12
BSC	9	9	6	4	-	-	-	-	28
ESC	8	6	3	-	-	-	-	-	17
PCC	-	5	12	17	12	4	7	-	57
PEC	-	-	-	-	9	6	-	3	18
OEC	-	-	-	-	-	3	6	3	12
EEC	1	1	2	2	2	2	3	8	21
MC	-	-	✓	✓	✓	✓	-	-	0
Total Credits	22	25	23	23	23	17	18	14	165

SREE SAKTHI ENGINEERING COLLEGE

(Autonomous)

REGULATIONS 2024

CHOICE BASED CREDIT SYSTEM

B. E COMPUTER SCIENCE AND ENGINEERING

CATEGORY-WISE COURSE LIST

Humanities, Social Sciences and Management Courses (HSMC)

Sl. No	Course Code	Course Name	Type	Contact Periods / Week	L	T	P	Credits
1	24HSM101	Professional English I	T	3	3	0	0	3
2	24HSM102	Heritage of Tamils	T	1	1	0	0	1
3	24HSM103	Professional English II	T	3	3	0	0	3
4	24HSM104	Tamils and Technology	T	1	1	0	0	1
5	24HSM401	Professional Ethics and Human Values	T	2	2	0	0	2
6	24HSM***	Management Elective	T	2	2	0	0	2

Total Credits: 12

Basic Science Courses (BSC)

Sl. No	Course Code	Course Name	Type	Contact Periods / Week	L	T	P	Credits
1	24BSC101	Matrices and Calculus	T	4	3	1	0	4
2	24BSC103	Engineering Chemistry	T	3	3	0	0	3
3	24BSC105	Statistics and Numerical Methods	T	4	3	1	0	4
4	24BSC102	Engineering Physics	T	3	3	0	0	3
5	24BSC202	Discrete Mathematics	T	4	3	1	0	4
6	24BSC207	Environmental Science and Sustainability	T	2	2	0	0	2
7	24BSC206	Probability and Random Process	T	4	3	1	0	4
8	24BSC121	Engineering Physics Laboratory	P	4	0	0	4	2
9	24BSC122	Engineering Chemistry Laboratory	P	4	0	0	4	2

Total Credits: 28

Engineering Science Courses (ESC)

Sl. No	Course Code	Course Name	Type	Contact Periods / Week	L	T	P	Credits
1	24ESC101	Basic Electrical and Electronics Engineering	T	3	3	0	0	3
2	24ESC105	Python Programming	T	3	3	0	0	3
3	24ESC103	Engineering Graphics	TP	6	2	0	4	4
4	24ESC213	Digital Principles and Computer Organization	TP	4	2	0	2	3
5	24ESC121	Engineering Practices Laboratory	P	4	0	0	4	2
6	24ESC122	Python Programming Laboratory	P	4	0	0	4	2

Total Credits: 17

Professional Core Courses (PCC)

Sl. No	Course Code	Course Name	Type	Contact Periods / Week	L	T	P	Credits
1	24CSC101	Programming in C	T	3	3	0	0	3
2	24CSC121	Programming in C Laboratory	P	4	0	0	4	2
3	24CSC201	Data Structures	T	3	3	0	0	3
4	24CSC202	Computer Architecture	T	3	3	0	0	3
5	24CSC211	Object Oriented Programming	TP	5	3	0	2	4
6	24CSC221	Data Structures Laboratory	P	4	0	0	4	2
7	24CSC203	Database Management Systems	T	3	3	0	0	3
8	24CSC212	Operating Systems	TP	5	3	0	2	4
9	24CSC213	Compiler Design	TP	5	3	0	2	4
10	24CSC214	Design and Analysis of Algorithms	TP	5	3	0	2	4
11	24CSC222	Database Management Systems Laboratory	P	4	0	0	4	2
12	24CSC212	Computer Networks	TP	5	3	0	2	4
13	24CSC312	Artificial Intelligence and Machine Learning	TP	5	3	0	2	4
14	24CSC313	Internet Programming	TP	5	3	0	2	4
15	24CSC314	Embedded Systems and IoT	TP	5	3	0	2	4
16	24CSC411	Cloud Computing	TP	5	3	0	2	4
17	24CSC401	Object Oriented Software Engineering	T	3	3	0	0	3

Total Credits: 57

Employability Enhancement Courses (EEC)

Sl. No	Course Code	Course Name	Type	Contact Periods / Week	L	T	P	Credits
1	24CDC101	Career Development Skills I	T	1	1	0	0	1
2	24CDC102	Career Development Skills II	T	1	1	0	0	1
3	24CDC201	Career Development Skills III	T	1	1	0	0	1
4	24CDC221	Mini Project I	P	2	0	0	2	1
5	24CDC222	Mini Project II	P	2	0	0	2	1
6	24CDC202	Career Development Skills IV	T	1	1	0	0	1
7	24CDC321	Mini Project III	P	2	0	0	2	1
8	24CDC301	Career Development Skills V	T	1	1	0	0	1
9	24CDC323	Mini Project IV	P	2	0	0	2	1
10	24CDC302	Career Development Skills VI	T	1	1	0	0	1
11	24CDC421	Career Development Skills VII	P	2	0	0	2	1
12	24CDC422	Project Work Phase I	P	4	0	0	4	2
13	24CDC423	Project Work Phase II	P	16	0	0	16	8

Total Credits: 21

ENROLLMENT FOR (HONOURS) MINOR DEGREE (OPTIONAL)

A student can optionally register for additional courses (18 credits) from semester V onwards and become eligible for the award of B.E / B. Tech (Honours) or Minor degree. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For minor degree, the student can register for courses from any one of the other programmes. Moreover, the student can register for courses from any one of the following verticals also.

Verticals for Minor Degree (In addition to all the verticals of other programmes)

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Public Administration	Vertical IV Business Data Analytics	Vertical V Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable infrastructure Development
Fundamentals of Investment	Team Building & Leadership Management for Business	Constitution of India	Data Mining for Business Intelligence	Sustainable Agriculture and Environmental Management
Banking Financial Services and Insurance	Creativity Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Introduction to Block Chain and its Applications	Principles of Marketing Management for Business	Administrative Theories	Marketing and Social Media Web Analytics	Materials for Energy Sustainability
Introduction to Fintech	Human Resource Management for Entrepreneurship	Indian Administrative System	Operation and Supply Chain Analytics	Green Technology
Fintech Personal Finance and Payments	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis

(Choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)

VERTICAL 1: FINTECH AND BLOCK CHAIN

Sl. No.	Course Code	Course Name	Type	Total Contact Periods	Periods Per Week			Credits
					L	T	P	
1	24HOF001	Financial Management	T	3	3	0	0	3
2	24HOF002	Fundamentals of Investment	T	3	3	0	0	3
3	24HOF003	Banking Financial Services and Insurance	T	3	3	0	0	3
4	24HOF004	Introduction to Block Chain and its Applications	T	3	3	0	0	3
5	24HOF005	Introduction to Fintech	T	3	3	0	0	3
6	24HOF006	Fintech Personal Finance and Payments	T	3	3	0	0	3

VERTICAL 2: ENTREPRENEURSHIP

Sl. No.	Course Code	Course Name	Type	Total Contact Periods	Periods Per Week			Credits
					L	T	P	
1	24HOE001	Foundations of Entrepreneurship	T	3	3	0	0	3
2	24HOE002	Team Building and Leadership Management for Business	T	3	3	0	0	3
3	24HOE003	Creativity and Innovation in Entrepreneurship	T	3	3	0	0	3
4	24HOE004	Principles of Marketing Management for Business	T	3	3	0	0	3
5	24HOE005	Human Resource Management for Entrepreneurship	T	3	3	0	0	3
6	24HOE006	Financing New Business Ventures	T	3	3	0	0	3

VERTICAL 3: PUBLIC ADMINISTRATION

Sl. No.	Course Code	Course Name	Type	Total Contact Periods	Periods Per Week			Credits
					L	T	P	
1	24HOP001	Principles of Public Administration	T	3	3	0	0	3
2	24HOP002	Constitution of India	T	3	3	0	0	3
3	24HOP003	Public Personnel Administration	T	3	3	0	0	3
4	24HOP004	Administrative Theories	T	3	3	0	0	3
5	24HOP005	Indian Administrative System	T	3	3	0	0	3
6	24HOP006	Public Policy Administration	T	3	3	0	0	3

VERTICAL 4: BUSINESS DATA ANALYTICS

Sl. No.	Course Code	Course Name	Type	Total Contact Periods	Periods Per Week			Credits
					L	T	P	
1	24HOB001	Statistics for Management	T	3	3	0	0	3
2	24HOB002	Data Mining for Business Intelligence	T	3	3	0	0	3
3	24HOB003	Human Resource Analytics	T	3	3	0	0	3
4	24HOB004	Marketing and Social Media Web Analytics	T	3	3	0	0	3
5	24HOB005	Operation and Supply Chain Analytics	T	3	3	0	0	3
6	24HOB006	Financial Analytics	T	3	3	0	0	3

VERTICAL 5: ENVIRONMENT AND SUSTAINABILITY

Sl. No.	Course Code	Course Name	Type	Total Contact Periods	Periods Per Week			Credits
					L	T	P	
1	24HOS001	Sustainable Infrastructure Development	T	3	3	0	0	3
2	24HOS002	Sustainable Agriculture and Environmental Management	T	3	3	0	0	3
3	24HOS003	Sustainable Bio Materials	T	3	3	0	0	3
4	24HOS004	Materials for Energy Sustainability	T	3	3	0	0	3
5	24HOS005	Green Technology	T	3	3	0	0	3
6	24HOS006	Environmental Quality Monitoring and Analysis	T	3	3	0	0	3

SEMESTER I

Course Code: 24HSM101	Course Title: Professional English – I	
Course Category: HSMC	Credits: 3	
L:T:P(Hours/Week) : 3:0:0	Total Contact Hours: 45	Max Marks: 100

COURSE OBJECTIVES

- Develop speaking skills to confidently introduce oneself, express preferences, and share opinions in various settings.
- Master reading strategies like skimming and scanning to understand and analyze information from different texts effectively.
- Engage actively in group discussions, present ideas clearly, discuss different perspectives, and participate in role-plays.
- Learn to write clear emails, summaries, and structured paragraphs while comparing and analyzing information from diverse sources.
- Demonstrate proficiency in writing essays, narratives, and dialogues using appropriate grammar and effective sentence transformations.

UNIT I INTRODUCTION TO EFFECTIVE SPEAKING 9

Listening –short text - formal & informal conversation – telephone conversation, Classroom lectures **Speaking** - Introducing oneself, one's family / friend; Talk about preferences – Agree and Disagree – Giving opinions - **Reading** – Telephone message - Introduction of different kinds of reading materials (Technical and Non-technical) - Writing– Principles of writing –Word formation –Word expansion(root words/etymology) - Hints development, Reading comprehension exercises - Grammar -Parts of speech, Questions –WH type, Yes/ No and Tag Questions.

UNIT II DIFFERENT STRATEGIES OF READING 9

Listening - Listening to travel podcast - travel documentary, Listening and responding to video lectures/Talks - **Speaking** - Strategies for good conversation - Improving fluency and self-expression – Articulation – Accent and intonation - **Reading** - Different reading strategies, Skimming, Scanning – Newspaper report - **Writing** – Descriptions, Instructions, Recommendations, Definitions – Single sentence definition – **Grammar** - Types of sentences, Prepositions, Modal verbs.

UNIT III GROUP INTERACTION 9

Listening – Radio and TV advertisements, speeches of great personalities – **Speaking** - Group interaction - Speaking in formal situations (teachers, officials, foreigners), role-play – **Reading** - An article, excerpts from literature – **Writing** - Paragraph writing, Letter writing – Formal –informal **Grammar**-Synonym and antonym, Tenses, Adjectives - Cause and Effect expressions

UNIT IV INTRODUCTION TO EFFECTIVE WRITING 9

Listening - Listening to announcements, discussions/debates - **Speaking** - Responding to questions – Different forms of interviews – welcome address, vote of thanks - **Reading** – Longer technical texts, social media posts and brochures, comparing facts and figures - **Writing** - Email-etiquette, summarizing and paragraphing – Single word substitutes - Free writing on any given topic (My favorite place/Hobbies/School life, etc.) **Grammar** –sentence pattern, idioms, Adverbs and Phrasal verbs.

UNIT V EFFECTIVE WRITING 9

Listening - Listening to dialogues, conversations and completing exercises based on them – Listening to longer texts and filling up the table **Speaking** – sharing information of a personal kind – greeting- peer discussion **Reading** - Reading and understanding specific meaning in a text - note making, reviews related to given topic -**Writing –** Types of essays, story writing - dialogue writing, Use of abbreviations and acronyms – **Grammar–** transformation of sentences (simple, compound and complex), Collocations, fixed and semi fixed expressions.

Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO 1: Understand effective speaking skills to introduce themselves, describe preferences, discuss opinions, and engage in both formal and informal conversations confidently.
CO 2: Analyze different reading strategies such as skimming and scanning to understand information from various texts, including travel podcasts, video lectures, and newspaper reports.
CO 3: Constructively engage in group discussions, articulating ideas clearly in formal settings, exploring diverse viewpoints, and effectively analysing speeches and articles.
CO 4: Apply skills to write clear emails, summarize information effectively, and analyze facts and figures from technical texts and social media posts.
CO 5: Identify advanced writing abilities to create well-structured essays, stories, and dialogues using expressive language techniques.

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	-	-	-	1	1	1	1	1	3	-	1	-	-	-
CO 2	1	2	1	1	1	1	1	1	1	1	1	2	-	-	-
CO 3	1	-	-	1	1	1	1	1	2	2	1	1	-	-	-
CO 4	1	2	1	1	1	1	1	1	1	2	1	1	-	-	-
CO 5	1	1	2	1	1	1	1	1	1	2	1	1	-	-	-

High-3; Medium-2; Low-1 ; No Correlation - -

Text Book(s) :

T1. Locker, Kitty O., and Stephen Kyo Kaczmarek. Business Communication: Building Critical Skills. 6th ed., McGraw-Hill, 2013.

T2. Singh Neetu., English for General Competitions: From Plinth to Paramount. n.d.

T3. Orient Blackswan., English for Engineers and Technologists. Vol. 1, 2022.

T4 Richards, Jack C. Interchange Student's Book 1. 4th ed., Cambridge University Press, 2015.

Reference Book(s):

R1 Verderber, Rudolph F., and Kathleen S. Verderber. Communicate! A Handbook for Interpersonal Communication. Cengage Learning, 2017.

R2 Wallwork, Adrian. English for Academic Correspondence and Socializing. Springer, 2011.

R3 Chaturvedi, P.D., and Mukesh Chaturvedi. Business Communication: Concepts, Cases, and Applications. n.d.

R4 Raman, Meenakshi, and Sangeetha Sharma. Technical Communication: Principles and Practice. Oxford University Press, 2014.

Course Code :24BSC101	Course Title: Matrices and Calculus

Course Category: BSC	Credits:4	
L:T:P(Hours/Week) : 3:1:0	Total Contact Hours:60	Max Marks:100

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques for practical applications in engineering.
- To use derivatives to analyze functions such as maxima / minima, concavity, inflection points.
- To apply advanced techniques of partial differentiation and Jacobian's matrices.
- To develop a strong understanding of double integral calculus, apply double integrals to solve real world problems.
- To enhance problem solving skills using triple integral calculus.

UNIT I MATRICES 9 +3

Eigen values and Eigenvectors of a real matrix – Properties of Eigen values and Eigen vectors – Cayley – Hamilton theorem (excluding proof) – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II DIFFERENTIAL CALCULUS 9+3

Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules – Applications Maxima and Minima of functions of one variable – Absolute maximum and Absolute minimum – Concave upward, Concave downward.

UNIT III MULTI VARIABLE CALCULUS 9+3

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobian's – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

UNIT IV DOUBLE INTEGRAL 9+3

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves- Change of variables in double integrals.

UNIT V TRIPLE INTEGRAL AND ITS APPLICATIONS 9+3

Evaluation of Triple integrals –- Simple Problems- Volume as triple integrals - Volume of solids – Change of variables in triple integrals

Course Outcomes	Cognitive

At the end of this course, students will be able to:	**Level**
CO 1: Identify and solve algebraic Eigen value problems from the practical areas in the engineering.	Analyze
CO 2: Understand the concepts of derivatives, limit, and continuity and to demonstrate the critical thinking, analytical skills in mathematical problem solving.	Understand
CO 3: Apply differentiation to optimize functions of multiple variables using partial derivatives and Lagrange multiplier.	Apply
CO 4: Use double integrals to calculate areas, volumes and surface areas of different regions and objects.	Apply
CO 5: Calculate Volumes of solids using triple integrals in cylindrical and spherical co-ordinates.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	P09	P010	PS11	PS12	PS01	PSO2	PSO3
CO1	3	3	3	1	-	2	-	-	-	-	-	-	-	-	-
CO2	3	3	3	1	-	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	1	-	2	-	-	-	-	-	-	-	-	-
CO4	3	3	3	1	-	2	-	-	-	-	-	-	-	-	-
CO5	3	3	3	1	-	2	-	-	-	-	-	-	-	-	-
MAX	3	3	3	1	-	2	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1; No Correlation - -

Text Book(s):

T1.Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley And Sons (Asia) Limited, New Delhi, 10th Edition, 2019

T2.James Stewart, "Calculus: Early Transcendentals ", Cengage Learning 9th Edition,New Delhi, 2017.

T3. David C Lay, "Linear Algebra and its Applications", Pearson Publications, 5thEdition, India, 2016.

Reference Book(s):

R1.Jain RK and Iyengar SRK. "Advanced Engineering Mathematics", Narsa Publications, New Delhi, 5th Edition, 2017.

R2.SrimanthaPal and Bhunia S.C, "Engineering Mathematics" Oxford University Press, 2015.

R3. Patrick M, Fitz Patrick, "Advanced Calculus"- 2nd Edition, American Mathematical Society (2006).

R4. Jerrold. E Marsden and Anthony J. Tromba, "Vector Calculus", W. H. Freeman, 6th Edition, 2011.

Course Code : 24BSC103	**Course Title : Engineering Chemistry**
Course Category : BSC	**Credits : 3**
L:T:P(Hours/Week) : 3:0:0	**Total Contact Hours : 45** **Max Marks : 100**

COURSE OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparation methods of nano materials.
- To familiarize the students by relating the principles and preventive methods of corrosion and to inculcate the working process and application of storage devices.
- To acquire knowledge in synthetic methods of fuels and understanding the combustion characteristics of different fuels.
- To gain knowledge in science of polymer and polymer reactions.

UNIT I WATER TECHNOLOGY 9

Water: Sources and impurities, Water Quality Parameters: Definition and Significance of- Colour, Odour, Turbidity, pH, Hardness, Alkalinity, TDS, COD and BOD, Fluoride and Arsenic. Domestic water treatment: Sedimentation with Coagulant- Sand Filtration –Disinfection methods (UV, Ozonation, Break-point Chlorination). Desalination of Brackish water: Reverse Osmosis. Boiler troubles: Scale and Sludge, Boiler Corrosion, Caustic Embrittlement, Priming and Foaming. Treatment of Boiler Feed Water: Internal Treatment (Phosphate, Colloidal, Sodium Aluminate and Calgon Conditioning) and External Treatment – Ion Exchange Demineralisation and Zeolite process.

UNIT II NANO CHEMISTRY 9

Basics: Distinction between Molecules, Nanomaterials and Bulk materials; Size-Dependent Properties (Optical, Electrical, Mechanical and Magnetic); Types of Nanomaterials: Definition, Properties and Uses of – Nanoparticle, Nanocluster, Nanorod, Nanowire and Nanotube. Preparation of Nanomaterials: Sol-Gel, Solvothermal, Laser Ablation, Chemical Vapour Deposition, Electrochemical Deposition and Electro Spinning. Main applications of nanomaterial's in Medicine, Agriculture, Energy, Electronics and Catalysis.

UNIT III BATTERIES AND CORROSION 9

Batteries: Introduction - Types of Batteries – Primary battery (Dry Cell) - Secondary battery (Lead Acid battery, Lithium-Ion-battery) - Fuel cells H2-O2 Fuel cell, Microbial fuel cell. Corrosion – Causes- Factors- Types – Chemical , Electrochemical Corrosion (Galvanic, Differential Aeration Theory) – corrosion control- material selection and design aspects – Electrochemical protection-

Sacrificial anode method and Impressed current cathodic method. Paints- constituents and function. Electroplating of copper and electroless plating of nickel.

UNIT IV FUELS AND COMBUSTION 9

Fuels-Solid Fuel: Coal – analysis of coal (Proximate analysis only)- Carbonization, Manufacture of Metallurgical Coke (Otto Hoffmann Method) - Liquid fuel- Manufacture of synthetic Petrol (Bergius process)- Octane Number, Cetane Number , Knocking in Engines- Anti Knocking Agents, Gasoline Additives, Gaseous fuel: Compressed Natural Gas(CNG) – Liquefied Petroleum Gases(LPG)-composition only - Liquid Hydrogen fuel. Combustion: Calorific value- higher and lower calorific values- Flue gas analysis (ORSAT method).

UNIT V POLYMER TECHNOLOGY 9

Introduction-Terminologies- Thermoplastics and Thermosetting Plastics- Types and mechanism of Polymerization: Addition (free radical)- Condensation and Copolymerization- Properties and applications of polymers-some commercial thermosetting resin-Phenol Formaldehyde resin, Amino resins, Silicone resins-some thermoplastics- Polyethylene, PVC, Polyvinyl acetate- Conducting polymer – application - LED and Liquid crystals.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: To Understand the quality of water, and its treatment methods.	Understand
CO2: To Understand the basic principles and preparatory methods of nano materials	Apply
CO3: To Apply the principles of electro chemistry and corrosion in engineering.	Understand
CO4: To Understand the different types of fuels, their preparation, properties and combustion characteristics.	Understand
CO5: To Apply the science of polymer and its application	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	P09	P010	PS11	PS12	PS01	PSO2	PSO3
CO1	3	2	2	1	-	1	1	-	-	-	-	2	-	-	-
CO2	3	2	2	1	-	2	2	-	-	-	-	1	-	-	-
CO3	3	2	2	-	-	2	1	-	-	-	-	1	-	-	-
CO4	3	2	2	-	-	1	2	-	-	-	-	1	-	-	-
CO5	3	2	2	1	-	2	-	-	-	-	-	1	-	-	-
MAX	3	2	2	1	-	2	2	-	-	-	-	2	-	-	-

High-3; Medium-2; Low-1; No Correlation - -

Text Book(s) :

T1. P. C. Jain and Monica Jain, “Engineering Chemistry”, 17^{th} Edition, DhanpatRai Publishing Company (P) Ltd, New Delhi, 2018.

T2. Sivasankar B., “Engineering Chemistry”, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.

T3. S.S.Dara,“A text book of EngineeringChemistry”,S.Chand Publishing,12^{th}Edition, 2018.

T4. John O’M Bockris, Amulya K. N Reddy,”Modern Electrochemistry Vol.1: Ionics”, Kluwar Academic Publishers, London, 2^{nd} Edition, 2002.

T5. John O’M Bockris, Amulya K. N Reddy,”Modern Electrochemistry Vol.2: Fundamentals of Electrodics”, Kluwar Academic Publishers, London, 2^{nd} Edition, 2002.

Reference Book(s) :

R1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, “Text book of nanoscience and nanotechnology”, Universities Press-IIM Series in Metallurgy and Materials Science, 2018.

R2. O.G. Palanna, “Engineering Chemistry” McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.

R3. Friedrich Emich, “Engineering Chemistry”, Scientific International PVT, LTD, New Delhi, 2014.

R4. Shikha Agarwal, “Engineering Chemistry-Fundamentals and Applications”, Cambridge Universit Press, Delhi, Second Edition, 2019.

R5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

Course Code: 24ESC101	Course Title: Basic Electrical and Electronics Engineering	
Course Category: PCC	Credits:3	
L:T:P(Hours/Week):3:0:0	Total Contact Hours:45	Max Marks:100

Course Objectives:

- To introduce the basics of electrical fundamentals
- To understand about Electrical Safety.
- To understand the concepts of DC machines and Transformer
- To impart the knowledge of various Measuring Instruments
- To study the basics of Electronics and the fundamentals of digital electronics

UNIT I: ELECTRICAL FUNDAMENTALS 9

Current – Voltage – Types – Resistor, Inductor, Capacitor – Ohm's law – Fuse – Characteristics of fuse element – fuse materials – Types – Current carrying capacity – A.C fundamentals – single phase and three phase connections –Domestic wiring - Earthing – Methods of earthing, Protective devices- Circuit Breaker – Types - Efficient use of electricity- Tariff - Types – Energy calculation

UNIT II : ELECTRICAL SAFETY 9

Terms and definitions - objectives of safety and security measures - Hazards associated with electric current and voltage - Primary and secondary electrical shocks- Possibilities of getting electrical shock and its severity - Medical analysis of electric shocks and its effects - Prevention of shocks - Safety precautions against contact shocks- Safety precautions and First Aid - Do's and Don'ts for safety in the use of domestic electrical appliances.

UNIT-III: ELECTRICAL MACHINES AND TRANSFORMER 9

DC Generator– Construction, Principle of Operation, EMF equation, Types. DC Motor–Principle of Operation, Types. Single Phase Transformers – Construction, Working Principle, Applications. (Qualitative Treatment only for all topics).

UNIT IV : MEASUREMENTS AND MEASURING INSTRUMENTS 9

Introduction – Analog and Digital instruments – types – PMMC – MI instruments – Measurement of Power - Power in DC and AC circuits – Measurement in single phase circuits –Measurement of Energy – Constructional and working principles of energy meter – Megger – Multimeter – Oscilloscope – Signal generation, signal analysis and fibre optics measurements

UNIT V: ELECTRONICS FUNDAMENTALS & DIGITAL ELECTRONICS 9

P-N junction diode –VI characteristics- Zener Diode- Half wave and Full wave rectifiers- BJT-PNP and NPN – Filters-– Optoelectronic devices-Binary Number System, Logic Gates, Boolean Algebra, Full and Half Adders, A/D Conversion and D/A Conversion.

Course Outcomes At the end of this course, students will be able to:	**Cognitive Level**
CO 1: Understand and apply the basic concepts in Electrical Engineering	Apply
CO 2: Apply the concept of Electrical Safety	Apply
CO 3: Understand the basic concepts of DC machines and Transformers	Apply
CO 4: Understand the fundamental art of measurement in engineering	Apply
CO 5: Explain the structure and operation of Electronic devices and the basic of digital electronics	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	P09	P010	PS11	PS12	PS01	PSO2	PSO3
CO1	3	3	3	3	3	2	-	-	-	-	-	3	3	-	-
CO2	2	1	3	2	2	3	2	-	-	-	-	3	2	-	-
CO3	3	3	2	2	2	2	-	-	-	-	-	3	2	-	-
CO4	3	3	2	2	1	2	-	-	-	-	-	3	3	-	-
CO5	3	3	2	2	1	1	-	-	-	-	-	3	2	-	3
MAX	3	3	3	3	3	3	2	-	-	-	-	3	3	-	3

High-3; Medium-2; Low-1

Text Book(s):

T1.Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020

T2.S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.

T3. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008

T4. James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.

T5. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

Reference Book(s):

R1. Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.

R2. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.

R3. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.

R4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.

R5. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010.

Web References:

1. https://archive.nptel.ac.in/courses/117/106/117106108/
2. https://archive.nptel.ac.in/courses/108/101/108101091/

Course Code : 24ESC105	**Course Title : Python Programming**	
Course Category : ESC	**Credits : 3**	
L:T:P(Hours/Week) : 3:0:0	**Total Contact Hours : 45**	**Max Marks : 100**

COURSE OBJECTIVES:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

Fundamentals of Computing – Identification of Computational Problems - Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

UNIT II DATA TYPES, FUNCTIONS, STRINGS 9

Python interpreter and interactive mode, debugging, values and types, variables, expressions, statements, tuple assignment, precedence of operators, comments, Conditionals, Iteration, Functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

UNIT III LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension.

UNIT IV FILES, MODULES, PACKAGES 9

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages.

UNIT V NUMPY AND PANDAS 9

NumPy- Introduction, Computations using NumPy functions, Computation on arrays, Aggregation, Indexing and sorting, Pandas-Introduction and Basic Pandas concepts, Data frames, Data handling.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Develop algorithmic solutions to simple computational problems.	Understand
CO2: Write simple Python programs using conditionals and loops for solving problems	Apply
CO3: Decompose a Python program into functions	Apply
CO4: Represent compound data using Python lists, tuples, dictionaries etc.	Apply
CO5: Implement Python programs using NumPy and Pandas	Apply

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	3	3	2	-	-	-	-	-	2	2	3	3
CO 2	3	3	3	3	2	-	-	-	-	-	2	2	3	-
CO 3	3	3	3	3	2	-	-	-	-	-	2	-	3	-
CO 4	2	2	-	-	1	-	-	-	-	-	1	-	3	-
CO 5	1	2	-	-	1	-	-	-	-	-	1	-	2	-
MAX	2	3	3	3	2	-	-	-	-	-	2	2	3	3

High-3; Medium-2; Low-1

Text Book(s):

T1. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016.

T2. Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and Programming”, 1st Edition, BCS Learning & Development Limited, 2017.

T3. William Mckinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython, 2nd Edition, Shroff/O’Reilly Publication, 2017.

Reference Book(s):

R1. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.

R2. G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 2021.

R3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data”, Third Edition, MIT Press, 2021.

Web References:

1. https://archive.nptel.ac.in/courses/112/106/112106286/
2. https://www.selfstudys.com/mcq/gate/mechanical-engineering/online-test/chapter-7-engineering-mechanics

Course Code : 24HSM102	Course Title: Heritage of Tamils	
Course Category :HSMC	Credits: 1	
L: T:P(Hours/Week): 1:0:0	Total Contact Hours: 15	Max Marks: 100

அலகுI மொழி மற்றும் இலக்கியம்

இந்திய மொழிக்குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச்சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள்- தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II மரபு- பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை- சிற்பக்கலை:

நடுகல் முதல் நவீன சிற்பங்கள் வரை-ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும்அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் -தேர்செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புற தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:

தெருக் கூத்து, கரகாட்டம், வில்லுப் பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல் பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம் தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்:

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் -சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப்பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் -இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ் புத்தகங்களின் அச்சு வரலாறு.

UNIT I LANGUAGE AND LITERATURE

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

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

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

UNIT III FOLK AND MARTIAL ARTS

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS

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

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

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

<u>TEXT BOOKS AND REFERENCE:</u>

1. தமிழக வரலாறுமக்களும் - பிள்ளை வெளி மீது (தமிழ்நாடு -பண்பாடும் பாடநூல் மற்றும் .(கல்வியியல்பணிகள்கழகம்
2. கணினித்தமிழ்முனைவர் -)சுந்தரம்.இல (விகடன்பிரசுரம்
3. கீழடி - .(தொல்லியல்துறைவெளியீடு)வைகை நதிக் கரையில் சங்ககால நகரநாகரிகம்
4. பொருநை(தொல்லியல்துறைவ வெளியீடு)ஆற்றங்கரைநாகரிகம் -
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL -(in print).
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

Course Code : 24BSC122	**Course Title : Engineering Chemistry Laboratory**	
Course Category : BSC	**Credits : 2**	
L:T:P(Hours/Week) : 0:0:4	**Total Contact Hours : 60**	**Max Marks : 100**

COURSE OBJECTIVES:

- To gain experimental knowledge of water quality parameters, such as acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electro analytical techniques such as, pH metry, potentiometry and conductometry in the determination of ions in aqueous solutions.
- To gain knowledge about the synthesis of nano particles and to understand the influence of rate of corrosion of materials depending on various factors.

- Students infer the quality of some solid and liquid fuels.

LIST OF EXPERIMENTS

1. Determination of Total, Permanent and Temporary hardness of water by EDTA method.
2. Estimation of Chloride content in water by Argentometric method and Determination of strength of given Hydrochloric acid by pH meter
3. Determination of strength of Acid by Conductometric titration (Strong acid vs Strong base / Strong base vs Mixture of acids).
4. Preparation of Gold / ZnO Nano particles by Sol- Gel Method
5. Estimation of ferrous ion content of the given solution using Potentiometer.
6. Determination of DO content of water sample by Winkler Method.
7. Determination of Rate of Corrosion of Mild steel by Weight Loss Method.
8. Determination of Efficiency of Corrosion in Mild steel.
9. Determination of calorific value of fuel using Bomb Calorimeter.
10. Determination of viscosity of oil using Redwood Viscometer.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: To analyse the quality of water samples i.e., acidity, alkalinity, chlorine content, hardness, DO and the amount of ions in solutions through volumetric techniques.	Analyze
CO 2: To gain knowledge in designing the engineering materials against corrosion.	Apply
CO 3: To know the preparation of nano particles by sol- gel method.	Understand
CO 4: To recognize the property and characteristics of solid and liquid fuels.	Understand
CO 5: To quantitatively analyse the impurities in solution by electro analytical techniques	Analyze

Course Articulation Matrix

High-3; Medium-2; Low-1; No Correlation – ‘-‘

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	-	1	1	-	1	-	-	1	-	-	-
CO2	3	3	1	1	-	1	1	-	1	-	-	1	-	-	-
CO3	3	3	1	-	-	1	1	-	1	-	-	1	-	-	-
CO4	3	3	1	-	-	1	1	-	1	-	-	1	-	-	-
CO5	3	3	1	1	-	1	1	-	1	-	-	1	-	-	-
MAX	3	3	2	1	-	1	1	-	1	-	-	1	-	-	-

Text Book(s):

T1. Vogel’s, “Text Book of Quantitative Chemical Analysis”, Pearson Publications, 2014.

Reference Book(s):

R1. Daniel C. Harris, “Quantitative Chemical Analysis”, W. H. Freeman and Company, New York, 7th Edition 2007.

Course Code: 24ESC122	**Course Title: Python Programming Laboratory**	
Course Category: ESC	**Credits: 2**	
L:T:P(Hours/Week) : 0:0:4	**Total Contact Hours: 60**	**Max Marks: 100**

COURSE OBJECTIVES:

- To understand the problem-solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python Programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing computations using NumPy functions

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Develop algorithmic solutions to simple computational problems	Create
CO 2: Implement programs in Python using conditionals and loops for solving problems	Apply
CO 3: Deploy functions to decompose a Python program	Analyze
CO 4: Process compound data using Python data structures	Apply
CO 5: Implement programs using NumPy and Pandas	Apply

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	3	3	-	-	-	-	-	2	2	3	3
CO 2	3	3	3	3	-	-	-	-	-	2	2	3	-
CO 3	3	3	3	3	-	-	-	-	-	2	-	3	-
CO 4	2	2	-	-	-	-	-	-	-	1	-	3	-
CO 5	1	2	-	-	-	-	-	-	-	1	-	2	-
MAX	2	3	3	3	-	-	-	-	-	2	2	3	3

High-3; Medium-2; Low-1

Text Book(s):

T1 Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.

T2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.
T3. William Mckinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython, 2nd Edition, Shroff/O'Reilly Publication, 2017.

Reference Book(s):

R1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
R2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
R3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021.

Web References:

1. https://archive.nptel.ac.in/courses/112/106/112106286/
2. https://www.selfstudys.com/mcq/gate/mechanical-engineering/online-test/chapter-7-engineering-mechanics.

Course Code: 24CDC101	**Course Title: Career Development Skills I**	
Course Category: EEC	**Credits: 1**	
L:T:P (Hours/Week) 1:0:0	**Total Contact Hours: 15**	**Max Marks: 100**

COURSE OBJECTIVES
• Learn about the career planning and goal setting to meet the corporate world.
• Develop motivational skills and personality development.
• Develop the methodologies for team building.

UNIT I	**CAREER PLANNING AND GOAL SETTING**	3

<table>
<tr><td colspan="3">Career planning: Self-Assessment – Skills Development – Networking – Professional Development – Flexibility and Adaptability – Work-Life Balance – Seeking Feedback – Stay Updated
Goal Settings: - Set SMART > Specificity – Measurability – Achievability – Relevance – Time-bound – Breakdown into Steps – Review and Adjust – Accountability – Celebrate Achievements</td></tr>
<tr><td>UNIT II</td><td>MOTIVATION</td><td>3</td></tr>
<tr><td colspan="3">Motivation I – Purpose – Learning mind-set – Stay Organized – Embrace Responsibility – Stay appositive – Reflect and Adapt – Peer Recognition and Support – Inspirational Guest Speakers of Role Models
Personality Effectiveness - Self –Awareness – Emotional Intelligence – Adaptability – Conflict Resolution – Leadership Skills – Time Management – Continuous Learning – Positive Attitude
i) Building Personality – Self-Reflection and Awareness – Assertiveness and Confidence – Relationship Building – Personal Branding
ii) Discipline – Consistency and Persistence – Self-Control and Delayed Gratification – Accountability – Resilience – Interpersonal Skills and Collaboration – Presentation skills – Learning from Mistakes</td></tr>
<tr><td>UNIT III</td><td>PERSONALITY DEVELOPMENT</td><td>3</td></tr>
<tr><td colspan="3">i) Grooming – Dress Code Etiquette – Personal Appearance – Body Language and Posture
ii) Hygiene – Practices & clothing care
iii) Cleanliness – Workspace maintenance – Environmental Awareness & Digital hygiene
Overall preparation – Role of confidence & Cultural Sensitivity</td></tr>
<tr><td>UNIT IV</td><td>PRESENTATION AND PUBLIC SPEAKING SKILLS</td><td>3</td></tr>
<tr><td colspan="3">Presentation Speaking Skills – Know the audience – Clear objective – Content structure – Postures and Gestures – Voice projection – Eye contact – appropriate language – Speech Clarity – Visual aids interaction
Public Speaking skills – Research – audience pulse – Pace and Pause – Expertise – Authenticity – Adaptability to unexpected situations
SWOT Analysis – Enhanced Self-awareness – Benchmarking with Strength, Weakness, Challenges and Opportunities – Risk management – Versatility – Decision making</td></tr>
<tr><td>UNIT V</td><td>TEAM BUILDING</td><td>3</td></tr>
<tr><td colspan="3">Team building – Openness – Cooperation – Building trust – Respect – Diversity and Inclusion – Cohesion – Prioritisation – Learning team culture – Celebrate success
Activity Sessions- i) Debate – Critical thinking – Confidence building – Persuasive techniques – Ethical reasoning – Empathy</td></tr>
</table>

ii) Picture connector – Imagination and Innovation – Analysis – Societal awareness – Expression – Cognitive development – Playful exploration

Total : 15 Hours

COURSE OUTCOMES

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

CO1: Learn about the career planning and goal setting to meet the corporate world.

CO2: Develop motivational skills and personality development.

CO3: Develop the methodologies for team building

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	3	-	-	-
CO2	-	-	-	-	-	-	-	2	2	3	-	2	-	-	-
CO3	1	1	1	-	-	-	-	1	2	2	-	-	-	-	-

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Dr.R.S.Aggarwal, "A Modern Approach to Verbal and Non-verbal Reasoning", S Chand Publishing, 2023.
T2.	Arun Sharma and Meenakshi Upadhyay, "Verbal Ability and Reading comprehension", Tata McGraw Hill Education, 2014.
T3.	Sanjay Kumar and Pushp Lata, "Communication skills", Oxford Higher Education, 2011.

REFERENCE BOOK(S)

R1.	Arun Sharma, "Logical Reasoning for CAT", Tata McGraw Hill Education, 2024.
R2.	Peeyush Bhardwaj, "The Hand on Guide to Analytical and Logical Reasoning", Arihant Publication, 2023.
R3.	Nira Konar, "Communication Skills for Professionals", PHI learning Pvt. Ltd, 2011.

SEMESTER II

Course Code : 24HSM103	**Course Title : Professional English – II**	
Course Category :HSMC	**Credits : 3**	
L:T:P(Hours/Week) : 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES:

- Develop skills in understanding and explaining cause and effect relationships through listening, speaking, reading, and writing activities.
- Enhance abilities to compare and contrast information effectively through listening, speaking, reading, and writing tasks.

- Build skills in analyzing problems, proposing solutions, and communicating ideas clearly through various listening, speaking, reading, and writing exercises.
- Acquire proficiency in reporting events and information accurately through listening, speaking, reading, and writing practices.
- Strengthen skills in delivering effective presentations and communicating clearly in professional contexts through listening, speaking, reading, and writing activities.

UNIT I CAUSE AND EFFECT 9

Listening – Listening to longer technical talks and completing exercises - formal speeches; **Speaking** – Role play exercises based on workplace contexts - asking for and giving directions. **Reading** – an excerpt from a travelogue-Journal articles on issues like Global warming; **Writing** - Instructions; Official letter / email; **Grammar** – If conditionals, Imperatives; Cause and effect expressions, prefix and suffixes, Articles.

UNIT II COMPARE AND CONTRAST 9

Listening – Product reviews and gap fill exercises, Short Talks (like TED Talks) for specific information; **Speaking** – discussing progress towards goals - talking about experience **Reading** – Graphical content (table / chart / graph) and making inferences, bio-note; **Writing** – Compare and Contrast Essay - writing responses to complaints - Making recommendations; **Grammar** –Degrees of Comparison; infinitives and gerunds, prepositional phrases.

UNIT III PROBLEM AND SOLUTION 9

Listening – online discussions on current issues and role play - situational dialogues; **Speaking** – discussing news stories - talking about travel procedures **Reading** – Visual content (Pictures on social issues / natural disasters) for comprehension - business letters; **Writing** - checklists - cause and effect essays - Problem and Solution Essay; **Grammar** – singular and plural, Reported speech, Relative pronoun;

UNIT IV REPORTING 9

Listening – Telephone interview - Oral news report; **Speaking** – discussing forecasts and scenarios – discussing likes and dislikes **Reading** – Newspaper report on survey findings- annual reports; **Writing** – report writing - accident report - Survey report,; **Grammar** – Active and passive voice, conjunction, Homophones & Homonyms

UNIT V PRESENTATION 9

Listening – Job interview - music review; **Speaking** – describing natural environment – explaining rules and regulations **Readin**g – company profiles - an excerpt of interview with professionals; **Writing** – Job application (cover letter and CV) - transcoding; **Grammar** –Collocations - Numerical adjectives - content and function words.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Identify cause and effect relationships accurately through listening, speaking, reading, and writing activities	Understand
CO 2: Understand the effective use of comparing and contrasting information from various sources using listening, speaking, reading, and writing skills.	Understand
CO 3: Analyze problems, propose solutions, and communicate ideas clearly through listening, speaking, reading, and writing exercises.	Analyze
CO 4: Interpret events and information accurately through listening, speaking, reading, and writing practices.	Understand
CO 5: Apply skills in delivering effective presentations and communicating clearly in professional contexts through listening, speaking, reading, and writing tasks.	Apply

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	2	-	1	1	1	1	1	1	2	1	1	-	-	-
CO 2	1	2	-	1	1	1	1	1	1	2	1	1	-	-	-
CO 3	1	2	1	1	1	1	1	1	2	2	1	1	-	-	-
CO 4	1	2	1	1	1	2	1	1	1	2	1	1	-	-	-
CO 5	1	1	1	1	1	1	1	1	1	2	2	1	-	-	-
MAX	1	2	1	1	1	2	1	1	2	2	2	1	-	-	-

High-3; Medium-2; Low-1 ; No Correlation - -

Text Book(s):

T1. Raman, Meenakshi, and Sangeeta Sharma. Technical Communication: Principles and Practice. Oxford University Press, 2014.

T2. Guffey, Mary Ellen, and Dana Loewy. Business Communication: Process and Product. 10th ed., Cengage Learning, 2021.

T3. English for Science & Technology - II. Cambridge University Press, 2023.

T4. English for Engineers and Technologists. Vol. 2, Orient Blackswan, 2022.

Reference Book(s):

R1. Laplante, Phillip A. Technical Writing: A Practical Guide for Engineers, Scientists, and

Nontechnical Professionals.

R2. Wallwork, Adrian. English for Academic Correspondence and Socializing. Springer, 2011.

R3. Chaturvedi, P.D., and MukeshChaturvedi. Business Communication: Concepts, Cases, and Applications.

R4. Anderson, Paul V. Technical Communication: A Reader-Centered Approach.

Course Code :24BSC105	**Course Title : Statistics and Numerical Methods**	
Course Category : BSC	**Credits : 4**	
L:T:P(Hours/Week) : 3:1:0	**Total Contact Hours : 60**	**Max Marks : 100**

COURSE OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.

- To explore the knowledge of testing of hypothesis for small and large samples this plays an important role in real life problems.
- To interpret the basic concepts of solving algebraic and transcendental equations.
- To analyze the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquire the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS (9+3)

Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT II DESIGN OF EXPERIMENTS (9+3)

One way and two way classifications - Completely randomized design – Randomized block design– Latin square design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS (9+3)

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Iterative methods of Gauss Seidal– Eigenvalues of a matrix by Power method.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION (9+3)

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Numerical single integration's using Trapezoidal and Simpson's 1/3 rules .

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (9+3)

Single step methods: Taylor's series method - Euler's method - Modified Euler's method – Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods:Milne's predictor corrector methods for solving first order differential equations.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to	

CO 1: Apply the concept of testing of hypothesis for small and large samples in real life problems.	Apply
CO 2: Analyze and compare different experimental designs.	Analyze
CO 3: Analyze and compare the accuracy and efficiency of different numerical methods.	Analyze
CO 4: Understand the knowledge of various techniques and methods for interpolation and numerical integration.	Understand
CO 5: Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	-	-	-	2	-	2	-	-	-	-
CO2	3	3	1	1	1	-	-	-	2	-	2	-	-	-	-
CO3	3	3	1	1	1	-	-	-	2	-	2	-	-	-	-
CO4	3	3	1	1	1	-	-	-	2	-	2	-	-	-	-
CO5	3	3	1	1	1	-	-	-	2	-	2	-	-	-	-
MAX	3	3	1	1	1	-	-	-	2	-	2	-	-	-	-

High-3; Medium-2; Low-1; No Correlation - -

Text Book(s):

T1.Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 11th Edition, New Delhi, 2022.

T2.Johnson, R.A., Miller, I and Freund J., “Miller and Freund’s Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2021.

Reference Book(s):

R1.Burden, R.L and Faires, J.D, “Numerical Analysis”, 9th Edition, Cengage Learning, 2019.

R2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences”, Cengage Learning, New Delhi, 8th Edition, 2016.

R3. Gerald. C.F. and Wheatley. P.O. “Applied Numerical Analysis” Pearson Education, Asia, New Delhi, 7th Edition, 2017.

R4. Gupta S.C. and Kapoor V. K., “Fundamentals of Mathematical Statistics”, Sultan Chand &Sons, New Delhi, 12th Edition, 2022.

R5. Spiegel. M.R., Schiller. J. and Srinivasan .R.A., " Schaum's Outlines on Probability and Statistics ", Tata Mc Graw Hill Edition, 4th Edition, 2018.

R6. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9 thEdition, Pearson Education, Asia, 2016.

R7.Veerarajan.T, "probability statistics and random processes".4th edition, Tata Mc Graw -Hill, 2016 .

Course Code : 24BSC102	Course Title :Engineering Physics	
Course Category : BSC	Credits : 3	
L:T:P(Hours/Week) : 3:0:0	Total Contact Hours : 45	Max Marks : 100

COURSE OBJECTIVES:

- To apply the knowledge of properties of matter in real world engineering applications.
- To analyze and characterize fiber optics and laser beams.

- To analyze thermal properties of matter and energy transfer processes.
- To analyze and explain the semiconductor materials and its application.
- To understand and apply the fundamental principles and mathematical formalism of quantum physics.

UNIT I PROPERTIES OF MATTER 9

Introduction-Elasticity-Stress-strain: Types of strain-Hooke's law- Stress - Strain Diagram and uses -Yield point-Elastic limit-Elastic moduli - Types of elastic moduli - Relation between elastic constants-Poisson's Ratio -Factors affecting elasticity- Bending of beam-Expression for bending moment and depression - Cantilever: Theory and Experimental determination- Expression for Young's modulus by Non uniform-Uniform bending and experimental determination-I-shape girders-Other states of matter.

UNIT II LASER AND FIBER OPTICS 9

LASER:

Interaction of radiation with matter (Quantum mechanical view) : Principle of spontaneous emission and stimulated emission - Einstein Coefficients-Derivation - Difference between spontaneous emission and stimulated emission - Basic components in Laser - Principle of laser - properties of laser - Types of lasers: Nd-YAG laser, CO_2 laser, Semiconductor laser: Homojunction - Heterojunctions - Application of laser.

FIBER OPTICS:

Fiber optics - principle of optical fibers - acceptance angle-total internal reflection-numerical aperture - types of optical fibre-losses in fibres: scattering losses-absorption losses-fiber optics sensors: Displacement sensors-pressure sensor with micro bending concept-application of fiber optic sensors-characteristics advantages of fiber optical sensors.

UNIT III THERMAL PHYSICS 9

Transfer of heat energy - conduction-convection-radiation - Thermal expansion of solids: Relation between α and β - Thermal expansion of liquids-Thermal Conduction/Conductivity: Heat conduction in solids - Heat Conduction through Compound media Series and Parallel - Radial flow of Heat - Analogy between thermal and electrical conduction - Experimental Measurement of Thermal Conductivity: Forbes Method (Good Conductor) - Lee’s Disc Method for finding Thermal Conductivity (Bad Conductor) - Convection: Thermal insulation - U-values-Radiation: High temperature furnace - Heat Exchangers - Greenhouse effect – Solar power - Refrigerators - Ovens.

UNIT IV SEMICONDUCTOR AND ITS APPLICATION 9

Introduction - Basics of the band theory of solids - Types of semiconductors - Hall effect - determination of Hall coefficient - P-N junction diode - voltage - current characteristics of a P-N junction diode - Introduction to optoelectronic devices - LED-construction, working and applications - OLED - construction, working and applications - Solar cell-construction, working and applications.

UNIT V QUANTUM PHYSICS 9

Introduction - Black body radiation – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional box –Tunnelling - Scanning tunnelling microscope.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply the knowledge of properties of matter to real world engineering applications	Apply
CO2: Analyze and characterize fiber optics and laser beams.	Analyze
CO3: Analyze the behavior of thermal system.	Analyze
CO4: Analyze and explain the semiconductor materials and its application.	Analyze
CO5: Understand fundamental principles and mathematical formalism of quantum physics.	Understand

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
MAX	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1 ; No Correlation - -

Text Book(s) :

T1. Avathanulu M.N and Kshirsagar P.G, "A text book of Engineering Physics", S. Chand and company, 11th Edition, 2014.

T2. Bhattacharya D.K and Poonam T, "Engineering Physics", Oxford University Press, 2017.

T3. Halliday D, Resnick R and Walker J, "Principles of Physics", Wiley, 9th Edition, 2010.

T4. Engineering Physics, Rajendran V., Tata McGraw-Hill Education Pvt. Ltd., 2010.

Reference Book(s):

R1. Arthur Beiser, “Concepts of Modern Physics”, Tata McGraw Hill, 9th Edition, 2015.

R2. Engineering Physics, R K Gaur and S L Gupta Dhanpat Rai Publications.Edition, 2014.

R3. "Physics" by David J. Johnson.

R4. Concepts of Physics, H. C. Verma vol 1 and 2, Bharati Bhawan Publishers & Distributors; First edition (2017).

Course Code: 24ESC104		**Course Title: Engineering Graphics**	
Course Category: ESC		**Credits: 4**	
L:T:P (Hours/Week)	**2:0:4**	**Total Contact Hours:90**	**Max Marks: 100**

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- To provide knowledge on fundamentals of engineering drawings and conic sections.
- To impart skill on orthographic projections of points and lines.

- To familiarize on projection of planes and simple solids.
- To provide knowledge on section of solids and development of surfaces of simple solids.
- To impart skill on conversion of isometric view to orthographic projection and vice versa.

UNIT I: CONCEPTS AND PLANE CURVES 6+12

Definition, standards, drawing tools, drawing sheets, scales, line and its types. Practices on lettering, numbering, dimension of drawings. Construction of conic sections - ellipse, parabola and hyperbola using eccentricity method - Cycloid and involute of circle and square.

UNIT II: PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12

Orthographic projection - principles - Principal planes - First angle projection - projection of points. Projection of straight lines inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes inclined to both the principal planes by rotating object method (Square, Circle, Polygonal surfaces).

UNIT III: PROJECTION OF SOLIDS AND FREE HAND SKETCHING 6+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Layout of views - Freehand sketching of multiple views from pictorial views of objects by free hand sketching.

UNIT IV: PROJECTION OF SECTIONED SOLIDS AND DEVLOPMENT OF SURFACE 6+12

Introduction to 'section of solids'. Section of simple solids in simple vertical position, when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones. Application of sections of solids and development of lateral surfaces.

UNIT V: ISOMETRIC AND PERSPECTIVE PROJECTION 6+12

Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones - combination of two solid objects in simple vertical positions - Applications of isometric projection. Perspective projection of simple solids - Prisms, pyramids and cylinders by visual ray method - Applications of perspective projection.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)

Introduction to computer aided drafting and dimensioning using appropriate software. 2D drawing commands: Zoom, Picture editing commands, Dimensioning, Isometric drawing, Isoplanes and 3D drafting. Plotting of drawing. Practice includes drawing the projection of lines and solids. Prepare isometric view of simple solids like prisms, pyramids, cylinders and cones.

COURSE OUTCOMES	Cognitive Level
At the end of this course, students will be able to:	

CO1: Construct the conic curves, involutes and cycloid.	Create
CO2: Construct the projections of points, lines and planes.	Create
CO3: Draw the projections of simple solids.	Create
CO4: Draw the development of simple solids.	Create
CO5: Draw the orthographic, isometric and perspective projections of simple solids.	Create

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
CO2	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
CO3	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
CO4	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
CO5	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-

(1 – Low, 2 – Medium, 3 – High, "-" – No Correlation)

Text Book(s):

T1.Venugopal K. And PrabhuRaja V., "Engineering Graphics", New Age International (P) Limited,2019.

T2. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai,2019

Reference Book(s):

R1. Bhatt N.D, "Engineering Drawing", Charotar Publishing House, 1st Edition, 2010.

R2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, 1st Edition, 2008.

R3. K Leo Dev Wins., "Engineering Drawing", Pearson (Wins) Publications, Latest Edition, 2019.

R4. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005

R5. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size, lay out of drawing sheet
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.

5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day .

Web References:

1. https://nptel.ac.in/courses/112103019
2. https://archive.nptel.ac.in/courses/112/102/112102304/

Course Code :24CSC101	**Course Title : Programming in C**	
Course Category : PCC	**Credits : 3**	
L:T:P(Hours/Week) : 3:0:0	**Total Contact Hours : 45**	**Max Marks : 100**

COURSE OBJECTIVES:

- To understand the constructs of C Language.
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop modular applications in C using functions

- To develop applications in C using pointers and structures
- To do input/output and file handling in C

UNIT I BASICS OF C PROGRAMMING 9

Introduction to programming paradigms – Applications of C Language - Structure of C program– C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements –Decision making statements - Switch statement - Looping statements

UNIT II ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

UNIT III FUNCTIONS AND POINTERS 9

Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions –Pointers –Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference.

UNIT IV STRUCTURES AND UNION 9

Structure - Nested structures – Pointer and Structures – Array of structures – Self-referential structures – Dynamic memory allocation - Singly linked list – typedef – Union - Storage classes and Visibility.

UNIT V FILE PROCESSING 9

Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.

COURSE OUTCOMES At the end of this course, students will be able to:	**Cognitive Level**
CO1: Demonstrate knowledge on C Programming constructs.	Understand
CO2: Develop simple applications in C using basic constructs	Apply
CO3: Design and implement applications using arrays and strings	Apply
CO4: Implement modular applications in C using functions	Apply
CO5: Develop applications in C using structures and pointers	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

CO1	1	2	2	1	2	1	1	1	2	-	3	2	1	2
CO2	2	2	2	1	2	1	1	1	2	-	3	3	2	2
CO3	2	3	2	1	2	1	1	1	2	-	3	2	2	2
CO4	3	2	2	1	3	1	1	1	2	-	3	3	2	2
CO5	2	3	3	1	2	1	2	1	2	-	3	2	2	3

High-3; Medium-2; Low-1

Text Book(s):

T1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.

T2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

Reference Book(s):

R1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.

R2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.

R3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.

R4. radip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.

Web References:

1. https://archive.nptel.ac.in/courses/112/106/112106286/
2. https://www.selfstudys.com/mcq/gate/mechanical-engineering/online-test/chapter-7-engineering-mechanics.

Course Code : 24HSM104	**Course Title: Tamils and Technology**	
Course Category: HSMC	**Credits: 1**	
L: T:P(Hours/Week) : 1:0:0	**Total Contact Hours : 15**	**Max Marks : 100**

அலகு I **நெசவு மற்றும் பானைத் தொழில் நுட்பம்:**

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில் நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள்- பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II **வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோவில்கள் மற்றும் பிற வழிப்பாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டி நாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை.

அலகு III உற்பத்தித் தொழில் நுட்பம்:

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல் மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் -சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்ப் பாசனத் தொழில் நுட்பம்:

அணை, ஏரி, குளங்கள், மதகு - சோழர் காலக் குமிழிகள் கூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

அலகு V அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்:

அறிவியல் தமிழ் வளர்ச்சி - கணினித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின் பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற் குவைத் திட்டம்.

UNIT I WEAVING AND CERAMIC TECHNOLOGY

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

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY

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

UNIT III MANUFACTURING TECHNOLOGY

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel - Copper and gold - Coins as source of history - Minting of Coins – Beads making - industries Stone beads - Glass beads -

Terracotta beads - Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY

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

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

<u>TEXT BOOKS AND REFERENCE:</u>

1. தமிழக வரலாறு -மக்களும் பண்பாடும் - கே .கே .பிள்ளை வெளி மீது :தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்.(
2. கணினித் தமிழ் -முனைவர் இல .சுந்தரம்) விகடன் பிரசுரம்(
3. கீழடி -வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம்) தொல்லியல் துறை வெளி யீடு.(
4. பொருநை -ஆற்றங்கரை நாகரிகம்) தொல்லியல் துறை வெளியீடு(
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL - (in print).
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

Course Code :24BSC121	Course Title :Engineering Physics Laboratory	
Course Category : BSC	Credits : 2	
L:T:P(Hours/Week) : 0:0:4	Total Contact Hours : 60	Max Marks : 100

COURSE OBJECTIVES:

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.

LIST OF EXPERIMENTS

1. Determination of Young's modulus – Uniform bending method
2. Determination of Rigidity modulus – Torsion Pendulum.
3. Determination of Young's modulus – Cantilever method.
4. Determination of thickness of a thin wire – Air Wedge
5. Determination of Young's modulus -Non-uniform bending method.
6. Determination of band gap of a semiconductor.
7. Lee's disc – Determination of thermal conductivity of a bad conductor.
8. Determination of the wavelength of the laser using grating–Laser.
9. Determination of acceleration due to gravity-Compound Pendulum.
10. Semiconductor Laser:
11. a. Determination of wavelength of laser

    b. Determination acceptance angle and numerical aperture of an optical fibre.

To make the student an active participant in each part of all lab exercises.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Understand the functioning of various physics laboratory equipment.	Understand
CO 2: Use graphical models to analyze laboratory data.	Analyze
CO 3: Use mathematical models as a medium for quantitative reasoning and describing physical reality.	Analyze
CO 4: Access, process and analyze scientific information.	Analyze
CO 5: Solve problems individually and collaboratively	Apply

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
MAX	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1 ; No Correlation - -

Text Book(s):

T1. Practical physics G.L squires Cambridge university plus

T2. Jayaraman: Engineering Physics laboratory manual Edition, 2013,

T3. Sesha Sai kumar Vemula:" Engineering Physics laboratory Lab manual Edition 2017,

T4. D.K Bhattacharya and Poonam Tandon:"Engineering Physics Edition 2015.

Reference Book(s):

R1.Naidu: "Engineering Physics "(Pearson).

R2.Malik and Singh: "Engineering Physics (Tata McGraw-Hill Education Pvt. Ltd.,)

Course Code: 24ESC121	Course Title: Engineering Practices Laboratory	
Course Category: ESC	Credits: 2	
L:T:P (Hours/Week) 0:0:4	Total Contact Hours: 60	Max Marks: 100

COURSE OBJECTIVES:

- Develop practical skills in plumbing, woodwork, welding, machining, and sheet metal work.
- Understand and apply techniques for various household and industrial fittings and connections.
- Study and demonstrate the assembly and operation of common mechanical systems and components.
- Wiring various electrical joints in common household electrical wire work
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP-A (CIVIL AND MECHANICAL)

I CIVIL ENGINEERING PRACTICE

Plumbing Works:

a) Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
b) Laying pipe connection to the suction & delivery side of a pump – inlet & outlet
c) Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

Carpentry Works:

a) Sawing, planning and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint.

Study

a) Study of joints in door panels, wooden furniture.
b) Study of common industrial trusses using models.

II MECHANICAL ENGINEERING PRACTICE

Welding:

a) Arc welding of butt joints, lap joints, tee joints.
b) Gas welding Practice.

Basic Machining:

a) Simple turning, drilling and tapping operations.

Sheet Metal Work:

a) Forming & Bending.
b) Model making – Trays, funnels, etc.
c) Different type of joints.

Demonstration only:

Study and assembling the following:

a) Centrifugal pump.
b) Submersible pump sets.

Demonstration only:

a) Basics of Smithy operations.
b) Foundry operation like mould preparation for grooved pulley.
c) Refrigeration and Air-Conditioning System.

GROUP-B (ELECTRICAL AND ELECTRONICS)

I ELECTRICAL ENGINEERING PRACTICE

a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with
b) Lamp, fan and three pin socket.
c) Staircase wiring.
d) Fluorescent Lamp wiring with introduction to CFL and LED types.
e) Energy meter wiring and related calculations/ calibration.
f) Study of Iron Box wiring and assembly.
g) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
h) Study of emergency lamp wiring/Water heater.

II ELECTRONICS ENGINEERING PRACTICE

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

a) Study an elements of smart phone.

b) Assembly and dismantle of LED TV.

c) Assembly and dismantle of computer/ laptop

COURSE OUTCOMES At the end of this course, students will be able to:	Cognitive Level
CO1: Perform basic plumbing, carpentry, welding, machining, and sheet metal tasks.	Understand
CO2: Create and interpret technical sketches for plumbing and carpentry.	Create
CO3: Execute basic electrical and electronics wiring and soldering.	Understand
CO4: Analyze and assemble mechanical systems like pumps and HVAC.	Analyze
CO5: Apply safety protocols in civil, mechanical, electrical, and electronics tasks.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	1	-	-	-	1	1	-	2	2	1
CO2	3	2	1	-	1	-	-	-	1	1	-	2	2	1
CO3	3	2	1	-	2	-	-	-	2	1	-	2	2	1
CO4	3	2	1	-	1	-	-	-	1	1	-	2	2	1
CO5	3	2	1	-	1	-	-	-	1	1	-	2	2	1
Max	**3**	**2**	**1**	**-**	**2**	**-**	**-**	**-**	**2**	**1**	**-**	**2**	**2**	**1**

(1 – Low, 2 – Medium, 3 – High, "-"– No Correlation)

Course Code: 24CSC111	**Course Title: Programming in C Laboratory**	
Course Category: PCC	**Credits: 2**	
L:T:P (Hours/Week) : 0:0:4	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES:

- To familiarize with C programming constructs.
- To develop programs in C using basic constructs.
- To develop programs in C using arrays.
- To develop applications in C using strings, pointers, functions.
- To develop applications in C using structures.
- To develop applications in C using file processing.

EXPERIMENTS

1. Write a C Program To take input of name, roll no and marks obtained by a student in 4 subjects of 100 marks each and display the name, roll no with percentage score secured.
2. Write a C program to check whether a number is Palindrome or not.
3. Write a C program to generate Fibonacci series.
4. Write a C Program to reverse the array elements in C Programming
5. Write a C program to find power of any number using recursion.
6. Write a C program to add, subtract, multiply and divide two integers using user defined type function with return type.
7. Write a C program to swap two integers using call by value and call by reference methods of passing arguments to a function.
8. Write a C program to find whether a character is consonant or vowel using switch statement.
9. Write a C program to list all files and sub-directories in a directory
10. Write a C Program to find the area and circumference of a circle.
11. Write a C Program to print all the calculator operations using switch statement.
12. Write a C program to perform matrix multiplication.

COURSE OUTCOMES At the end of this course, students will be able to:	Cognitive Level
CO 1: Demonstrate knowledge on C Programming constructs.	Understand
CO 2: Develop simple applications in C using basic constructs	Apply
CO 3: Develop programs in C using arrays.	Apply
CO 4: Develop applications in C using strings, pointers, functions	Apply
CO 5: Develop applications in C using structures	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	3	1	1	1	-	-	2	1	2	2	2	2
CO2	2	3	3	2	1	1	-	-	2	1	2	2	2	2
CO3	2	2	2	1	1	2	-	-	2	-	2	2	2	2
CO4	2	2	2	2	3	2	-	-	3	-	3	3	3	3
CO5	2	2	3	2	1	2	-	-	2	1	2	2	2	2

High-3; Medium-2; Low-1

Text Book(s):

T1.Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.

T2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

Reference Book(s):

R1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.

R2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.

R3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.

R4. radip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.

Web References:

1. https://archive.nptel.ac.in/courses/112/106/112106286/
2. https://www.selfstudys.com/mcq/gate/mechanical-engineering/online-test/chapter-7-engineering-mechanics.

Course Code: 24CDC102	Course Title: Career Development Skills II	
Course Category: EEC	Credits: 1	
L:T:P (Hours/Week) 1:0:0	Total Contact Hours: 15	Max Marks: 100

COURSE OBJECTIVES
• Develop interpersonal skills.
• Develop Listening and Speaking skills.
• Make interferences and predictions about spoken discourse that enhance RW skills.

UNIT I	MOTIVATION AND INTERPERSONAL SKILLS	3
Motivation II – Offer personalised guidance and support – Engage active learning methods – Create a supportive environment personally – Highlight success stories – Celebrate progress – Follow ups. **Interpersonal Skills** – Verbal, Non-verbal and Listening skills – Analysing problems – Contributing ideas – Positive relationships – Mutual respect – Negotiation.		
UNIT II	**LISTENING AND CONVERSATION SKILLS**	**3**
Listening skills – Focus and attention – Non-verbal cues – Paraphrasing – Understanding emotions – Reflecting feelings – Allowing pause – Avoiding interruption – Respond appropriately – Clarifying and Confirming – Maintaining open-mindedness **Conversation skills –** Opening lines **–** Ice-breakers – Sharing and expressing ideas – Clarity and relevance – Smooth translations – Articulate thoughts - Avoid judgement – Polite language – Express appreciation – Open to feedback		
UNIT III	**TYPES OF SKILLS**	**3**
Reading skills – Speed and Accuracy – Understanding main ideas – Skimming and Scanning – Word recognition – Expanding vocabulary – Analysing text – Making connections – Evaluate and Synthesise – Academic / Professional/ Personal reading **Writing skills –** Clear communication – Logical organization – Grammar and Mechanics – Avoiding redundancy – Choosing strong words – Tone and Style – Concluding structure – Editing and Revision – Originality – Academic/ Professional/ Personal writing **Attitudes –** Positive Attitudes - Preparedness – Adaptability – Professionalism – Resilience – Listening skills – Teamwork and Collaboration – Curiosity and Learning orientation – Gratitude and Humility **Manners & Behaviour –** Politeness and Courtesy – Confidence without arrogance – Respect for personal space and boundaries – Flexibility and Conflict Resolution skills		

UNIT IV	TIME AND STRESS MANAGEMENT	3

i)Self-awareness – Understanding Strengths and Weaknesses – Personal values – Emotional intelligence – Self-Reflection and Learning Style

ii)Self-confidence – building a Positive Self – Image – Overcoming fear of failure – Assertiveness

Time management – Setting Priorities – Planning and Scheduling – Time Estimation and Budgeting – Minimizing Procrastination – Effective decision making

Stress management – Stressors Identification - Relaxation techniques – Mindfulness- Physical Activity – Positive thinking - Healthy lifestyle – Sound sleep – Hobbies and leisure activities – Humour and laughter – Say 'no' to unwanted

Emotional intelligence – Self-regulation – empathy – Societal bearing – Understanding causes and consequences of emotions

UNIT V	HIGHER EDUCATION AND ENTREPRENEURSHIP	3

i) Introduction to Higher Education – Specialization – Research opportunities – Career advancement – Employability –

ii) Competitive exams – Merit recognition – Validation of academic abilities – Global recognition (GRE, GMAT, SAT) – Competitive edge – Global career opportunities – Excel, Grow and Achieve professionally

Introduction to Entrepreneurship – Independence and autonomy – Opportunity to pursue passion – Innovation and creativity – Creating jobs – Sharing and Mutual growth via collaborations and partnerships.

Total : 15 Hours

COURSE OUTCOMES

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

CO1: Develop strong interpersonal skills.

CO2: Develop strong listening and speaking skills.

CO3: Make predictions about spoken discourse that enhance RW skills

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1								3			
CO2								2	2	3		2			
CO3	1	1	1			1		1	2	2		1			

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Dr.R.S.Aggarwal, “A Modern Approach to Verbal and Non-verbal Reasoning”, S Chand Publishing, 2023.
T2.	Arun Sharma and Meenakshi Upadhyay, “Verbal Ability and Reading comprehension”, Tata McGraw Hill Education, 2014.
T3.	Sanjay Kumar and Pushp Lata, “Communication skills”, Oxford Higher Education, 2011.

REFERENCE BOOK(S)	
R1.	Arun Sharma, “Logical Reasoning for CAT”, Tata McGraw Hill Education, 2024.
R2.	Peeyush Bhardwaj, “The Hand on Guide to Analytical and Logical Reasoning”, Arihant Publication, 2023.
R3.	Nira Konar, “Communication Skills for Professionals”, PHI learning Pvt. Ltd, 2011.

SEMESTER III

Course Code: 24BSC202	**Course Title: Discrete Mathematics**	
Course Category: BSC	**Credits: 4**	
L:T:P (Hours/Week) 3:1:0	**Total Contact Hours: 60**	**Max Marks: 100**

COURSE OBJECTIVES
• To understand the basic concepts of propositions by various discrete structure techniques.
• To apply predicate calculus to represent and solve mathematical and real world problems.
• To solve practical issues and apply the algebraic concepts of set operations.
• To investigate functions as relations and its properties.
• To familiarize the algebraic structures.

UNIT I	PROPOSITIONAL CALCULUS	9+3
Propositions – Logical connectives – Compound propositions – Conditional and biconditional propositions – Truth tables – Tautologies and Contradictions – Inverse, Converse and Contrapositive – Logical equivalences and implications –Normal forms – Principal conjunctive normal form and Principal disjunctive normal form – Rules of inference – Arguments – Validity of arguments.		
UNIT II	**PREDICATE CALCULUS**	**9+3**
Predicates – Statement function – Variables – Quantifiers – Universe of discourse – Theory of inference – Rules of universal specification and generalization – Rules of Existential specification and generalization - Validity of arguments.		
UNIT III	**SET THEORY**	**9+3**
Cartesian product of sets – Relations on sets – Types of relations and their properties – Matrix representation of a relation - Graph of a relation – Equivalence relations – Partial ordering – Poset – Hasse diagram – Lattices – Properties of lattices.		
UNIT IV	**FUNCTIONS**	**9+3**
Definition – Classification of functions – Composition of functions – Inverse functions – Characteristic function of a set – Recurrence relations – Solution of recurrence relations – Generating Functions – Solving recurrence relation by generating functions.		
UNIT V	**GROUP THEORY**	**9+3**
Groups and Subgroups – Homomorphism – Cosets – Lagrange‘s theorem – Normal subgroups – Coding Theory: Group codes –Hamming distance – Basic notions of error correction – Error recovery in group codes.		

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Apply propositional logic to validate the arguments.
CO2: Illustrate the rules of inference and methods of proof in predicate calculus to verify the

validity of arguments.
CO3: Elucidate various set theoretic concepts.
CO4: Understand different types of functions and solve recurrence relations.
CO5: Interpret the concepts of group structures in coding theory.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	1	1	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	1	1	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	1	1	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-	3	1	-

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Rosen. K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
T2.	Tremblay. J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
T3.	Veerarajan. T., “Discrete Mathematics with Graph Theory and Combinatorics”, Reprint Edition, Tata McGraw Hill Publishing Company, New Delhi, 2013.

REFERENCE BOOK(S)

R1.	Alan Doerr and Kenneth Levasseur, “Applied Discrete Structures”, 3rd Edition, 2018.
R2.	Susanna S. Epp, “Discrete Mathematics with Applications”, Metric Edition, Cengage Learning, USA, 2019.
R3.	Lipschutz. S and Mark Lipson, “Discrete Mathematics”, Schaum’s Outlines,3rd Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2010.

Course Code: 24BSC207	**Course Title: Environmental Science and Sustainability**	
Course Category: BSC	**Credits: 2**	
L:T:P (Hours/Week) 2:0:0	**Total Contact Hours: 30**	**L:T:P (Hours/Week) 2:0:0**

COURSE OBJECTIVES

• To explain the relationship and the unity of life in all its forms, the implications of lifestyle on the environment.
• To evaluate the environmental resources and causes for degradation.
• To summarize the renewable and non-renewable resources
• To explicit the impact of individuals' contribution in the environmental pollution.
• To mitigate the various pollution control protocols at the global and local environment.

UNIT I	**ENVIRONMENT, ECOSYSTEM AND BIODIVERSITY**	**6**
Key environmental problems, their basic causes and sustainable solutions. IPAT equation. Ecosystem, earth - life support system and ecosystem components; Food chain, food web, Energy flow in ecosystem; Ecological succession- stages involved, Primary and secondary succession, Hydrarch, mesarch, xerarch -Importance, types, mega-biodiversity -Threats due to natural and anthropogenic activities and Conservation methods.		
UNIT II	**SUSTAINING NATURAL RESOURCES AND ENVIRONMENTAL QUALITY**	**6**
Environmental hazards - causes and solutions. Biological hazards - AIDS, Malaria, Chemical hazards- BPA, PCB, Phthalates, Mercury, Nuclear hazards- Risk and evaluation of hazards. Water footprint; virtual water, blue revolution. Water quality management and its conservation. Solid and hazardous waste - types and waste management methods-Sustainable Development Goals(SDG).		
UNIT III	**ENERGY RESOURCES**	**6**
Renewable - Non-renewable energy resources- Advantages and disadvantages - oil, Natural gas, Coal, Nuclear energy. Energy efficiency and renewable energy. Solar energy, Hydroelectric power, Ocean thermal energy, Wind and geothermal energy. Energy from biomass, solar- Hydrogen revolution.		
UNIT IV	**ENVIRONMENTAL IMPACT ASSESSMENT**	**6**
Introduction to environmental impact analysis. EIA guidelines, Notification of Government of India (Environmental Protection Act-Air, water, forest and wildlife). Impact assessment methodologies. Public awareness. Environmental priorities in India.		
UNIT V	**GLOBAL CLIMATIC CHANGE AND MITIGATION**	**6**
Climate disruption, Greenhouse effect, Ozone layer depletion and Acid rain. Kyoto protocol, Carbon credits, Carbon sequestration methods and Montreal Protocol, Role of Information technology in environment - Case Studies-Guest lecture by Industry Experts or R&D organization.		
		Total: 30 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand the interrelationship between living organism and environment.
CO2: Identify various environmental hazards.
CO3: Design various methods for the conservation of resources.
CO4: Explain the importance of environment by assessing its impact on the human world.
CO5: Relate the global climatic changes and its mitigation procedures.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	-	-	2	3	-	-	-	-	1	1	-	-
CO2	3	1	1	-	-	2	2	-	-	-	-	2	1	-	-
CO3	2	1	1	-	-	3	2	-	-	-	-	2	1	-	-
CO4	3	1	1	-	-	2	1	-	-	-	-	2	1	-	-
CO5	3	1	1	-	-	3	1	-	-	-	-	2	1	-	-

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	AnubhaKaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.
T2.	G. Tyler Miller and Scott E. Spoolman, "Environmental Science", 15th Edition, Cengage learning, 2016.

REFERENCE BOOK(S)

R1.	George Tyler Miller, Jr. and Scott Spoolman, "Living in the Environment – Principles Connections and Solutions", 17th Edition, Brooks/Cole, USA, 2012.
R2.	David M. Hassenzahl, Mary Catherine Hager and Linda R.Berg, "Visualizing Environmental Science", 4th Edition, John Wiley & Sons, USA, 2011.
R3.	Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd Edition, Pearson Education, 2004.

Course Code: 24ESC213	Course Title: Digital Principles & Systems Design	
Course Category: ESC	Credits: 3	
L:T:P (Hours/Week) 3:0:2	Total Contact Hours: 75	Max Marks: 100

COURSE OBJECTIVES
• To introduce the principles of Canonical forms to minimize the logic expression and understand the operation of various combinational logic circuits.
• To analyze and design synchronous sequential circuits using appropriate methodologies.
• To examine and construct asynchronous sequential circuits by applying systematic design procedures.
• To learn integrated circuit families.
• To write verilog code for combinational logical circuits.

UNIT I	BOOLEAN ALGEBRA AND COMBINATIONAL LOGIC CIRCUITS	9
Minimization Techniques - Boolean postulates and laws - Karnaugh map Minimization - Logic gates - NAND–NOR implementations, Combinational Logic-Adders - Subtractors - Multiplexer/ Demultiplexer– Decoder - Encoder – parity generator - parity checker - Magnitude Comparator - Code converters.		
UNIT II	SYNCHRONOUS SEQUENTIAL LOGIC	9
Flip flops - SR, D, JK, T, Analysis and design of clocked sequential circuits- Moore/Mealy models, state minimization, state assignment, logic implementation - Synchronous and Asynchronous counter, serial in serial out and parallel in parallel out Shift registers.		
UNIT III	ASYNCHRONOUS SEQUENTIAL LOGIC	9
Pulse mode and fundamental mode sequential circuits - Stable and Unstable states - Cycles and Races - State reduction, Race Free State assignments - Hazards, Essential Hazards, Design of Hazard free circuits.		
UNIT IV	MEMORY DEVICES AND PROGRAMMABLE LOGIC DEVICES	9
Memory Devices - Classifications of memory - ROM - PROM - EPROM - EEPROM - RAM - Static and dynamic RAM - Programmable Logic Devices - Implementation of combinational logic circuits using PLA, PAL and PROM.		

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UNIT V	SYSTEM DESIGN USING VERILOG HDL	9
VLSI Circuit Design Flow - Basic concepts: Data types - Modules and ports for Modelling in Verilog HDL - Gate level modelling - Dataflow modelling - Behavioural modelling - structural modelling - Switch level modelling - Design examples.		

PRACTICALS	
1.	Design of Adders and Subtractors.
2.	Design of Multiplexers &Demultiplexers.
3.	Design of Encoders and Decoders.
4.	Design of Magnitude Comparators.
5.	Design and implementation of Synchronous counters.
6.	Design and implementation of Serial in Serial out (SISO) shift register.
7.	Simulation of Adders and Subtractors Using Verilog code.
8.	Simulation of Multiplexers & Demultiplexers Using Verilog code.
	Total: 75 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Use Boolean algebra and simplification procedures relevant to digital logic for Combinational circuits.
CO2: Analyse and design synchronous sequential circuits.
CO3: Analyse and design asynchronous sequential circuits.
CO4: Examine memory devices and to design the programmable devices.
CO5: Apply Verilog code for realization of combinational logical circuits.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	2								2	3
CO2	3	2	1	1	2									2
CO3	3	2	1	1	2								1	1
CO4	3	2	1	1	2								1	
CO5	3	2	1	1	2								2	

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	M. Morris Mano and Michael D. Ciletti, “Digital Design”, 5th Edition, Pearson Education, 2014.
T2.	S. Palnitkar, “Verilog HDL – A Guide to Digital Design and Synthesis”, Pearson Education, 2003.

REFERENCE BOOK(S)	
R1.	Thomas L.Floyd, “Digital Fundamentals”, 11th Edition, Prentice Hall, 2015.
R2.	A.Anand Kumar, “Fundamentals of Digital Circuits”, 4th Edition, PHI Learning Private Limited, 2016.
R3.	D. Donald Givone, “Digital Principles and Design”, Tata McGraw Hill, 2008.
R4.	Leach D, Malvino A P & Saha, “Digital Principles and Applications” 8th Edition, Tata McGraw-Hill Publishing Company, 2014.

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Course Code: 24CSC201	**Course Title: Data Structures**	
Course Category: PCC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES
• To learn the systematic way of solving problems and ADTs.
• To learn linear data structures – stacks and queues.
• To understand non-linear data structures – trees.
• To analyze connectivity in non-linear data structures – graphs.
• To implement advanced sorting and searching techniques.

UNIT I	**ABSTRACT DATA TYPES AND PROBLEM SOLVING**	**9**
Concepts of Data Structures - Overview of Data Structures - Abstract Data Types (ADTs) - List ADT - Linked List Implementation - Singly - Circularly -Doubly -Linked Lists - Introduction to Analysis of Algorithms-Asymptotic Notations.		
UNIT II	**STACKS AND QUEUES**	**9**
Stack ADT - Operations - Applications of Stack - Implementation of Stack - Queue ADT - Operations - Applications of Queues - Implementation of Queues.		
UNIT III	**TREES**	**9**
The Search Tree ADT - Tree Traversals - Binary Search Tree ADT - AVL Trees - Priority Queue (Heaps) - Binary Heap (Heap Sort).		
UNIT IV	**GRAPHS**	**9**
Graph Definition - Representation of Graphs - Types of Graph - Breadth-First Traversal - Depth-First Traversal - Bi-Connectivity - Dijkstra's Algorithm - Minimum Spanning Tree - Prim's Algorithm - Kruskal's Algorithm.		
UNIT V	**SEARCHING AND SORTING**	**9**
Searching - Linear Search - Binary Search, Sorting - Bubble Sort - Selection Sort - Insertion Sort- Quick Sort - Merge Sort - Shell Sort.		
		Total: 45 Hours

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COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand the concept of Abstract Data Types (ADTs) and their role in structuring data.
CO2: Apply stack operations in applications such as expression evaluation and recursion handling**.**
CO3: Understand and implement efficient tree-based data structures and algorithms for optimized searching, sorting, and priority-based operations.
CO4: Implement graph traversal techniques such as Breadth-First Search (BFS) and Depth-First Search (DFS).
CO5: Apply sorting algorithms including Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, and Shell Sort.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	3										3	1
CO2		1												2
CO3		3	1	1						1			3	1
CO4	3	1	2					1						
CO5	3	1	2										3	3

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Mark A. Weiss , " Data Structures and Algorithm Analysis in C++ ", 4th Edition, Pearson Education, 2019.
T2.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", 4th Edition, The MIT Press, 2022.

REFERENCE BOOK(S)	
R1.	Langsam, Augenstein and Tanenbaum, "Data Structures Using C and C++", 2nd Edition, Pearson Education, 2015.
R2.	Alfred V. Aho, Jeffrey D. Ullman,John and E. Hopcroft ,"Data Structures and Algorithms", 1st edition, Pearson, 2002.
R3.	Kruse, "Data Structures and Program Design in C", 2nd Edition, Pearson Education, 2006.

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Course Code: 24CSC202	**Course Title: Computer Architecture**	
Course Category: PCC	**Credits: 3**	
L:T:P(Hours/Week): 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES
• To impart basic concepts of computer arithmetic.
• To learn about machine instructions and arithmetic operations.
• To familiarize about basic processing unit.
• To understand the concept of pipelining.
• To facilitate students in learning I/O organization.

UNIT I	**COMPUTER ARITHMETIC**	**9**
Arithmetic Algorithms for Additions, Subtraction, Multiplication and Division on Signed Magnitude, 2's Complement Numbers and Floating-Point Numbers.		
UNIT II	**MACHINE INSTRUCTIONS AND ARITHMETIC OPERATIONS**	**9**
Memory Locations and Addresses - Instruction and Instruction Sequencing - Addressing Modes - Stacks - Subroutines RISC and CISC Styles - Encoding of Machine Instructions.		
UNIT III	**BASIC PROCESSING UNIT**	**9**
Fundamental Concepts - Instruction Execution - Hardware Components - Instruction Fetch and Execution Steps Control Signals - Hardwired Control - CISC Style Processors.		
UNIT IV	**PIPELINING**	**9**
Basic Concepts - Pipeline Organization - Pipelining Issues - Data Dependencies - Memory Delays - Branch Delays - Resource Limitations - Performance Evaluation -Superscalar Operation.		
UNIT V	**I/O ORGANIZATION**	**9**
Accessing I/O Devices: I/O Device Interface - Program-Controlled I/O. Interrupts: Enabling and Disabling Interrupts - Handling Multiple Devices - Controlling I/O Device Behaviour - Processor Control Register - Bus Structures - Bus Operation - Arbitration - Interface Circuits- Direct Memory Access.		
		Total: 45 Hours

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COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Apply arithmetic algorithms for addition, subtraction, multiplication, and division on signed magnitude, 2’s complement, and floating-point numbers.
CO2: Analyze memory addressing, instruction sequencing, and machine instruction encoding in RISC and CISC architectures.
CO3: Explain instruction execution, control signals, and hardware components in hardwired and CISC-style processors.
CO4: Evaluate pipelining concepts, data dependencies, memory delays, and performance enhancements in superscalar operations.
CO5: Design efficient I/O device interfaces, interrupt handling mechanisms, and bus structures for processor communication.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1		1								2	
CO2	2	1			1	2							2	
CO3		2	2							2				2
CO4		1	1		2								2	
CO5	2	1	1		1								2	

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraj Manjikian, “Computer Organization and Embedded Systems”, McGraw-Hill, Sixth Edition, 2017.
T2.	Morris Mano, “Computer System Architecture ”, Pearson Education, Third Edition, 2017.

REFERENCE BOOK(S)	
R1.	William Stallings, “Computer Organization and Architecture – Designing for Performance”, Pearson Education, Tenth Edition, 2016.
R2.	David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware / Software Interface”, Morgan Kaufmann, Fifth Edition, 2013.
R3.	John P. Hayes, “Computer Architecture and Organization”, McGraw Hill, Third Edition, 2017.

[Type text]

Course Code: 24CSC211	**Course Title: Object Oriented Programming**	
Course Category: PCC	**Credits: 4**	
L:T:P(Hours/Week): 3:0:2	**Total Contact Hours: 75**	**Max Marks: 100**

COURSE OBJECTIVES
• To understand Object Oriented Programming concepts and basics of Java programming language.
• To apply the principles of packages, inheritance and interfaces.
• To develop a java application with exceptions and threads.
• To develop java programs using files and strings.
• To design and build Graphical User Interface Application using JAVAFX.

UNIT I	**INTRODUCTION TO OOP AND JAVA**	**9**
Overview of OOP - Object oriented programming paradigms - Features of Object Oriented Programming - Java Buzzwords - Overview of Java - Data Types, Variables and Arrays - Operators - Control Statements - Programming Structures in Java - Defining classes in Java - Constructors -Methods - Access specifiers - Static members - JavaDoc comments.		
UNIT II	**INHERITANCE, PACKAGES AND INTERFACES**	**9**
Overloading Methods - Objects as Parameters - Returning Objects - Static, Nested and Inner Classes. Inheritance: Basics - Types of Inheritance -Super keyword -Method Overriding - Dynamic Method Dispatch - Abstract Classes - final with Inheritance - Packages and Interfaces: Packages - Packages and Member Access - Importing Packages - Interfaces.		
UNIT III	**EXCEPTION HANDLING AND MULTITHREADING**	**9**
Exception Handling basics - Multiple catch Clauses - Nested try Statements - Java's Built-in Exceptions - User defined Exception. Multithreaded Programming: Java Thread Model- Creating a Thread and Multiple Threads - Priorities - Synchronization - Inter Thread Communication- Suspending - Resuming, and Stopping Threads - Multithreading - Wrappers - Auto boxing.		
UNIT IV	**I/O, GENERICS, STRING HANDLING**	**9**
I/O Basics - Reading and Writing Console I/O - Reading and Writing Files - Generics: Generic Programming - Generic classes - Generic Methods - Bounded Types - Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.		

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UNIT V	JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS	9
JAVAFX Events and Controls: Event Basics - Handling Key and Mouse Events. Controls: Checkbox, Toggle Button - Radio Buttons - List View - Combo Box - Choice Box - Text Controls - Scroll Pane. Layouts - Flow Pane - HBox and VBox - Border Pane - Stack Pane - Grid Pane. Menus - Basics - Menu - Menu bars - Menu Item.		

PRACTICALS	
1.	Write a java program to illustrate the concept of class and object creation.
2.	Write a java program to implement constructors.
3.	Write a java program to implement abstract class and abstract method.
4.	Write a java program to implement Inheritance.
5.	Write a java program to implement I/O, Throwing and Catching exceptions.
6.	Write a java program to implement Designing Packages
7.	Write a java program to implement Interfaces in Java.
8.	Write a java program to manipulate file operations.
9.	Write a java program to create multithreads in Java applications.
10.	Write a java program to implement Event driven programming.
	Total: 75 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Apply the concepts of classes and objects, inheritance, to solve simple problems.
CO2: Develop programs using packages and interfaces.
CO3: Apply the concepts of exception handling mechanisms to solve real world problems.
CO4: Build Java applications with I/O packages, Java collection API and JDBC.
CO5: Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications.

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COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	3	1					3			2	3	1
CO2			3	2	1		1		2			3	3	3
CO3	3	3	1									2	3	1
CO4	3	1	2		1				1			3	3	1
CO5	1	1	2	3								2	3	3

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Herbert Schildt, “Java: The Complete Reference”, 11th Edition, McGraw Hill Education, New Delhi, 2019.
T2.	Herbert Schildt, “Introducing JavaFX 8 Programming”, 1st Edition, McGraw Hill Education, New Delhi, 2015.

REFERENCE BOOK(S)

R1.	Cay S. Horstmann, “Core Java Fundamentals”, Volume 1, 11th Edition, Prentice Hall, 2018.
R2.	Paul Deitel, Harvey Deital, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
R3.	Sachin Malhotra, Saurabh Choudhary, “Programming in Java”, Revised Second Edition, Oxford, 2018.

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Course Code: 24CSC221	**Course Title: Data Structures Laboratory**	
Course Category: PCC	**Credits: 2**	
L:T:P(Hours/Week): 0:0:4	**Total Contact Hours: 60**	**Max Marks: 100**

COURSE OBJECTIVES
• To understand and implement fundamental data structures such as structures.
• To develop and apply linked list operations for implementing linear linked lists.
• To implement and analyze tree and graph algorithms.
• To apply and evaluate various sorting algorithms.
• To implement Dijkstra's algorithm for shortest path computation.

LIST OF EXPERIMENTS	
1.	Write a program that implement structures (its operations) using i) Structures ii) Array of Structures iii) Nested Structures iv) Pointer to Structures.
2.	Implementation of Linear Linked List.
3.	Write a program that implement Stack (its operations) using linked list.
4.	Write a program that implement Queue (its operations) using linked list.
5.	Write a program to implement the tree traversal methods. i) Pre-order ii) In order iii) Post order.
6.	Implementation of Binary Search Tree.
7.	Write a program to implement the graph traversal methods. i) DFS ii) BFS
8.	Implementation of Dijkstra's Algorithm.
9.	Write a program that implements the following sorting Techniques – I methods. i) Bubble sort ii) Insertion sort iii) Selection sort
10.	Write a program that implements the following sorting Techniques – II methods. i) Quick sort ii) Merge sort iii) Shell sort
	Total: 60 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Implement various concepts of C programming language.
CO2: Implement applications using Stacks and Linked lists.
CO3: Implement Binary Search tree and tree traversal methods.
CO4: Implement graph algorithms.
CO5: Analyze the various sorting algorithms.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	1									2	
CO2	3		1	1	1				1				1	2
CO3	2	1		1							1			
CO4		1		3	1								2	1
CO5	3	2	1	1									3	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Mark A. Weiss , " Data Structures and Algorithm Analysis in C++ ", 4th Edition, Pearson, 2019.
T2.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", 4th Edition, The MIT Press, 2022.

REFERENCE BOOK(S)

R1.	Langsam, Augenstein and Tanenbaum, Data Structures Using C and C++, 2nd Edition, Pearson Education, 2015.
R2.	Alfred V. Aho, Jeffrey D. Ullman,John E. Hopcroft ,Data Structures and Algorithms, 1st edition, Pearson, 2002.
R3.	Kruse, Data Structures and Program Design in C, 2nd Edition, Pearson Education, 2006.

Course Code: 24CDC201	Course Title: Career Development Skills III	
Course Category: EEC	Credits: 1	
L:T:P (Hours/Week) 1:0:0	Total Contact Hours: 15	L:T:P (Hours/Week) 1:0:0

COURSE OBJECTIVES
• To enhance numerical, analytical, and logical reasoning skills.
• To develop professional workplace etiquette and effective email communication skills.

UNIT I	QUANTITATIVE APTITUDE AND REASONING	12
Quantitative Aptitude – Number System – HCF and LCM – Average – AP&GP – Logarithm. Data Interpretation and Logical Reasoning Skills – Tabulations – Logical Sequence – Puzzle Test. Verbal and Non-Verbal Reasoning – Logical Sequence of Words – Truth Verification – Analogy – Figure Matrix. Verbal Ability – Grammar Concepts – Antonyms and Synonyms – Reading Comprehension.		
UNIT II	BUSINESS ETIQUETTE	3
Workplace Etiquette – Punctuality and Time Management – Professional Attire and Grooming – Respectful Communication – Workspace Cleanliness and Organization – Ethical Behaviour and Integrity. E-Mail Etiquette – Importance of Professional Email Communication – Crafting an Effective Subject Line – Maintaining a Polite and Respectful Tone – Respond with Proper Salutations and Closings – Responding Promptly to Emails – Avoid Excessive Formatting or Emojis – Proper Use of Reply All and Forward Functions – Handling Sensitive or Confidential Information. Activities – Role Play, Presentation, Case Study, Mock Team Meeting, Discussion, Responding to Email.		
		Total: 15 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Develop strong analytical, reasoning, and verbal skills across quantitative aptitude, data interpretation, logical reasoning, and verbal ability.
CO2: Apply professional workplace etiquette and exhibit proficiency in crafting clear, respectful, and effective email communication.

COURSE ARTICULATION MATRIX															
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	1								3			
CO2								2	2	3		2			

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Dr.R.S.Aggarwal, ―A Modern Approach to Verbal and Non-verbal Reasoning‖, S Chand Publishing, 2023.
T2.	Arun Sharma and Meenakshi Upadhyay, ―Verbal Ability and Reading comprehension‖, Tata McGraw Hill Education, 2014.
T3.	Sanjay Kumar and Pushp Lata, ―Communication skills‖, Oxford Higher Education, 2011.

REFERENCE BOOK(S)	
R1.	Arun Sharma, ―Logical Reasoning for CAT‖, Tata McGraw Hill Education, 2024.
R2.	Peeyush Bhardwaj, ―The Hand on Guide to Analytical and Logical Reasoning‖, Arihant Publication, 2023.
R3.	Nira Konar, ―Communication Skills for Professionals‖, PHI learning Pvt. Ltd, 2011.

Course Code : 24CDC221	**Course Title : Mini Project I**	
Course Category : EEC	**Credits : 1**	
L:T:P(Hours/Week) : 0:0:2	**Total Contact Hours : 15**	**Max Marks :100**

COURSE OBJECTIVES:

- To enhance students' analytical skills for better problem understanding and evaluation.
- To foster a passion for problem-solving through engaging and challenging tasks.
- To develop students' ability to apply engineering concepts in real-world scenarios effectively.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Formulate a real-world problem, identify the requirements, and design solutions.	Apply
CO 2: Identify technical ideas, strategies, and methodologies.	Analyze
CO 3: Utilize new tools, algorithms, and techniques to contribute to the solution.	Apply
CO 4: Test and validate the prototype for cost-effectiveness.	Evaluate
CO 5: Prepare a report and deliver oral demonstrations.	Create

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	2	-	-	2	2	2	-	-			
CO2	1	2	1	1	2	-	-	2	2	2	-	-			
CO3	1	2	1	1	2	-	-	2	2	2	2	-			
CO4	1	2	1	1	2	-	-	2	2	2	2	-			
CO5	1	2	-	-	2	-	-	2	2	2	-	-			
MAX	1	2	1	1	2			2	2	2	2				

SEMESTER IV

Course Code: 24BSC206	Course Title: Probability and Random Processes	
Course Category: BSC	**Credits: 4**	
L:T:P (Hours/Week) 3:1:0	**Total Contact Hours: 60**	**Max Marks: 100**

COURSE OBJECTIVES
• To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
• To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
• To understand the basic concepts of random processes which are widely used in IT fields.
• To understand the concept of correlation and spectral densities.
• To understand the significance of linear systems with random inputs.

UNIT I	PROBABILITY AND RANDOM VARIABLES	9
Probability – Axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal Distribution.		
UNIT II	**TWO - DIMENSIONAL RANDOM VARIABLES**	**9**
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).		
UNIT III	**RANDOM PROCESSES**	**9**
Classification – Stationary process – Markov process - Markov chain - Poisson process – Random telegraph process.		
UNIT IV	**CORRELATION AND SPECTRAL DENSITIES**	**9**
Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.		
UNIT V	**LINEAR SYSTEMS WITH RANDOM INPUTS**	**9**
Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.		

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
CO2: Demonstrate accurate and efficient use of advanced algebraic techniques.
CO3: Apply the concept of random processes in engineering disciplines.
CO4: Understand and apply the concept of correlation and spectral densities.
CO5: The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable. Able to analyze the response of random inputs to linear time invariant systems.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PO1
CO1	3	3	3						3			2			3
CO2	3	3	3						3			2			3
CO3	3	3	3						3			2			3
CO4	3	3	3						3			2			3
CO5	3	3	3						3			2			3

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Ibe, O.C., ―Fundamentals of Applied Probability and Random Processes‖, 1st Indian Reprint, Elsevier, 2007.
T2.	Peebles, P.Z., ―Probability, Random Variables and Random Signal Principles‖, Tata McGraw Hill, 4th Edition, New Delhi, 2002.

REFERENCE BOOK(S)	
R1.	Cooper. G.R., McGillem. C.D., ―Probabilistic Methods of Signal and System Analysis‖, 3rd Indian Edition, Oxford University Press, New Delhi, 2012.
R2.	Hwei Hsu, ―Schaum_s Outline of Theory and Problems of Probability, Random Variables and Random Processes‖, Tata McGraw Hill Edition, New Delhi, 2004.
R3.	Miller. S.L. and Childers. D.G., ―Probability and Random Processes with Applications to Signal Processing and Communications‖, Academic Press, 2004.

R4.	Stark. H. and Woods. J.W., ―Probability and Random Processes with Applications to Signal Processing‖, 3rd Edition, Pearson Education, Asia, 2002.
R5.	Yates. R.D. and Goodman. D.J., ―Probability and Stochastic Processes‖, 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

Course Code: 24CSC203	**Course Title: Database Management System**	
Course Category: PCC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To learn the fundamentals of data models, relational algebra and SQL.
• To represent a database system using ER diagrams and to learn normalization techniques.
• To understand the fundamental concepts of transaction, concurrency and recovery processing.
• To analyze the internal storage structures using different file and indexing techniques which will help in physical DB design.
• To have an introductory knowledge about the Distributed databases, NOSQL and database security.

UNIT I	**RELATIONAL DATABASES**	**9**
Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL – Dynamic SQL.		
UNIT II	**DATABASE DESIGN**	**9**
Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – JoinDependencies and Fifth Normal Form.		
UNIT III	**TRANSACTIONS**	**9**
Transaction Concepts – ACID Properties – Schedules – Serializability – Transaction support in SQL – Need for Concurrency – Concurrency control – Two Phase Locking- Timestamp – Multiversion – Validation and Snapshot isolation– Multiple Granularity locking – Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update – Shadow paging – ARIES Algorithm.		

UNIT IV	IMPLEMENTATION TECHNIQUES	9
RAID – File Organization – Organization of Records in Files – Data dictionary Storage – Column Oriented Storage – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing,Query Processing Overview – Algorithms for Selection, Sorting and join operations – Query optimization using Heuristics - Cost Estimation.		
UNIT V	**DISTRIBUTED DATABASE AND DATABASE SECURITY**	**9**
Distributed Databases: Architecture, Data Storage, Transaction Processing, and Query processing and optimization – NOSQL Databases: Introduction – CAP Theorem – Document Based systems – Key value Stores – Column Based Systems – Graph Databases. Database Security: Security issues – Access control based on privileges – Role Based access control – SQL Injection – Statistical Database security – Flow control – Encryption and Public Key infrastructures – Challenges.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Construct SQL Queries using relational algebra.
CO2: Design database using ER model and normalize the database.
CO3: Construct queries to handle transaction processing and maintain consistency of the database.
CO4: Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database.
CO5: Analyze how advanced databases differ from Relational Databases and find a suitable database for the given requirement.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	1				2			1	2	1
CO2	3	1	1	1	1				2			3	3	1
CO3	3	2	3	2	1				2			2	2	3
CO4	1	2	3	2					3			3	1	2
CO5	1	1	3	3	2				1			1	2	2

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Abraham Silberschatz, Henry F. Korth, and S. Sudharshan, ―Database System Concepts‖, Seventh Edition, McGraw Hill, 2020.
T2.	Ramez Elmasri and Shamkant B. Navathe, ―Fundamentals of Database Systems‖, Seventh Edition, Pearson Education, 2017.

REFERENCE BOOK(S)	
R1.	C.J.Date, A.Kannan and S.Swamynathan, ―An Introduction to Database Systems‖, Eighth Edition, Pearson Education, 2006.
R2.	Peter Rob and Carlos Coronel , ―Database Systems Design, Implementation and Management‖, 7th edition, Thomson, 2009.
R3.	Raghu Ramakrishnan, ―Database Management Systems‖, Fourth Edition, McGraw Hill, 2015.

Course Code: 24CSC212	**Course Title: Computer Networks**	
Course Category: PCC	**Credits: 4**	
L:T:P(Hours/Week): 3:0:2	**Total Contact Hours: 75**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the functions of protocols of each layer of TCP/IP protocol suite.
• To recognize the functions various data link protocols in data link layer.
• To learn the functions of network layer and the various routing protocols.
• To familiarize the functions and protocols of the Transport layer.
• To recognize the functions and protocols of the application layer.

UNIT I	**OSI AND TCP/IP MODEL**	**9**
Network - Uses of Networks - Types of Networks - Reference Models: TCP/IP Model - The OSI Model - Comparison of the OSI and TCP/IP reference model - Architecture of Internet - Physical Layer: Guided transmission media - Wireless transmission media - Switching.		
UNIT II	**DATA LINK LAYER**	**9**
Design issues - Error detection and correction - Elementary data link protocols - Sliding window protocols - Example data link protocols - HDLC, the data link layer in the internet. The Medium Access Sublayer: Channel allocations problem - Multiple access protocols - Ethernet - Data Link Layer switching - Wireless LAN - Broadband Wireless - Bluetooth.		
UNIT III	**NETWORK LAYER**	**9**
Network layer design issues - Routing algorithms - Congestion control algorithms - Internet working, the network layer in the internet (IPv4 and IPv6) - Quality of Service.		
UNIT IV	**TRANSPORT LAYER**	**9**
Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP.		

UNIT V	**APPLICATION LAYER**	**9**
Domain name system - Electronic mail - World Wide Web: Architectural overview, Dynamic web document and HTTP. APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol - File Transfer Protocol - Simple Mail Transfer Protocol - Telnet.		
		Total: 45 Hours

PRACTICALS	
1.	Execute commands like tcpdump, netstat, ifconfig, nslookup and trace route. Capture ping and trace route PDUs using a network protocol analyzer and examine.
2.	Write a HTTP web client program to download a web page using TCP sockets.
3	Applications using echo client and echo server.
4.	Applications using TCP socket Chat
5.	Applications using TCP socket File Transfer
6.	Simulation of DNS using UDP sockets.
7.	Write a code simulating ARP /RARP protocols.
8.	Implement the data link layer framing methods such as character, character – stuffing and bit Stuffing.
9.	Develop a program to find the shortest path between vertices using the Bellman-Ford and path vector routing algorithm.
10.	Develop a program on a datagram socket for client/server to display the messages.
	Total: 30 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Explain the basic layers and its functions in computer networks.
CO2: Understand the basics of how data flows from one node to another.
CO3: Analyze routing algorithms.
CO4: Analyze the working of various Transport layer protocols.
CO5: Analyze the working of various application layer protocols.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1						1			1	3	
CO2	2	1	1		2				1			2	1	2
CO3	2	2	1		3				1			1	1	3
CO4	2	2	1	1	2				1	3		1	1	
CO5	2	3	2						1			1	1	

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	James F. Kurose and Keith W. Ross, ―Computer Networking, A Top-Down Approach Featuring the Internet‖, Eighth Edition, Pearson Education, 2021.
T2.	Behrouz A. Forouzan, ―Data communication and Networking‖, 4th Edition, McGraw-Hill, 2006.

REFERENCE BOOK(S)	
R1.	A. S. Tanenbaum, ―Computer Networks‖, 4th edition, Pearson Education/ PHI, New Delhi, 2003.
R2.	Kurose and Ross, ―Computer Networking: A top down approach‖, Pearson Education, India, 2010.
R3.	Larry L. Peterson and Bruce S. Davie, ―Computer Networks: A Systems Approach‖, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

Course Code: 24CSC213	**Course Title: Compiler Design**	
Course Category: PCC	**Credits: 4**	
L:T:P(Hours/Week): 3:0:2	**Total Contact Hours: 75**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the basics of principles of compiler.
• To acquire knowledge about tokens, finite automata in lexical analyzer.
• To design various types of parsers in syntax analyzer.
• To learn the generation of intermediate code.
• To generate target code and apply optimization techniques.

UNIT I	**PRINCIPLES OF COMPILER**	**9**
Compilers: Structure of a Compiler – Cousins of the Compiler – Grouping of Phases into passes – Compiler construction tools – Science of building a Compiler - Application of Compiler Technology.		
UNIT II	**LEXICAL ANALYSIS**	**9**
Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification and Recognition of Tokens - A Language for specifying Lexical Analyzer - Scanner Generator (FLEX) - Finite Automata -From a Regular Expression to NFA and DFA - Minimization of DFA.		
UNIT III	**SYNTAX ANALYSIS**	**9**
Role of the parser – Writing Grammars – Context-Free Grammars – Top Down parsing – Recursive Descent Parsing – Predictive Parsing – Bottom-up parsing – Shift Reduce Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser - YACC.		
UNIT IV	**INTERMEDIATE CODE GENERATION**	**9**
Syntax Directed Definitions - Construction of Syntax tree - Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – Type checking and type conversion.		
UNIT V	**CODE GENERATION AND CODE OPTIMIZATION**	**9**
Issues in the design of code generator - Runtime Storage management - Basic Blocks and		

Flow Graphs - A simple Code generator - DAG representation of Basic Blocks – Peephole Optimization - Principal Sources of Optimization – Optimization of basic Blocks - Loops in flow graphs - Overview of LLVM.
Total: 45 Hours

PRACTICALS	
1.	Write a C Program to Scan and Count the number of characters, words, and lines in a file.
2.	Write a C Program to implement NFAs that recognize identifiers, constants, and operators of the mini language.
3.	Write a C Program to implement DFAs that recognize identifiers, constants, and operators of the mini language.
4.	Design a lexical analyzer for the given language. The lexical analyzer should ignore redundant spaces, tabs and new lines, comments etc.
5.	Implement the lexical analyzer using JLex, Flex or other lexical analyzer generating tools.
6.	Implement simple code optimization techniques using Constant folding
7.	Implement simple code optimization techniques using Strength reduction
8.	Implement simple code optimization techniques using Algebraic transformation
9.	Generate the three address code for a simple program using lex and yacc
10.	Implement back-end of the compiler for which the three address code is given as input and the 8086 assembly language code is produced as output.
	Total: 30 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Interpret the structure of compiler.
CO2: Design a lexical analyzer to identify the tokens in a program.
CO3: Construct a parser through the application of a grammar.
CO4: Perform type checking to develop intermediate code.
CO5: Translate intermediate code to target code and apply various Optimization techniques.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1						1			1	3	
CO2	2	1	1		2				1			2	1	2
CO3	2	2	1		3				1			1	1	3
CO4	2	2	1	1	2				1	3		1	1	
CO5	2	3	2						1			1	1	

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Alfred V. Aho and Jeffrey D Ullman, ―Compilers: Principles, Techniques and Tools, 2nd Edition‖, Pearson Education Asia, 2014.
T2.	Allen I. Holub, ―Compiler Design in C‖, 1st edition, Pearson Education, 2015.

REFERENCE BOOK(S)

R1.	C. N. Fischer and R. J. LeBlanc, ―Crafting a compiler with C‖, Benjamin Cummings, PHI, 2010.
R2.	Henk Alblas and Albert Nymeyer, ―Practice and Principles of Compiler Building with C‖, PHI, 2001.
R3.	Kenneth C. Louden, ―Compiler Construction: Principles and Practice‖, Thompson Learning, 2006.

Course Code: 24CSC214	**Course Title: Design and Analysis of Algorithms**	
Course Category: PCC	**Credits: 3**	
L:T:P(Hours/Week): 3:0:0	**Total Contact Hours: 75**	**Max Marks : 100**

COURSE OBJECTIVES
• To perform analysis of Algorithms using asymptotic and empirical approaches.
• To analyze the problems by using Brute force and Divide and Conquer.
• To analyze iterative improvement in the graphs.
• To explain the concepts greedy method and dynamic programming.
• To illustrate the methods of backtracking techniques.

UNIT I	**FUNDAMENTALS OF ALGORITHMS**	**9**
Algorithm :Analysis of Algorithms, Pseudo code for expressing algorithms, Performance analysis - Space complexity, Time complexity, Asymptotic notation - Big notation, Omega notation, Theta notation, Divide And Conquer: General method, Applications - Analysis of binary search, quick sort, merge sort.		
UNIT II	**BRUTE FORCE AND DIVIDE-AND-CONQUER**	**9**
Brute Force — String Matching — Closest-Pair and Convex-Hull Problems — Exhaustive Search — Travelling Salesman Problem — Knapsack Problem — Assignment problem. Divide and Conquer Methodology — Multiplication of Large Integers — Closest-Pair and Convex — Hull Problems.		
UNIT III	**ITERATIVE IMPROVEMENT**	**9**
The Simplex Method — The Maximum-Flow Problem — Maximum Matching in Bipartite Graphs, Stable marriage Problem. Articulation points, Graph colouring problem.		
UNIT IV	**DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE**	**9**
Dynamic Programming: General method, applications - optimal binary search trees Elements of dynamic programming — Matrix-chain multiplication – Multi multi stage graph. Greedy Technique: Problem solving using Greedy Algorithm- Activity selection problem, Minimum Spanning trees- Greedy algorithms (Kruskals algorithm, Prims algorithm).		

UNIT V	NP-HARD AND NP-COMPLETE PROBLEMS	9
Non-deterministic algorithms, NP-hard and NP-complete classes, Backtracking: n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem – Matching: Maximum bipartite matching.		
Total: 45 Hours		

PRACTICALS	
1.	i.Divide and Conquer ii.Topological sorting using decrease and conquer
2.	i.Quick sort ii.Radix sort
3.	i. Merge sort ii. Bucket sort
4.	i.Heap sort using transform and conquer ii.Coin change problem
5.	i.Warshall's algorithm for transitive closure ii.B-Trees
6.	Floyd's algorithm for all-pairs shortest path
7.	Huffman coding and decoding using greedy technique
8.	Simplex method for solving linear programming problems
9.	N-Queen problem using backtracking
10.	i. Assignment problem using branch and bound ii. Traveling salesman problem using branch and bound
	Total: 30 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Compare functions using asymptotic analysis and describe the relative merits of worst-average-, and best-case analysis.
CO2: Analyze the various brute force and divide and conquer algorithms.
CO3: Synthesize iterative improvement in the graph algorithms and algorithms that employ graph computations as key components, and analyze them.
CO4: Design algorithms for more complex problems like dynamic programming and greedy technique.

CO5: Analyze NP-Hard and NP-Complete problems.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2		1				1	1		1	1	
CO2	1	2	1		1				2	1		1	1	
CO3	1	2	2		1				2	1		1	1	
CO4	1	2	1		1				1	2		1	1	
CO5	1	2	2		1				1	2		1	1	

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Cormen, Thomas H, Leiserson, Charles E. Rivest, Ronald L., Stein and Clifford, ―Introduction to Algorithms‖, 3rd ed., MIT Press, 2009.
T2.	A Ellis Horowitz, Satraj Sahni and Rajasekharam, ―Fundamentals of Computer Algorithms‖, 2nd edition, University Press, New Delhi, 2007.

REFERENCE BOOK(S)

R1.	Anany Levitin, ―Introduction to the Design and Analysis of Algorithms‖, 3rd Edition, Pearson Education, 2012.
R2.	Aho, Ullman and Hopcroft, ―Design and Analysis of Algorithms‖, 2nd edition, Pearson education, New Delhi, 2009.
R3.	S. Sridhar, ―Design and Analysis of Algorithms‖, Oxford University Press, 2014.

Course Code: 24CSC222	Course Title: Database Management System Laboratory	
Course Category: PCC	Credits: 2	
L:T:P(Hours/Week): 0:0:4	Total Contact Hours: 60	Max Marks : 100

COURSE OBJECTIVES
• To learn the fundamentals of data models, relational algebra and SQL.
• To represent a database system using ER diagrams and to learn normalization techniques.
• To understand the fundamental concepts of transaction, concurrency and recovery processing.
• To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
• To have an introductory knowledge about the Distributed databases, NOSQL and database security.

LIST OF EXPERIMENTS	
1.	Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.).
2.	Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys).
3.	Create a table using Normalization and remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form.
4.	Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables.
5.	Implement DML commands - Insert, Select, Update, Delete.
6.	Create a table using the Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, CONSTRAINTS etc.
7.	Develop Sub queries (Nested, Correlated) and Joins (Inner, Outer and EquiJoin).
8.	Create SQL Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.

9.	Execute on Triggers, creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger.
10.	Develop a program using Procedures and Creation of Stored Procedures, Execution of Procedure, Modification of Procedure and Packages and its Functions.
	Total: 60 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Construct SQL Queries using relational algebra
CO2: Design database using ER model and normalize the database
CO3: Construct queries to handle transaction processing and maintain consistency of the database
CO4: Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database
CO5: Appraise how advanced databases differ from Relational Databases and find a suitable database for the given requirement.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1				3	1	3	2	2	3
CO2	2	2	3	2	2				1	2	3	3	2	1
CO3	3	3	2	1	1				1	1	1	3	2	3
CO4	1	3	3	3	1				1	1	3	2	3	1
CO5	3	2	1	1	1				2	2	3	1	3	1

(1 – Low, 2 – Medium, 3 – High)

Course Code: 24CDC202	**Course Title: Career Development Skills IV**	
Course Category: EEC	**Credits: 1**	
L:T:P (Hours/Week) 1:0:0	**Total Contact Hours: 15**	**L:T:P (Hours/Week) 1:0:0**

COURSE OBJECTIVES
• To strengthen numerical, analytical, and logical reasoning abilities.
• To improve business communication abilities.

UNIT II	**QUANTITATIVE APTITUDE AND REASONING**	**12**
Quantitative Aptitude – Percentage – Profit and Loss – Ratio and Proportion – Pipes and Cistern – Time and Work. Data Interpretation and Logical Reasoning Skills – Bar Graphs –Coding and Decoding – Venn Diagram. Verbal and Non-Verbal Reasoning – Critical Reasoning – Types of Reasoning – Cube and Dice – Pattern Completion. Verbal Ability – Grammar Concepts – Enhancing Vocabulary – One Word Substitution.		
UNIT II	**BUSINESS COMMUNICATION SKILLS**	**3**
Business Communication – Effective Listening Skills – Summarizing and Paraphrasing – Presentation, Planning and Delivery. Sales and Negotiations – Understanding Customers' Needs, Building Rapport and Trust – Negotiation Techniques and Closing the Deal – Continuous Improvement and Professional Development. Customer Service – Importance and Key Elements of Effective Customer Service – Empowering Frontline Employees and Leveraging Technology – Measuring and Improving Customer Satisfaction. Activities – Paraphrasing, Self-Introduction, Presentation, Role Play, Group Discussion.		
		Total: 15 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Solve problems using numerical, analytical, and logical reasoning skills.
CO2: Utilize communication techniques for effective business interactions for improving professional efficiency.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1								3			
CO2								2	2	3		2			

Course Code :24CDC222	Course Title: Mini Project II	
Course Category: EEC	Credits:1	
L:T:P(Hours/Week) : 0:0:2	Total Contact Hours: 15	Max Marks: 100

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Dr.R.S.Aggarwal, “A Modern Approach to Verbal and Non-verbal Reasoning”, S Chand Publishing, 2023.
T2.	Arun Sharma and Meenakshi Upadhyay, “Verbal Ability and Reading comprehension”, Tata McGraw Hill Education, 2014.
T3.	Sanjay Kumar and Pushp Lata, “Communication skills”, Oxford Higher Education, 2011.

REFERENCE BOOK(S)	
R1.	Arun Sharma, “Logical Reasoning for CAT”, Tata McGraw Hill Education, 2024.
R2.	Peeyush Bhardwaj, “The Hand on Guide to Analytical and Logical Reasoning”, Arihant Publication, 2023.
R3.	Nira Konar, “Communication Skills for Professionals”, PHI learning Pvt. Ltd, 2011.

COURSE OBJECTIVES:

- To enhance students' analytical skills for better problem understanding and evaluation.
- To foster a passion for problem-solving through engaging and challenging tasks.
- To develop students' ability to apply engineering concepts in real-world scenarios effectively.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Formulate a real-world problem, identify the requirements, and design solutions.	Apply
CO 2: Identify technical ideas, strategies, and methodologies.	Analyze
CO 3: Utilize new tools, algorithms, and techniques to contribute to the solution.	Apply
CO 4: Test and validate the prototype for cost-effectiveness.	Evaluate
CO 5: Prepare a report and deliver oral demonstrations.	Create

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	2	-	-	2	2	2	-	-			
CO2	1	2	1	1	2	-	-	2	2	2	-	-			
CO3	1	2	1	1	2	-	-	2	2	2	2	-			
CO4	1	2	1	1	2	-	-	2	2	2	2	-			
CO5	1	2	-	-	2	-	-	2	2	2	-	-			

(1 – Low, 2 – Medium, 3 – High)

Course Code: 24MAC221		Course Title: Summer Internship I	
Course Category: MC		**Credits: 0**	
L:T:P (Hours/Week)	**0**	**Total Contact Hours: 0**	**Max Marks: 0**

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- To enable students to apply theoretical knowledge to real-world engineering challenges.

- To expose students to industry-standard tools, technologies, and practices.
- To enhance professional skills such as teamwork, communication, and time management in a workplace environment.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Apply engineering principles to design and solve real-world problems using acquired knowledge.	Apply
CO 2: Analyze industry processes and technologies to evaluate their effectiveness in solving engineering challenges.	Analyze
CO 3: Evaluate the performance of engineering systems and propose enhancements based on hands-on experience.	Evaluate
CO 4: Design and implement innovative solutions in collaborative projects, demonstrating leadership and teamwork.	Create

MAPPING OF CO – PO & PSO:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	1	2	1	2	1			
CO2	3	3	2	3	2	2	2	1	2	2	2	2			
CO3	3	2	3	3	2	2	2	2	2	2	2	2			
CO4	3	2	3	2	3	2	3	1	3	3	3	2			

(1 – Low, 2 – Medium, 3 – High)

SEMESTER V

Course Code: 24CSC311	Course Title: Operating Systems	
Course Category: PCC	**Credits: 4**	
L:T:P (Hours/Week) 3:0:2	**Total Contact Hours: 75**	**Max Marks: 100**

COURSE OBJECTIVES
• To understand the fundamental operations of operating systems.
• To explore process concepts, scheduling, multithreading, synchronization mechanisms, and concurrency control techniques for efficient process management.
• To explain memory management techniques, virtual memory, page replacement algorithms, and understand deadlock characterization, prevention, detection, and avoidance.
• To understand file system structures, access methods, directory implementation, file sharing, protection, and storage management.
• To analyse mass storage structures, disk scheduling, I/O hardware, interfaces, and storage management techniques.

UNIT I	OPERATING SYSTEMS OVERVIEW AND STRUCTURES	9
Introduction, Operating System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Distributed Systems. Operating System Services and Systems Calls, System Programs, Operating System Structure, Operating Systems Generations.		
UNIT II	**PROCESS MANAGEMENT, CONCURRENCY AND SYNCHRONIZATION**	**9**
Process Concepts, Process State, Process Control Block, Scheduling Queues, Process Scheduling, Multithreaded Programming. Process Synchronization, Critical Section Problem, Peterson‘s Solution, Synchronization Hardware, Semaphores.		
UNIT III	**MEMORY MANAGEMENT**	**9**
Swapping, Contiguous Memory Allocation, Paging, Structure of The Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance.		
UNIT IV	**FILE SYSTEM**	**9**
Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection. File System Implementation: File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.		

UNIT V	**I/O SYSTEM**	**9**
Mass Storage Structure - Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling Algorithms, Swap Space Management, Stable Storage Implementation, Tertiary Storage Structure. I/O: Hardware, Application I/O Interface.		
		Total: 45 Hours

PRACTICALS	
1.	Illustrate UNIX commands and Shell Programming.
2.	Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF.
3.	Write C programs to simulate the following CPU Scheduling algorithms a) Round Robin b) priority.
4.	Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls. a) Pipes b) FIFOs c) Message Queues d) Shared Memory.
5.	Write C programs to simulate the following memory management techniques. a) Paging b) Segmentation.
6.	Write C programs to implement the following Memory Allocation Methods. a) First Fit b) Worst Fit c) Best Fit.
7.	Implement the following File Allocation Strategies using C programs. a) Sequential b) Indexed c) Linked.
8.	Write C programs for the implementation of various disk scheduling algorithms.
9.	Write a C program to implement deadlock detection algorithm.
10.	Write a C program to implement threading.
	Total: 30 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Identify and summarize the key concepts and features of Operating Systems.
CO2: Compare various operating systems with respect to characteristics and features.
CO3: Implement algorithm of CPU Scheduling, Memory Scheduling and disk scheduling.
CO4: Analyse and adjust the OS configurations based on the specified needs.
CO5: Distinguish between the inline and outline concepts in I/O systems.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2					3	2	3	1	1	2
CO2	2	2	3	1	1				2	1	1	2	2	2
CO3	1	3	2	2	1				2	2	1	1	1	2
CO4	1	3	3	3					1	2	1	2	1	2
CO5	3	1	2	1	1				3	2	3	2	2	2

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―Operating System Principles‖, 7th edition, Wiley India Private Limited, New Delhi, 2006.
T2.	Ramaz Elmasri, A. Gil Carrick and David Levine, ―Operating Systems – A Spiral Approach‖, Tata McGraw Hill, 2010.

REFERENCE BOOK(S)

R1.	Stallings, ―Operating Systems, Internals and Design Principles‖, 5th edition, Pearson Education, India.
R2.	Andrew S. Tanenbaum, ―Modern Operating Systems‖, 2nd edition, Prentice Hall of India 2007.
R3.	Deitel & Deitel, ―Operating systems‖, 3rd edition, Pearson Education, India 2008.

Course Code: 24CSC312	**Course Title: Artificial Intelligence and Machine Learning**	
Course Category: PCC	**Credits: 4**	
L:T:P (Hours/Week) **3:0:2**	**Total Contact Hours: 75**	**Max Marks : 100**

COURSE OBJECTIVES
• To explore about uninformed and heuristic search techniques.
• To analyse techniques for reasoning under uncertainty.
• To explain the concepts of Machine Learning and supervised learning algorithms
• To understand about ensembling and unsupervised learning algorithms.
• To understand and describe the fundamental principles of deep learning through neural networks.

UNIT I	**PROBLEM SOLVING**	**9**
Introduction to AI – AI Applications - Problem solving agents – Search algorithms – Uninformed search strategies – Heuristic search strategies – Local search and optimization problems – Adversarial search – Constraint satisfaction problems (CSP).		
UNIT II	**PROBABILISTIC REASONING `**	**9**
Acting under uncertainty – Bayesian inference – Naïve bayes models. Probabilistic reasoning – Bayesian networks – Exact inference in BN – Approximate inference in BN – Causal networks.		
UNIT III	**SUPERVISED LEARNING**	**9**
Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Probabilistic discriminative model – Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random forests.		
UNIT IV	**ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING**	**9**
Combining multiple learners: Model combination schemes, Voting, Ensemble Learning – bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.		
UNIT V	**NEURAL NETWORKS**	**9**
Perceptron - Multilayer perceptron, activation functions, network training – Gradient descent		

optimization – Stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.
Total: 45 Hours

PRACTICALS	
1.	Implementation of Uninformed search algorithms (BFS, DFS).
2.	Implementation of Informed search algorithms (A*, memory-bounded A*).
3.	Implementation of Naive Bayes models.
4.	Implementation of Bayesian Networks.
5.	Building Regression models.
6.	Implementing ensembling techniques.
7.	Implementation of clustering algorithms.
8.	Building simple NN models.
9.	Building deep learning NN models.
10.	Building decision trees and random forests.
	Total: 30 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Evaluate and implement the most effective search algorithms for solving problems.
CO2: Apply reasoning under uncertainty.
CO3: Construct and apply supervised learning models to solve problems.
CO4: Develop and implement ensembling and unsupervised learning models.
CO5: Construct and train deep learning neural network models.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	4					1	3	3	3	1	2
CO2	1	1	1	3	1				1	2	1	3	2	3
CO3	2	1	2	1					2	1	1	3	1	1
CO4	3	1	3	1					2	1	2	1	2	2
CO5	3	1	1	2	2				3	1	2	3	2	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Stuart Russell and Peter Norvig, ―Artificial Intelligence – A Modern Approach‖, Fourth Edition, Pearson Education, 2021.
T2.	Ethem Alpaydin, ―Introduction to Machine Learning‖, Fourth Edition, MIT Press 2020.

REFERENCE BOOK(S)	
R1.	Dan W. Patterson, ―Introduction to Artificial Intelligence and Expert Systems‖, Pearson Education, 2007.
R2.	Kevin Night, Elaine Rich, and Nair B., ―Artificial Intelligence‖, McGraw Hill, 2008.
R3.	Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006.

Course Code: 24CSC313	Course Title: Internet Programming	
Course Category: PCC	**Credits: 4**	
L:T:P(Hours/Week): 3:0:2	**Total Contact Hours: 75**	**Max Marks : 100**

COURSE OBJECTIVES
• To construct a basic website using HTML and Cascading Style Sheets.
• To build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
• To develop server side programs using Servlets and JSP.
• To construct simple web pages in PHP and to represent data in XML format.
• To understand AJAX client-server architecture, XML Http Request, web services, SOAP, and database-driven web services.

UNIT I	WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0	9
Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols –World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls – CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.		
UNIT II	**CLIENT SIDE PROGRAMMING**	**9**
Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,- Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request – SQL.		
UNIT III	**SERVER SIDE PROGRAMMING**	**9**
Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example – JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code		

UNIT IV	PHP and XML	9
An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation- Regular Expressions – File handling – Cookies – Connecting to Database. XML: Basic XML- Document Type Definition– XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).		
UNIT V	**INTRODUCTION TO AJAX and WEB SERVICES**	**9**
AJAX: Ajax Client Server Architecture - XML Http Request Object – Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP.		
		Total: 45 Hours

PRACTICALS	
1.	Create a web page with the following using HTML. a) To embed a map in a web page b) To fix the hot spots in that map c) Show all the related information
2.	Create a web page with the following. a) Cascading style sheets. b) Embedded style sheets. c) Inline style sheets. Use our college information for the web pages.
3.	Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
4.	Write programs in Java using Servlets: a) To invoke servlets from HTML forms b) Session tracking using hidden form fields and Session tracking for a hit count
5.	Write programs in Java to create three-tier applications using servlets for conducting online examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
6.	Install TOMCAT web server. Convert the static web pages of programs into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.

7.	Redo the previous task using JSP by converting the static web pages into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database.
8.	Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document.
9.	a) Validate the form using PHP regular expression. b) PHP stores a form data into database.
10.	Write a web service for finding what people think by asking 500 people_s opinion for any consumer product.
	Total:30 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand and apply the basics of web development, including the structure and functionality of web clients and servers..
CO2: Develop interactive web pages using JavaScript, leveraging the DOM model and event handling techniques.
CO3: Design and implement dynamic web applications using Java Servlets and Java Server Pages (JSP).
CO4: Analyze XML concepts, including XML schemas, document validation, and XSLT transformations for presenting XML data.
CO5: Develop and consume web services (SOAP, WSDL) to create dynamic, data-driven applications with server-side integration.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3				1	3	3	1	3	3
CO2	2	2	2	1	2				2	2	1	3	2	3
CO3	1	1	3	2	3				1	2	1	1	1	1
CO4	2	3	3	1	2				3	1	2	2	2	2
CO5	1	2	3	2	2				2	1	3	1	1	2

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Deitel and Deitel and Nieto, ―Internet and World Wide Web – How to Program‖, 5th Edition, Prentice Hall, 2011.
T2.	Stephen Wynkoop and John Burke, ―Running a Perfect Website‖, QUE, 2nd Edition, 1999.

TEXT BOOK(S)	
R1.	Chris Bates, ― Web Programming – Building Intranet Applications , 3rd Edition, Wiley Publications, 2009.
R2.	Jeffrey C and Jackson, ―Web Technologies A Computer Science Perspective‖, Pearson Education, 2011.
R3.	Gopalan N.P. and Akilandeswari J, ―Web Technology, Prentice Hall of India, 2011.
R4.	Uttam K Roy, ―Web Technologies, Oxford University Press, 2011.

Course Code: 24CDC301	**Course Title: Career Development Skills V**	
Course Category: EEC	**Credits: 1**	
L:T:P (Hours/Week) 1:0:0	**Total Contact Hours: 15**	**L:T:P (Hours/Week) 1:0:0**

COURSE OBJECTIVES
• To extend logical reasoning, analytical, and numerical skills.
• To learn how to create effective resumes and job applications.

UNIT I	**QUANTITATIVE APTITUDE AND REASONING**	**12**
Quantitative Aptitude – Time and Distance – Boats and Streams – Mixture – Simple Interest – Compound Interest. Data Interpretation and Logical Reasoning Skills – Pie Chart – Blood Relation – Direction Sense. Verbal and Non-Verbal Reasoning – Verbal Analogy –Syllogism – Series – Counting of Figures. Verbal Ability – Word Roots, Affixes and Foreign Words – Idioms and Phrases – Spotting Common Errors.		
UNIT II	**LEADERSHIP ETIQUETTE**	**3**
Resume Building – Basic Facts – Resume Types – Sections of Resume – Resume Format – Ordinary Resume “Do's and Don’ts” – Electronic Resume Formats – Using Resume Keywords – Online Resume Banks. Job Application Basic Formats – Personal Information – Work History – Education – Skills and Qualifications – Achievements and Awards – References – Examples. Activities – Developing Corporate Resume, Drafting Job Application, Rendering Presentation, Discussion.		
		Total: 15 Hours
COURSE OUTCOMES		
At the end of this course, students will be able to		
CO1: Utilize logical reasoning, analytical thinking, and numerical skills to solve complex problems. CO2: Demonstrate key leadership traits to effectively lead teams		

COURSE ARTICULATION MATRIX															
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	1								3			
CO2								2	2	3		2			

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Dr.R.S.Aggarwal, ―A Modern Approach to Verbal and Non-verbal Reasoning‖, S Chand Publishing, 2023.
T2.	Arun Sharma and Meenakshi Upadhyay, ―Verbal Ability and Reading comprehension‖, Tata McGraw Hill Education, 2014.
T3.	Sanjay Kumar and Pushp Lata, ―Communication skills‖, Oxford Higher Education, 2011.

REFERENCE BOOK(S)	
R1.	Arun Sharma, ―Logical Reasoning for CAT‖, Tata McGraw Hill Education, 2024.
R2.	Peeyush Bhardwaj, ―The Hand on Guide to Analytical and Logical Reasoning‖, Arihant Publication, 2023.
R3.	Nira Konar, ―Communication Skills for Professionals‖, PHI learning Pvt. Ltd, 2011.

Course Code :24CDC321	Course Title: Mini Project III	
Course Category: EEC	**Credits:1**	
L:T:P(Hours/Week) : 0:0:2	**Total Contact Hours: 15**	**Max Marks: 100**

COURSE OBJECTIVES:

- To enhance students' analytical skills for better problem understanding and evaluation.
- To foster a passion for problem-solving through engaging and challenging tasks.
- To develop students' ability to apply engineering concepts in real-world scenarios effectively.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Formulate a real-world problem, identify the requirements, and design solutions.	Apply
CO 2: Identify technical ideas, strategies, and methodologies.	Analyze
CO 3: Utilize new tools, algorithms, and techniques to contribute to the solution.	Apply
CO 4: Test and validate the prototype for cost-effectiveness.	Evaluate
CO 5: Prepare a report and deliver oral demonstrations.	Create

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	2	-	-	2	2	2	-	-			
CO2	1	2	1	1	2	-	-	2	2	2	-	-			
CO3	1	2	1	1	2	-	-	2	2	2	2	-			
CO4	1	2	1	1	2	-	-	2	2	2	2	-			
CO5	1	2	-	-	2	-	-	2	2	2	-	-			

SEMESTER VI

Course Code: 24CSC314	Course Title: Embedded Systems and IoT	
Course Category: PCC	Credits: 4	
L:T:P (Hours/Week) 3:0:2	Total Contact Hours: 75	Max Marks: 100

COURSE OBJECTIVES
• To learn the internal architecture and programming of an embedded processor.
• To introduce interfacing I/O devices to the processor.
• To introduce the evolution of the Internet of Things (IoT).
• To build a small low-cost embedded and IoT system using Arduino/Raspberry Pi/ open platform.
• To apply the concept of Internet of Things in real world scenario

UNIT I	8-BIT EMBEDDED PROCESSOR	9
8-Bit Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling.		
UNIT II	**EMBEDDED C PROGRAMMING**	**9**
Memory And I/O Devices Interfacing – Programming Embedded Systems in C – Need For RTOS – Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies.		
UNIT III	**IOT AND ARDUINO PROGRAMMING**	**9**
Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino – Arduino Toolchain – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino		
UNIT IV	**IOT COMMUNICATION AND OPEN PLATFORMS**	**9**
IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee – GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.		
UNIT V	**APPLICATIONS DEVELOPMENT**	**9**
Complete Design of Embedded Systems – Development of IoT Applications – Home Automation – Smart Agriculture – Smart Cities – Smart Healthcare.		
		Total: 45 Hours

PRACTICALS	
1.	Write 8051 Assembly Language experiments using simulator.
2.	Verify the process of data transfer between registers and memory.
3.	Perform ALU operations.
4.	Write basic and arithmetic Programs Using Embedded C.
5.	Introduction to Arduino platform and programming
6.	Explore different communication methods with IoT devices (Zigbee, GSM)
7.	Explore different communication methods with IoT devices (Bluetooth)
8.	Introduction to Raspberry PI platform and python programming
	Total: 30 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Explain the architecture of embedded processors.
CO2: Create embedded C programs.
CO3: Design simple embedded applications.
CO4: Compare the communication models in IOT.
CO5: Design IoT applications using Arduino/Raspberry Pi /open platform.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3					1	2	3	3	2	1	3
CO2	2	1	3	2	2				1	2	2	3	3	1	3
CO3	3	1	3	3	1				1	2	1	1	1	3	3
CO4	3	2	3	2	1				1	2	2	3	2	2	1
CO5	2	3	3	2	2				1	3	3	2	3	1	3

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, ―The 8051 Microcontroller and Embedded Systems‖, 2nd Edition, Pearson Education, 2014.
T2.	Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, ―IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things‖, CISCO Press, 2017.

REFERENCE BOOK(S)	
R1.	Michael J. Pont, ―Embedded C‖, Pearson Education, 2007.
R2.	Wayne Wolf, ―Computers as Components: Principles of Embedded Computer System Design‖, Elsevier, 2006.
R3.	Andrew N Sloss, D. Symes, C. Wright, Morgan Kauffman ―Arm System Developer's Guide ―Elsevier, 2006.

Course Code: 24CDC302	**Course Title: Career Development Skills VI**	
Course Category: EEC	**Credits: 1**	
L:T:P (Hours/Week) 1:0:0	**Total Contact Hours: 15**	**L:T:P (Hours/Week) 1:0:0**

COURSE OBJECTIVES		
• To broaden logical reasoning, analytical and numerical skills.		
UNIT I	**QUANTITATIVE APTITUDE AND REASONING**	**12**
Quantitative Aptitude – Area – Calendar – Clocks – Permutation &Combination – Probability. Data Interpretation and Logical Reasoning Skills – Line Graph-Data Sufficiency – Seating Arrangement. Verbal and Non-Verbal Reasoning – Cause and Effect – Cloze Test – Mirror and Water Images – Mathematical Operator. Verbal Ability – Sentence Formation, Completion, Correction and Improvement – Change of Voice and Speech – Jumbled Sentences and Paragraph Formation.		
UNIT II	**LEADERSHIP ETIQUETTE**	**3**
Leadership – Characteristics and Styles – Developing Leadership Skills – Communication and Interpersonal Skills – Motivating and Inspiring Teams – Ethical Leadership – Decision Making – Problem Solving. Behavioural Skills (Using Star Method – Situation, Task, Action and Result) – Introduction – Defining the Context – Identifying the Objectives – Describing the Steps to be Taken – Highlighting the Outcome – Developing Behavioral Skills – STAR Method in Interviews and Benefits. Specific Technical Knowledge – Specialized Skills – Foundational Concepts and Principles – Practical Applications – Industry-Specific Regulations and Standards – Emerging Trends and Innovations – Continuous Learning and Professional Development – Troubleshooting and Problem – Solving Techniques – Collaboration and Knowledge Sharing. Activities – Role Play, Presentation, Case Study, Group Discussion.		
		Total: 15 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Use the logical reasoning, analytical thinking, and numerical skills to find answers for complex problems.
CO2:Apply appropriate formats, sections and keywords to effectively present their qualifications while preparing resume and job application.

COURSE ARTICULATION MATRIX															
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	1								3			
CO2								2	2	3		2			

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Dr.R.S.Aggarwal, ―A Modern Approach to Verbal and Non-verbal Reasoning‖, S Chand Publishing, 2023.
T2.	Arun Sharma and Meenakshi Upadhyay, ―Verbal Ability and Reading comprehension‖, Tata McGraw Hill Education, 2014.
T3.	Sanjay Kumar and Pushp Lata, ―Communication skills, Oxford Higher Education, 2011.

REFERENCE BOOK(S)	
R1.	Arun Sharma, ―Logical Reasoning for CAT‖, Tata McGraw Hill Education, 2024.
R2.	Peeyush Bhardwaj, ―The Hand on Guide to Analytical and Logical Reasoning‖, Arihant Publication, 2023.
R3.	Nira Konar, ―Communication Skills for Professionals, PHI learning Pvt. Ltd, 2011.

Course Code :24CDC323	**Course Title: Mini Project IV**
Course Category: EEC	**Credits: 1**
L:T:P(Hours/Week) : 0:0:2	**Total Contact Hours: 15** / **Max Marks: 100**

COURSE OBJECTIVES:

- To enhance students' analytical skills for better problem understanding and evaluation.
- To foster a passion for problem-solving through engaging and challenging tasks.
- To develop students' ability to apply engineering concepts in real-world scenarios effectively.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Formulate a real-world problem, identify the requirements, and design solutions.	Apply
CO 2: Identify technical ideas, strategies, and methodologies.	Analyze
CO 3: Utilize new tools, algorithms, and techniques to contribute to the solution.	Apply
CO 4: Test and validate the prototype for cost-effectiveness.	Evaluate
CO 5: Prepare a report and deliver oral demonstrations.	Create

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	2	-	-	2	2	2	-	-			
CO2	1	2	1	1	2	-	-	2	2	2	-	-			
CO3	1	2	1	1	2	-	-	2	2	2	2	-			
CO4	1	2	1	1	2	-	-	2	2	2	2	-			
CO5	1	2	-	-	2	-	-	2	2	2	-	-			
MAX															

Course Code: 24MAC321		Course Title: Summer Internship II	
Course Category: MC		Credits: 0	
L:T:P (Hours/Week)	0	Total Contact Hours:0	Max Marks: 0

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- To enable students to apply theoretical knowledge to real-world engineering challenges.
- To expose students to industry-standard tools, technologies, and practices.
- To enhance professional skills such as teamwork, communication, and time management in a workplace environment.

Course Outcomes At the end of this course, students will be able to:	Cognitive Level
CO 1: Apply engineering principles to design and solve real-world problems using acquired knowledge.	Apply
CO 2: Analyze industry processes and technologies to evaluate their effectiveness in solving engineering challenges.	Analyze
CO 3: Evaluate the performance of engineering systems and propose enhancements based on hands-on experience.	Evaluate
CO 4: Design and implement innovative solutions in collaborative projects, demonstrating leadership and teamwork.	Create

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	1	2	1	2	1			
CO2	3	3	2	3	2	2	2	1	2	2	2	2			
CO3	3	2	3	3	2	2	2	2	2	2	2	2			
CO4	3	2	3	2	3	2	3	1	3	3	3	2			

SEMESTER VII

Course Code: 24CSC411	**Course Title: Cloud Computing**	
Course Category: PCC	**Credits: 4**	
L:T:P(Hours/Week): 3:0:2	**Total Contact Hours: 75**	**Max Marks : 100**

COURSE OBJECTIVES
• To introduce the broad perceptive of cloud architecture and model.
• To understand the concept of Virtualization and design of cloud Services.
• To understand the architectural design, resource management, and deployment of compute and storage clouds, along with IoT enabling technologies and their innovative applications.
• To apply different cloud programming model as per need.
• To learn to design the trusted cloud Computing system.

UNIT I	**CLOUD ARCHITECTURE AND MODEL**	**9**
Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.		
UNIT II	**VIRTUALIZATION**	**9**
Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.		
UNIT III	**CLOUD INFRASTRUCTURE AND IoT**	**9**
Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources-Enabling Technologies for the Internet of Things – Innovative Applications of the Internet of Things.		
UNIT IV	**PROGRAMMING MODEL**	**9**
Parallel and Distributed Programming Paradigms – MapReduce, Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming		

Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim.		
UNIT V	**SECURITY IN THE CLOUD**	**9**
Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security – Identity Management and Access Control – Autonomic Security.		
Total: 45 Hours		

PRACTICALS	
1.	Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2.	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3.	Install Google App Engine. Create hello world app and other simple web applications using python/java
4.	Use GAE launcher to launch the web applications
5.	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim
6.	Find a procedure to transfer the files from one virtual machine to another virtual machine
7.	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8.	Install Hadoop single node cluster and run simple applications like wordcount
Total: 30 Hours	

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Identify the architecture, infrastructure and delivery models of cloud computing.
CO2: Apply suitable virtualization concept.
CO3: Explain the fundamentals of security in IoT.
CO4: Identify the appropriate cloud player, Programming Models and approach.
CO5: Identify the core issues of cloud computing such as security, privacy and interoperability.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1					2	3	1	3	2	1	3
CO2	3	1	2	2					1	2	1	3	2	2	1
CO3	2	3	2	3					3	1	1	**3**	1	1	1
CO4	1	2	3	3					3	3	1	2	1	3	3
CO5	2	3	3	1					2	2	1	2	2	2	3

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	George Reese, ―Cloud Application Architectures: Building Applications and Infrastructure in the Cloud‖, O'Reilly, 2009.
T2.	Gautam Shroff, ―Enterprise Cloud Computing‖, Cambridge University Press,2011.
T3.	James E. Smith, Ravi Nair, ―Virtual Machines: Versatile Platforms for Systems and Processes‖, Elsevier, 2005.
T4.	John W. Rittinghouse and James F. Ransome, ―Cloud Computing: Implementation, Management, and Security‖, CRC Press, 2010 .

REFERENCE BOOK(S)

R1.	Kai Hwang, Geoffrey C Fox, Jack G Dongarra, ―Distributed and Cloud Computing, From Parallel Processing to the Internet of Things‖, Morgan Kaufmann Publishers, 2012.
R2.	Kumar Saurabh, ―Cloud Computing – insights into New-Era Infrastructure‖, Wiley India, 2011.
R3.	Michael Miller, ―Cloud Computing‖, Que Publishing,2008.

Course Code: 24CSC401	**Course Title: Object Oriented Software Engineering**	
Course Category: PCC	**Credits: 3**	
L:T:P(Hours/Week): 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To identify and describe the various stages involved in software development.
• To gain knowledge of various techniques and activities used in requirements elicitation, and understand how to manage the process.
• To explore system design principles and activities, including addressing design goals and managing system design.
• To understand UML behavioral diagrams (e.g., activity diagrams, state diagrams, sequence diagrams) for modeling system interactions and behaviors.
• To comprehend the principles and activities of configuration management and its role in maintaining consistency and control over the software system.

UNIT I	**SOFTWARE ENGINEERING ASPECTS**	**9**
Software Engineering Concepts – Characteristics of software – Software engineering development activities – Managing software development – SDLC Process Models – Waterfall, RAD, Agile Software Development- Project communication concepts- Organizational activities.		
UNIT II	**REQUIREMENT ELICITATION AND ANALYSIS**	**9**
Overview of requirements elicitation – Requirements elicitation concepts – Requirements elicitation activities – Managing requirements elicitation – Concepts of analysis – Activities from use cases to objects – Managing analysis.		
UNIT III	**OBJECT ORIENTATION WITH OBJECT AND SYSTEM DESIGN**	**9**
Preface to object orientation – Classes and Objects - Decomposing the system – System Design: System design concepts and activities – From objects to subsystems – Addressing design goals – Managing system design – Object Design: Reusing pattern solutions – Overview of reuse concepts – Design patterns – Mapping models to code: Mapping concepts.		

UNIT IV	UNIFIED MODELING LANGAUAGE AND DIAGRAMS	9
Introduction to UML –UML Structured Diagrams: Class diagram – Use Case diagram – Component and Deployment diagram –User Centered design, UML Behavioral Diagrams: Modelling interactions and behavior: Activity diagram – State diagram –Sequence diagram Implementing classes based on interaction and state diagrams.		
UNIT V	**TESTING AND CONFIGURATION MANAGEMENT**	**9**
Testing: Testing concepts activities and managing testing - Rational management - Rational concepts and activities, Configuration Management: Configuration management activities and concepts - Configuration management concepts and activities – Managing configuration management.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Demonstrate a solid understanding of software engineering concepts, including the characteristics and challenges of software.
CO2: Analyze and manage requirements to ensure they are clearly understood and aligned with stakeholder needs.
CO3: Apply system design concepts and methodologies to meet design goals while managing the design process effectively.
CO4: Construct and interpret UML diagrams (e.g., class, use case, component, deployment) to represent system architecture and interactions.
CO5: Implement configuration management activities effectively to control changes in the software and maintain its integrity during development and deployment.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2						1	1	2	2	2	1
CO2	2	3	2	3						2	3	2	3	2	1
CO3	2	3	2	1						2	3	2	2	3	1
CO4	2	3	2	2						2	3	2	2	3	1
CO5	2	3	1	2								1	3	2	2

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Sommerville, ―Software Engineering‖, Pearson Education, 2009.
T2.	Roger S. Pressman. ―Software Engineering - A Practitioner's Approach‖, McGraw-Hill International Edition, 2010.

REFERENCE BOOK(S)	
R1.	Bernd Bruegge, Allen H., ―Object-Oriented Software Engineering: Using UML, Patterns and Java‖, Pearson Education, 2011.
R2.	Timothy C, Lethbridge and Robert Laganiere, ―Object -Oriented Software Engineering: Practical software development using UML and Java‖, McGraw-Hill Higher Education, 2013.
R3.	Stephen Schach, ―Object-Oriented and Classical Software Engineering‖, 8th edition, McGraw-Hill, 2010.

Course Code: 24HSM401	Course Title: Professional Ethics and Human Values	
Course Category: HSMC	Credits: 2	
L:T:P (Hours/Week) 2:0:0	Total Contact Hours: 30	Max Marks : 100

COURSE OBJECTIVES
• To learn about morals, values & work ethics and how to live peacefully.
• To create awareness about the customs and religions and learn different professional roles.
• To provide depth knowledge on framing of the problem and determining the facts.
• To create awareness about safety, risk & risk benefit analysis.
• To develop knowledge about global issues.

UNIT I	HUMAN VALUES	6
Morals, Values and Ethics - Integrity - Work Ethic - Service learning - Civic Virtue - Respect for others - Living Peacefully - Caring - Sharing - Honesty - Courage - Cooperation - Commitment - Empathy - Self Confidence Character - Spirituality - Case Study.		
UNIT II	ENGINEERING ETHICS	6
Senses of Engineering Ethics-Variety of moral issued - Types of inquiry - Moral dilemmas - Moral autonomy - Kohlberg‘s theory - Gilligan‘s theory - Consensus and controversy - Models of professional roles - Theories about right action - Self-interest - Customs and religion - Uses of Ethical theories - Valuing time - Cooperation – Commitment - Case Study.		
UNIT III	ENGINEERING AS SOCIAL EXPERIMENTATION	6
Engineering As Social Experimentation - Framing the problem - Determining the facts - Codes of Ethics - Clarifying Concepts - Application issues - Common Ground - General Principles - Utilitarian thinking respect for persons - Case study.		
UNIT IV	ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK	6
Safety and risk - Assessment of safety and risk - Risk benefit analysis and reducing risk - Safety and the Engineer - Designing for the safety - Intellectual Property Rights (IPR).		
UNIT V	GLOBAL ISSUES	6
Globalization - Cross culture issues - Environmental Ethics - Computer Ethics - Computers as the instrument of Unethical behavior - Computers as the object of Unethical acts - Autonomous Computers-Computer codes of Ethics - Weapons Development - Ethics and Research - Analyzing Ethical Problems in research - Case Study.		
		Total: 30 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand and analyse the essentials of human values and skills, self-exploration, happiness and prosperity.
CO2: Recognize the theories and principles of professional ethics.
CO3: Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
CO4: Analyse Safety and Risk benefit analysis and acquire knowledge on professional rights and responsibilities of an engineer.
CO5: Provide the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1					2	1	3	1	1	2	1	1	1	
CO2	1					3	2	3	2	1	2	1	1	1	
CO3	1	2	2			3	3	3	2	1	1	1	1	1	
CO4	1	2	2			3	3	3	2	1	2	1	1	1	
CO5	1					3	2	3	2	1	1	1	1	1	

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Fourth Edition, McGraw-Hill Education, Delhi, 2005.
T2.	M. Govindarajan, S. Natarajan and V. S. Senthilkumar, ―Professional Ethics and Human Values‖, PHI Learning Private Limited, 2013.

REFERENCE BOOK(S)

R1.	Jayshree Suresh and B.S. Raghavan, ―Human Values and Professional Ethics‖, Fourth Revised Edition, S.Chand & Company Limited, New Delhi, 2012.
R2.	S. B. Gogate, ―Human Values and Professional Ethics‖, First Reprint, Vikas Publishing House Pvt. Ltd., Noida, 2014.
R3.	Charles E. Harris, Michael S. Pritchard, Ray W. James, Michael Jerome Rabins and Elaine E. Englehardt, ― Engineering Ethics Concepts and Cases‖, Fifth Edition, Wadsworth Cengage Learning, 2014.

Course Code: 24CDC421	Course Title: Career Development Skills VII	
Course Category: EEC	Credits: 1	
L:T:P (Hours/Week) 2:0:0	Total Contact Hours: 30	L:T:P (Hours/Week) 2:0:0

COURSE OBJECTIVES
• To build skills to prepare for interviews, focusing on professionalism, clear communication, and making a positive impression.
• To enhance students ability for effective communication and professional success.

UNIT I	INTERVIEW SKILLS	15
Preparing for the Interview – Company and Role – Common Interview Questions – Skills and Experience – Maintain Positive Mind-Set. Before the Interview – Practice Critical Interview Questions – Genuine Questions to Ask the Interviewer – Reviewing Resume – Dress code – Early Arrival – Keep Enough Copies of Resume. During the Interview – Professional Look – Greeting the Interviewer – Answering Questions Confidently. The Interviewee‘s Behavior – Importance – Creating Good Impression – Body Language – Eye Contact – Tone – Voice – Confidence and Composure – Enthusiasm and Engagement – Responding to Questions. Taking Questions-Types of Questions Expected – Strategies for Answering Questions – Avoiding Pitfalls While Answering-Turning Questions into Opportunities – Maintaining Emotional Control – Leaving a Positive Impression. Tackling Questions – Answering to Behavioural Questions – Responding to Technical Questions – Handling Situational and Hypothetical Questions – Handling Weaknesses and Challenges. Questioning the Interviewer – Demonstrating Interest and Engagement – Showcasing Talents, Knowledge and Research Expertise – Exploring the Company Culture and Values – Inquiring about Growth Opportunities – Addressing Concerns or Challenges – Closing the Interview on a Strong Positive Note. Farewell and Follow-Up – Expressing gratitude – Offering Resources and Support – Importance of Staying in Touch – Contact Information – Inviting Feedback and Follow-Up – Closing Wishes.		
UNIT II	**GROUP DISCUSSION AND MOCK INTERVIEW**	**15**
Group Discussion – Introduction & Importance – Effective Communication in Group Discussion – Roles and Responsibilities – Strategies for Active Participation - Overcoming Challenges in Group Discussion – Evaluating the Process – Conclusion and Key Takeaways.		

Body Language, Voice Modulation – Importance & Techniques for Effective Voice Modulation – Pitch Variation – Tone and Inflection – Volume Control – Pace and Pause – Practical Applications of Voice Modulation. Content and Creativity – Importance of Engaging Content – Leveraging Creativity to Stand Out – Crafting Compelling Narratives – Optimizing for Different Platforms – Measuring and Analyzing Content Performance – Staying Ahead of Trends and Innovations. Basic Mock Interview Sessions – Introduction – Purpose and Benefits – Interview Preparation – Common Interview Questions – Behavioral Interview Techniques – Technical Interview Strategies – Mock Interview Feedback and Reflection – Steps and Resources. Activities – Group Discussion, Role Play, Presentation, Mock Interview.
Total: 30 Hours
COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Show professionalism, apply clear communication strategies, and effectively present themselves during interviews to make a positive impression.
CO2: Apply effective communication strategies and professional behavior to enhance their success in various workplace scenarios.
COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								3	2	3		2			
CO2								3	2	3		2			

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Marry Stella, ―Facing Job Interviews‖, Lotus Press, New Delhi, 2007.
T2.	Uco Jillert Wiersma, ―Interview Charisma‖, Career Knows Publishing, Norwalk, Connecticut, 2016.
T3.	Theodore Kingsley, ―Interviewing Skills 3 in 1‖, Indy Pub, 2023.
REFERENCE BOOK(S)	
R1.	Stephen R Covey, ―Seven Habits of Highly Effective People‖, G.K Hall, 1997.
R2.	Sanjay Kumar and Pushp Lata, ―Communication skills, Oxford Higher Education, 2011.
R3.	Nira Konar, ―Communication Skills for Professionals, PHI learning Pvt. Ltd, 2011.

Course Code : 24CDC422		**Course Title : Project Work Phase I**	
Course Category : EEC		**Credits : 2**	
L:T:P(Hours/Week)	**0:0:4**	**Total Contact Hours :30**	**Max Marks : 100**

COURSE OBJECTIVES

• To enable students to apply learned technologies in the design, analysis, and simulation of physical systems.
• To enable students to apply learned technologies in the design, analysis, and simulation of physical systems.
• To help students integrate various systems into a cohesive and functional product.
• To develop students' ability to work effectively in teams and manage time constraints.
• To improve students' skills in presenting and documenting technical work clearly in both oral and written formats.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Design, analyze, realize/simulate a physical system by using the technology they learned during the program.	Apply
CO 2: Integrate various systems into a single product.	Analyze
CO 3: Work in a team with confined time duration.	Evaluate
CO 4: Disseminate their work both in oral and written format.	Create

MAPPING OF CO – PO & PSO:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3	-	2	2	-	-	-	3			
CO2	3	3	3	3	3	2	2	2	-	-	-	3			
CO3	-	-	-	-	-	-	-	-	3	-	-	-			
CO4	-	-	-	-	-	-	-	-	-	3	3	-			

SEMESTER VIII

Course Code : 24CDC423	Course Title : Project Work Phase II	
Course Category : EEC	Credits : 8	
L:T:P(Hours/Week) : 0:0:16	Total Contact Hours :120	Max Marks : 100

COURSE OBJECTIVES
• To enable students to apply learned technologies in the design, analysis, and simulation of physical systems.
• To help students integrate various systems into a cohesive and functional product.
• To develop students' ability to work effectively in teams and manage time constraints.
• To improve students' skills in presenting and documenting technical work clearly in both oral and written formats.

COURSE OUTCOMES
At the end of this course, students will be able to:
CO 1: Design, analyze, realize/simulate a physical system by using the technology they learned during the program.
CO 2: Integrate various systems into a single product.
CO 3: Work in a team with confined time duration.
CO 4: Disseminate their work both in oral and written format.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	2	2	-	-	-	3		
CO2	3	3	3	3	3	2	2	2	-	-	-	3		
CO3	-	-	-	-	-	-	-	-	3	-	-	-		
CO4	-	-	-	-	-	-	-	-	-	3	3	-		
Max														

COURSE ASSESSMENT METHODS:

Direct	Indirect
1. Interdisciplinary work 2. Innovation 3. Working model/ simulation result 4. Report with good referencing 5. End Semester Viva Voce	1.Course end survey

Students are required to work in groups of up to 4 members to complete their main project. Special exceptions may be granted for interdisciplinary projects and computer-based simulations, with prior approval from the department committee. Management-related projects will not be permitted. Interdisciplinary projects will be given higher weightage.

PROFESSIONAL ELECTIVE COURSES I, II, III

Course Code: 24CSP001	Course Title: Image Processing	
Course Category: PEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks : 100

COURSE OBJECTIVES
• To become familiar with digital image fundamentals
• To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
• To learn concepts of degradation function and restoration techniques
• To study the image segmentation and representation techniques.
• To become familiar with image compression and recognition methods

UNIT I	DIGITAL IMAGE FUNDAMENTALS	9
Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI mo dels, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.		
UNIT II	IMAGE ENHANCEMENT	9
Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.		
UNIT III	IMAGE RESTORATION	9
Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.		
UNIT IV	IMAGE SEGMENTATION	9
Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation,Segmentation by morphological watersheds – basic concepts – Dam construction – Watershedsegmentation algorithm.		
UNIT V	IMAGE COMPRESSION AND RECOGNITION	9
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier		

Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.
Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
CO2: Operate on images using the techniques of smoothing, sharpening and enhancement.
CO3: Understand the restoration concepts and filtering techniques.
CO4: Learn the basics of segmentation, features extraction, compression and recognition methods for color models.
CO5: Comprehend image compression concepts.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	-	-	-	-	3	2	3	2
CO2	3	3	2	2	2	2	-	-	-	-	2	2	3	2
CO3	3	2	2	2	2	2	-	-	-	-	2	2	2	1
CO4	3	3	2	2	2	2	-	-	-	-	2	2	2	1
CO5	3	3	3	2	2	2	-	-	-	-	2	2	2	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Pearson, Third Edition, 2010.
T2.	Anil K. Jain, 'Fundamentals of Digital Image Processing', Pearson, 2002

REFERENCE BOOK(S)	
R1.	Kenneth R. Castleman, 'Digital Image Processing', Pearson, 2006.
R2	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, 'Digital Image Processing using MATLAB', Pearson Education, Inc., 2011.

Course Code: 24CSP002	**Course Title: Graphics and Multimedia**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the fundamentals of illumination, color models, graphical output primitives rendering.
• To learn 2D transformations, viewing, coordinate systems, and clipping algorithms.
• To understand 3D object representation, transformations, and viewing techniques.
• To familiarize multimedia systems, compression, storage, and retrieval technologies.
• To explore multimedia authoring, interfaces, and Blender graphics fundamentals.

UNIT I	**ILLUMINATION AND COLOR MODELS**	**9**
Light sources - basic illumination models – halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive color concepts - RGB color model - YIQ color model - CMY color model - HSV color model - HLS color model; Color selection. Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.		
UNIT II	**TWO-DIMENSIONAL GRAPHICS**	**9**
Two dimensional geometric transformations – Matrix representations and homogeneous Coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.		
UNIT III	**THREE-DIMENSIONAL GRAPHICS**	**9**
Three dimensional concepts; Three dimensional object representations – Polygon surfaces Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modelling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.		

UNIT IV	MULTIMEDIA SYSTEM DESIGN & MULTIMEDIA FILE	9
Multimedia basics − Multimedia applications − Multimedia system architecture − Evolving technologies for multimedia − Defining objects for multimedia systems − Multimedia data interface standards − Multimedia databases. Compression and decompression − Data and file format standards − Multimedia I/O technologies − Digital voice and audio − Video image and animation − Full motion video − Storage and retrieval technologies.		
UNIT V	**HYPERMEDIA**	**9**
Multimedia authoring and user interface − Hypermedia messaging − Mobile messaging − Hypermedia message component − Creating hypermedia message − Integrated multimedia message standards − Integrated document management − Distributed multimedia systems. CASE STUDY: BLENDER GRAPHICS Blender Fundamentals – Drawing Basic Shapes – Modelling – Shading & Textures.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand illumination, color models, and graphical rendering techniques.
CO2: Apply 2D transformations, viewing, and clipping techniques effectively.
CO3: Understand 3D object representation, transformations, viewing, and rendering Techniques.
CO4: Understand multimedia fundamentals, architectures, technologies, and data Management.
CO5: Master multimedia authoring, user interface, and Blender graphics.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	1	1					1	2	1	2	2
CO2	1	2	2	1	2					1	2	2	2	2
CO3	2	1	1	1	1					1	2	2	2	2
CO4	2	1	1	2	1					2	1	1	2	2
CO5	1	1	1	2	1					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Donald Hearn and Pauline Baker M, “Computer Graphics", Prentice Hall, New Delhi, 2007.
T2.	Andleigh, P. K and Kiran Thakrar, “Multimedia Systems and Design”, PHI, 2003.

REFERENCE BOOK(S)	
R1.	Judith Jeffcoate, “Multimedia in practice: Technology and Applications”, PHI, 1998.
R2.	Foley, Vandam, Feiner and Hughes, “Computer Graphics: Principles and Practice”, 2nd Edition, Pearson Education, 2003.
R3.	Ralf Steinmetz and Klara Nahrstedt, “Multimedia: Computing, Communications and Applications”, First Edition, Pearson, 1995.

Course Code: 24CSP003	**Course Title: Advanced Java Programming**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the fundamentals of web programming and client side scripting.
• To learn server side development using servlets, web sockets.
• To learn the spring framework and build applications using Spring.
• To learn and implement the concept of Java Persistence API.
• To learn the advanced client side scripting and framework.

UNIT I	**INTRODUCTION TO WEB & JAVASCRIPT**	**9**
Introduction to Web: Server - Client - Communication Protocol (HTTP), Javascript Prototypes - Classes - Modules – Fetch API – JS Canvas - Storage: LocalStorage, Cookies, IndexedDB, JSON.		
UNIT II	**SERVER SIDE PROGRAMMING**	**9**
Web Server: Web Containers - Web Components, Servlet: Lifecycle - Request - Servlet Context -Response - Filter - Session - Dispatching Requests, WebSocket, Logging - Log4j2, Logging - Log4j2, Build tool - Gradle. Introduction to Spring: IoC Container and Dependency Injection (DI).		
UNIT III	**SPRING**	**9**
Spring Configuration and Spring Boot, Spring MVC, Spring Bean Lifecycle - DispatcherServlet and Configuration - Interceptors – Annotations, Controllers - Views - Input Validation -File Upload Container,Dependency and IOC .		
UNIT IV	**AOP, JAVA PERSISTENCE API AND HIBERNATE**	**9**
Aspect Oriented Programming(AOP) - Entity: Basic, Embeddable and Collection Types - Identifiers- Entity Relationship - Inheritance, Persistence Context and Entity Manager, JPQL, Criteria API,Spring Data JPA - Specification and Projection.		
UNIT V	**ADVANCED SPRING PROGRAMMING**	**9**
Spring Boot JDBC - Spring Boot Actuator - Spring Cloud - Spring Boot Testing - Spring Security Architecture , Spring Cache - Building RESTful Web Services.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Write client side scripting.
CO2: Implement the server side of the web application.
CO3: Implement Web Application using Spring.
CO4: Develop a Java application using Java Persistence API.
CO5: Implement a full-stack Single Page Application using React, Spring and JPA.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	David Flanagan, “Java Script: The Definitive Guide”, 7th Edition, O’Reilly Media, Inc, 2020.
T2.	Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019.

REFERENCE BOOK(S)

R1.	Alex Banks, Eve Porcello, "Learning React", 2nd Edition, O’Reilly Media, Inc, 2020.
R2.	David R. Heffelfinger, "Java EE 8 Application Development", First Edition, Packt Publishing, 2017.
R3.	Robin Wieruch, "The Road to React", First Edition, Independently Published, 2021.

Course Code: 24CSP004	**Course Title: Wireless Sensor Networks**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To learn about the issues in the design of wireless ad hoc networks.
• Comprehend sensor network protocols, architectures, and routing methodologies.
• Data-centric networking, QoS, and in-network processing.
• Security techniques and protocols for wireless sensor networks.
• To understand various security issues in ad hoc and sensor networks and solutions to the issues.

UNIT I	**WIRELESS SENSOR NETWORK ARCHITECTURE**	**9**
Introduction to wireless sensor networks- Challenges, Comparison with ad hoc network, Node architecture and Network architecture, design principles, Service interfaces, Gateway, Short range radio communication standards - Physical layer and transceiver design considerations.		
UNIT II	**MAC & ROUTING IN WIRELESS SENSOR NETWORKS**	**9**
Introduction – Applications – Challenges – Sensor network architecture – MAC Protocols for wireless sensor networks – Low duty cycle protocols and wakeup concepts – Contention- Based protocols – Schedule-Based protocols – IEEE 802.15.4 Zig bee – Topology Control – Routing Protocols.		
UNIT III	**TRANSPORT & QOS IN WIRELESS SENSOR NETWORKS**	**9**
Data-Centric and Contention-Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Congestion Control – In-network processing – Operating systems for wireless sensor networks – Examples.		
UNIT IV	**SECURITY IN AD HOC AND SENSOR NETWORKS**	**9**
Security Attacks – Key Distribution and Management – Intrusion Detection – Software based Antitamper techniques – Watermarking techniques – Defense against routing attacks - Secure Ad hoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS.		
UNIT V	**V TOOLS FOR WSN**	**9**
TinyOS – Introduction, NesC, Interfaces, modules, configuration, Programming in TinyOS		

using NesC, TOSSIM, Contiki – Structure, Communication Stack, Simulation environment – Cooja simulator, Programming.
Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Identify different issues in wireless ad hoc and sensor networks.
CO2: To analyze protocols developed for ad hoc and sensor networks.
CO3: To identify and understand security issues in ad hoc and sensor networks.
CO4: To learn the significance of Transport layer and QoS in wireless sensor networks.
CO5: To analyze the tools used for Wireless Sensor Networks.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2					1	2	1	2	2
CO2	2	2	2	3	2					1	2	2	1	2
CO3	2	2	2	2	2					1	2	2	1	1
CO4	3	2	2	3	2					2	1	1	2	2
CO5	3	2	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Anna Hac, “Wireless Sensor Network Design”, John Wiley & Sons, 2003.
T2.	Holger Karl and Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, Inc., 2007.

REFERENCE BOOK(S)

R1.	Erdal Çay and Chunming Rong, “Security in Wireless Ad Hoc and Sensor Networks”, John Wiley and Sons, 2009.
R2.	C.Siva Ram Murthy and B.S.Manoj, “Ad Hoc Wireless Networks – Architectures and Protocols”, Pearson Education, 2006.
R3.	Pangun Park, "Wireless Sensor Networks: Security, Coverage, and Localization", First Edition, Springer, 2018.

Course Code: 24ITP001	**Course Title: Blockchain Technology**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the basics of Blockchain.
• To learn the basics of Cryptocurrency.
• To understand the working of digital tokens and wallets.
• To familiarize the working of contracts.
• To understand the working of block chain platforms.

UNIT I	**OVERVIEW OF BLOCKCHAIN**	**9**
Why Blockchain - The Structure of Blockchain - Data Structure of Blockchain – Data Distribution in Blockchain - Block Validation. Block Validators Consensus - Proof of Work – Proof of Stake - Proof of Activity - Proof of Elapsed Time - Proof of Burn.		
UNIT II	**CRYPTOCURRENCY**	**9**
Bitcoin Bitcoin Working - Bitcoin Transactions - Bitcoin Mining - Value of Bitcoin - Community, Politics and Regulations – Advantages – Disadvantages. Ethereum Overview – Decentralized Application. Components of Ethereum Smart contracts – Ether - Ethereum Clients – Ethereum Virtual Machine – Etherscripter.		
UNIT III	**DEVELOPMENT FRAMEWORKS**	**9**
Digital Tokens Overview - Initial Coin Offering – OmiseGO – EOS – Tether. Meta Mask Wallet Seed – Meta Mask Transactions. Mist Overview - Mist wallet. Truffle Features of Truffle – Development Truffle boxes - Community truffle box.		
UNIT IV	**HYPERLEDGER**	**9**
Hyperledger Fabric Introduction - Fabric vs Ethereum – Hyperledger Iroha - Features of Iroha. Hyperledger Sawtooth Components of sawtooth - Proof of Elapsed time.		
UNIT V	**V TOOLS FOR WSN**	**9**
Multichain - HydraChain. Future Blockchain IOTA – Corda - Chain Core.Blockchain Framework CoCo Framework – Tierion – BigchainDB.		

Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Identify Block Chain as Data structure and Distribution Data.
CO2: Implement the transactions of Crypto currency.
CO3: Identify the different ways to achieve Block chain Technology.
CO4: Design and build smart contracts.
CO5: Use smart contract for real world application in a Blockchain Platform.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

TEXT BOOK(S)

T1.	Josh Thompson, “Blockchain The Blockchain for Beginnings, Guide to BlockchainTechnology and Blockchain Programming”, 1st Edition, Create Space Independent Publishing Platform, 2017.
T2.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder, “Bitcoin and cryptocurrency technologies a comprehensive introduction”, 1st Edition, Princeton University Press, 2016.

REFERENCE BOOK(S)

R1.	Joseph Bonneau et al, SoK, “Research perspectives and challenges for Bitcoin and Cryptocurrency”, 1st Edition, IEEE Symposium on security and Privacy, 2015.
R2.	Antony Lewis, “The Basics of Bitcoins and Blockchains An Introduction to Cryptocurrencies and the Technology that Powers Them”, Mango Publishing group, 2018.
R3.	Andreas M. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", Second Edition, O’Reilly Media, 2017.

Course Code: 24ITP002	**Course Title: Information Security**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the basics of information security.
• To learn the legal, ethical and professional issues in information security.
• To demonstrate the aspects of risk management.
• To get aware of various standards in the Information Security System.
• To design and implementation of Security Techniques.

UNIT I	**INTRODUCTION**	**9**
History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC.		
UNIT II	**SECURITY INVESTIGATION**	**9**
Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies.		
UNIT III	**SECURITY ANALYSIS**	**9**
Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk -Systems: Access Control Mechanisms, Information Flow and Confinement Problem.		
UNIT IV	**LOGICAL DESIGN**	**9**
Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity.		
UNIT V	**PHYSICAL DESIGN**	**9**
Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Discuss the basics of information security
CO2: Illustrate the legal, ethical and professional issues in information security
CO3: Demonstrate the aspects of risk management.
CO4: Become aware of various standards in the Information Security System
CO5: Design and implementation of Security Techniques.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2003.
T2.	Evan Wheeler, "Security Risk Management: Building an Information Security Risk Management Program from the Ground Up", First edition, Syngress Publishing, 2011.

REFERENCE BOOK(S)	
R1.	Micki Krause and Harold F. Tipton, " Handbook of Information Security Management", Vol 1-3 CRCPress LLC, 2004.
R2	Stuart McClure, Joel Scrambray and George Kurtz, "Hacking Exposed", Tata McGrawHill, 2003.
R3.	William Stallings, "Network Security Essentials: Applications and Standards", Fifth Edition, Pearson, 2013.

Course Code: 24ITP003	**Course Title: XML AND WEB SERVICES**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To learn XML concepts and exposed to build applications based on XML.
• To gain knowledge about SOAP, HTTP and UDDI to create web services.
• To understand the SOA architecture and principles of Service Oriented Architecture.
• To learn about the role of SOA in J2EE, .NET and web services.
• To know about the Cloud Computing architecture and services.

UNIT I	**XML AND WEB SERVICES INTRODUCTION**	**9**
XML structure – Elements – Creating Well-formed XML - Name Spaces – Schema Elements, Types, Attributes – XSL Transformations – Parser – Web Services Overview – Architecture.		
UNIT II	**WSDL, SOAP and UDDI**	**9**
WSDL - Overview Of SOAP – HTTP – XML-RPC – SOAP: Protocol – Message Structure – Intermediaries – Actors – Design Patterns And Faults – SOAP With Attachments – UDDI.		
UNIT III	**SOA BASICS**	**9**
Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate - Principles of service orientation – Service Layers.		
UNIT IV	**SOA in J2EE and .NET**	**9**
SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAXWS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) – Java API for XML based RPC (JAX-RPC) – JAX-RS SOA support in .NET – ASP.NET web services.		
UNIT V	**CLOUD COMPUTING**	**9**
Vision of Cloud computing – Cloud Definition – Characteristics and Benefits – Virtualization – Cloud computing Architecture – Cloud Reference Model, Types of Clouds – Cloud Platforms in Industry.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: To know the structure of XML and to design and store data in XML.
CO2: To apply SOAP , HTTP and UDDI services in the web applications.
CO3: To apply SOA architecture and the underlying design principles for the web projects.
CO4: To understand the role of SOA in J2EE and .NET.
CO5: To know the cloud computing architecture and the types of clouds.

(1 – Low, 2 – Medium, 3 – High)

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

TEXT BOOK(S)

T1.	Dan woods and Thomas Mattern, “Enterprise SOA designing IT for Business Innovation”, O’REILLY, First Edition, 2006.
T2.	Frank. P. Coyle, “XML, Web Services And The Data Revolution”, Pearson Education, 2002.

REFERENCE BOOK(S)

R1.	Heather Williamson, “XML, The Complete Reference”, McGraw Hill Education, 2012.
R2.	Newcomer and Lomow, “Understanding SOA with Web Services”, Pearson Education, 2009.
R3.	Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, “Mastering Cloud Computing”, McGraw Hill, 2013.

Course Code: 24AMP001	**Course Title: Pattern Recognition**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• Understand the in-depth concept of Pattern Recognition.
• Implement Bayes Decision Theory.
• Understand the in-depth concept of Perception and related Concepts.
• Understand the concept of ML Pattern Classification.
• Understand the concept of DL Pattern Recognition.

UNIT I	**PATTERN RECOGNITION**	**9**
Induction Algorithms. Rule Induction. Decision Trees. BayesianMethods. Overview. NaiveBayes. The Basic Na¨ıve Bayes Classifier. Naive Bayes Induction for Numeric Attributes. Correction to the Probability Estimation. Laplace Correction. No Match. Other Bayesian Methods. Other Induction Methods. Neural Networks. Genetic Algorithms. Instance-based Learning. Support Vector Machines.		
UNIT II	**WSDL, SOAP and UDDI**	**9**
About Statistical Pattern Recognition. Classification and regression. Features, Feature Vectors, and Classifiers. Pre-processing and feature extraction. The curse of dimensionality. Polynomial curve fitting. Model complexity. Multivariate non-linear functions. Bayes' theorem. Decision boundaries. Parametric methods. Sequential parameter estimation. Linear discriminant functions. Fisher's linear discriminant. Feed-forward network mappings.		
UNIT III	**STATISTICAL PATTERN RECOGNITION**	**9**
Bayes Decision Theory. Discriminant Functions and Decision Surfaces. The Gaussian Probability Density Function. The Bayesian Classifier for Normally Distributed Classes. Exact interpolation. Radial basis function networks. Network training. Regularization theory. Noisy interpolation theory. Relation to kernel regression. Radial basis function networks for classification. Comparison with the multi-layer perceptron. Basis function optimization.		
UNIT IV	**BAYES DECISION THEORY CLASSIFIERS**	**9**
Linear Discriminant Functions and Decision Surfaces. The Two-Category Case. The Multicategory Case. The Perceptron Criterion Function. Batch Perceptron.		

Perceptron Algorithm Convergence. The Pocket Algorithm. Mean Square Error Estimation. Stochastic Approximation and the LMS Algorithm. Convergence Proof for Single-Sample Correction. Fixed increment descent. Some Direct Generalizations. Fixed increment descent. Batch variable increment Perceptron. Balanced Winnow algorithm. Relaxation Procedures. The Descent Algorithm.

UNIT V	LINEAR DISCRIMINANT FUNCTIONS	9
The Two Layer Perception. The Three Layer Perception. Algorithms Based On Exact Classification Of The Training Set. Feedforward operation and classification. General feedforward operation. Expressive power of multilayer networks. Backpropagation algorithm. Network learning. Training protocols. Stochastic Backpropagation. Batch Backpropagation. Radial basis function networks (RBF). Special bases. Time delay neural networks (TDNN). Recurrent networks. Counter propagation. Cascade-Correlation. Cascade-correlation. Neocognitron.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Discover imaging, and interpretation of temporal patterns.
CO2: Identify Structural Data Patterns.
CO3: Implement Pattern Classification using Machine Learning Classifiers.
CO4: Analyze Pattern Recognition using Deep Learning Models.
CO5: Implement Image Pattern Recognition.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Richard O. Duda, Peter E. Hart, and David G. Stork.. "Pattern Classification", 2nd Edition, Wiley, 2000.
T2.	Jurgen Beyerer, Matthias Richter, and Matthias Nagel., "Pattern Recognition", Wiley, 2018.

Course Code: 24AMP002	Course Title: Natural Language Processing	
Course Category: PEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks : 100

COURSE OBJECTIVES
• To understand basics of linguistics, probability and statistics.
• To study statistical approaches to NLP and understand sequence labeling.
• To outline different parsing techniques associated with NLP.
• To explore semantics of words and semantic role labeling of sentences.
• To understand discourse analysis, question answering and chatbots.

UNIT I	INTRODUCTION	9
Natural Language Processing – Components - Basics of Linguistics and Probability and Statistics – Words-Tokenization-Morphology-Finite State Automata.		
UNIT II	STATISTICAL NLPAND SEQUENCE LABELING	9
N-grams and Language models –Smoothing -Text classification- Naïve Bayes classifier – Evaluation - Vector Semantics – TF-IDF - Word2Vec- Evaluating Vector Models -Sequence Labeling – Part of Speech – Part of Speech Tagging -Named Entities –Named Entity Tagging.		
UNIT III	CONTEXTUAL EMBEDDING	9
Constituency –Context Free Grammar –Lexicalized Grammars- CKY Parsing – Earley's Algorithm Evaluating Parsers -Partial Parsing – Dependency Relations- Dependency Parsing – Transition- Based - Graph Based.		
UNIT IV	COMPUTATIONAL SEMANTICS	9
Word Senses and WordNet – Word Sense Disambiguation – Semantic Role Labeling – Proposition Bank- FrameNet- Selectional Restrictions - Information Extraction - Template Filling.		
UNIT V	DISCOURSE ANALYSIS AND SPEECH PROCESSING	9
Discourse Coherence – Discourse Structure Parsing – Centering and Entity Based Coherence – Question Answering –Factoid Question Answering – Classical QA Models – Chatbots and Dialogue systems – Frame-based Dialogue Systems – Dialogue–State Architecture.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand basics of linguistics, probability and statistics associated with NLP.
CO2: Implement a Part-of-Speech Tagger.
CO3: Design and implement a sequence labeling problem for a given domain.
CO4: Implement semantic processing tasks and simple document indexing and searching system using the concepts of NLP.
CO5: Implement a simple chatbot using dialogue system concepts.

COURSE ARTICULATION MATRIX

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Daniel Jurafsky and James H.Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition” (Prentice Hall Series in Artificial Intelligence), 2020.
T2.	Jacob Eisenstein. “Natural Language Processing “, MIT Press, 2019.

REFERENCE BOOK(S)	
R1.	Samuel Burns “Natural Language Processing: A Quick Introduction to NLP with Python and NLTK, 2019.
R2	Christopher Manning, “Foundations of Statistical Natural Language Processing”, MIT Press, 2009.
R3	Nitin Indurkhya, Fred J. Damerau, “Handbook of Natural Language Processing”, Second edition, Chapman & Hall/CRC: Machine Learning & Pattern Recognition, Hardcover, 2010.

Course Code: 24AMP003	**Course Title: Text and Visual Analytics**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the methods for keyword extraction from documents.
• To learn clustering methods for grouping of documents.
• To explore the methods for classification of documents and E-mails.
• To explore text visualization techniques and anomaly detection.
• To learn about Events and trends in text streams.

UNIT I	**TEXT EXTRACTION**	**9**
Introduction - Rapid automatic keyword extraction: candidate keywords, keyword scores, adjoining keywords, extracted keywords - Benchmark evaluation: precision and recall, efficiency, stoplist generation, Evaluation on new articles.		
UNIT II	**DOCUMENT CLUSTERING**	**9**
Multilingual document clustering: Multilingual LSA, Tucker1 method, PARAFAC2 method, LSA with term alignments, LMSA, LMSA with term alignments; Constrained clustering with k-means type algorithms.		
UNIT III	**CONTENT BASED CLASSIFICATION**	**9**
Classification algorithms for Document Classification, Content-based spam email classification, Utilizing nonnegative matrix factorization for email classification problems.		
UNIT IV	**ANOMALY AND TREND DETECTION**	**9**
Text visualization techniques: Visualization in text analysis, Tag clouds, tag clouds, authorship and change tracking, Data Exploration and the search for noval patterns, sentiment tracking, visual analytics and Future Lens, scenario discovery. adaptive threshold setting for novelty mining: Introduction, adaptive threshold for anomaly detection, Experimental study.		
UNIT V	**TEXT STREAMS**	**9**
Events and trends in text streams: Introduction, Text streams, Feature extraction and data reduction, Event detection, Trend detection, Event and trend descriptions. Embedding semantics in LDA topic models: Introduction, vector space modeling, latent semantic analysis,		

probabilistic latent semantic analysis, Latent Dirichlet allocation, embedding external semantics from Wikipedia, data-driven semantic embedding.
Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Design text extraction techniques.
CO2: Devise clustering techniques for text mining.
CO3: Design classification techniques for text mining.
CO4: Apply visualization techniques and perform anomaly & trend detection.
CO5: Perform Event operations in Text streams.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Michael W. Berry and Jacob Kogan, "Text Mining Applications and Theory", Wiley publications, 2010.
T2.	Aggarwal, Charu C., and ChengXiangZhai, eds., “Mining text data”, Springer Science & Business Media, 2012.

REFERENCE BOOK(S)	
R1.	Miner, Gary, et al., “Practical text mining and statistical analysis for non-structured text data applications”, Academic Press, 2012.
R2.	Srivastava, Ashok N., and MehranSahami, “Text mining: Classification, clustering, and applications”, Chapman and Hall/CRC, 2009.
R3.	Buitelaar, Paul, Philipp Cimiano, and Bernardo Magnini, eds., “Ontology learning from text: methods, evaluation and applications”, Vol. 123. IOS press, 2005.

Course Code: 24ADP001	Course Title: Foundation of Robotics and Automation	
Course Category: PEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks : 100

COURSE OBJECTIVES
• To study the kinematics, drive systems and programming of robots.
• To study the basics of robot laws and transmission systems.
• To familiarize students with the concepts and techniques of robot manipulator, its kinematics.
• To familiarize students with the various Programming and Machine Vision application in robots.
• To build confidence among students to evaluate, choose and incorporate robots in engineering systems.

UNIT I	FUNDAMENTALS OF ROBOT	9
Robot – Definition – Robot Anatomy – Co-ordinate systems, Work Envelope, types and classification – specifications – Pitch, yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and their functions – Need for Robots – Different Applications.		
UNIT II	**ROBOT KINEMATICS**	**9**
Forward kinematics, inverse kinematics and the difference: forward kinematics and inverse Kinematics of Manipulators with two, three degrees of freedom (in 2 dimensional), four degrees of freedom (in 3 dimensional) – derivations and problems. Homogeneous transformation matrices, translation and rotation matrices.		
UNIT III	**ROBOT DRIVE SYSTEMS AND END EFFECTORS**	**9**
Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of All These Drives. End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic grippers, vacuum grippers, internal grippers and external grippers, selection and design considerations of a gripper.		
UNIT IV	**SENSORS IN ROBOTICS**	**9**
Force sensors, touch and tactile sensors, proximity sensors, non-contact sensors, safety		

considerations in robotic cell, proximity sensors, fail safe hazard sensor systems, and compliance mechanism. Machine vision system - camera, frame grabber, sensing and digitizing image data – signal conversion, image storage, lighting techniques, image processing and analysis – data reduction, segmentation, feature extraction, object recognition, other algorithms, applications – Inspection, identification, visual serving and navigation.

UNIT V	**PROGRAMMING AND APPLICATIONS OF ROBOT**	**9**
Teach pendant programming, lead through programming, robot programming languages – VAL programming – Motion Commands, Sensors commands, End-Effector Commands, and simple programs - Role of robots in inspection, assembly, material handling, underwater, space and medical fields.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Interpret the features of robots and technology involved in the control.
CO2: Apply the basic engineering knowledge and laws for the design of robotics.
CO3: Explain the basic concepts like various configurations, classification and parts of end effectors compare various end tools and sensors used in robots.
CO4: Explain the concept of kinematics, degeneracy, dexterity and trajectory planning.
CO5: Demonstrate the image processing and image analysis techniques by machine vision

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Ganesh.S.Hedge, "A textbook of Industrial Robotics", Lakshmi Publications, 2006.
T2.	Mikell.P.Groover , "Industrial Robotics – Technology, Programming and applications" McGraw Hill, 2012.

REFERENCE BOOK(S)	
R1.	Fu K.S. Gonalz R.C. and ice C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw Hill book, 2007.
R2.	YoramKoren, "Robotics for Engineers", McGraw Hill Book, Co., 2002.
R3.	Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill 2005.

Course Code: 24ADP002	**Course Title: Data Analysis in Cloud Computing**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand big data.
• To learn and use NoSQL big data management.
• To learn mapreduce analytics using Hadoop and related tools.
• To work with map reduce applications.
• To understand the usage of Hadoop related tools for Big Data Analytics.

UNIT I	**UNDERSTANDING BIG DATA**	**9**
Introduction to big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data applications– big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.		
UNIT II	**NOSQL DATA MANAGEMENT**	**9**
Introduction to NoSQL – aggregate data models – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – master slave replication – consistency – Cassandra – Cassandra data model – Cassandra examples – Cassandra clients.		
UNIT III	**MAP REDUCE APPLICATIONS**	**9**
MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats.		
UNIT IV	**BASICS OF HADOOP**	**9**
Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures - Cassandra – Hadoop integration.		

UNIT V	HADOOP RELATED TOOLS	9
Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Describe big data and use cases from selected business domains.
CO2: Explain NoSQL big data management.
CO3: Install, configure, and run Hadoop and HDFS.
CO4: Perform map-reduce analytics using Hadoop.
CO5: Use Hadoop-related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Michael Minelli, Michelle Chambers, and AmbigaDhiraj, “Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses”, Wiley, 2013.
T2.	Eric Sammer, “Hadoop Operations”, O'Reilley, 2012.

REFERENCE BOOK(S)	
R1.	Sadalage, Pramod J. “NoSQL distilled”, O'Reilley, 2013
R2.	E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
R3.	Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.

R3.	Kimberly Graves, “CEH Official Certified Ethical hacker Review Guide”, Wiley Publishers, 2007.
R4.	William Stallings, Lawrie Brown, “Computer Security Principles and Practice”, Third Edition, Pearson Education, 2015.

Course Code: 24CYP001	Course Title: Fundamentals of Cyber Security	
Course Category: PEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks : 100

COURSE OBJECTIVES
• To learn cybercrime and cyberlaw
• To understand the cyber attacks and tools for mitigating them.
• To understand information gathering.
• To learn how to detect a cyber-attack.
• To learn how to prevent a cyber-attack

UNIT I	Introduction	9
Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.		
UNIT II	Attacks and Countermeasures	9
OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.		
UNIT III	Reconnaissance	9
Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.		
UNIT IV	Intrusion Detection	9
Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.		
UNIT V	Intrusion Prevention	9

Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.
Total : 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Explain the basics of cyber security, cyber crime and cyber law
CO2: Classify various types of attacks and learn the tools to launch the attacks
CO3 Apply various tools to perform information gathering
CO4: Apply intrusion techniques to detect intrusion
CO5: Apply intrusion prevention techniques to prevent intrusion

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2			1		1	1		1			1	2		
CO2	2		2	1		1	1		2			1	2		
CO3	2	2	2	2		2	1		1			2	2	2	
CO4	2	1	2	2		2	1		2			2	2	2	
CO5	2	1	2	2		2	1		2			2	2		

(1 - Low, 2 - Medium, 3 - High)

TEXT BOOK(S)	
T1.	. Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021 (Unit 1)
T2.	Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011 (Unit 1)
T3.	https://owasp.org/www-project-top-ten/

REFERENCE BOOK(S)	
R1.	RENCES 1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones & Bartlett Learning Publishers, 2013 (Unit 2)
R2.	Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy", Elsevier, 2011 (Unit 3)

R3.	Kimberly Graves, “CEH Official Certified Ethical hacker Review Guide”, Wiley Publishers, 2007 (Unit 3)
R4	William Stallings, Lawrie Brown, “Computer Security Principles and Practice”, Third Edition, Pearson Education, 2015 (Units 4 and 5)
R5	Georgia Weidman, “Penetration Testing: A Hands-On Introduction to Hacking”, No Starch Press, 2014

Course Code: 24CYP002	**Course Title: Ad-hoc Networks**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the basics of Ad-hoc & Sensor Networks.
• To learn various fundamental and emerging protocols of all layers in ad-hoc network.
• To familiarize about the issues pertaining to major obstacles in establishment and efficient management of ad-hoc and sensor networks.
• To understand the nature and applications of ad-hoc and sensor networks.
• To understand various security practices and protocols of Ad-hoc and Sensor Networks.

UNIT I	**ADHOC NETWORKS FUNDAMENTALS & COMMUNICATION PROTOCOLS**	**9**
Fundamentals Of WLANs – IEEE 802.11 Architecture - Self Configuration and Auto Configuration-issues in Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols - TCP Over Ad-Hoc Networks-TCP Protocol Overview - TCP and MANETs – Solutions for TCP Over Ad-Hoc Networks.		
UNIT II	**ADHOC NETWORK ROUTING AND MANAGEMENT**	**9**
Routing in Ad-Hoc Networks- Introduction -Topology based versus Position based Approaches – Proactive Routing - DSDV, WRP, TBRPF Reactive Routing – DSR, AODV, Hybrid Routing Approach ZRP, CBRP- Location services - DREAM – Quorums based Location Service – Forwarding Strategies – Greedy Packet Forwarding, LAR.		
UNIT III	**SENSOR NETWORK COMMUNICATION PROTOCOLS**	**9**
Introduction – Architecture - Single Node Architecture – Sensor Network Design Considerations – Energy Efficient Design Principles for WSN's – Protocols for WSN – Physical Layer - Transceiver Design Considerations – MAC Protocols for wireless sensor network – IEEE 802.15.4 Zigbee – Link Layer and Error Control Issues - Routing Protocols – Gossiping and agent based unicast forwarding, Energy efficient unicast –Transport Protocols & QoS – Congestion Control Issues – Application specific Support – Target detection and tracking.		

UNIT IV	SENSOR NETWORK MANAGEMENT AND PROGRAMMING	9
Sensor Management - Topology Control Protocols and Sensing Mode Selection Protocols - Time Synchronization - Localization and Positioning – Operating Systems and Sensor Network Programming – Sensor Network Simulators- Case study: Industrial automation and tsunami early warning system with wireless sensor networks.		
UNIT V	**ADHOC AND SENSOR NETWORK SECURITY**	**9**
Security in Ad-Hoc and Sensor Networks – Key Distribution and Management – Software based Anti-tamper Techniques – Water Marking techniques – Defense against Routing Attacks - Secure Adhoc Routing Protocols – Broadcast Authentication WSN Protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Work with existing Ad-hoc and sensor network protocols and standards and Create a Sensor network environment for different type of applications.
CO2: Design ad-hoc and sensor network architectures using QoS and Congestion control Mechanisms.
CO3: Interpret the various control fields of the protocol in each layer.
CO4: Select appropriate routing algorithms for different network environments.
CO5: Deploy security mechanisms in the wireless ad-hoc and sensor networks.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					1	2	2	1	1
CO5	2	1	2	2	2					1	2	2	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Adrian Perrig and J. D. Tygar, "Secure Broadcast Communication: In Wired and Wireless Networks", Springer, 2006.

T2.	Amiya Nayak and Ivan Stojmenovic, "Wireless Sensor and Actuator Networks: Algorithm and Protocols for Scalable Coordination and Data communication", John Wiley & Sons, 2010.

REFERENCE BOOK(S)	
R1.	Carlos De Morais Cordeiro and Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks:Theory and Applications", Second Edition, World Scientific Publishing, 2011.
R2.	C.Siva Ram Murthy and B.S.Manoj, "Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2011.
R3.	C.K.Toh, "Ad Hoc Mobile Wireless Networks", Pearson Education, 2007.

Course Code: 24CYP003	**Course Title: Ethical Hacking**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the basics of computer based vulnerabilities.
• To explore different foot printing, reconnaissance and scanning methods.
• To expose the enumeration and vulnerability analysis methods.
• To understand hacking options available in Web and wireless applications.
• To practice tools to perform ethical hacking to expose the vulnerabilities.

UNIT I	**INTRODUCTION**	**9**
Ethical Hacking Overview - Role of Security and Penetration Testers .- Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing .- Network and Computer Attacks - Malware - Protecting Against Malware Attacks.- Intruder Attacks - Addressing Physical Security.		
UNIT II	**FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS**	**9**
Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall.		
UNIT III	**ENUMERATION AND VULNERABILITY ANALYSIS**	**9**
Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss.		
UNIT IV	**SYSTEM HACKING**	**9**
Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade.		

UNIT V	NETWORK PROTECTION SYSTEMS	9
Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems – Network Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.		

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Express knowledge on basics of computer based vulnerabilities.
CO2: Gain understanding on different foot printing, reconnaissance and scanning methods.
CO3: Demonstrate the enumeration and vulnerability analysis methods.
CO4: Gain knowledge on hacking options available in Web and wireless applications.
CO5: Acquire knowledge on the options for network protection.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Michael T. Simpson, Kent Backman, and James E. Corley, “Hands-On Ethical Hacking and Network Defense”, Course Technology, Delmar Cengage Learning, 2010.
T2.	Patrick Engebretson, “The Basics of Hacking and Penetration Testing” SYNGRESS, Elsevier, 2013.

REFERENCE BOOK(S)	
R1.	Dafydd Stuttard and Marcus Pinto, “The Web Application Hacker’s Handbook: Finding and Exploiting Security Flaws”, O’Reilly Media, 2011.
R2.	Justin Seitz, “Black Hat Python: Python Programming for Hackers and Pentesters”, 2014.
R3.	Andrew Hoffman, “Web Application Security: Exploitation and Countermeasures for Modern Web Applications”, O’Reilly Media, First Edition, 2020.

PROFESSIONAL ELECTIVE COURSES IV, V, VI

Course Code: 24CSP305	Course Title: UI/UX Design	
Course Category: PEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks : 100

COURSE OBJECTIVES
• To understand a sound knowledge in UI & UX.
• To understand the need for UI and UX.
• To understand the various Research Methods used in Design.
• To explore the various Tools used in UI & UX.
• To analyze wireframe and prototype.

UNIT I	FOUNDATIONS OF DESIGN	9
UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy.		
UNIT II	**FOUNDATIONS OF UI DESIGN**	**9**
Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides.		
UNIT III	**FOUNDATIONS OF UX DESIGN**	**9**
Introduction to User Experience - Why You Should Care about User Experience – Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals.		
UNIT IV	**WIREFRAMING, PROTOTYPING AND TESTING**	**9**
Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings-Prototype Iteration.		
UNIT V	**RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE**	**9**
Identifying and Writing Problem Statements - Identifying Appropriate Research Methods – Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams – Flow Mapping - Information Architecture.		
		Total: 45 Hours

COURSE OUTCOMES

At the end of this course, students will be able to
CO1: Build UI for user Applications.
CO2: Evaluate UX design of any product or application.
CO3: Demonstrate UX Skills in product development.
CO4: Implement Sketching principles.
CO5: Create Wireframe and Prototype.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	1	1	3	1					3	2	3	2
CO2	2	2	3	1	3	2					2	2	1	2
CO3	2	2	3	1	3	2					2	2	2	1
CO4	1	3	3	1	1	1					2	2	2	1
CO5	3	1	3	3	2	2					2	2	2	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Joel Marsh, “UX for Beginners”, O’Reilly , 2022.
T2.	Jon Yablonski, “Laws of UX using Psychology to Design Better Product & Services”, O’Reilly , 2021.

REFERENCE BOOK(S)	
R1.	Jenifer Tidwell, Charles Brewe, and Aynne Valencia, “Designing Interface” Third Edition , O’Reilly, 2020.
R2.	Steve Schoger and Adam Wathan “Refactoring UI”, Self-published, 2018.
R3.	Steve Krug, “Don't Make Me Think, Revisited: A Common sense Approach to Web & Mobile”, Third Edition, New Riders, 2015.

Course Code: 24CSP306	**Course Title: Python Web Development**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• Explore polymorphism, inheritance, and customizing behavior in classes.
• Learn to install and use WxPython for UI development.
• Learn Flask basics: routes, templates, control flow, and inheritance.
• Build applications like blogs, forums, and social media clones.
• Learn Git for version control and collaborative development.

UNIT I	**OBJECT ORIENTED APPROACH IN PYTHON**	**9**
Classes Class Coding Basics: Instances Behavior Methods Operator Overloading Customizing Behavior Methods-Constructors-Polymorphism Inheritance.		
UNIT II	**USER INTERFACE APPLICATIONS IN PYTHON**	**9**
Wxpython installation-Menus and Toolbars-Layout Management-Wxpython Events-Wxpython Dialogs-Widgets-Graphics.		
UNIT III	**FLASK FRAMEWORK FOR WEB DEVELOPMENT**	**9**
Flatx Bo Basics Routes Templates-Control Flow-Inheritance -Forms-Modules - Connection with Databases-Relatiorial Database versus NoSQL-Modeling-Mapping Classes to Mongodb-Building Data Lalyer with Mongo Engine.		
UNIT IV	**REAL TIME DEVELOPMENT OF WEB APPLICATION**	**9**
Develop Web Applications with Flask and MongoDB-Example Applications Blogs-Forums Social media applications Assignments. Twitter clone Instagram clone Auto Evaluation of Student.		
UNIT V	**DEPLOYMENT OF APPLICATIONS**	**9**
Collaborative Version Control Systems-Git Commands-Real Time Usage of Git Commands Deployment Using AWS, Google Cloud and Heroku.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Describe the object-oriented concepts in Python
CO2: Identify the Ul applications in Python
CO3: Utilize the use of flask framework for web development
CO4: Develop real time web applications using flask and MongoDB.
CO5: Implement the steps to deploy the developed web applications

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	1	1	-	-	-	-	1	2	1	2	2
CO2	1	2	2	1	2	-	-	-	-	1	2	2	2	2
CO3	2	1	1	1	1	-	-	-	-	1	2	2	2	2
CO4	2	1	1	2	1	-	-	-	-	2	1	1	2	2
CO5	1	1	1	2	1	-	-	-	-	2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Mark Lutz, "Learning Python" 5" Edition, O' Reilly 2013.
T2.	Miguel Grinberg. Flask Web Development Developing Web Applications with Python", 1 Edition, OReilly, 2014

REFERENCE BOOK(S)	
R1.	Karl Seguin. "The Little Mongo DB Book", https://github.com/kariseguin/the-little-mongodb-book.
R2	Scoll Chacon and Ben Straub, "Pro Gif, Free e-book under Creative commons, 2 Edilion, Apress, 2016.
R3	Mark Lutz ,”Programming Python" 4th Edition –O'Reilly 2010.

Course Code: 24CSP307	**Course Title: Software Quality Management**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the Software Project Planning and Evaluation techniques.
• To plan and manage projects at each stage of the software development life cycle (SDLC).
• To learn about the activity planning and risk management principles.
• To manage software projects and control software deliverables.
• To develop skills to manage the various phases involved in project management and people management.

UNIT I	**PROJECT EVALUATION AND PROJECT PLANNING**	**9**
Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.		
UNIT II	**PROJECT LIFE CYCLE AND EFFORT ESTIMATION**	**9**
Software process and Process Models – Choice of Process models - Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II - a Parametric Productivity Model.		
UNIT III	**ACTIVITY PLANNING AND RISK MANAGEMENT**	**9**
Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.		
UNIT IV	**PROJECT MANAGEMENT AND CONTROL**	**9**
Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring		

– Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.		
UNIT V	**STAFFING IN SOFTWARE PROJECTS**	**9**
Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand Project Management principles while developing software.
CO2: Gain extensive knowledge about the basic project management concepts, framework and the process models.
CO3: Obtain adequate knowledge about software process models and software effort estimation techniques.
CO4: Estimate the risks involved in various project activities.
CO5: Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2	-	-	-	-	1	2	1	2	2
CO2	2	1	2	2	2	-	-	-	-	1	2	2	1	2
CO3	2	1	2	2	2	-	-	-	-	1	2	2	1	1
CO4	2	1	2	2	2	-	-	-	-	2	1	1	2	2
CO5	2	1	2	2	2	-	-	-	-	2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
T2.	Robert K. Wysocki "Effective Software Project Management" – Wiley Publication, 2011.

REFERENCE BOOK(S)	
R1.	Walker Royce: “Software Project Management” Addison-Wesley, 1998.
R2	Gopalaswamy Ramesh, “Managing Global Software Projects” – McGraw Hill Education (India), Fourteenth Reprint 2013.
R3	Watts S. Humphrey,” "Managing the Software Process" Addison-Wesley ,1989

Course Code: 24CSP308	Course Title: Web Mining	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To describe web mining and understand the need for web mining.
• To differentiate between Web mining and data mining.
• To understand the different application areas for web mining.
• To understand the different methods to introduce structure to web-based data.
• To understand Web Crawlers and Wrappers.

UNIT I	WEB MINING	9
Wels Data Mining and Data Mining Foundations, Introduction-World Wide Web (WWW), A Brief History of the Web and the internet, Web Data Mining-Data Mining Foundations-Association Rules and Sequential Patterns-Basic Concepts of Association Rules, Apriori Algorithm -Frequent Itemset Generation, Association Rule Generation, Data Formats for Association Rule Mining, Mining with multiple minimum supports-Mining Algorithm, Rule Generation, Mining Class Association Rules.		
UNIT II	**SUPERVISED LEARNING**	**9**
Supervised and Unsupervised Learning. Supervised Learning Basic Concepts, Decision Tree Induction - Classifier Evaluation Rule Induction-Classification Based on Associations, Naïve Bayesian Classification, Naive Bayesian Text Classification Bayesian Model-SVM-KNN Learning Probabilistic Framework, Naïve.		
UNIT III	**UNSUPERVISED LEARNING**	**9**
K-Means Clustering Representation of Clusters-Hierarchical Methods Distance Functions Data Standardization-Handling of Mixed Attributes-Cluster Evaluation.		
UNIT IV	**INFORMATION RETRIEVAL AND WEB SEARCH**	**9**
Basic Concepts of Information Retrieval-Information Retrieval Models-Evaluation Measures-Text and Web Page Pre-Processing-Inverted Index and Its Compression-Laleni Semantic Indexing-Web Spamming.		
UNIT V	**WEB CRAWLING**	**9**
A Basic Crawler Algorithm-Universal Crawlers-Focused Crawlers Topical Crawlers-Crawler ethics and conflicts-Wrapper Introduction Wrapper Introduction.		

Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand the fundamentals of Web Mining and Data Mining concept.
CO2: Apply the Supervised Learning algorithms and its application areas.
CO3: Formulate the application areas of in supervised Learning Algorithms.
CO4: Apply the information retrieval techniques and the requirements of Web spamming.
CO5: Apply the concept of Basic Web crawler algorithms and overview of different web crawlers.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2					1	2	1	2	2
CO2	2	2	2	3	2					1	2	2	1	2
CO3	2	2	2	2	2					1	2	2	1	1
CO4	3	2	2	3	2					2	1	1	2	2
CO5	3	2	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Bing Liu, “Web Data Mining, Exploring Hyperlinks, Contants, and Usage Data”, Second Edition, Springer Publications, 2011.
T2.	Jarel Han, Micheline Kamber, "Data Mining Concepts and Techniques", Second Edition, Elsevier Publications, 2017.

REFERENCE BOOK(S)

R1.	Anthony Scime, "Web Mining: Applications and Techniques", First Edition, Idea group Publishing, 2004.
R2.	Soumen Chakrabart, "Mining the Web: Discovering Knowledge from Hypertext Data", First Edition, Morgan Kaufmann, 2006.
R3.	Ian H. Witten, Eibe Frank and Mark A. Hall, Christopher J. Pal, "Data Mining: Practical Machine Learning Tools and Techniques", Fourth Edition, Morgan Kaufmann, 2016.

Course Code: 24CSP309	**Course Title: Distributed Systems**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To identify the computation and communication models of distributed systems.
• To understand the issues related to synchronization and information collection in distributed systems.
• To apply distributed mutual exclusion and distributed deadlock detection techniques.
• To analyze agreement protocols and fault tolerance mechanisms in distributed systems.
• To evaluate the cloud computing models and the underlying concepts.

UNIT I	**COMMUNICATION MODELS**	**9**
Introduction: Definition-Relation to Computer System Components – Motivation – Message – Passing Systems versus Shared Memory Systems – Primitives for Distributed Communication – Synchronous versus Asynchronous Executions – Design Issues and Challenges; A Model of Distributed Computations: A Distributed Program – A Model of Distributed Executions – Models of Communication Networks – Global State of a Distributed System.		
UNIT II	**LOGICAL TIME AND GLOBAL STATE**	**9**
Logical Time: Physical Clock Synchronization: NTP – A Framework for a System of Logical Clocks – Scalar Time – Vector Time; Message Ordering and Group Communication: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Group Communication – Causal Order – Total Order; Global State and Snapshot Recording Algorithms: Introduction – System Model and Definitions – Snapshot Algorithms for FIFO Channels.		
UNIT III	**DISTRIBUTED MUTEX AND DEADLOCK**	**9**
Distributed Mutual exclusion Algorithms: Introduction – Preliminaries – Lamport's algorithm – RicartAgrawala's Algorithm — Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks – Chandy-Misra-Haas Algorithm for the AND model and OR Model.		

UNIT IV	CONSENSUS AND RECOVERY	9
Consensus and Agreement Algorithms: Problem Definition – Overview of Results – Agreement in a Failure-Free System(Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Checkpointing and Rollback Recovery: Introduction – Background and Definitions – Issues in Failure Recovery – Checkpoint-based Recovery – Coordinated Checkpointing Algorithm - Algorithm for Asynchronous Checkpointing and Recovery.		
UNIT V	**CLOUD COMPUTING**	**9**
Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms: Compute Services – Storage Services – Application Services.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Explain the foundations of distributed systems.
CO2: Solve synchronization and state consistency problems.
CO3 Use resource sharing techniques in distributed systems.
CO4: Apply working model of consensus and reliability of distributed systems.
CO5: Explain the fundamentals of cloud computing.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Kshemkalyani Ajay D and Mukesh Singhal, “Distributed Computing: Principles, Algorithms and Systems”, Cambridge Press, 2011.
T2.	Mukesh Singhal and Niranjan G Shivaratri, “Advanced Concepts in Operating systems”, McGraw Hill Publishers, 1994.

REFERENCE BOOK(S)	
R1.	George Coulouris, Jean Dollimore, Time Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.
R2	Pradeep L Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007.
R3	Tanenbaum A S, Van Steen M, “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.

Course Code: 24ITP304	Course Title: Software Testing Tools and Techniques	
Course Category: PEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks : 100

COURSE OBJECTIVES
• To know the behaviour of the testing techniques and to design test cases to detect the errors in the software.
• To get insight into the levels of testing in the user environment
• To understand standard principles to check the occurrence of defects and its removal.
• To learn the functionality of automated testing tools to apply in the specialize environment.
• To understand the models and metrics of software quality and reliability.

UNIT I	TESTING TECHNIQUES & TEST CASE DESIGN	9
Using White Box Approach to Test design - Test Adequacy Criteria – Static Testing Vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – Their Role in White box Based Test Design – Code Complexity Testing – Evaluating Test Adequacy Criteria. Test Case Design Strategies – Using Black Box Approach to Test Case Design – Random Testing – Requirements based testing – Boundary Value Analysis –Decision tables – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Error guessing – Compatibility testing – User documentation testing – Domain testing – Case study for Control Flow Graph and State based Testing.		
UNIT II	LEVELS OF TESTING	9
The Need for Levels of Testing- Unit Test Planning –Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording Results – Integration Tests – Designing Integration Tests – Integration Test Planning – Scenario Testing – Defect Bash Elimination. System Testing – Acceptance testing – Performance testing – Regression Testing - Internationalization testing - Ad-hoc testing – Alpha, Beta Tests- Testing OO systems – Usability and Accessibility Testing – Configuration Testing - Compatibility Testing – Testing the documentation – Website Testing - Case Study for Unit and Integration Testing.		

UNIT III	TESTING FOR SPECIALIZED ENVIRONMENT	9
Testing Client / Server Systems – Testing in a Multiplatform Environment - Testing Object Oriented Software – Object Oriented Testing – Testing Web based systems – Web based system – Web Technology Evolution – Traditional Software and Web based Software – Challenges in Testing for Web-based Software – Quality Aspects – Web Engineering – Testing of Web based Systems. Case Study for Web Application Testing.		
UNIT IV	**TEST AUTOMATION**	**9**
Selecting and Installing Software Testing Tools - Software Test Automation – Skills needed for Automation – Scope of Automation – Design and Architecture for Automation – Requirements for a Test Tool – Challenges in Automation – Tracking the Bug – Debugging – Case study using Bug Tracking Tool.		
UNIT V	**SOFTWARE TESTING AND QUALITY METRICS**	**9**
Six-Sigma – TQM - Complexity Metrics and Models – Quality Management Metrics - Availability Metrics - Defect Removal Effectiveness - FMEA - Quality Function Deployment – Taguchi Quality Loss Function – Cost of Quality. Case Study for Complexity and Object Oriented Metrics.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Test the software by applying various testing techniques.
CO2: Debug the project and to test the entire computer based systems at all levels.
CO3: Test the applications in the specialized environment using various automation tools.
CO4: Evaluate the web applications using bug tracking tools.
CO5: Apply quality and reliability metrics to ensure the performance of the software.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Adithya P. Mathur, “ Foundations of Software Testing Fundamentals algorithms and techniques”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.
T2	Paul C. Jorgensen, "Software Testing: A Craftsman’s Approach", 4th Edition, CRC Press 2013.

REFERENCE BOOK(S)	
R1.	Dale H. Besterfiled , “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint, 2011.
R2.	Edward Kit, “ Software Testing in the Real World – Improving the Process”, Pearson Education, 1995.
R3.	Glenford J. Myers, Tom Badgett, Corey Sandler, “The Art of Software Testing”, 3rd Edition, John Wiley & Sons Publication, 2012.

Course Code: 24ITP305	**Course Title: Mobile Computing**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
To learn the basic concepts, aware of the GSM, SMS, GPRS Architecture.
To have an exposure about wireless protocols -WLN, Bluetooth, WAP, ZigBee issues.
To Know the Network, Transport Functionalities of Mobile communication.
To impart knowledge about Mobile Application Development Platform
To impart the knowledge about basic components needed for Mobile App development

UNIT I	**WIRELESS COMMUNICATION FUNDAMENTALS, ARCHITECTURE**	**9**
Frequency Spectrum- Multiplexing- Spread spectrum-GSM vs CDMA - -Comparison of 2G , 3G, 4G - GSM Architecture-Entities-Call Routing- Address and identifiers- GSM Protocol architecture-Mobility Management-Frequency Allocation- Security –GPRS Architecture (entity and Protocol).		
UNIT II	**MOBILE WIRELESS SHORT RANGE NETWORKS**	**9**
Introduction-WLAN Equipment-WLAN Topologies-WLAN Technologies-IEEE 802.11 Architecture-WLAN MAC-Security of WLAN, Power Management-Standards- WAP Architecture- Bluetooth enabled Devices Network-Layers in Bluetooth Protocol-Security in Bluetooth- IrDA- ZigBee.		
UNIT III	**MOBILE IP NETWORK LAYER, TRANSPORT LAYER**	**9**
IP and Mobile IP Network Layer- Packet delivery and Handover Management-Location Management- Registration- Tunneling and Encapsulation-Route Optimization- Mobile Transport Layer-Conventional TCP/IP Transport Layer Protocol-Indirect, Snooping, Mobile TCP.		
UNIT IV	**MOBILE APPLICATION DEVELOPMENT USING ANDROID**	**9**
Mobile Applications Development - Understanding the Android Software Stack – Android Application Architecture –The Android Application Life Cycle – The Activity Life CycleCreating Android Activity -Views- Layout -Creating User Interfaces with basic views-linking activities with Intents.		

UNIT V	**MOBILE APPLICATION DEVELOPMENT AND SERVICES**	**9**
Services-Broadcast Receivers – Adapters – Data Storage, Retrieval and Sharing.-Location based services- Development of simple mobile applications .		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Gain the knowledge about various types of Wireless Data Networks and Voice Networks.
CO2: Understand the architectures, the challenges and the Solutions of Wireless Communication.
CO3: Realize the role of Wireless Protocols in shaping the future Internet.
CO4: Able to develop simple Mobile Application Using Android
CO5: Able to develop simple Mobile Application and its service

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2	-	-	-	-	1	2	1	2	2
CO2	2	1	2	2	2	-	-	-	-	1	2	2	1	2
CO3	2	1	2	2	2	-	-	-	-	1	2	2	1	1
CO4	2	1	2	2	2	-	-	-	-	2	1	1	2	2
CO5	2	1	2	2	2	-	-	-	-	2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Asoke K Talukder, Hasan Ahmed,Roopa R Yavagal “Mobile Computing”, Tata McGraw Hill Pub ,2nd Edition Aug – 2010.
T2.	Barry A. Burd ,’Android Application Development For Dummies All in One”, Wiley, 2015.

REFERENCE BOOK(S)	
R1.	Ed Burnette,’Hello, Android: Introducing Google’s Mobile Development Platform’ third edition’ Pragmatic Programmers,2012.
R2	Maritn Sauter, ―From GSM to LTE: An Introduction to Mobile Networks and Mobile Broadband‖, John Wiley and Sons, 2011 .

R3	Raj Kamal "Mobile Computing" Oxford Higher Education, Second Edition, 2012.

Course Code: 24ITP306	**Course Title: Mobile App Development**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand Mobile App Development.
• To create intuitive mobile user interfaces.
• To apply data handling techniques.
• To analyze apps with multimedia features.
• To evaluate the test and deploy mobile applications.

UNIT I	**GETTING STARTED WITH MOBILITY**	**9**
Mobility landscape – Mobile platforms - Mobile apps development – Overview of Android platform –setting up the mobile app development environment along with an emulator– a case study on Mobile app development.		
UNIT II	**BUILDING BLOCKS OF MOBILE APPS – I**	**9**
App user interface designing – Mobile UI resources (Layout, UI elements, Drawable, Menu) - Activity – States and life cycle - Interaction amongst activities - App functionality beyond user interface – Threads - Async task - Services – states and lifecycle - Notifications.		
UNIT III	**BUILDING BLOCKS OF MOBILE APPS - II**	**9**
Broadcast receivers - Telephony and SMS APIs - Native data handling – on-device file I/O – shared preferences - mobile databases such as SQLite, and enterprise data access (via Internet/Intranet).		
UNIT IV	**SPRUCING UP MOBILE APPS SPRUCING UP MOBILE APP**	**9**
Graphics and animation – Custom views – canvas - animation APIs - multimedia – audio/video playback and record - location awareness, and native hardware access (sensors such as accelerometer and gyroscope).		
UNIT V	**TESTING MOBILE APPS AND TAKING APPS TO MARKET**	**9**

Debugging mobile apps, White box testing, Black box testing, and test automation of mobile apps, JUnit for Android, Robotium, Monkey Talk, Versioning, signing and packaging mobile apps, distributing apps on mobile market place.
Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: To understand mobile application.
CO2: Create intuitive mobile user interfaces.
CO3: Perform testing, signing, packaging and distribution of mobile apps.
CO4: Understand the limitations and features of developing for mobile devices.
CO5: Infer the existing state of mobile app development via researching existing apps.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Anubhav Pradha and Anil V Deshpande, “Mobile Apps Development”, First Edition, Wiley India,2013.
T2.	Barry Burd, “Android Application Development All in one for Dummies”, First Edition, Wiley India, 2011.

REFERENCE BOOK(S)	
R1.	Lauren Darcey , Shane Conder, “Teach Yourself Android Application Development In 24 Hours”, Second Edition, Wiley India , 2012.
R2.	Erik Hellman, “Android Programming – Pushing the Limits”, 1st Edition, Wiley India Pvt Ltd,2014.
R3.	Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.

Course Code: 24AMP304	**Course Title: Deep Neural Networks**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the fundamental concepts related to Image formation and processing.
• To learn feature detection, matching and detection.
• To become familiar with feature-based alignment and motion estimation.
• To develop skills on 3D reconstruction and image-based rendering, recognition.
• Explore advanced CNN architectures and attention mechanisms.

UNIT I	**INTRODUCTION TO NEURAL NETWORKS**	**9**
Introduction to artificial intelligence, Machine learning, Deep learning-Neural networks - Basics of CNN architecture: Convolution, Pooling, Activation functions-Convolutiona Convolutional layers, Filters, Strides, Padding-Pooling layers: Max pooling, Average pooling-Activation functions: ReLU, Sigmoid, Tanh -Loss Functions-Backpropagelion in CNNs.		
UNIT II	**CNN ARCHITECTURES AND MEMORY COMPUTATION**	**9**
Popular CNN architectures: LeNet, AlexNet, VGGNet, GoogLeNet, ResNet-Understanding memory computation in CNNs: Parameter sharing, Weight sharing, Receptive fields - Calculating the number of parameters in CNNs-Trade-offs between model complexity and memory requirements - Efficient architectures for memory-Constrained environments.		
UNIT III	**TRAINING AND FINE-TUNING IN CNN**	**9**
Loss functions for classification tasks: Cross-entropy loss, Softmax activation - Optimization algorithms: Stochastic Gradient Descent (SGD), Adam, RMS prop Regularization Techniques. Dropout, Weight decay-Transfer leaming and fine-tuning: Using protrained models, Freezing layers, Adapting to new tasks.		
UNIT IV	**EVALUATION PARAMETERS OF CNN**	**9**
Performance evaluation metrics for classification tasks: Accuracy, Precision, Recall, F1 score-Confusion matrix and its interpretation-Receiver Operating Characteristic (ROC) curve and Area Under the Curve (AUC)-Evaluation metrics for object detection and localization tasks: Intersection over Union (loU), Mean Average Precision-Handling class imbalan Evaluation challenges.		

UNIT V	ADVANCED CNN ARCHITECTURES	9
Convolutional layers with different receptive field sizes: Dilated convolutions, Atreus convolutions-Altention mechanisms in CNNs: Self-attention Spatial attention Advanced CNN architectures for specific tasks: Semantic segmentation, Instance segmentation and Image captioning.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand the basic concepts of soft. Computing.
CO2: Implement the various image processing techniques.
CO3: Apply feature-based based image alignment, segmentation, and motion estimations.
CO4: Interpret 30 image reconstruction techniques.
CO5: Develop innovative image processing and computer vision applications.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Charu C. Aggarwal, "Neural Networks and Deep Learning A Textbook", first edition, Springer International Publishing, 2018.
T2.	Hasmik Osipyan ,Bosedelyiade Edwards and Adrian David Cheok, "Deep Neural Network Applications", first edition, CRC Press, 2022.

REFERENCE BOOK(S)	
R1.	Katy Warr, "Strengthening Deep Neural Networks Making Al Less Susceptible to Adversarial Trickery", first edition, O'Reilly Media, 2019.
R2.	Ian Goodfellow, Yoshua Bengio, and Aaron Courville, "Deep Learning", First Edition, MIT Press, 2016.

R3.	Aston Zhang, Zack C. Lipton, Mu Li, and Alex J. Smola, "Dive into Deep Learning", first edition ,Cambridge University Press, 2023.

Course Code: 24AMP305	**Course Title: Generative Artificial Intelligence**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES		
• To understand the basics of Generative AI.		
• To know the basics of Text Generation.		
• To understand the process of generating videos.		
• To know about GAN and its variants.		
• To understand and Apply Gen AI tools.		
UNIT I	**INTRODUCTION TO GEN AI**	**9**
Historical Overview of Generative modeling - Difference between Gen AI and Discriminative Modeling – Importance of generative models in AI and Machine Learning – Types of Generative models – GANs, VAEs, autoregressive models and Vector quantized Diffusion models - Understanding if probabilistic modeling and generative process - Challenges of Generative Modeling – Future of Gen AI – Ethical Aspects of AI – Responsible AI – Use Cases.		
UNIT II	**GENERATIVE MODELS FOR TEXT**	**9**
Language Models Basics – Building blocks of Language models - Transformer Architecture – Encoder and Decoder – Attention mechanisms - Generation of Text – Models like BERT and GPT models – Generation of Text - Autoencoding – Regression Models – Exploring ChatGPT – Prompt Engineering – Designing Prompts– Revising Prompts using Reinforcement Learning from Human Feedback (RLHF) - Retrieval Augmented Generation – Multimodal LLM – Issues of LLM like hallucination.		
UNIT III	**GENERATION OF IMAGES**	**9**

Introduction to Generative Adversarial Networks – Adversarial Training Process – Nash Equilibrium – Variational Autoencoders – Encoder-Decoder Architectures - Stable Diffusion Models – Introduction to Transformer-based Image Generation – CLIP – Visual Transformers ViT- Dall-E2 and Dall-E3, GPT-4V – Issues of Image Generation models like
Mode Collapse and Stability.

UNIT IV	GENERATION OF PAINTING, MUSIC, AND PLAY	9

Variants of GAN – Types of GAN - Cyclic GAN – Using Cyclic GAN to Generate Paintings – Neural Style Transfer – Style Transfer - Music Generating RNN – MuseGAN – Autonomous agents – Deep Q Algorithm – Actor-critic Network.

UNIT V	OPEN SOURCE MODELS AND PROGRAMMING FRAMEWORKS	9

Training and Fine tuning of Generative models – GPT4All - Transfer learning and Pretrained models - Training vision models – Google Copilot - Programming LLM – LangChain – Open Source Models – Llama - Programming for TimeSformer – Deployment – Hugging Face.

Total: 45 Hours

COURSE OUTCOMES

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

CO 1: Understand the concepts of Generative Modeling.

CO 2: Apply Gen AI to Generating Texts.

CO 3: Understand and Apply Gen AI for generating video.

CO 4: Understand and Apply Gen AI for generating video.

CO 5: Apply Open Source Tools for solving problems using Gen AI.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Denis Rothman, “Transformers for Natural Language Processing and Computer Vision”, Third Edition , Packt Books, 2024.
T2.	David Foster, “Generative Deep Learning”, O’Reily Books, 2024.

REFERENCE BOOK(S)	
R1.	Altaf Rehmani, “Generative AI for Everyone”, BlueRose One, 2024.
R2.	Rajalingappaa Shanmugamani, "Deep Learning for Computer Vision”,2nd Edition, Packt Publishing ,2018.
R3.	Rafael Valle, "Hands-On Generative Adversarial Networks with Keras, Packt Publishing ,2020.

Course Code: 24ADP303	**Course Title: Foundation of AR/VR**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To impart the fundamental aspects and principles of AR/VR technologies.
• To know the internals of the hardware and software components.
• To learn about the graphical processing units and their architectures.
• To gain knowledge about AR/VR application development.
• To know the technologies involved in the development of AR/VR based applications.

UNIT I	**INTRODUCTION**	**9**
Introduction to Virtual Reality and Augmented Reality – Definition – Introduction to Trajectories and Hybrid Space-Three I’s of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR-AR Technologies Input Devices – 3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System.		
UNIT II	**VR MODELING**	**9**

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.		
UNIT III	**VR PROGRAMMING**	**9**
VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D.		
UNIT IV	**APPLICATIONS**	**9**
Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization – VR in Business – VR in Entertainment – VR in Education.		
UNIT V	**AUGMENTED REALITY**	**9**
Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation Navigation-Wearable devices.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand the basic concepts of AR and VR.
CO2: Understand the tools and technologies related to AR/VR.
CO3: Understand the working principle of AR/VR related Sensor devices.
CO4: Design of various models using modeling techniques.
CO5: Develop AR/VR applications in different domains.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences for mobile", Packt Publisher, 2018.
T2.	Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley, 2016.

REFERENCE BOOK(S)	
R1.	John Vince, "Introduction to Virtual Reality", Springer-Verlag, 2004.
R2.	William R. Sherman, Alan B. Craig,"Understanding Virtual Reality – Interface, Application, Design", Morgan Kaufmann, 2003.
R3.	Tony Parisi, "Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile",O'Reilly, 2015.

Course Code: 24ADP304	Course Title: R Programming	
Course Category: PEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks : 100

COURSE OBJECTIVES
• To understand R data structures and operations.
• To apply matrices, arrays, and lists.
• To understand data frames and apply functions.
• To analyse object-oriented programming and visualization.
• To understand R with languages and perform analysis.

UNIT I	INTRODUCTION	9
Introducing to R – R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all and any – Vectorized operations – NA and NULL values – Filtering – Vectorised if-then else – Vector Equality – Vector Element names.		
UNIT II	**MATRICES, ARRAYS AND LISTS**	**9**
Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – recursive lists.		

UNIT III	DATA FRAMES	9
Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames – Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Other factors and table related functions – Control statements – Arithmetic and Boolean operators and values – Default values for arguments - Returning Boolean values – functions are objects – Environment and Scope issues – Writing Upstairs - Recursion – Replacement functions – Tools for composing function code – Math and Simulations in R.		
UNIT IV	**OOP**	**9**
S3 Classes – S4 Classes – Managing your objects – Input/Output – accessing keyboard and monitor – reading and writing files – accessing the internet – String Manipulation – Graphics – Creating Graphs – Customizing Graphs – Saving graphs to files – Creating three-dimensional plots.		

UNIT V	INTERFACING	9
Interfacing R to other languages – Parallel R – Basic Statistics – Linear Model – Generalized Linear models – Non-linear models – Time Series and Auto-correlation – Clustering.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand and manipulate R vectors effectively.
CO2: Work with matrices, arrays, and lists.
CO3: Create and manipulate data frames and factors.
CO4: Utilize R object-oriented programming and graphics.
CO5: Interface R with other languages and statistics.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Norman Matloff , “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, 2011.
T2.	Jared P. Lander, “R for Everyone: Advanced Analytics and Graphics”, AddisonWesley Data & Analytics Series, 2013.

REFERENCE BOOK(S)	
R1.	Mark Gardener,” Beginning R – The Statistical Programming Language”, Wiley, 2013.
R2.	Robert Knell,” Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R”, Amazon Digital South Asia Services Inc, 2013.
R3.	Hadley Wickham, "Advanced R",CRC Press, 2014.

Course Code: 24ADP305	Course Title: Big Data Analytics	
Course Category: PEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks : 100

COURSE OBJECTIVES
• To understand the basics of big data analytics.
• To understand the search methods and visualization.
• To learn mining data streams.
• To learn frameworks.
• To understand on R language.

UNIT I	INTRODUCTION TO BIG DATA	9
Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis–Nature of Data - Analytic Processes and Tools - Analysis Vs Reporting - Modern Data Analytic Tools- Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference -Prediction Error.		
UNIT II	SEARCH METHODS AND VISUALIZATION	9
Search by simulated Annealing – Stochastic, Adaptive search by Evaluation – Evaluation Strategies –Genetic Algorithm – Genetic Programming – Visualization – Classification of Visual Data Analysis Techniques – Data Types – Visualization Techniques – Interaction techniques –Specific Visual data analysis Techniques.		
UNIT III	MINING DATA STREAMS	9
Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing -Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.		
UNIT IV	FRAMEWORKS	9
MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Case Study- Preventing Private Information Inference Attacks on Social Networks Grand Challenge: Applying Regulatory Science and Big Data to Improve Medical Device Innovation.		

UNIT V	**R LANGUAGE**	**9**
Overview, Programming structures: Control statements - Operators - Functions - Environment and scope issues - Recursion - Replacement functions, R data structures - Vectors - Matrices and arrays -Lists -Data frames -Classes, Input/output, String manipulations.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand the basics of big data analytics.
CO2: Understand the searching techniques.
CO3: Understand to use Hadoop, Map Reduce Framework.
CO4: Understand the NO SQL Databases.
CO5: Understand R language frameworks.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Michael Berthold and David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
T2.	Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 3rd edition 2020.

REFERENCE BOOK(S)	
R1.	Norman Matloff, “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, USA, 2011.
R2.	Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
R3.	Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007.

Course Code: 24ADP306	Course Title: Large Language Models	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• Understand the basics of Large language models.
• Know about the LLM pretraining methods.
• Understand the concept of tuning methods.
• Understand and apply prompt Engineering.
• Know about the evaluation methods for LLM.

UNIT I	BASICS OF MODERN LLMS	9

Language Models (LM) Basics – Overview of Language Models – Building blocks of Language Models -Language Models Architecture – Transformer Architecture- Encoders and Decoders – Attention Mechanisms – Attention is all You Need – Autoencoding Methods – Autoregression Methods – Seq2seq Tasks.

Suggested Activities:

- Turorials on Transformers.
- Problem solving in attention mechanisms.
- Group study on "Attention is all you need" paper.

Suggested Evaluation Methods:

- Quiz on fundamentals
- Assignments on attention mechanisms.

UNIT II	LLM PRETRAINING METHODS	9

Encoder-Decoder – Pretraining and Language Modeling – Autoregressive language modeling –Autoencoder language modeling – Early experiments with Encoder-Decoder – Masked Language Modeling – BERT Pretraining and Masked LM – LLM Pretraining Data – Processing clear texts – Scaling up of web data – Decoding Strategies.

Suggested Activities:

- Study of BERT
- Tutorials on autoregression methods.

Suggested Evaluation Methods:

- Assignment on NLTK

UNIT III	PARAMETER EFFICIENT TUNING METHODS	9

The basics of PETM include prefix tuning, Prompt tuning, Adapters, Compactors, Layer Freezing, Bias, Fine Tuning, Pruning, Reparameterization, Low-Rank Adaptation (LoRA), Advantages and Disadvantages, Explainability and LLMs, and Ethical Considerations.

Suggested Activities:

- Tutorials on tuning.
- External learning on LoRA

Suggested Evaluation Methods:

- Quiz on Tuning
- External discussion on Ethics of AI
- Study on Explainability.'

UNIT IV	PROMPT ENGINEERING	9

In-context learning – Fine-Tuning – Zero-Shot Learning – Few Shot Learning – Basics of Prompting –Instruction prompting – Chain of Thought prompting – Prompt Selection – Automatic Prompt design –Case Study – Visual Question and Answering system – Sentiment Training with multi-language dataset– CLIP, Learning Transferable Visual Models from natural language supervision.

Suggested Activities:

- Discussion of Prompt Engineering.
- Design on prompts

Suggested Evaluation Methods:

- Tutorial on QA systems
- External discussion on visual models

UNIT V	GENERATION BASED AUTOMATIC EVALUATION METHODS	9

Evaluation – Human Evaluation – Intrinsic Vs Extrinsic evaluation- Ranking – Multiple Metrics – General Language Understanding Evaluation (GLUE) – Grammar Error Correction (GEM) – Beyond metrics – Human evaluation methods – RLHF – Extrinsic evaluation – Quantitative and Qualitative evaluation –Human annotation – Reporting – Challenges in evaluation – Evaluation metrics like accuracy, MAE, ranking Evaluation – Correlation Evaluation.

Suggested Activities:

- Survey of evaluation methods.
- Study of GLUE.

Suggested Evaluation Methods:

- Survey of evaluation methods.
- Quizz on evaluation methods.

Total: 45 Hours

COURSE OUTCOMES

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

CO1: Develop an understanding of the basics of Transformers and LLM Models.
CO2: Know about LLM pretraining Methods.
CO3: Know about Prompt Engineering.
CO4: Know about Prompt Engineering.
CO5: Know about Evaluation methods.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	1	1	1	1	2	1	3	3
CO2	3	3	3	3	2	1	1	1	1	1	2	1	3	3
CO3	3	3	3	3	2	1	1	1	1	1	2	1	3	3
CO4	3	3	3	3	2	1	1	1	1	1	2	1	3	3
CO5	3	3	3	3	2	1	1	1	1	1	2	1	3	3

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Michael Berthold and David J. Hand, “Intelligent Data Analysis”, Spri Ozdemir, Quick Start to Large Language Models: Strategies and Best practices for using ChatGPT and other LLMs, Addison Wesley, Pearson,2024
T2.	Thimura Amaratunga, Understanding Large Language Models Learning and their underlying concepts and technologies, Apress, 2023nger, 2007.

REFERENCE BOOK(S)

R1.	Francois Chollet, “Deep Learning with Python,” Manning Publications, 2018.
R2.	Ian Good Fellow, Yoshua Bengio, Aaron Courville, “Deep Learning,” MIT Press, 2017

Course Code: 24CYP304	**Course Title: Network Programming and Management**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES		
• To understand the basics of computer networks and communication protocols.		
• To explore socket programming concepts for both TCP and UDP.		
• To study the implementation of client-server applications.		
• To learn about network management protocols and SNMP.		
• To develop practical skills in monitoring and managing networks.		
UNIT I	**INTRODUCTION TO NETWORK PROGRAMMING**	**9**
Computer Networks – OSI and TCP/IP Models – IP, TCP, UDP, ICMP Protocols – IPv4 and IPv6 Addressing – Domain Name System (DNS) – Socket Programming Basics – Stream and Datagram Sockets – TCP and UDP Socket Programs – Client-Server Architecture.		
UNIT II	**ADVANCED SOCKET PROGRAMMING**	**9**
Socket System Calls – Binding and Listening – Accepting Client Connections – Forking and Multithreading – Select and Poll System Calls – Non-blocking I/O – Error Handling in Network Programs – Secure Socket Layer (SSL/TLS) – File Transfer using TCP – Chat Application using UDP.		
UNIT III	**REMOTE COMMUNICATION AND WEB PROGRAMMING**	**9**
Remote Procedure Call (RPC) – RPC Architecture – HTTP Protocol – Creating HTTP Clients and Servers – REST API Communication – Time Synchronization using NTP – Web Services – Raw Socket Programming – Packet Capture and Analysis.		
UNIT IV	**NETWORK MANAGEMENT AND SNMP**	**9**
Network Management Concepts – SNMP Protocol – SNMPv1, SNMPv2, SNMPv3 – Management Information Base (MIB) – Structure of Management Information (SMI) – Network Monitoring Tools – Wireshark – MRTG – Nagios – NetFlow – Network Performance Metrics.		
UNIT V	**NETWORK SECURITY AND APPLICATIONS**	**9**
Cryptography in Networks – Firewalls and VPNs – Intrusion Detection and Prevention Systems (IDS/IPS) – Secure File Transfer (SFTP, SCP) – Logging and Auditing – Network Access Control – Case Studies – Real-time Applications – Secure Email – Network Troubleshooting Techniques.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Describe OSI and TCP/IP models and network protocol architecture.
CO2:Apply socket programming concepts for developing network applications.
CO3 : Develop and implement simple client-server models using TCP and UDP sockets.
CO4 : Analyze and manage network performance using tools and SNMP.
CO5 : Understand and implement network security and management policies

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	W. Richard Stevens, Unix Network Programming: Volume 1, Pearson Education.
T2.	Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill.

REFERENCE BOOK(S)

R1.	Douglas E. Comer, Internetworking with TCP/IP – Principles, Protocols and Architecture, Vol I, Prentice Hall.
R2.	James F. Kurose and Keith W. Ross**,** Computer Networking: A Top-Down Approach, Pearson.
R3.	Mark A. Miller, Network Management: Principles and Practice, Pearson Education.
R4.	William Stallings, SNMP, SNMPv2, SNMPv3 and RMON 1 *and 2*, Addison-Wesley.

Course Code: 24CYP305	**Course Title: Cyber Forensics**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
• To learn cyber crime and forensics.
• To learn about forensics tools.
• To learn to analyze and validate forensics data.
• To understand cyber laws and the admissibility of evidence with case studies.
• To learn the vulnerabilities in network infrastructure with ethical hacking.

UNIT I	**CYBER CRIME AND FORENSICS**	**9**
Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Role of ECD and ICT in Cybercrime - Classification of Cyber Crime. The Present and future of Cybercrime - Cyber Forensics -Steps in Forensic Investigation - Forensic Examination Process - Types of CF techniques - Forensic duplication and investigation - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.		
UNIT II	**EVIDENCE COLLECTION AND FORENSICS TOOLS**	**9**
Processing Crime and Incident Scenes – Digital Evidence - Sources of Evidence -Working with File Systems. - Registry - Artifacts - Current Computer Forensics Tools Software Hardware Tools - Forensic Suite - Acquisition and Seizure of Evidence from Computers and Mobile Devices - Chain of Custody- Forensic Tools.		
UNIT III	**ANALYSIS AND VALIDATION**	**9**
Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition- Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics- Analysis of Digital Evidence - Admissibility of Evidence - Cyber Laws in India - Case Studies.		
UNIT IV	**ETHICAL HACKING**	**9**
Introduction to Ethical Hacking – Foot printing and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats – Sniffing – Email Tracking.		
UNIT V	**ETHICAL HACKING IN WEB**	**9**

Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers - Hacking Web Applications – SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms.
Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand the basics of cyber crime and computer forensics.
CO2 : Apply a number of different computer forensic tools to a given scenario.
CO3 : Analyze and validate forensics data.
CO4 : Understand Admissibility of evidence in India with Cyber laws and Case Studies.
CO5 : Identify the vulnerabilities in a given network infrastructure.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	2					1	2	1	2	2
CO2	2	1	2	2	2					1	2	2	1	2
CO3	2	1	2	2	2					1	2	2	1	1
CO4	2	1	2	2	2					2	1	1	2	2
CO5	2	1	2	2	2					2	1	1	1	1

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Bill Nelson, Amelia Phillips, Christopher Steuart, “ Guide to Computer Forensics and Investigations”, Cengage Learning ,Sixth Edition, 2019.
T2.	Eoghan Casey, "Digital Forensics and Cyber Crime", First Edition, Academic Press, 2011.

REFERENCE BOOK(S)	
R1.	John R.Vacca, “Computer Forensics “, Cengage Learning, 2005.
R2.	MarjieT.Britz, “Computer Forensics and Cyber Crime An Introduction”, 3rd Edition, Prentice Hall, 2013.
R3.	AnkitFadia, “Ethical Hacking”, Second Edition, Macmillan India Ltd, 2006.

OPEN ELECTIVE COURSES

OPEN ELECTIVE OFFERED BY PARENT (CSE) DEPARTMENT

Course Code: 24CSO001	**Course Title: Generative AI**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES
To Understand the capabilities, evolution, benefits, challenges, and applications of Generative AI.
To Learn techniques for writing effective prompts and explore different prompt engineering approaches.
To Study the fundamentals of generative models, including RNNs, LSTMs, GANs, VAEs, transformers, and diffusion models.
To Explore Generative AI platforms, pre-trained models, and applications for text, image, and code generation.
To Analyze the ethical, social, and economic implications, along with the limitations and future of Generative AI.

UNIT I	**INTRODUCTION TO GENERATIVE AI**	**9**
Capabilities - History and Evolution -Benefits- Challenges - Applications of Generative AI – Tools for Text, Image Code, Audio and Video generation– Economic Potential of Generative AI - Use cases.		
UNIT II	**PROMPT ENGINEERING TECHNIQUES AND APPROACHES**	**9**
Prompt Creation -Writing effective prompts -Techniques for using text prompts: Zero shot and few-shot prompt techniques – Prompt engineering approaches: Interview pattern, Chain-of Thought, Tree-of Thought - Benefits of using text prompts - Challenges in generating meaningful and coherent prompts.		
UNIT III	**MODELS FOR GENERATIVE AI**	**9**
Basics of Sequential data processing – Building blocks of Generative AI - Discriminative modelling – Generative modelling –Recurrent Neural Networks – Long Short-Term Memory (LSTM) Networks - Generative Adversarial Networks (GANs) - Variational Auto encoders (VAEs) – Transformer–based Models - Diffusion models Applications.		
UNIT IV	**PLATFORMS FOR GENERATIVE AI**	**9**
Introduction to Platforms – Features of platforms – Capabilities -Applications - Pre-trained Models - Challenges – Generation of Text to Text – Generation of Text to Image – Text to Code Generation – Explainable AI – Benefits – Use cases.		
UNIT V	**ETHICAL ISSUES AND LIMITATIONS OF GENERATIVE AI**	**9**

Limitations of Generative AI – Issues and concerns – Considerations for Responsible Generative AI – Economic Implications – Social Implications – Future and professional Growth of Generative AI.
Total: 45 Hours
COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand the capabilities, evolution, benefits, challenges, and applications of Generative AI.
CO2: Apply effective prompt engineering techniques for improving AI-generated outputs.
CO3: Analyze various generative models, including RNNs, LSTMs, GANs, VAEs, transformers, and diffusion models.
CO4: Explore Generative AI platforms, pre-trained models, and multimodal AI generation techniques.
CO5: Evaluate ethical, social, and economic implications along with the future potential of Generative AI.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			2									2
CO2			2		2			2					1	
CO3		2		2	2									2
CO4					3		3		2				1	
CO5						2		1		1		1		

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	David Foster, “Deep Learning: Teaching Machines to Paint, Write”, 2nd edition. O’Reilly Media, Inc 2023.
T2.	Joseph Babcock, Raghav Bali, “Generative AI with Python and TensorFlow 2: Create Images, Text, and Music with VAEs, GANs, LSTMs, Transformer Models”, Packt Publishing,2021

REFERENCE BOOK(S)	
R1.	Ian Good fellow, Joshua Bengio, Aaron Courville, “Deep Learning”, MIT Press,2016.
R2.	Ben Auffarth “Generative AI with LangChain: Build Large Language Model (LLM) Apps with Python, ChatGPT, and Other LLMs”,2023
R3.	Rajeev Kapur, “AI Made Simple: A Beginner’s Guide to Generative Intelligence”,2023

Course Code: 24CSO002	Course Title: Game Programming	
Course Category: PEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks: 100

COURSE OBJECTIVES
To understand the concepts of Game design and development.
To learn the processes, mechanics and issues in Game Design.
To be exposed to the Core architectures of Game Programming.
To know about Game programming platforms, frame works and engines.
To learn to develop games.

UNIT I	3D GRAPHICS FOR GAME PROGRAMMING	9
3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation,Physics-based Simulation, Scene Graphs.		
UNIT II	GAME ENGINE DESIGN	9
Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.		
UNIT III	GAME PROGRAMMING	9
Application layer, Game logic, Game views, managing memory, controlling the main loop, loading and caching game data, User Interface management, Game event management.		
UNIT IV	GAMING PLATFORMS AND FRAMEWORKS	9
2D and 3D Game development using Flash, DirectX, Java, Python, Game engines - Unity. DX Studio,		
UNIT V	GAME DEVELOPMENT	9
Developing 2D and 3D interactive games using DirectX or Python – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Discuss the concepts of Game design and development.
CO2: Design the processes, and use mechanics for game development.

CO3: Explain the Core architectures of Game Programming.
CO4: Use Game programming platforms, frame works and engines.
CO5: Create interactive Games.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			2									2
CO2			2		2			2					1	
CO3		2		2	2									2
CO4					3		3		2				1	
CO5						2		1		1		1		

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Mike Mc Shaffrfy and David Graham, “Game Coding Complete”, Fourth Edition, Cengage Learning, PTR, 2012.
T2.	David H. Eberly, “3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics” 2 nd Editions, Morgan Kaufmann, 2006.

REFERENCE BOOK(S)

R1.	Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, 2 nd Edition Prentice Hall / New Riders, 2009.
R2.	Eric Lengyel, “Mathematics for 3D Game Programming and Computer Graphics”, 3 rd Edition, Course Technology PTR, 2011.
R3.	David H. Eberly, “3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics” 2 nd Editions, Morgan Kaufmann, 2006.

Course Code: 24CSO003	**Neural Networks and Deep Learning**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES
To understand the fundamental concepts of artificial neural networks and their applications.
To explore different deep learning architectures and their significance in real-world problems.
To study optimization techniques for training deep neural networks effectively.
To analyze various deep learning frameworks and tools used for implementation.
To apply deep learning techniques to solve problems in areas such as image processing, NLP, and speech recognition.

UNIT I	**INTRODUCTION TO NEURAL NETWORKS**	**9**
Biological vs. Artificial Neural Networks - Perceptron and Multilayer Perceptron (MLP) - Activation Functions (Sigmoid, ReLU, Tanh, Softmax) - Gradient Descent and Backpropagation Algorithm		
UNIT II	**DEEP LEARNING ARCHITECTURES**	**9**
Introduction to Deep Neural Networks (DNN) - Convolutional Neural Networks (CNN) - Architecture and Applications - Recurrent Neural Networks (RNN) - LSTMs and GRUs - Autoencoders and Generative Adversarial Networks (GANs)		
UNIT III	**OPTIMIZATION TECHNIQUES IN DEEP LEARNING**	**9**
Loss Functions and Cost Functions - Regularization Techniques (Dropout, L1/L2 Regularization) - Batch Normalization and Data Augmentation - Adam, RMSprop, and other Optimization Methods		
UNIT IV	**TOOLS AND FRAMEWORKS FOR DEEP LEARNING**	**9**
Overview of Deep Learning Frameworks (TensorFlow, PyTorch, Keras) - Model Training, Validation, and Hyperparameter Tuning - Transfer Learning and Pretrained Models (ResNet, VGG, BERT) - Deployment of Deep Learning Models		
UNIT V	**APPLICATIONS OF DEEP LEARNING**	**9**
Image Processing and Object Detection (YOLO, Faster R-CNN) - Natural Language Processing (NLP) and Speech Recognition - Reinforcement Learning and AI in Robotics - Case Studies in Healthcare, Finance, and Autonomous Systems		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Explain the architecture and functioning of different types of neural networks.
: Design and implement deep learning models using different architectures.
CO3: Optimize deep learning models using various training strategies.
: Utilize deep learning frameworks such as TensorFlow and PyTorch for problem-solving.
CO5: Apply deep learning techniques to domains such as computer vision and natural language processing.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1											
CO2	3	3	2	2										
CO3	3	3	3	2	2									
CO4	3	3	3	3	2	2								
CO5	3	3	3	3	3	2	1							

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
T2.	Simon Haykin, Neural Networks and Learning Machines, Pearson, 2018.
T3.	François Chollet, Deep Learning with Python, Manning Publications, 2021.

REFERENCE BOOK(S)	
R1.	Aurelien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly, 2022.
R2.	Charu C. *Aggarwal*, Neural Networks and Deep Learning: A Textbook, Springer, 2018.
R3.	Satish Kumar, Neural Networks: A Classroom Approach, McGraw-Hill, 2017.

Course Code: 24CSO004	**Course Title: Introduction to Augmented Reality (AR) / Virtual Reality (VR)**	
Course Category: PEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES
To know the basic concepts of virtual reality.
To understand visual computation in computer graphics.
To understand the interaction between the system and the computer.
To know the application of VR in Digital Entertainment.
To know the basic concepts of augmented reality.

UNIT I	**INTRODUCTION OF VIRTUAL REALITY**	**9**
Fundamental Concept and Components of Virtual Reality - Primary Features and Present Development on Virtual Reality - Multiple Models of Input and Output Interface in Virtual Reality: Input - Tracker - Sensor - Digital Glove - Movement Capture - Video-based Input - 3D Menus & 3DScanner – Output - Visual /Auditory / Haptic Devices.		
UNIT II	**VISUAL COMPUTATION IN VIRTUAL REALITY**	**9**
Fundamentals of Computer Graphics - Software and Hardware Technology on Stereoscopic Display - Advanced Techniques in CG: Management of Large-Scale Environments & Real Time Rendering.		
UNIT III	**INTERACTIVE TECHNIQUES IN VIRTUAL REALITY**	**9**
Body Track - Hand Gesture - 3D Manus - Object Grasp. Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR.		
UNIT IV	**APPLICATION OF VR IN DIGITAL ENTERTAINMENT**	**9**
VR Technology in Film & TV Production - VR Technology in Physical Exercises and Games - Demonstration of Digital Entertainment by VR.		
UNIT V	**AUGMENTED AND MIXED REALITY**	**9**
Taxonomy - technology and features of augmented reality - difference between AR and VR - Challenges with AR - AR systems and functionality - Augmented reality methods - visualization techniques for augmented reality - wireless displays in educational augmented reality applications - mobile projection interfaces - marker-less tracking for augmented reality		

- enhancing interactivity in AR environments - evaluating AR systems.
Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Explain the architecture and functioning of different types of neural networks.
: Design and implement deep learning models using different architectures.
CO3: Optimize deep learning models using various training strategies.
: Utilize deep learning frameworks such as TensorFlow and PyTorch for problem-solving.
CO5: Apply deep learning techniques to domains such as computer vision and natural language processing.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1											
CO2	3	3	2	2										
CO3	3	3	3	2	2									
CO4	3	3	3	3	2	2								
CO5	3	3	3	3	3	2	1							

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Burdea, G. C., P. Coffet., “Virtual Reality Technology”, Second Edition, Wiley-IEEE Press, 2003/2006.
T2.	Alan B. Craig, “Understanding Augmented Reality, Concepts and Applications”, Morgan Kaufmann, 2013.

REFERENCE BOOK(S)	
R1.	Alan Craig, William Sherman, Jeffrey Will, “Developing Virtual Reality Applications, Foundations of Effective Design”, Morgan Kaufmann, 2009.
R2.	Jason Jerald, “The VR Book: Human-Centered Design for Virtual Reality”, ACM Books,2015
R3.	Paul Mealy, “Virtual & Augmented Reality For Dummies”, For dummies, 2018

Course Code:24CSO005	**Course Title: High Speed Networks**	
Course Category: OEC	**Credits: 3**	
L:T:P(Hours/Week): 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
Understand High-Speed Network Technologies
Analyze Congestion and Traffic Management
Explore TCP and ATM Congestion Control Mechanisms
Study Integrated and Differentiated Services
Learn About QoS-Supporting Protocols

UNIT I	**HIGH SPEED NETWORKS**	**9**
Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture,ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet – Gigabit Ethernet– Fibre Channel – Wireless LAN's, WiFi and WiMax Networks applications, requirements – Architecture of 802.11.		
UNIT II	**CONGESTION AND TRAFFIC MANAGEMENT**	**9**
Queuing Analysis – Queuing Models – Single Server Queues – Effects of Congestion –Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.		
UNIT III	**TCP AND ATM CONGESTION CONTROL**	**9**
TCP Flow control – TCP Congestion Control – Retransmission – Timer Management –Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats – ABR Capacity allocations – GFR traffic management.		
UNIT IV	**INTEGRATED AND DIFFERENTIATED SERVICES**	**9**
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline – FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.		
UNIT V	**PROTOCOLS FOR QOS SUPPORT**	**9**
RSVP – Goals & Characteristics, Data Flow, RSVP operations – Protocol Mechanisms– Multiprotocol Label Switching – Operations, Label Stacking – Protocol details – RTP – Protocol Architecture – Data Transfer Protocol– RTCP.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: compare and analyse the fundamental principles of various high speed communication networks and their protocol architectures
CO2: Analyse the methods adopted for performance modeling of traffic flow and estimation
CO3: Examine the congestion control issues and traffic management in TCP/IP and ATM networks
CO4: Compare, analyse and implement the various routing protocols in simulation software tools examine the various services.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2		1				1	1		1	1	
CO2	1	2	1		1				2	1		1	1	
CO3	1	2	2		1				2	1		1	1	
CO4	1	2	1		1				1	2		1	1	
CO5	1	2	2		1				1	2		1	1	

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	William Stallings, “High speed networks and internet”, Second Edition, PearsonEducation, 2002.

REFERENCE BOOK(S)	
R1.	Warland, Pravin Varaiya, “High performance communication networks”, 2 nd Edition , Jean Harcourt Asia Pvt. Ltd., , 2001.
R2.	Irvan Pepelnjk, Jim Guichard, Jeff Apcar, “MPLS and VPN architecture”,Cisco Press, Volume 1 and 2, 2003.
R3.	Abhijit S. Pandya, Ercan Sea, “ATM Technology for Broad Band Telecommunication Networks”, CRC Press, New York, 2004.

OPEN ELECTIVES OFFERED BY MECHANICAL DEPARTMENT

Course Code: 24MEO001	**Drone Technologies**	
Course Category: OEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
To understand the basics of drone technology concepts.
To learn and understand the fundamental of design, fabrication and programming of drone.
To impart the knowledge of a flying and operation of drone.
To know about the various applications of drone.
To understand the safety risks and guidelines of fly safely.

UNIT I	**INTRODUCTION TO DRONE TECHNOLOGY**	**9**
Drone Concept - Vocabulary Terminology- History of drone - Types of current generation of drones based on their method of propulsion- Drone technology impact on the businesses- Drone business through entrepreneurship- Opportunities/applications for entrepreneurship and employability.		
UNIT II	**DRONE DESIGN, FABRICATION AND PROGRAMMING**	**9**
Classifications of the UAV -Overview of the main drone parts- Technical characteristics of the parts -Function of the component parts -Assembling a drone- The energy sources- Level of autonomy- Drones configurations -The methods of programming drone- Download program - Install program on computer-Running Programs- Multi rotor stabilization- Flight modes -Wi-Fi connection.		
UNIT III	**DRONE FLYING AND OPERATION**	**9**
Concept of operation for drone -Flight modes- Operate a small drone in a controlled environment- Drone controls Flight operations –management tool –Sensors-Onboard storage capacity -Removable storage devices- Linked mobile devices and applications.		
UNIT IV	**DRONE COMMERCIAL APPLICATIONS**	**9**
Choosing a drone based on the application -Drones in the insurance sector- Drones in delivering mail, parcel sand other cargo- Drones in agriculture- Drones in inspection of transmission lines and power distribution -Drones in filming and panoramic picturing.		
UNIT V	**FUTURE DRONES AND SAFETY**	**9**
The safety risks- Guidelines to fly safely -Specific aviation regulation and standardization-		

Drone License-Miniaturization of drones- Increasing autonomy of drones -The use of drones in swarms.
Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO 1: Understand the various types of drone technology, drone fabrication and programming.
CO 2: Apply the suitable operating procedures for functioning a drone.
CO 3: Understand appropriate sensors and actuators for Drones.
CO 4: Apply the drone mechanism for specific applications.
CO 5: Create the programs for various drones.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1					2			1		1	
CO2	3	3	1	1					2			1		1	
CO3	3	3	1	1					2			1		1	
CO4	3	3	1	1					2			1		1	
CO5	3	3	1	1					2			1		1	

(1 -Low, 2 -Medium, 3 -High)

TEXT BOOK(S)	
T1.	Daniel Tal and John Altschuld, "Drone Technology in Architecture, Engineering and construction a Strategic Guide to Unmanned Aerial Vehicle Operation and Implementation", John Wiley & Sons, Inc, 2021.
T2.	Terry Kilby and Belinda Kilby, "Make: Getting Started with Drones", Maker Media, Inc, 2016.

REFERENCE BOOK(S)	
R1.	John Baichtal, "Building Your Own Drones: A Beginners Guide to Drones, UAVs, and ROVs", Que Publishing, 2020.

Course Code: 24MEO002	**Introduction to Six Sigma**

Course Category: OEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
To understand the core concepts of Six Sigma, including its history, philosophy, and principles.
To explore various tools and techniques used in Six Sigma for defining, measuring, analysing, improving, and controlling processes.
To learn Six Sigma methodologies like DFSS and FMEA for designing and optimizing processes.
To comprehend the strategies for effective implementation of Six Sigma and the challenges faced during its deployment.
To examine evaluation strategies and continuous improvement techniques, focusing on lean manufacturing and waste reduction.

UNIT I	**SIX SIGMA BACKGROUND AND FUNDAMENTALS**	**9**
Historical Overview -Definition of quality -What is six sigma -TQM and Six sigma - lean manufacturing and six sigma- six sigma and process tolerance -Six sigma and cultural changes -six sigma capability -six sigma need assessments - implications of quality levels, Cost of Poor Quality (COPQ), Cost of Doing Nothing -assessment questions.		
UNIT II	**THE SCOPE OF TOOLS AND TECHNIQUES**	**9**
Tools for definition -IPO diagram, SIPOC diagram, Flow diagram, CTQ Tree, Project Charter -Tools for measurement -Check sheets, Histograms, Run Charts, Scatter Diagrams, Cause and effect diagram, Pareto charts, Control charts, Flow process charts, Process Capability Measurement, Tools for analysis -Process Mapping, Regression analysis, RU/CS analysis, SWOT, PESTLE, Five Whys, interrelationship diagram, overall equipment effectiveness, TRIZ innovative problem solving -Tools for improvement -Affinity diagram, Normal group technique, SMED, 5S, mistake proofing, Value stream Mapping, forced field analysis -Tools for control -Radar chart, PDCA cycle, Milestone tracker diagram, Earned value management.		
UNIT III	**SIX SIGMA METHODOLOGIES**	**9**
Design For Six Sigma (DFSS), Design for Six Sigma Method - Failure Mode Effect Analysis (FMEA), FMEA process - Risk Priority Number (RPN) - Six Sigma and Leadership, committed leadership -Change Acceleration Process (CAP) - Developing communication plan - Stakeholder.		

UNIT IV	**SIX SIGMA IMPLEMENTATION AND CHALLENGES**	**9**
Tools for implementation -Supplier Input Process Output Customer (SIPOC) -Quality Function Deployment or House of Quality (QFD) -alternative approach –implementation -leadership training, close communication system, project selection -project management and team -champion training -customer quality index -challenges -program failure, CPQ vs six sigma, structure the deployment of six sigma -cultural challenge -customer/internal metrics.		
UNIT V	**EVALUATION AND CONTINUOUS IMPROVEMENT METHODS**	**9**
Evaluation strategy -the economics of six sigma quality, return on six Sigma (ROSS), ROI, poor project estimates -continuous improvement -lean manufacturing -value, customer focus, Perfection, focus on waste, overproduction -waiting, inventory in process (IIP), processing waste, transportation, motion, making defective products, underutilizing people -Kaizen -5S.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand the concepts of Six Sigma and various tools.
CO2: Analyze the solutions and corrective actions to improve process performance and reduce defects using tools like DOE and mistake-proofing.
CO3: Evaluate and develop the control plans and monitor key performance indicators (KPIs) to ensure sustained improvement in processes.
CO4: Create the process documentation, Standard Operating Procedures (SOPs), and regular reviews to maintain improvements over time.
CO5: Understand about the Gain leadership and team management skills for leading Six Sigma projects, including project planning, execution, and resource management.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1					2			1			
CO2	3	3	1	1					2			1			
CO3	3	3	1	1					2			1			
CO4	3	3	1	1					2			1			
CO5	3	3	1	1					2			1			

(1 -Low, 2 -Medium, 3 -High)

TEXT BOOK(S)

T1.	Thomas Pyzdek and Paul A. Keller, “The Six Sigma Handbook”, McGraw-Hill, 2018.
T2.	Mikel Harry and Richard Schroeder, “Six Sigma the Breakthrough Management Strategy Revolutionizing the World's Top Corporations”, double day, 2006.

REFERENCE BOOK(S)	
R1.	Michael George, David Rowlands, and Bill Kastle, “What is Lean Six Sigma”, McGraw -Hill 2003.
R2.	Thomas Pyzdek, “The Six Sigma Handbook”, McGraw-Hill, 2000.
R3.	Fred Soleimannejed, “Six Sigma, Basic Steps and Implementation”, Author House, 2004.
R4.	Forrest W. Breyfogle, III and James M. Cupello, Becki Meadows, “Managing Six Sigma a Practical Guide to Understanding, Assessing, and Implementing the Strategy That Yields Bottom-Line Success”, John Wiley & Sons, 2000.

Course Code: 24MEO003	**Sustainable Engineering**
Course Category: OEC	**Credits: 3**

L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks : 100

COURSE OBJECTIVES
To be acquainted with sustainability in engineering and its evaluation.
To provide knowledge in environment and social sustainability.
To provide the student with the knowledge of strategy to achieve sustainability.
To familiarize with trends in sustainable operations.
To create awareness in current sustainable practices in manufacturing industry.

UNIT I	ECONOMIC SUSTAINABILITY	9
Industrial Revolution-Economic sustainability: globalization and international issues Sustainability status - Emerging issues- Innovative products- Reconfiguration manufacturing enterprises - Competitive manufacturing strategies - Performance evaluation- Management for sustainability -Assessments of economic sustainability.		
UNIT II	**SOCIAL AND ENVIRONMENTAL SUSTAINABILITY**	**9**
Social sustainability -Introduction-Work management -Human rights - Societal Commitment-Customers -Business practices -Modelling and assessing social sustainability. Environmental issues pertaining to the manufacturing sector: Pollution - Use of resources - Pressure to reduce costs - Environmental management: Processes that minimize negative environmental impacts - environmental legislation and energy costs - need to reduce the carbon footprint of manufacturing Operations-Modelling and assessing environmental sustainability.		
UNIT III	**SUSTAINABILITY PRACTICES**	**9**
Sustainability awareness - Measuring Industry Awareness-Drivers and barriers -Availability of sustainability indicators -Analysis of sustainability practicing -Modeling and assessment of sustainable practicing -Sustainability awareness -Sustainability drivers and barriers - Availability of sustainability indicators- Designing questionnaires- Optimizing Sustainability Indexes-Elements –Cost and time model.		
UNIT IV	**MANUFACTURING STRATEGY FOR SUSTAINABILITY**	**9**
Concepts of competitive strategy and manufacturing strategies and development of a strategic improvement programme - Manufacturing strategy in business success strategy formation and formulation - Structured strategy formulation - Sustainable manufacturing system design options - Approaches to strategy formulation - Realization of new strategies/system designs.		
UNIT V	**TRENDS IN SUSTAINABLE OPERATIONS**	**9**

Principles of sustainable operations - Life cycle assessment manufacturing and service activities - Influence of product design on operations - Process analysis -Capacity management - Quality management -Inventory management - Just-In-Time systems -Resource efficient design - Consumerism and sustainable well-being.
Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO 1: Apply the importance of economic sustainability.
CO 2: Understand the importance of sustainable practices.
CO 3: Analyze the drivers and barriers for the given conditions.
CO 4: Apply strategy in sustainable manufacturing.
Create the plan for sustainable operation of industry with environmental, cost consciousness.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1					2			1	1	2	
CO2	3	3	1	1					2			1	1	2	
CO3	3	3	1	1					2			1	1	2	
CO4	3	3	1	1					2			1	1	2	
CO5	3	3	1	1					2			1	1	2	

(1 -Low, 2 -Medium, 3 -High)

TEXT BOOK(S)	
T1.	Davim J.P., “Sustainable Manufacturing”, John Wiley & Sons., United States, 2019.
T2.	Ibrahim Garbie, “Sustainability in Manufacturing Enterprises Concepts, Analyses and Assessments for Industry 4.0”, Springer International Publishing., United States, 2021.
REFERENCE BOOK(S)	
R1.	Jovane F., Ęmper, W.E. and Williams, D.J., “The Manufuture Road towards Competitive and Sustainable High-Adding-Value Manufacturing”, Springer, United States, 2019.
R2.	Kutz M., “Environmentally Conscious Mechanical Design”, John Wiley & Sons., United States, 2021
R3.	Seliger G., “Sustainable Manufacturing: Shaping Global Value Creation”, Springer, United States, 2020.

Course Code: 24MEO004	**Foundation Skills in Integrated Product Development**
Course Category: OEC	**Credits: 3**

L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks : 100

COURSE OBJECTIVES
• To understand the fundamentals of product development, including global trends and product decision-making.
• To explore requirement engineering, system design, and modelling for effective product development.
• To learn various design, testing, and prototyping techniques for product development.
• To understand the concepts of sustenance engineering, product validation, and end-of-life (EoL) support.
• To comprehend the business dynamics of the engineering services industry.

UNIT I	FUNDAMENTALS OF PRODUCT DEVELOPMENT	9
Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economic Trends -Environmental Trends - Political/Policy Trends - Introduction to Product Development Methodologies and Management - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle - Product Development Planning and Management.		
UNIT II	**REQUIREMENTS AND SYSTEM DESIGN**	**9**
Requirement Engineering - Types of Requirements - Requirement Engineering - traceability Matrix and Analysis -Requirement Management - System Design & Modeling - Introduction to System Modeling - System Optimization -System Specification - Sub-System Design - Interface Design.		
UNIT III	**DESIGN AND TESTING**	**9**
Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques –Challenges in Integration of Engineering Disciplines -Concept Screening & Evaluation - Detailed Design -Component Design and Verification -Mechanical, Electronics and Software Subsystems - High Level Design/Low Level Design of S/W Program - Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing -Prototyping - Introduction to Rapid Prototyping and Rapid Manufacturing - System Integration, Testing, Certification and Documentation		
UNIT IV	**SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL)**	**9**

	SUPPORT	

Introduction to Product verification processes and stages - Introduction to Product Validation processes and stages - Product Testing Standards and Certification - Product Documentation- Sustenance -Maintenance and Repair -Enhancements - Product EoL -Obsolescence Management -Configuration Management - EOL Disposal.

UNIT V	**BUSINESS DYNAMICS -ENGINEERING SERVICES INDUSTRY**	**9**

The Industry - Engineering Services Industry - Product Development in Industry versus Academia -The IPD Essentials - Introduction to Vertical Specific Product Development processes -Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and Software Systems - Product Development Trade-offs -Intellectual Property Rights and Confidentiality -Security and Configuration Management.

Total: 45 Hours

COURSE OUTCOMES

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

CO1. Apply product life cycle concepts to plan and manage product development effectively.

CO2. Analyse system design and optimization techniques for subsystem and interface design.

CO3. Understand the concepts using concept generation techniques.

CO4. Formulate the strategies for product maintenance, repair, and enhancements.

CO5. Evaluate the integration of mechanical, embedded, and software systems in product manufacturing and assembly.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1					2			1	2	1	
CO2	3	3	1	1					2			1	2	1	
CO3	3	3	1	1					2			1	2	1	
CO4	3	3	1	1					2			1	2	1	
CO5	3	3	1	1					2			1	2	1	

(1 -Low, 2 -Medium, 3 -High)

TEXT BOOK(S)

T1.	Ulrich, Karl T.; Eppinger, Steven D.; Yang, Maria C.; Product Design and Development; 7th Edition; McGraw-Hill Education; 2020.
T2.	Pugh, Stuart; Total Design: Integrated Methods for Successful Product Engineering; 1st Edition; Addison-Wesley Publishing; 1990.

REFERENCE BOOK(S)	
R1.	Cross, Nigel; Engineering Design Methods: Strategies for Product Design; 4th Edition; John Wiley & Sons; 2008.
R2.	Otto, " Product Design: Techniques in Reverse Engineering and New Product Development" 1st Edition; Pearson Education; 2000.

Course Code: 24MEO005	**Maintenance Engineering**
Course Category: OEC	**Credits: 3**

L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks : 100

COURSE OBJECTIVES
To understand the principles, objectives and importance of maintenance adopted in industry for successful progress.
To introduce different maintenance categories, its merits and types of lubrication.
To expose the idea of condition monitoring, methods and instruments used for allied measurements.
To learn about failure analysis and repair methods for few mechanical elements.
To promote computerization in maintenance and inventory management.

UNIT I	PRINCIPLES OF MAINTENANCE PLANNING	9
Basic principles of maintenance planning - Objectives and principles of planned maintenance activity - Importance and benefits of sound maintenance systems - Maintenance organization - Maintenance economics.		
UNIT II	**MAINTENANCE CATEGORIES AND LUBRICATION**	**9**
Maintenance categories - Comparative merits of each category - Preventive maintenance, Maintenance schedules, Repair cycle - Total Productive Maintenance - Principles and methods of lubrication.		
UNIT III	**CONDITION MONITORING**	**9**
Condition based maintenance - Cost comparison with and without Condition Monitoring - Methods and instruments for condition monitoring - Noise, vibration, wear and temperature measurement.		
UNIT IV	**FAILURE ANALYSIS AND REPAIR METHODS**	**9**
Failure analysis - Failures and their development - Role of Non Destructive Testing in failure analysis - Repair methods for bearings, cylinder block, fuel pump, shaft.		
UNIT V	**COMPUTER AIDED MAINTENANCE MANAGEMENT**	**9**
Approach towards Computerization in maintenance - computer-aided maintenance management system (CAMMS) - Advantages of CAMMS - spare parts and inventory centre performance reporting.		
Total: 45 Hours		

COURSE OUTCOMES

At the end of this course, students will be able to
CO1: Explain the principles, objectives and importance of maintenance adopted in industry.
: Select the suitable maintenance category and lubrication type.
CO3: Apply the appropriate methods and instruments for condition monitoring.
CO4: Analyze the failures of mechanical systems and select suitable repair methods.
CO5: Utilize computers in maintenance and inventory management.

COURSE ARTICULATION MATRIX														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	1	1					2			1	2	1	
CO2	3	3	1	1					2			1	2	1	
CO3	3	3	1	1					2			1	2	1	
CO4	3	3	1	1					2			1	2	1	
CO5	3	3	1	1					2			1	2	1	

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	Srivastava S.K, "Maintenance Engineering", S Chand and Company, 2010.
T2.	Mishra R.C, Pathak K, "Maintenance Engineering and Management", Second edition, Prentice Hall India Learning Pvt. Ltd., 2012.

REFERENCE BOOK(S)	
R1.	Keith Mobley R, Lindley R. Higgins and Darrin J. Wikoff, "Maintenance Engineering" , Seventh edition, McGraw-Hill Professional, 2008.
R2.	Davies A, "Handbook of Condition Monitoring: Techniques and Methodology", Springer, 2012.
R3.	Otegui Jose Luis, "Failure Analysis, Fundamentals and Applications in Mechanical Components", Nineteenth edition, Springer, 2014.

OPEN ELECTIVES OFFERED BY ECE DEPARTMENT

Course Code: 24ECO001	**Introduction To Control Engineering**	
Course Category: OEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
To introduce the control system components and transfer function model with their graphical representation
To understand the analysis of system in time domain along with steady state error.
To introduce frequency response analysis of systems.
To accord basic knowledge in design of compensators.
To introduce the state space models.

UNIT I	**MATHEMATICAL MODELLING**	**9**
Introduction – transfer function – simple electrical, mechanical, ,pneumatic , hydraulic and thermal systems–analogies		
UNIT II	**FEEDBACK CONTROL SYSTEMS**	**9**
Control system components - Block diagram representation of control systems, Reduction of block diagrams, Signal flow graphs, Output to input ratios		
UNIT III	**TIME DOMAIN ANALYSIS**	**9**
Response of systems to different inputs viz., Step impulse, pulse, parabolic and sinusoidal inputs, Time response of first and second order systems, steady state errors and error constants of unity feedback circuit.		
UNIT IV	**STABILITY ANALYSIS**	**9**
Necessary and sufficient conditions, Routh - Hurwitz criteria of stability, Root locus and Bode techniques ,Concept and construction, frequency response.		
UNIT V	**STATE SPACE TECHNIQUE**	**9**
State vectors–state space models-Digital Controllers–design aspects.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Represent and develop systems in different forms using the knowledge gained.
: Analyses the system in time and frequency domain and the stability of physical systems.
CO3: Ability to Derive Transfer function Model of Electrical and Mechanical Systems.

: Ability to Obtain the transfer Function by the Reduction of Block diagram & Signal flow graph.
CO5: Acquire and analyze knowledge in State variable model for MIMO systems.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3				1		1		1			
CO2	3	3	3	2				1		1		1			
CO3	2	1	2	1				1		1		1			
CO4	3	3	3	3				1		1		1			
CO5	3	3	3	2				1		1		1			

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Nagarath, I.J. and Gopal, M., "Control Systems Engineering", New Age International Publishers, 2017.
T2.	Benjamin C. Kuo, "Automatic Control Systems", Wiley, 2014

REFERENCE BOOK(S)

R1.	Katsuhiko Ogata, "Modern Control Engineering", Pearson, 2015.
R2.	John J.D., Azzo Constantine, H. and HoupisSttuart, N Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Taylor& Francis Reprint 2009.
R3.	Rames C.Panda and T. Thyagarajan, "An Introduction to Process Modelling Identification and Control of Engineers", Narosa Publishing House, 2017.

Course Code: 24ECO002	**Course Title: SEMICONDUCTOR MANUFACTURING**	
Course Category: OEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES
To understand basic semiconductor manufacturing technology
To know Integrated Circuit Fabrication
To introduce the basic semiconductor manufacturing processes
To familiarize with steps involved in CMOS IC chip fabrication
To explain major processing technology used IC manufacturing.

UNIT I	INTRODUCTION TO SEMICONDUCTOR MANUFACTURING	9
Historical perspective, processing overview, semiconductor materials, semiconductor devices, process technology, fabrication steps.		
UNIT II	**MANUFACTURING PROCESS: CRYSTAL GROWTH, SILICON OXIDATION, PHOTOLITHOGRAPHY**	**9**
Silicon crystal growth, material characterization, thermal oxidation process, impurity redistribution, masking properties of silicon dioxide, oxidation thickness characteristics.		
UNIT III	**MANUFACTURING PROCESS: ETCHING, DIFFUSION, ION IMPLANTATION, FILM DEPOSITION**	**9**
Wet chemical etching, Dry etching, basic diffusion process, extrinsic diffusion, lateral diffusion, Photolithography, Ion Implantation, implanted damage and annealing, epitaxial growth techniques, structures and defects, dielectric deposition, metallization.		
UNIT IV	**PROCESS INTEGRATION**	**9**
Passive components, bipolar technology, MOSFET Technology, MESFET Technology, MEMS Technology.		
UNIT V	**IC MANUFACTURING**	**9**
Electrical testing, packing, statistical process control, computer integrated manufacturing, challenges for integration, system-on-a-chip.		

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Relate technology changes from semiconductor manufacturing industry.
CO2: Explain steps for making silicon wafers from sand.
CO3: Apply various technology involved in manufacturing.
CO4: Analyze the integration of steps in CMOS IC chip fabrication.
CO5: Build CMOS-based used in the electronics industry.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1									1	2	
CO2	1	1	2	1										2	
CO3	1	2	1	1										2	
CO4	2	1	2	2									1	1	
CO5		2	2	1									1		

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)	
T1.	G. S. May and S. M. Sze, "Fundamentals of Semiconductor Fabrication", Wiley India, 2004.
T2.	Hong Xiao, "Introduction to Semiconductor Manufacturing Technology", 2nd Edition, SPIE Press, 2012.

REFERENCE BOOK(S)	
R1.	W. R. Runyan and K. E. Bean, "Semiconductor Integrated Circuit Processing Technology", Addison Wesley Publishing Company, 2010.
R2.	S. A. Campbell, "The Science and Engineering of Microelectronic Fabrication", Oxford University Press, 2012.
R3.	M. J. Madou, "Fundamentals of Micro fabrication", CRC Press, 2nd Edition, 2011.
R4.	S. M. Sze, "Semiconductor Devices: Physics and Technology", 2nd Edition., Wiley India, 2011.

Course Code: 24ECO003	**Course Title: Mechatronics**	
Course Category: OEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES
To illustrate the selecting the sensors to develop mechatronics systems.
To explain the architecture and timing diagram of microprocessor, and also interpret and develop programs.
To design appropriate interfacing circuits to connect I/O devices with microprocessor.
To apply PLC as a controller in mechatronics system.
To design and develop the apt mechatronics system for an application.

UNIT I	INTRODUCTION AND SENSORS	9
Introduction to Mechatronics – Systems – Need for Mechatronics – Emerging areas of Mechatronics – Classification of Mechatronics. Sensors and Transducers: Static and Dynamic Characteristics of Sensor, Potentiometers – LVDT – Capacitance Sensors – Strain Gauges – Eddy Current Sensor – Hall Effect Sensor –Temperature Sensors – Light Sensors.		
UNIT II	**8085 MICROPROCESSOR**	**9**
Introduction – Pin Configuration - Architecture of 8085 – Addressing Modes – Instruction set, Timing diagram of 8085.		
UNIT III	**PROGRAMMABLE PERIPHERAL INTERFACE**	**9**
Introduction – Architecture of 8255, Keyboard Interfacing, LED display – Interfacing, ADC and DAC Interface, Temperature Control – Stepper Motor Control – Traffic Control Interface.		
UNIT IV	**PROGRAMMABLE LOGIC CONTROLLER**	**9**
Introduction – Architecture – Input / Output Processing – Programming with Timers, Counters and Internal relays – Data Handling – Selection of PLC.		
UNIT V	**ACTUATORS AND MECHATRONICS SYSTEM DESIGN**	**9**
Types of Stepper and Servo motors – Construction – Working Principle – Characteristics, Stages of Mechatronics Design Process – Comparison of Traditional and Mechatronics Design Concepts with Examples – Case studies of Mechatronics Systems – Pick and Place Robot – Engine Management system – Automatic Car Park Barrier.		

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Select sensors to develop mechatronics systems.
CO2: Explain the architecture and timing diagram of microprocessor, and also interpret and

develop programs.
CO3: Design appropriate interfacing circuits to connect I/O devices with microprocessor.
CO4: Apply PLC as a controller in mechatronics system.
CO5: Design and develop the apt mechatronics system for an application.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1								2			
CO2	1	2	1	1								2			
CO3	1	2	1	1								2			
CO4	1	2	1	1								2			
CO5	2	2	1	1								2			

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Bolton W., "Mechatronics", 6th Edition, Pearson Education, 2015.
T2.	Ramesh S Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085", 6th Edition, Penram International Publishing Private Limited, 2013.

REFERENCE BOOK(S)

R1.	Bradley D.A., Dawson D., Buru N.C. and Loader A.J., "Mechatronics", Chapman and Hall, 2012.
R2.	Davis G. Alciatore and Michael B. Histand, "Introduction to Mechatronics and Measurement systems", McGraw Hill Education, 2011.
R3.	Devadas Shetty and Richard A. Kolk, "Mechatronics Systems Design", Cengage Learning, 2010.

Course Code: 24ECO004	**Course Title: Sensors and Actuators**	
Course Category: OEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES
To illustrate the fundamental concepts of Instrument types and its Sensors
To analyze the variable resistance and the Inductance Sensors
To study about the Variable Sensors and the Special Sensors.
To understand about the Automotive Actuators
To study about the Automatic Temperature Control Actuators .

UNIT I	INTRODUCTION TO MEASUREMENTS AND SENSORS	9
Sensors: Functions- Classifications- Main technical requirement and trends Units and standards-Calibration methods- Classification of errors- Error analysis- Limiting error-Probable error-Propagation of error- Odds and uncertainty- principle of transduction-Classification. Static characteristics- mathematical model of transducers- Zero, First and Second order transducers-Dynamic characteristics of first and second order transducers for standard test inputs.		
UNIT II	**VARIABLE RESISTANCE AND INDUTANCE SENSORS**	**9**
Principle of operation- Construction details- Characteristics and applications of resistive potentiometer- Strain gauges- Resistive thermometers- Thermistors- Piezo resistive sensors Inductive potentiometer- Variable reluctance transducers:- EI pick up and LVDT		
UNIT III	**VARIABLE AND OTHER SPECIAL SENSORS**	**9**
Variable air gap type, variable area type and variable permittivity type- capacitor microphone Piezoelectric, Magnetostrictive, Hall Effect, semiconductor sensor- digital transducers-Humidity Sensor. Rain sensor, climatic condition sensor, solar, light sensor, antiglare sensor.		
UNIT IV	**AUTOMOTIVE ACTUATORS**	**9**
Electromechanical actuators- Fluid-mechanical actuators- Electrical machines- Direct-current machines- Three-phase machines- Single-phase alternating-current Machines - Duty-type ratings for electrical machines. Working principles, construction and location of actuators viz. Solenoid, relay, stepper motor etc.		
UNIT V	**AUTOMATIC TEMPERATURE CONTROL ACTUATORS**	**9**
Different types of actuators used in automatic temperature control- Fixed and variable displacement temperature control- Semi Automatic- Controller design for Fixed and variable displacement type air conditioning system.		

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

CO1: List common types of sensor and actuators used in vehicles.
CO2: Design measuring equipment's for the measurement of pressure force, temperature and flow.
CO3: Generate new ideas in designing the sensors and actuators for automotive application
CO4: Understand the operation of the sensors, actuators and electronic control.
CO5: Design temperature control actuators for vehicles.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2										1			
CO2	3	2		2	1										
CO3	3	2		2	1										
CO4	3	2		2	1										
CO5	3	2		2	1		2					1			

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Doebelin, Ernest O. Doebelin Dhanesh N. Manik, " Measurement Systems", 7th Edition, McGraw Hill Publishers, 2019.
T2.	Robert Brandy, "Automotive Electronics and Computer System", Prentice Hall, 2001.
T3.	Bosch, "Automotive Electrics, Automotive Electronics Systems and Components, Networking and Hybrid Drive", 5th Edition, McGraw Hill Publishers, 2007.

REFERENCE BOOK(S)

R1.	James D Halderman, " Automotive Electrical and Electronics", Prentice Hall, USA, 2013.
R2.	Tom Denton, "Automotive Electrical and Electronics Systems," 3rd Edition, SAE International, 2004.
R3.	William Ribbens, "Understanding Automotive Electronics -An Engineering Perspective," 7th Edition, Elsevier Butterworth-Heinemann Publishers, 2012.

Course Code: 24ECO005	Course Title: Wireless Networks	
Course Category: OEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks: 100

COURSE OBJECTIVES
To understand the concept about Wireless networks, protocol stack and standards
To understand and analyze the network layer solutions for Wireless networks
To study about fundamentals of 3G Services, its protocols and applications
To have in depth knowledge on internetworking of WLAN and WWAN
To learn about evolution of 4G Networks, its architecture and applications

UNIT I	WIRELESS LAN	9
Introduction-WLAN technologies: - IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, WirelessHART.		
UNIT II	MOBILE NETWORK LAYER	9
Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT: CoAP.		
UNIT III	3G OVERVIEW	9
Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA.		
UNIT IV	INTERNETWORKING BETWEEN WLANS AND WWANS	9
Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System		
UNIT V	4G & BEYOND	9
Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.		

COURSE OUTCOMES

At the end of this course, students will be able to
CO1: Identify and choose wireless transmission standard, physical layer protocol and MAC layer protocol on the basis of various network applications.
CO2: Understand and explain mobile IP and data routing using it. Classify ad hoc network protocols
CO3: Understand the TCP protocol for wireless networks and able to do congestion free transmission over wireless networks.
CO4: Understand the major concepts involved in wireless wide-area networks and its architecture.
CO5: Have knowledge of 4G technologies and analyze various smart antenna techniques, modulation and coding techniques used in 4G technology.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3													
CO2	3	3													
CO3	3	3													
CO4	2	3													
CO5	2														

(1 – Low, 2 – Medium, 3 – High)

TEXT BOOK(S)

T1.	Jochen Schiller, ”Mobile Communications”, 2nd Edition, Pearson Education 2012.
T2.	Vijay Garg, “Wireless Communications and Networking”, 1st Edition, Elsevier 2007.

REFERENCE BOOK(S)

R1.	Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband”, 2nd Edition, Academic Press, 2008.
R2.	Anurag Kumar, D.Manjunath, Joy kuri, “Wireless Networking”, 1st Edition, Elsevier 2011.
R3.	Simon Haykin , Michael Moher, David Koilpillai, “Modern Wireless Communications”, 1st Edition, Pearson Education 2013

OPEN ELECTIVE OFFERED BY CIVIL DEPARTMENT

Course Code: 24CEO001	Course Title: Environment and Agriculture	
Course Category: OEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks: 100

COURSE OBJECTIVES
To understand the environmental basis of agriculture and the impact of globalization on agro-ecosystems.
To analyze the environmental impacts of irrigation, mechanized agriculture, and urbanization on land and water resources.
To study the effects of climate change, global warming, and water cycle disruptions on agricultural systems
To examine the relationship between ecological diversity, agricultural biotechnology, and sustainable farming practices.
To explore emerging agricultural environmental concerns, including global policies, alternative farming methods, and sustainable agricultural solutions.

UNIT I	ENVIRONMENTAL CONCERNS	9
Environmental basis for agriculture and food - land use and landscape changes - water quality issues - changing social structure and economic focus - globalization and its impacts - agro ecosystems.		
UNIT II	**ENVIRONMENTAL IMPACTS**	**9**
Irrigation development and watersheds - mechanized agriculture and soil cover impacts - erosion and problems of deposition in irrigation systems - agricultural drainage and downstream impacts - agriculture versus urban impacts.		
UNIT III	**CLIMATE CHANGE**	**9**
Global warming and changing environment - ecosystem changes - changing blue – green -grey water cycles - water scarcity and water shortages - desertification.		
UNIT IV	**ECOLOGICAL DIVERSITY AND AGRICULTURE**	**9+3**
Ecological diversity, wild life and agriculture - GM crops and their impacts on the environment - insets and agriculture - pollination crisis - ecological farming principles - forest fragmentation and agriculture - agricultural biotechnology concerns.		
UNIT V	**EMERGING ISSUES**	**9+3**
Global environmental governance - alternate culture systems - mega farms and vertical farms - virtual water trade and its impacts on local environment - agricultural environment policies and its impacts - sustainable agriculture distributed GIS.		

Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
: Understand the environmental basis of agriculture, land use changes, and the impact of globalization on agro-ecosystems.
: Analyze the environmental impacts of irrigation, mechanized agriculture, soil erosion, and urbanization on land and water resources.
: Evaluate the effects of climate change, global warming, and water cycle disruptions on agricultural sustainability.
: Assess the role of ecological diversity, GM crops, and agricultural biotechnology in sustainable farming practices.
: Explore emerging environmental challenges in agriculture and assess policies, alternative farming methods, and sustainable agricultural solutions.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1				2	2						2	1	1
CO2	2	2	1	2	2	2	2					1	2	2	2
CO3	2	2	2	2	1	2	2					1			
CO4	2	2	2	2	2	2	2	1				2	2		
CO5	2	2	2	2	2	2	2	1				2	2		

(1 - Low, 2 - Medium, 3 - High)

TEXT BOOK(S)

T1.	M.Lakshmi Narasaiah, Environment and Agriculture, Discovery Pub. House, 2006.
T2.	Arvind Kumar, Environment and Agriculture, ABH Publications, New Delhi, 2005.

REFERENCE BOOK(S)

R1.	T.C. Byerly, Environment and Agriculture, United States. Dept. of Agriculture. Economic Research Service, 2006.
R2.	Environment and agriculture: environmental problems affecting agriculture in the Asia and Pacific region; World Food Day Symposium, Bangkok, Thailand. 1989

Course Code: 24CEO002	Course Title: Green Building Design

Course Category: OEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES		
• To understand the environmental implications of buildings, including energy use, carbon emissions, water consumption, and waste disposal		
• To analyze the impact of building technologies and materials, considering embodied energy, resource utilization, and sustainable alternatives.		
• To evaluate thermal comfort in buildings by examining heat transfer characteristics and the effects of geographical location.		
• To explore the role of solar energy in buildings, focusing on solar passive cooling and heating techniques through case studies		
• To apply green building principles by implementing efficient water management, waste disposal, and urban sustainability practices.		
UNIT I	**ENVIRONMENTAL IMPLICATIONS OF BUILDINGS**	**9**
Energy use - carbon emissions - water use, waste disposal; building materials: sources, methods of production and environmental implications - embodied energy in building materials: transportation energy for building materials; maintenance energy for buildings.		
UNIT II	**IMPLICATIONS OF BUILDING TECHNOLOGIES EMBODIED ENERGY OF BUILDINGS**	**9**
Framed construction - masonry construction - resources for building materials, alternative concepts - recycling of industrial and buildings wastes - biomass resources for buildings.		
UNIT III	**COMFORTS IN BUILDING**	**9**
Thermal comfort in buildings issues; heat transfer - characteristic of building materials and building techniques - incidence of solar heat on buildings - implications of geographical locations.		
UNIT IV	**UTILITY OF SOLAR ENERGY IN BUILDINGS**	**9**
Utility of solar energy in buildings - concepts of solar passive cooling and heating of buildings - low energy cooling - case studies of solar passive cooled and heated buildings.		
UNIT V	**GREEN COMPOSITES FOR BUILDINGS**	**9**
Concepts of green composites - water utilisation in buildings - low energy approaches to water management - management of solid wastes - management of sullage water and sewage. urban environment and green buildings - green cover and built environment.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Explain the environmental implications of buildings, including energy use, carbon emissions, and waste disposal.
CO2: Examine the impact of building technologies and construction materials on sustainability and embodied energy.
CO3: Assess thermal comfort in buildings and determine the influence of heat transfer characteristics of materials.
CO4: Demonstrate the utility of solar energy in buildings and implement solar passive cooling and heating techniques.
CO5: Develop green building solutions incorporating water management, solid waste disposal, and urban environmental sustainability strategies.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1			2	2	1				1	2	1	2
CO2	2	2	2	2	1	2	2	1		1	1	1	2		
CO3	1	1	2	1		2	2			1		1	2		
CO4	2	2	2	2	1	2	2	1		1	1	2	2		
CO5	2	1	1	1		2	2	1					2	1	2

(1 - Low, 2 - Medium, 3 - High)

TEXT BOOK(S)	
T1.	K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007.
T2.	Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009.
T3.	Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

REFERENCE BOOK(S)	
R1.	Osman Attmann, “Green Architecture Advanced Technologies and Materials”, McGraw. Hill, 2010.
R2.	Jerry Yudelson, McGraw Hil “Green building Through Integrated Design”. 2009.

Course Code: 24CEO003	Course Title: Geographical Information System

Course Category: OEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks: 100

COURSE OBJECTIVES
To understand the basic concepts and significance of GIS.
To understand different database structures, including relational and object-oriented models
To understand different methods of spatial data input, including scanning and digitization.
To understand the importance of metadata in GIS.
To explore various data management functions and their significance.

UNIT I	FUNDAMENTALS OF GIS	9
Introduction to GIS - basic spatial concepts - coordinate systems - GIS and information systems - definitions - history of GIS - components of a GIS - hardware, software, data, people, methods - proprietary and open source software - types of data - spatial, attribute data- types of attributes - scales/ levels of measurements.		
UNIT II	**SPATIAL DATA MODELS**	**9**
Database structures - relational, object oriented - entities - ER diagram - data models - conceptual, logical and physical models - spatial data models - raster data structures - raster data compression - vector data structures - raster vs vector models- tin and grid data models.		
UNIT III	**DATA INPUT AND TOPOLOGY**	**9**
Scanner - raster data input - raster data file formats - geo referencing - vector data input - digitizer - datum projection and reprojection -coordinate transformation - topology - adjacency, connectivity and containment - topological consistency - non topological file formats - attribute data linking - linking external databases - GPS data integration.		
UNIT IV	**DATA QUALITY AND STANDARDS**	**9+3**
Data quality - basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage - metadata - GIS standards –interoperability - OGC - spatial data infrastructure		
UNIT V	**DATA MANAGEMENT AND OUTPUT**	**9+3**
Import/Export - data management functions- raster to vector and vector to raster conversion - data output - map compilation - chart/graphs - multimedia - enterprise vs desktop GIS - distributed GIS.		
		Total: 45 Hours

COURSE OUTCOMES

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

CO1: Understand the fundamental principles and components of a Geographic Information System (GIS).

CO2: Analyze differentiate between raster and vector data models and analyze their suitability for specific applications.

CO3: Apply data input techniques to create and manage spatial data, including establishing topological relationships.

CO4: Evaluate spatial data quality based on established standards and recommend appropriate data sharing practices.

CO5: Create design and produce effective GIS outputs, including maps and reports, to communicate spatial information.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		1									1	1	1	1
CO2	2		2	1	1							1	1		
CO3	2		2	1	1							1	1		
CO4	2	1	2	2	1							1			
CO5	2	1	2	2	2							1	1	1	1

(1 - Low, 2 - Medium, 3 - High)

TEXT BOOK(S)

T1. Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition, 2011.

T2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, “An Introduction Geographical Information Systems, Pearson Education, 2nd Edition, 2007.

REFERENCE BOOK(S)

R1. Lo. C. P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006.

Course Code: 24CEO004	**Course Title: Climate Change and its Impacts**	
Course Category: OEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES
To explore key climate parameters such as temperature, rainfall, humidity, and wind
To identify greenhouse gases and their impact on climate change.
To assess the effects of climate change on human health, malnutrition, and migration.
To identify various adaptation options for mitigating climate change effects.
To understand the importance of conducting an energy audit to improve energy efficiency.

UNIT I	**ENVIRONMENTAL IMPLICATIONS OF BUILDINGS**	**9**
Energy use - carbon emissions - water use - waste disposal; Building materials: sources, methods of production and environmental Implications - Embodied Energy in Building Materials: Transportation Energy for Building Materials - Maintenance Energy for Buildings.		
UNIT II	**IMPLICATIONS OF BUILDING TECHNOLOGIES EMBODIED ENERGY OF BUILDINGS**	**9**
Framed Construction - Masonry Construction - Resources for Building Materials - Alternative concepts - Recycling of Industrial and Buildings Wastes - Biomass Resources for buildings.		
UNIT III	**COMFORTS IN BUILDING**	**9**
Thermal Comfort in Buildings - Issues; Heat Transfer Characteristic of Building Materials and Building Techniques - Incidence of Solar Heat on Buildings - Implications of Geographical Locations.		
UNIT IV	**UTILITY OF SOLAR ENERGY IN BUILDINGS**	**9**
Utility of Solar energy in buildings - concepts of Solar Passive Cooling and Heating of Buildings - Low Energy Cooling - Case studies of Solar Passive Cooled and Heated Buildings.		
UNIT V	**GREEN COMPOSITES FOR BUILDINGS**	**9**
Concepts of Green Composites - Water Utilisation in Buildings - Low Energy Approaches to Water Management - Management of Solid Wastes - Management of Sullage Water and Sewage - Urban Environment and Green Buildings - Green Cover and Built Environment.		

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

: Understand the environmental implications of buildings, including energy use, carbon emissions, and waste disposal.
: Analyze the impact of building technologies and construction materials on sustainability and embodied energy
: Evaluate thermal comfort in buildings and the influence of heat transfer characteristics of materials.
Assess the utility of solar energy in buildings and explore solar passive cooling and heating techniques.
: Apply green building concepts, including water management, solid waste disposal, and urban environmental sustainability.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1			2	2	1					2	1	2
CO2	2	2	2	1	1	2	2			1	1	1	2		
CO3	1	1	2			2	2	1		1		1	1		
CO4	2	2	2	1	1	2	2	1			1	2			
CO5	2	1	1			2	2	1				1	2	1	2

(1 - Low, 2 - Medium, 3 - High)

TEXT BOOK(S)	
T1.	K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007.
T2.	Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009.
T3.	Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

REFERENCE BOOK(S)	
R1.	Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
R2.	Jerry Yudelson Green building Through Integrated Design. McGraw Hill, 2009.
R3.	Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Bill Burke.

Course Code: 24CEO005	**Course Title: Disaster Management**	
Course Category: OEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES
To provide students an exposure to disasters, their significance and types.
To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR).
To enhance awareness of institutional processes in the country.
To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

UNIT I	**INTRODUCTION TO DISASTERS**	**9**
Definition: disaster, hazard, vulnerability, resilience, risks - disasters: types of disasters - earthquake, landslide, flood, drought, fire etc - classification, causes, impacts including social, economic, political, environmental, health, psychosocial, etc.- differential impacts- in terms of caste, class, gender, age, location, disability - global trends in disasters: urban disasters, pandemics, complex emergencies, climate change- dos and don’ts during various types of disasters.		
UNIT II	**APPROACHES TO DISASTER RISK REDUCTION (DRR)**	**9**
Disaster cycle - phases, culture of safety, prevention, mitigation and preparedness community based DRR, structural- non-structural measures, roles and responsibilities of- community, panchayat raj institutions/urban local bodies(PRIS/ULBS), states, centre, and other stakeholders- institutional processes and framework at state and central level- state disaster management authority(SDMA) - early warning system - advisories from appropriate agencies.		
UNIT III	**INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT**	**9**
Factors affecting vulnerabilities, differential impacts, impact of development projects such as dams, embankments, changes in land-use etc. - climate change adaptation- IPCC scenario and scenarios in the context of India - relevance of indigenous knowledge, appropriate technology and local resources.		
UNIT IV	**DISASTER RISK MANAGEMENT IN INDIA**	**9**
Hazard and vulnerability profile of India, components of disaster relief: water, food, sanitation, shelter, health, waste management, institutional arrangements (mitigation, response and		

preparedness, disaster management act and policy - other related policies, plans, programmes and legislation - role of GIS and information technology components in preparedness, risk assessment, response and recovery phases of disaster - disaster damage assessment

UNIT V	**DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS**	**9**
Landslide hazard zonation: case studies, earthquake vulnerability assessment of buildings and infrastructure: case studies, drought assessment: case studies, coastal flooding: storm surge assessment, floods: fluvial and pluvial flooding: case studies; forest fire: case studies, man-made disasters: case studies, space based inputs for disaster mitigation and management and field works related to disaster management.		

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Explain key concepts related to disasters, including hazard, vulnerability, resilience, and risk.
CO2: Understand disaster risk reduction (DRR) strategies, including structural and non-structural measures.
CO3: Analyze factors affecting vulnerabilities and their differential impacts on different communities.
CO4: Assess India's hazard and vulnerability profile.
CO5: Assess the vulnerabilities of buildings and infrastructure to earthquakes and other hazards.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1				2	2					2	2	1	1
CO2	2	2	1			2	2	1				2	2		
CO3	1	2	2		1	2	2						2		
CO4	1	1	2	1	1	2	2					1	2		
CO5	1			1		2	2						1	1	2

(1 - Low, 2 - Medium, 3 - High)

TEXT BOOK(S)	
T1.	Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-938038642
T2.	Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-12590073
T3.	Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

T4.	Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCE BOOK(S)	
R1.	Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005.
R2.	Government of India, National Disaster Management Policy, 2009.

OPEN ELECTIVE OFFERED BY EEE DEPARTMENT

Course Code: 24EEO001	**Course Title: Sustainable and Environmental Friendly HV Insulation system**	
Course Category: OEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
To know about the products related with sustainable application.
To learn about Green Gaseous insulators and its hazardous effects.
To learn about Green liquid insulators and its hazardous effects.
To learn about Green solid insulators and its hazardous effects.
To understand the standards and testing of green insulation systems.

UNIT I	**SUSTAINABLE AND ENVIRONMENTAL ENERGY AND PRODUCTS**	**9**
Carbon print, global warming potential, environment requirement for any product and system.		
UNIT II	**ALTERNATE GREEN GASEOUS INSULATORS**	**9**
SF6 gas and its hazardous environmental effects, alternate gases, gaseous mixtures and othersources and its properties.		
UNIT III	**ALTERNATE GREEN LIQUID INSULATORS**	**9**
Hazardous effects of existing liquid dielectric materials (such as organic oil), alternate sources ofenvironmental friendly liquid such as ester oil, vegetable oils dielectric and its properties.		
UNIT IV	**ALTERNATE GREEN SOLID INSULATORS**	**9**
Hazardous effects of existing solid dielectric materials, alternate sources of environmental friendlysolid dielectric and its properties.		
UNIT V	**EVOLVING STANDARDS FOR GREEN INSULATION SYSTEMS**	**9**
Requirements, evolving standards of management, testing, usage and disposal of alternate insulation systems, Major applications and standards.		
		Total : 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand sustainable and environmental energy and products.
CO2: Understand the alternate green gaseous insulators.
CO3: Understand the alternate green liquid insulators.
CO4: Understand the alternate green solid insulators.
CO5: Understand the standards and testing of Green insulation systems.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1			1	1	1	1						1		
CO2	2					2	2						2		
CO3	2					2	2						2		
CO4	2					2	2						2		
CO5	2				2	2	2						2		

(1 - Low, 2 - Medium, 3 - High)

TEXT BOOK(S)

T1.	R. Arora and H.C.W Mosch, "High Voltage Insulation Engineering", 2^{nd} Edition, New Age International Publishers, 2021.
T2.	Chandra Swaroop Meena, Ashwani Kumar and Varun Pratap Singh, "Sustainable Technologies for Energy Efficient Building", 2^{nd} Edition, CRC Press, 2021.
T3.	U.Mohan Rao and Ramanujam Sarathi, "Alternative Liquid Dielectrics for High Voltage Transformer Insulation Systems: Performance Analysis and Applications", 2^{nd} Edition, Wiley-IEEE press, 2021.

REFERENCE BOOK(S)

R1.	M.H. Fulekar, Bhawana Pathak and R.K. Kale, "Environment and Sustainable Development", Springer, 2020.
R2.	P. Muthukumar and Dilip Kumar Sakar, "Innovations in Sustainable Energy and Technology", Springer, 2020.

Course Code: 24EEO002	Course Title: Smart Grids	
Course Category: OEC	Credits: 3	
L:T:P (Hours/Week) 3:0:0	Total Contact Hours: 45	Max Marks : 100

COURSE OBJECTIVES		
• To acquire knowledge about the evolution of Smart and Interconnected energy systems.		
• To gain knowledge about the various challenges and benefits of smart grid and the national and international initiatives taken.		
• To acquire knowledge on the concepts related with transmission in smart grid technologies.		
• To get an insight into smart grid technologies applied to distribution systems.		
• To gain knowledge about various computing technologies for Smart Operation of the Grid.		
UNIT I	**SMART GRID**	**9**
Evolution of Energy Systems, Concept, Definitions and Need, Difference between Conventional & Smart Grid, Drivers, structures, functions, opportunities, challenges and benefits of Smart Grid, Basics of Micro grid, National and International Initiatives in Smart Grid.		
UNIT II	**SMART METERING**	**9**
Introduction to Advanced Metering infrastructure (AMI) - drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Real time management and control, Phasor Measurement Unit (PMU).		
UNIT III	**SMART GRID TECHNOLOGIES (Transmission)**	**9**
Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, Wide area Monitoring, Protection and control.		
UNIT IV	**SMART GRID TECHNOLOGIES (Distribution)**	**9**
DMS, Volt/VAr control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Electric Vehicles.		
UNIT V	**HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS**	**9**
Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband overPower line (BPL), IP based Protocols, Computing technologies for Smart Grid applications (Web Service to CLOUD Computing), Role of big data and IoT, Cyber Security for Smart Grid.		
		Total : 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand the importance and objectives of Power System Grid.
CO2: Understand the concept of a smart grid.
CO3: Identify and discuss smart metering devices and associated technologies on Transmission Sector.
CO4: Deliver an overview of Micro grid and Electric Vehicle Technology on Distribution Sector.
CO5: Interpret the various computing technologies to understand the role of Cloud computing and IoT for effective and efficient operation of Smart Grid.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2			1		1	1		1			1	2		
CO2	2		2	1		1	1		2			1	2		
CO3	2	2	2	2		2	1		1			2	2	2	
CO4	2	1	2	2		2	1		2			2	2	2	
CO5	2	1	2	2		2	1		2			2	2		

(1 - Low, 2 - Medium, 3 - High)

TEXT BOOK(S)	
T1.	Stuart Borlase, "Smart Grids Advanced Technologies and Solutions", 2nd Edition, CRC, 2018.
T2.	Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu and Akihiko Yokoyama, "Smart Grid:Technology and Applications", John Wiley, 2012.
T3.	James Momoh, "Smart Grid Fundamentals of Design and Analysis", IEEE press, 2012.

REFERENCE BOOK(S)	
R1.	Ahmed F. Zobaa and Trevor J. Bihl, "Big data analytics in future power systems", 1st Edition, CRC press, 2018.
R2.	Stuart Borlase, "Smart Grid: Infrastructure, Technology and Solutions", CRC Press, 2012.
R3.	Janaka B. Ekanayake , "Smart Grid: Technology and Applications", 1st Edition, Wiley Publications, 2021.

Course Code: 24EEO003	**Course Title: Hybrid Energy Technology**	
Course Category: OEC	**Credits: 3**	
L:T:P (Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks : 100**

COURSE OBJECTIVES
To acquire knowledge about different types of hybrid energy systems.
To know about the various electrical Generators used for the Wind Energy Conversion Systems.
To design the power converters used in SPV Systems.
To gain knowledge about the various power converters used in hybrid energy systems.
To get knowledge about the performance of the various hybrid Renewable energy systems.

UNIT I	**HYBRID ENERGY SYSTEMS**	**9**
Hybrid Energy Systems - Need for Hybrid Energy Systems - Solar - Wind - Fuel Cell -Diesel, Wind - Biomass - Diesel, Micro - Hydel - PV, Ocean and geyser energy - Classification of Hybrid Energy systems - Importance of Hybrid Energy systems - Advantages and Disadvantages - Environmental aspects of renewable energy - Impacts of renewable energy generation on the environment - Present Indian and international energy scenario of conventional and RE sources - Ocean energy, Hydel Energy - Wind Energy, Biomass energy, Hydrogen energy - Solar Photovoltaic (PV) and Fuel cells: Operating principles and characteristics.		
UNIT II	**ELECTRICAL MACHINES FOR WIND ENERGY CONVERSION SYSTEMS**	**9**
Review of reference theory fundamentals - Construction, Principle of operation and analysis: Squirrel Cage Induction Generator (SCIG), Doubly Fed Induction Generator (DFIG) - Permanent Magnet Synchronous Generator (PMSG).		
UNIT III	**POWER CONVERTERS AND ANALYSIS OF SOLAR PV SYSTEMS**	**9**
Power Converters for SPV Systems - Line commutated converters (inversion-mode) - Boost and buck-boost converters - selection of inverter, battery sizing, array sizing - Analysis of SPV Systems - Block diagram of the solar PV systems - Types of Solar PV systems: Stand-alone PV systems.		

UNIT IV	ANALYSIS OF POWER CONVERTERS FOR HYBRID ENERGY SYSTEMS	9
Introduction to Power Converters - Stand-alone Converters - AC - DC - AC converters: uncontrolled rectifiers, PWM Inverters - Bi-Directional Converters - Grid-Interactive Inverters - Matrix converter - Merits and Limitations.		
UNIT V	**CASE STUDIES FOR HYBRID RENEWABLE ENERGY SYSTEMS**	**9**
Hybrid Systems - Range and type of Hybrid systems - Performance Analysis - Cost Analysis - Casestudies of Diesel - PV, Wind - PV - Fuel - cell, Micro - hydel - PV, Biomass-Diesel - Fuel - cell systems.		
		Total : 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Analyze the impacts of hybrid energy technologies on the environment anddemonstrate them to harness electrical power.
CO2: Select a suitable Electrical machine for Wind Energy Conversion Systems and simulatewind energy conversion system.
CO3: Design the power converters such as AC-DC, DC-DC, and AC-AC converters forSPV systems.
CO4: Analyze the power converters such as AC-DC, DC-DC, and AC-AC converters forHybrid energy systems.
CO5: Interpret the hybrid renewable energy systems.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		2	1		1	1		1			1	2	1	
CO2	2	1	2	1		1	1		1			1	2	2	
CO3	2	2	2	1		1	1		1				2	2	
CO4	2	2	1	2		1	1		1				2	2	
CO5	2	2	2	2		1	1		1			1	1	1	

(1 - Low, 2 - Medium, 3 - High)

TEXT BOOK(S)	
T1.	Bahman Zohuri, “Hybrid Energy Systems”, Springer, 1st Edition, 2018.
T2.	S.M. Muyeen, “Wind Energy Conversion Systems”, 1st Edition, Springer, 2012.
T3.	Md. Rabiul Islam, Md. Rakibuzzaman Shah and Mohd Hasan Ali, “Emerging Power Converters for Renewable Energy and Electric Vehicles”, 1st Edition, CRC Press, 2021.

REFERENCE BOOK(S)	
R1.	Ernst Joshua, “Wind Energy Technology”, 3rd Edition, PHI, India, 2018.
R2.	Rashid.M. H, “Power electronics Hand book”, 4th Edition, Academic press, 2018.
R3.	Rai. G.D, “Non-conventional energy sources”, 6th Edition, Khanna publishers, 2017.

Course Code: 24EEO004	**Course Title: Introduction to PLC Programming**	
Course Category: PEC	**Credits: 3**	
L:T:P(Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES		
To understand basic PLC terminologies, PLC architecture and operation.		
To configure and integrate sensors, switches, and solid-state relays in PLC-based control systems.		
To develop PLC logic for simple applications using ladder logic.		
To understand the hardware and software behind PLC and SCADA.		
To gain exposure to the applications of PLC programming.		
UNIT I	**INTRODUCTION TO PLC**	**9**
Introduction to PLC: Microprocessor, I/O Ports, Isolation, Filters, Drivers, Microcontrollers/DSP, PLC/DDC - PLC Construction: What is a PLC, PLC Memories, PLC I/O, PLC Special I/O, PLC Types.		
UNIT II	**PLC INSTRUCTIONS**	**9**
PLC Basic Instructions: PLC Ladder Language - Function block Programming-Ladder/Function Block functions - PLC Basic Instructions, Basic Examples (Start/Stop Rung, Entry/Reset Rung) - Configuration of Sensors, Switches, Solid State Relays - Interlock examples - Timers, Counters, Examples.		
UNIT III	**PLC PROGRAMMING**	**9**
Different types of PLC program, Basic Ladder logic, logic functions, PLC module addressing, registers basics, basic relay instructions, Latching Relays, arithmetic functions, comparison functions, data handling, data move functions, timer-counter instructions, input-output instructions, sequencer instructions.		
UNIT IV	**COMMUNICATION OF PLC AND SCADA**	**9**
Communication Protocol - Modbus, HART, Profibus. SCADA: - Hardware and software, Remote terminal units, Master Station and Communication architectures.		
UNIT V	**CASE STUDIES**	**9**
Stepper Motor Control - Elevator Control - CNC Machine Control - conveyor control - Interlocking Problems.		
		Total: 45 Hours

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Identify the basic requirements of PLC input/output devices and architecture.
CO2: Apply the Instruction Set used for ladder Logic and Function BlockProgramming.
CO3: Design PLC Programmes by Applying Timer/Counter and Arithmetic and Logic Instructions Studied for Ladder Logic and Function Block.
CO4: Analyze SCADA hardware, software, remote terminal units, master stations, and communication architectures.
CO5: Understand the applications of PLC programming.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1					1		1					
CO2	3	3	2					1		1	2				2
CO3	3	3	3	3	1			1		1					
CO4	3	3		3	3			1		1			3	3	
CO5	3	3	3	2	1			1		1			3	3	3

(1 - Low, 2 - Medium, 3 - High)

TEXT BOOK(S)	
T1.	Frank Petruzzula, "Programmable Logic Controllers", 6th Edition, Tata Mc-Graw Hill, 2023.
T2.	John W. Webb and Ronald A. Reis, "Programmable Logic Controllers Principles and Applications", 3rd Edition, PHI publication, 2011.
T3.	Madhuchhanda Mitra and Samarjit Sen Gupta, "Programmable Logic Controllers and Industrial Automation: An Introduction", 2nd Edition, Penram International Publishing () Pvt. Ltd, 2017.

REFERENCE BOOK(S)	
R1.	Madhuchand Mitra and Samerjit Sengupta, "Programmable Logic Controllers Industrial Automation an Introduction", 2nd Edition, Penram International Publishing Pvt. Ltd, 2005.
R2.	J. R. Hackworth and F. D. Hackworth, "Programmable Logic Controllers Principlesand Applications", Pearson publication, 2004.

Course Code: 24EEO005	**Course Title: Flexible AC Transmission Systems**	
Course Category: OEC	**Credits: 3**	
L:T:P(Hours/Week) 3:0:0	**Total Contact Hours: 45**	**Max Marks: 100**

COURSE OBJECTIVES
To know about the Power control in Electrical Transmission lines.
To impart knowledge about static VAR Compensator and its applications.
To gain knowledge on Thyristor Controlled Series Capacitor and its applications.
To understand the performance of power systems with FACTS controllers.
To acquire knowledge about advanced FACTS controllers.

UNIT I	**REAL AND REACTIVE POWER COMPENSATION**	**9**
Real and reactive power control in electrical power transmission lines - loads & system compensation - Uncompensated transmission line - shunt and series compensation.		
UNIT II	**STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS**	**9**
Voltage control by SVC - Advantages of slope in dynamic characteristics - Influence of SVC on system voltage - Design of SVC voltage regulator - TCR - FC - TCR - Modeling of SVC for power flow and fast transient stability- Applications: Enhancement of transient stability - Steady state power transfer - Enhancement of power system damping.		
UNIT III	**THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS**	**9**
Operation of the TCSC - Different modes of operation - Modelling of TCSC, Variability reactance model - Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit - Enhancement of system damping.		
UNIT IV	**VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS**	**9**
Static Synchronous Compensator (STATCOM) - Principle of operation - VI Characteristics. Applications: Steady state power transfer - enhancement of transient stability - prevention of voltage instability. SSSC - operation of SSSC and the control of power flow - modelling of SSSC in load flow and transient stability studies - Dynamic voltage restorer (DVR).		
UNIT V	**ADVANCED FACTS CONTROLLERS**	**9**

Interline DVR(IDVR) - Unified Power flow controller (UPFC) - Interline power flow controller (IPFC) - Unified Power quality conditioner (UPQC).
Total : 45 Hours

COURSE OUTCOMES

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

CO1: Explain Power control in Electrical Transmission lines.

CO2: Analyze and develop Static VAR Compensator (SVC) for Steady state power transfer.

: Analyze and develop Thyristor Controlled Series Capacitor (TCSC) for system stability.

CO4: Analyze the performance of steady state and dynamics of facts controllers.

CO5: Explain about advanced FACTS controllers.

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2					2				2		
CO2	2	1	2	1					2				2		1
CO3	2	2		2					2				2		
CO4	2	2	1	1					2				2		
CO5	2	1	2	2					2				2		1

(1 - Low, 2 - Medium, 3 - High)

TEXT BOOK(S)

T1.	R.Mohan Mathur and Rajiv K.Varma, “Thyristor-Based Facts Controllers for Electrical Transmission Systems”, IEEE press and JohnWiley &Sons, Inc, 2002.
T2.	Narain G. Hingorani, “Understanding FACTS-Concepts and Technology of Flexible AC Transmission Systems”, Standard Publishers Distributors, 2011.

REFERENCE BOOK(S)

R1.	K.R. Padiyar, “FACTS Controllers in Power Transmission and Distribution”, New Age International (P) Limited, Publishers, New Delhi, 2008.
R2.	V.K.Sood, “HVDC and FACTS controllers-Applications of Static Converters in Power System”, Kluwer Academic Publishers, April 2004.

MANDATORY COURSES

MANDATORY COURSES:

Course Code: 24MAC001	**Course Title: Constitution of India**	
Course Category: MC	**Credits: 0**	
L:T:P (Hours/Week) 1:0:0	**Total Contact Hours: 15**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand evolution of Indian Constitution.
• To analyze the fundamental rights.
• To understand the composition of Parliament.
• To study constitution amendment procedure.
• To know about the powers of high court and supreme court.

UNIT I	**INTRODUCTION**	**2**
Evolution of Indian Constitution, Significance of Constitution, Composition, Preamble and its Philosophy.		
UNIT II	**RIGHTS, DUTIES AND DIRECTIVE PRINCIPLES**	**3**
Fundamental Rights- Writs and Duties, Directive Principles of State Policy.		
UNIT III	**COMPOSITION OF PARLIAMENT AND FEDERALISM**	**4**
Union Government, President and Vice President, Houses of the Parliament and their functions, Composition of State Legislature, Powers, Functions and Position of Governor, Function of Chief Ministers, Council of Ministers, The Indian Federal System, Administrative Relationship between Union and States.		
UNIT IV	**BILLS AND CONSTITUTION AMENDMENT PROCEDURE**	**3**
Types of Bills, Stages of passing of Bill into an Act, Veto Power, Constitution Amendment Procedure, Various Amendments made and their significance for India.		
UNIT V	**JUDICIARY**	**3**
Supreme Court and High Court, Functions and powers, Judicial Review.		

TEXT BOOK(S)	
T1.	Subash C. Kashyap , "Our Constitution", 5th Edition, NBT, India, New Delhi, 2015.
T2.	Basu D D , "Introduction to the Constitution of India", 20th Edition, Prentice Hall of India, New Delhi, 2011.

REFERENCE BOOK(S)	
R1.	Briji Kishore Sharma , "Introduction to the Constitution of India", 8th Edition, Prentice Hall of India, New Delhi, 2017.
R2.	Hoshiar Singh , "Indian Administration", 1st Edition, Pearson Education, New Delhi, 2011.
R3.	Jain M C , "The Constitution of India", 5th Edition, State Mutual Book & Periodical Service, Limited, New Delhi, 1988.
R4.	Shukla V N , "Constitution of India", 13th Edition, Eastern Book Company Limited, New Delhi, 2017.

Course Code : 24MAC002	**Course Name: Industrial Safety**	
Course Category : MC	**Credits : 0**	
L:T:P(Hours/Week) : 1:0:0	**Total Contact Hours : 15**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the Introduction and basic terminologies of safety.
• To learn about the Important Statutory Regulations and standards.
• To conduct and participate the various safety activities in the Industry.
• To have knowledge about Workplace Exposures and Hazards.
• To assess the various Hazards and consequences through various Risk Assessment Techniques.

UNIT I	**SAFETY TERMINOLOGIES**	**3**
Hazard-Types of Hazard- Risk-Hierarchy of Hazards Control Measures-Lead indicators- lag Indicators-Flammability- Toxicity Time-weighted Average (TWA) - Personnel Protective Equipment- Health and Safety Policy-Material Safety Data Sheet MSDS.		
UNIT II	**STANDARDS AND REGULATIONS**	**3**
Indian Factories Act-1948- Health- Safety- Hazardous materials and Welfare- ISO 45001:2018 occupational health and safety (OH&S).		
UNIT III	**SAFETY ACTIVITIES**	**3**
Mock Drills- On-site Emergency Action Plan- Off-site Emergency Action Plan- Safety poster and Display- Human Error Assessment.		
UNIT IV	**WORKPLACE HEALTH AND SAFETY**	**3**
Noise hazard- Particulate matter- musculoskeletal disorder improper sitting poster and lifting Ergonomics RULE & REBA.		
UNIT V	**HAZARD IDENTIFICATION TECHNIQUES**	**3**
Job Safety Analysis-Preliminary Hazard Analysis-Failure mode and Effects Analysis- Hazard and Operability- Fault Tree Analysis- Event Tree Analysis Qualitative and Quantitative Risk Assessment.		

TEXT BOOK(S)	
T1.	R.K. Jain and Prof. Sunil S. Rao "Industrial Safety, Health and Environment Management Systems", Khanna Publisher, 2012.

T2.	L. M. Deshmukh, "Industrial Safety Management: Hazard Identification and Risk Control", McGraw-Hill Education, 2015

REFERENCE BOOK(S)	
R1.	Frank Lees, "Loss Prevention in Process Industries", 4th Edition, Butterworth-Heinemann publications, UK, 2012.
R2.	John Ridley and John Channing, "Safety at Work: Routledge", 7th Edition, McGraw-Hill Education, 2015.
R3.	Dan Petersen, "Techniques of Safety Management: A System Approach", Khanna Publisher, 2012.

Course Code: 24MAC003	**Course Title: Entrepreneurship**	
Course Category: MC	**Credits: 0**	
L:T:P (Hours/Week) 1:0:0	**Total Contact Hours: 15**	**Max Marks : 100**

COURSE OBJECTIVES
• To develop and strengthen the entrepreneurial quality and motivation of learners.
• To impart the entrepreneurial skills and traits essential to become successful entrepreneurs.
• To apply the principles and theories of entrepreneurship and management in Technology oriented businesses.
• To empower the learners to run a Technology driven business efficiently and effectively
• To understand the emerging trends in Entreppreneurship.

UNIT I	**INTRODUCTION TO ENTREPRENEURSHIP**	**3**
Entrepreneurship- Definition, Need, Scope - Entrepreneurial Skill & Traits - Entrepreneur vs. Intrapreneur; Classification of entrepreneurs, Types of entrepreneurs -Factors affecting entrepreneurial development – Achievement Motivation – Contributions of Entreprenrship to Economic Development.		
UNIT II	**BUSINESS OWNERSHIP & ENVRIONMENT**	**3**
Types of Business Ownership – Business Environmental Factors – Political-Economic-Sociological-Technological-Environmental-Legal aspects – Human Resources Mobilization-Basics of Managing Finance- Essentials of Marketing Management - Production and Operations Planning – Systems Management and Administration.		
UNIT III	**FUNDAMENTALS OF TECHNOPRENEURSHIP**	**3**
Introduction to Technopreneurship - Definition, Need, Scope- Emerging Concepts-Principles - Characteristics of a technopreneur - Impacts of Technopreneurship on Society – Economy- Job Opportunities in Technopreneurship - Recent trends		
UNIT IV	**APPLICATIONS OF TECHNOPRENEURSHIP**	**3**
Technology Entrepreneurship - Local, National and Global practices - Intrapreneurship and Technology interactions, Networking of entrepreneurial activities – Launching - Managing Technology based Product / Service entrepreneurship -— Success Stories of Technopreneurs - Case Studies.		

UNIT V	EMERGING TRENDS IN ENTREPRENERUSHIP	3
Effective Business Management Strategies For Franchising - Sub-Contracting- Leasing- Technopreneurs – Agripreneurs - Netpreneurs- Portfolio entrepreneurship - NGO Entrepreneurship – Recent Entrepreneurial Developments - Local – National – Global perspectives.		

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Learn the basics of Entrepreneurship.
CO2: Understand the business ownership patterns and environment.
CO3: Understand the Job opportunities in Industries relating to Technopreneurship.
CO4: Learn about applications of Tehnopreneurship and to become a successful Technopreneurs.
CO5: Acquaint with the recent and emerging trends in entrepreneurship.

TEXT BOOK(S)	
T1.	S.S.Khanka, “Entrepreneurial Development”, S.Chand & Co. Ltd., Ram Nagar New Delhi, 2021.
T2.	Donal F Kuratko, “Entrepreneurship Theory, Process, Practice”, 11^{th} Edition, Cengage Learning, 2019.
T3.	Daniel Mankani, “Technopreneurship: The successful Entrepreneur in the new Economy”, Prentice Hall, 2012.

REFERENCE BOOK(S)	
R1.	Edward Elgar, “Entrepreneurship, Cooperation and the Firm: The Emergence and Survival of High-Technology Ventures in Europe”, Wiley Publication, 2010.
R2.	S.S.Khanka, “Entrepreneurial Development”, S.Chand & Co. Ltd. Ram Nagar New Delhi, 2021.

Course Code: 24MAC004	**Course Title: Film Appreciation**	
Course Category: MC	**Credits: 0**	
L:T:P (Hours/Week) 1:0:0	**Total Contact Hours: 15**	**Max Marks:100**

COURSE OBJECTIVES
• To understand the historical development of film as an art and entertainment form.
• To learn the language of cinema and its evolution over a century.
• To develop the ability to read a film critically and appreciate its various nuances.
• To cultivate an appreciation for film as a text, exploring its narrative, themes, and stylistic elements.
• To foster a joyful and engaging approach to studying films.

UNIT I	**THEME - A: THE COMPONENT OF FILMS**	**3**
A-1: The material and equipment A-2: The story, screenplay and script A-3: The actors, crew members, and the director A-4: The process of film making… structure of a film		
UNIT II	**THEME - B: EVOLUTION OF FILM LANGUAGE**	**3**
B-1: Film language, form, movement etc. B-2: Early cinema… **silent film** (Particularly French) B-3: The emergence of feature films: **Birth of a Nation** B-4: Talkies		
UNIT III	**THEME - C: FILM THEORIES AND CRITICISM/APPRECIATION**	**3**
C-1: Realist theory; Autarkists C-2: Psychoanalytic, Ideological, Feminists C-3: How to read films? C-4: Film Criticism / Appreciation		
UNIT IV	**THEME – D: DEVELOPMENT OF FILMS**	**3**
D-1: Representative Soviet films D-2: Representative Japanese films D-3: Representative Italian films		

D-4: Representative Hollywood film and the studio system		
UNIT V	**THEME - E: INDIAN FILMS**	**3**
E-1: The early era E-2: The important films made by the directors E-3: The regional films E-4: The documentaries in India		

COURSE OUTCOMES
At the end of this course, students will be able to:
CO1: Understand the historical development of film as an art and entertainment form.
CO2: Learn the language of cinema and its evolution over a century.
CO3: Develop the ability to read a film critically and appreciate its various nuances.
CO4: Cultivate an appreciation for film as a text, exploring its narrative, themes, and stylistic Elements.
CO5: Foster a joyful and engaging approach to studying films.

READING:

A Reader containing important articles on films will be prepared and given to the students. The students must read them and present in the class and have discussion on these.

Course Code: 24MAC005	**Course Title: Well Being with Traditional Practices - Yoga, Ayurveda and Siddha**	
Course Category: MC	**Credits: 0**	
L:T:P (Hours/Week) 1:0:0	**Total Contact Hours: 15**	**Max Marks : 100**

COURSE OBJECTIVES
• To enjoy life happily with fun filled new style activities that help to maintain health.
• To adapt a few lifestyle changes that will prevent many health disorders.
• To be cool and handbill every emotion very smoothly in every walk of life.
• To learn to eat cost effective but healthy foods that are rich in essential nutrients.
• To develop immunity naturally that will improve resistance against many health disorders.

UNIT I	**HEALTH AND ITS IMPORTANCE**	**3**
Health- Definition - Importance of maintaining health - More importance on prevention than treatment, Types of health, Present health status - The life expectancy-present status - mortality rate - dreadful diseases - Non-communicable diseases (NCDs) the leading cause of death - 60% - heart disease – cancer – diabetes - chronic pulmonary diseases - risk factors – tobacco – alcohol - unhealthy diet - lack of physical activities. Types of diseases and disorders - Causes of the diseases / disorders - Importance of prevention of illness - Simple lifestyle modifications to maintain health - Maintaining BMI-Importance and actions to be taken.		
UNIT II	**DIET**	**3**
Role of diet in maintaining health - energy one needs to keep active throughout the day - nutrients one needs for growth and repair - helps one to stay strong and healthy - helps to prevent diet-related illness, Balanced diet and its 7 Components - Carbohydrates – Proteins – Fats – Vitamins – Minerals - Fibre and Water, Food additives and their merits & demerits - Effects of food additives - Types of food additives - Food additives and processed foods - Food additives and their reactions, Definition of BMI and maintaining it with diet Importance - Consequences of not maintaining BMI - different steps to maintain optimal BM.		
UNIT III	**ROLE OF AYURVEDA & SIDDHA SYSTEMS IN MAINTAINING HEALTH**	**3**
AYUSH systems and their role in maintaining health - preventive aspect of AYUSH -		

AYUSH as a soft therapy, Secrets of traditional healthy living - Traditional Diet and Nutrition - Regimen of Personal and Social Hygiene - Daily routine (Dinacharya) - Seasonal regimens (Ritucharya) - basic sanitation and healthy living environment - Sadvritta (good conduct) - for conducive social life, Principles of Siddha & Ayurveda systems - Macrocosm and Microcosm theory - Pancheekarana Theory / (Five Element Theory) 96 fundamental Principles - Uyir Thathukkal (Tri-Dosha Theory) - Udal Thathukkal.		
UNIT IV	**MENTAL WELLNESS**	**3**
Emotional health - Definition and types - Three key elements: the subjective experience - the physiological response - the behavioral response - Importance of maintaining emotional health - Role of emotions in daily life -Short term and long term effects of emotional disturbances, Stress management - Stress definition - Stress in daily life - How stress affects one's life - Identifying the cause of stress - Symptoms of stress - Managing stress (habits, tools, training, professional help) - Complications of stress mismanagement.		
UNIT V	**YOGA**	**3**
Definition and importance of yoga - Types of yoga - How to Choose the Right Kind for individuals according to their age - The Eight Limbs of Yoga - Simple yogasanas for cure and prevention of health disorders - What yoga can bring to our life.		

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Learn the importance of different components of health.
CO2: Understand the importance of diet and workouts in maintaining health.
CO3: Learn new techniques of Ayurveda and Siddha systems.
CO4: Understand about emotional health and stress management.
CO5: Understand the concept of Yogasanas.

TEXT BOOK(S)	
T1.	Ashley Martin, "Nutrition and Dietetics", White Word Publications, New York, NY 10001, USA, 2012
T2.	Cory Martin, "Yoga for Beginners_ 35 Simple Yoga Poses to Calm Your Mind and Strengthen Your Body", Althea Press, Berkeley, California, 2015.

REFERENCE BOOK(S)	
R1.	Moshe Zeidner, Gerald Matthews, and Richard D. Roberts, “What We Know About Emotional Intelligence - How It Affects Learning, Work, Relationships, and Our Mental Health”, Cambridge, Massachusetts, London, England, 2012
R2.	Kristin Neff and Christopher Germer, “A Bradford Book”, The MIT Press, Cambridge, Massachusetts, London, England, 2015

Course Code: 24MAC006	**Course Title: Introduction to Women and Gender Studies**	
Course Category: MC	**Credits: 0**	
L:T:P (Hours/Week) 1:0:0	**Total Contact Hours: 15**	**Max Marks : 100**

COURSE OBJECTIVES
• To understand the basic concepts of gender
• To study Feminist theories
• To expose women's movement nationally and globally
• To discuss on gender and language
• To learn about gender representation

UNIT I	**CONCEPTS**	**3**
Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour.		
UNIT II	**FEMINIST THEORY**	**3**
Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, ecofeminist.		
UNIT III	**WOMEN'S MOVEMENTS: GLOBAL AND NATIONAL**	**3**
Rise of Feminism in Europe and America, Women's Movement in India.		
UNIT IV	**GENDER AND LANGUAGE**	**3**
Linguistic Forms and Gender, Gender and narratives.		
UNIT V	**GENDER AND REPRESENTATION**	**3**
Advertising and popular visual media, Gender and Representation in Alternative Media, Gender and social media.		

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Understand the basic concepts of gender.
CO2: Learn Feminist theories.
CO3: Learn on women's movement nationally and globally.
CO4: Discuss on gender and language.

CO5: Learn about gender representation.

TEXT BOOK(S)	
T1.	Miliann Kang, “Introduction to Women, Gender and Sexualities Studies”, University of Massachusetts Press, 2017.
T2.	Melissa J. Gillis and Andrew T. Jacobs**,** “Introduction to Women's and Gender Studies: An Interdisciplinary Approach”, Pearson, 2019.

REFERENCE BOOK(S)	
R1.	Gail Ukockis,”Women's Issues for a New Generation: A Social Work Perspective”, Pearson, 2016.
R2.	Momin Rahman and Stevi Jackson, “Gender and Sexuality: Sociological Approaches”, 1^{st} Edition, Kindle, 2012.

Course Code: 24MAC007	**Course Title: Elements of Literature**	
Course Category: MC	**Credits: 0**	
L:T:P (Hours/Week) 1:0:0	**Total Contact Hours: 15**	**Max Marks : 100**

COURSE OBJECTIVES
• To develop an awareness of the finer sensibilities of human existence through art.
• To appreciate the role of literature in expressing human experience.
• To explore different forms of literature as modes of human expression.
• To understand the elements of drama.

UNIT I	**RELEVANCE OF LITERATURE**	**3**
a) Enhances Reading, thinking, discussing and writing skills. b) Develops finer sensibility for better human relationship. c) Increases understanding of the problem of humanity without bias. d) Providing space to reconcile and get a cathartic effect.		
UNIT II	**ELEMENTS OF FICTION**	**3**
a) Fiction, fact and literary truth. b) Fictional modes and patterns. c) Plot character and perspective.		
UNIT III	**ELEMENTS OF POETRY**	**3**
a) Emotions and imaginations. b) Figurative language. c) (Simile, metaphor, conceit, symbol, pun and irony). d) Personification and animation. e) Rhetoric and trend.		
UNIT IV	**ELEMENTS OF DRAMA**	**3**
a) Drama as representational art. b) Content mode and elements. c) Theatrical performance. d) Drama as narration, mediation and persuasion. e) Features of tragedy, comedy and satire.		

COURSE OUTCOMES
At the end of this course, students will be able to
CO1: Develop an awareness of the finer sensibilities of human existence through art
CO2: Appreciate the role of literature in expressing human experience
CO3: Explore different forms of literature as modes of human expression
CO4: Understand the features and varieties of drama

TEXT BOOK(S)	
T1.	W.H. Hudson, “An Introduction to the Study of English Literature”, Atlantic, 2007.
T2.	Mario Klarer, Routledge, “An Introduction to Literary Studies”, Pearson, 2013.

REFERENCE BOOK(S)	
R1.	Graham Mode, “The Experience of Poetry”, Open college of Arts with Open Unv Press, 2012.
R2.	J.L.Styan, “The Elements of Drama”, Literary Licensing, 2011.