'येथे बहुतांचे हित'

Marathwada Mitra Mandal's

COLLEGE OF ENGINEERING

Karvenagar, Pune - 52.

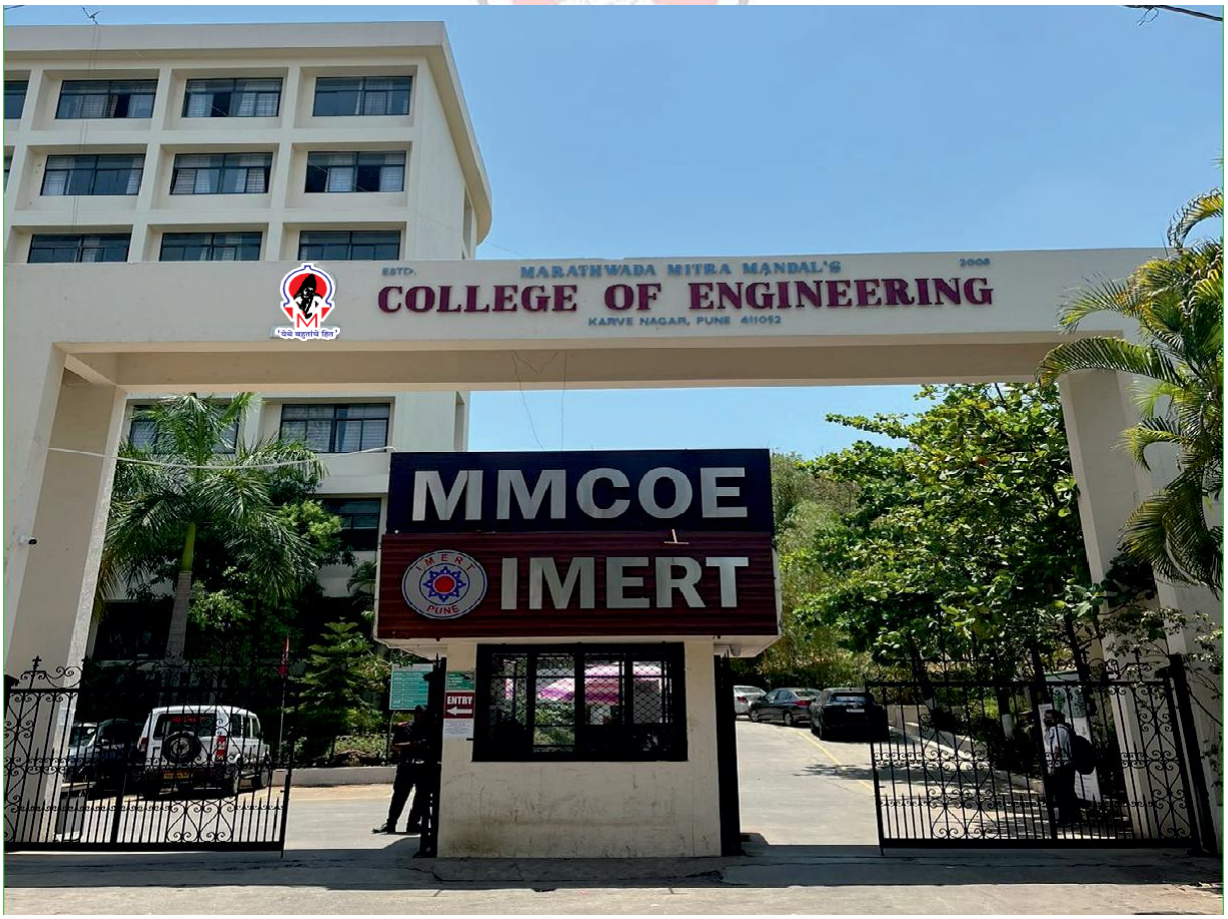
An Autonomous Institute affiliated to SPPU

Accredited with A++ Grade by NAAC
Recipient of Best College award by SPPU | Accredited by NBA
Recognized under 2(f) and 12(B) of UGC Act 1956

www.mmcoe.edu.in

Curriculum Structure and Syllabus

Department of Engineering Science and Humanities



Academic Year 2025-26

Marathwada Mitra Mandal's College of Engineering

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CONTENTS

Institute Vision

To be a globally renowned institution through excellence in engineering education for sustainable and holistic development

Institute Mission

Our Mission is to

M1: Empower students with cutting – edge technologies and global competencies

M2: Foster culture of research and entrepreneurial mind-set

M3: Imbibe social and professional values

M4: Provide an inclusive environment for lifelong learning

"येथे बहुतांचे हित"

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes (PO)

Engineering Graduates will be able to:

PO1	**Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop the solution of complex engineering problems.
PO2	**Problem Analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3	**Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for public health and safety, whole-life cost, net zero carbon, culture, society and environment. (WK5)
PO4	**Conduct Investigations of Complex Problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)
PO5	**Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling, recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO6	**The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)
PO7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8	**Individual and Collaborative Team Work**: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9	**Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
PO10	**Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects in multidisciplinary environments.
PO11	**Life-Long Learning:** Recognize the need for, and have the preparation and ability for: (i) independent and life-long learning, (ii) adaptability to new and emerging technologies, and (iii) critical thinking in the broadest context of technological change. (WK8)

Abbreviations	
BSC:	Basic Science Course
UG:	Undergraduate Programme
ESC:	Engineering Science Course
PCC:	Program Core Courses
PEC:	Program Elective Courses
MDM:	Multidisciplinary Minor Courses
OEL:	Open Elective
VSE:	Vocational & Skill Enhancement Course
AEC:	Ability Enhancement Course
EEM:	Entrepreneurship/Economics/Management
IKS:	Indian Knowledge System
VEC:	Value Education Course
RMD:	Research Methodology
CEP/FPR:	Comm. Eng. Project (CEP)/Field Project (FP)
PRJ:	Project
INT/OJT:	Internship/On-Job Training
CCC:	Co-Curricular Courses
IT:	Internal Tool
ET:	External Tool
ETE:	End –Term Examination
CIE:	Continuous Internal Evaluation
TW:	Term work
OR:	Oral Examination
PR:	Practical Examination
L:	Lecture
P:	Practical
T:	Tutorial
OL:	Online Teaching
ODL:	Open Distance Learning

Assessment Tool Guidelines for Continuous Internal Evaluation (CIE)

AY: 2025-26

Distribution of CIE 40 marks for each subject is as below:

Sr. No.	Unit No.	Weightage	Assessment Tools
1	Unit 1	8 Marks	Class Test
2	Unit 2	8 Marks	
3	Unit 3	8 Marks	1. Quizzes 2. Home Assignments 3. Case Study 4. Field work 5. Report writing 6. Presentations/Seminar Topics 7. Mini projects/Course Projects 8. Mind map 9. Poster Presentation 10. Problem Solving and Coding 11. Parametric Study 12. Any other assessment tool with permission of BoS chairperson
4	Unit 4	8 Marks	
5	Unit 5	8 Marks	

1. Above are the suggestive assessment tools for CIE.
2. The class test is a one-time assessment; no retests will be conducted
3. Module coordinators should review and verify the assessment tools implemented for each course.
4. Course coordinators are required to maintain softcopy records of the respective CIE assessment tools used for their classes.

Department of Artificial Intelligence and Data Science

Department Vision

Emerge globally as a leading center for Artificial Intelligence and Data Science education, contributing to sustainable development.

Department Mission

In alignment with the institute's mission, the AI&DS department is committed to:

M1: Equip students with advanced Artificial Intelligence knowledge for industry- ready skills.

M2: Cultivate a culture of research and entrepreneurship to drive innovation and problem-solving.

M3: Inculcate social and professional values for ensuring holistic development.

M4: Foster a lifelong learning that supports upskilling and global engagement.

Program Educational Objectives (PEOs)

Graduates of the AI&DS program will be able to:

PEO1: Apply, analyze, and evaluate computing skills for problem-solving.

PEO2: Engage in continuous learning through professional development, certifications, emerging technologies in Artificial Intelligence and Data Science.

PEO3: Demonstrate ethical behavior, effective communication and leadership skills in diverse environments.

PEO4: Build successful careers in industry or entrepreneurship,
demonstrating competence and adaptability in a dynamic global environment.

Program Specific Outcomes (PSOs)

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

PSO1: Demonstrate the ability to understand, apply, and develop fundamental computer programs and AI and Data Science solutions using key concepts such as data analytics, machine learning, deep learning and natural language processing.

PSO2: Develop and implement AI and data-driven models by critically analyzing complex problems, designing effective solutions, and evaluating their impact across diverse real-world applications.

PSO3: Utilize emerging AI and Data Science technologies to innovate, promote entrepreneurial ventures, and develop successful careers in industry and research, while embracing lifelong learning and higher education.

F. Y. B. Tech Artificial Intelligence & Data Science Engineering - SEMESTER - I																
Sr. No.	Course Code	Course Name	Course Type	Teaching Scheme (Hrs./week)			Examination Scheme						Credits			
				L	P	T	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
1	SH24BSC151	Applied Physics	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
2	SH24BSC102	Engineering Mathematics -I	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
3	ME24PCC151	Engineering Graphics	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
4	EE24PCC101	Basics of Electrical Technology	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
5	CE24PCC101	Fundamentals of Programming Languages	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
6	SH24BSC155	Applied Physics Lab	BSC	-	2	-	-	-	25	-	-	25	-	1	-	1
7	SH24BSC107	Engineering Mathematics -I Tutorial	BSC	-	-	1	-	-	25	-	-	25	-	-	1	1
8	ME24PCC152	Engineering Graphics Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
9	EE24PCC102	Basics of Electrical Technology Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
10	CE24PCC102	Fundamentals of Programming Languages Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
11	AI24VSE101	Engineering Exploration Lab -1	VSE	-	4	-	-	-	50	-	-	50	-	2	-	2
12	SH24IKS153	Indian Culture & Civilization	IKS	-	-	2	-	-	50	-	-	50	-	-	2	2
13	SH24CCC154	Performing arts	CCC	-	-	1	-	-	25	-	-	25	-	-	1	1
TOTAL				12	6	7	200	300	250	-	-	750	12	3	7	22

F. Y. B. Tech Artificial Intelligence & Data Science Engineering - SEMESTER - II																
Sr. No.	Course Code	Course Name	Course Type	Teaching Scheme (Hrs/week)			Examination Scheme						Credits			
				L	P	T	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
1	SH24BSC101	Applied Chemistry	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
2	SH24BSC152	Engineering Mathematics -II	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
3	SH24ESC103	Geomatics	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
4	ET24PCC101	Basics of Electronics Technology	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
5	AI24PCC151	Foundation of Artificial Intelligence	PCC	2	-	-	40	60	-	-	-	100	2	-	-	2
6	SH24BSC106	Applied Chemistry Lab	BSC	-	2	-	-	-	25	-	-	25	-	1	-	1
7	SH24BSC156	Engineering Mathematics -II Tutorial	BSC	-	-	1	-	-	25	-	-	25	-	-	1	1
8	SH24ESC108	Geomatics Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
9	ET24PCC102	Basics of Electronics Technology Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
10	AI24PCC152	Foundation of Artificial Intelligence Tutorial	PCC	-	-	1	-	-	25	-	-	25	-	-	1	1
11	AI24VSE153	Engineering Exploration Lab - 2	VSE	-	4	-	-	-	50	-	-	50	-	2	-	2
12	SH24AEC104	Communication Skills	AEC	-	-	2	-	-	50	-	-	50	-	-	2	2
13	SH24CCC105	Yoga & Meditation	CCC	-	-	1	-	-	25	-	-	25	-	-	1	1
TOTAL				12	6	7	200	300	250	-	-	750	12	3	7	22

L- Lecture
ETE- End Term Examination
L : 1 Hr.= 1 credit

P- Practical
TW- Term work
P: 2 Hr. = 1 Credit

T- Tutorial
PR- Practical
T: 1 Hr. = 1 Credit

CIE-Continuous Internal Evaluation
OR- Oral

Department of Computer Engineering

Department Vision

To excel in computer engineering education for sustainable development.

Department Mission

M1: To develop globally competent professional through interdisciplinary learning and center for Excellence

M2: To empower research, innovation and entrepreneurial thinking

M3: To promote ethical values and holistic development.

M4: To prepare graduates for lifelong learning and dynamic careers.

Program Educational Objectives (PEOs)

PEO1: Graduates will demonstrate strong foundational knowledge to address global and multidisciplinary challenges.

PEO2: Graduates will engage in innovation, research and entrepreneurship across multidisciplinary domains.

PEO3: Graduates will practice ethical conduct, professional and social responsibility.

PEO4: Graduates will exhibit lifelong learning and communication skill enhancement.

Program Specific Outcomes (PSOs)

PSO1: Apply problem solving skills to design effective solutions in High Performance Computing, Artificial Intelligence and Cyber Security.

PSO2: Develop advanced skill- based solutions using standard Software Engineering practices.

F. Y. B. Tech Computer Engineering - SEMESTER - I																
Sr. No.	Course Code	Course Name	Course Type	Teaching Scheme (Hrs./week)			Examination Scheme						Credits			
				L	P	T	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
1	SH24BSC151	Applied Physics	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
2	SH24BSC102	Engineering Mathematics -I	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
3	ME24PCC151	Engineering Graphics	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
4	EE24PCC101	Basics of Electrical Technology	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
5	CE24PCC101	Fundamentals of Programming Languages	PCC	2	-	-	40	60	-	-	-	100	2	-	-	2
6	SH24BSC155	Applied Physics Lab	BSC	-	2	-	-	-	25	-	-	25	-	1	-	1
7	SH24BSC107	Engineering Mathematics -I Tutorial	BSC	-	-	1	-	-	25	-	-	25	-	-	1	1
8	ME24PCC152	Engineering Graphics Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
9	EE24PCC102	Basics of Electrical Technology Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
10	CE24PCC102	Fundamentals of Programming Languages Tutorial	PCC	-	-	1	-	-	25	-	-	25	-	-	1	1
11	CE24VSE103	Engineering Exploration Lab -1	VSE	-	4	-	-	-	50	-	-	50	-	2	-	2
12	SH24IKS153	Indian Culture & Civilization	IKS	-	-	2	-	-	50	-	-	50	-	-	2	2
13	SH24CCC154	Performing arts	CCC	-	-	1	-	-	25	-	-	25	-	-	1	1
TOTAL				12	6	7	200	300	250	-	-	750	12	3	7	22

F. Y. B. Tech Computer Engineering - SEMESTER - II																
Sr. No.	Course Code	Course Name	Course Type	Teaching Scheme (Hrs/week)			Examination Scheme						Credits			
				L	P	T	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
1	SH24BSC101	Applied Chemistry	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
2	SH24BSC152	Engineering Mathematics -II	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
3	SH24ESC103	Geomatics	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
4	ET24PCC101	Basics of Electronics Technology	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
5	AI24PCC151	Foundation of Artificial Intelligence	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
6	SH24BSC106	Applied Chemistry Lab	BSC	-	2	-	-	-	25	-	-	25	-	1	-	1
7	SH24BSC156	Engineering Mathematics -II Tutorial	BSC	-	-	1	-	-	25	-	-	25	-	-	1	1
8	SH24ESC108	Geomatics Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
9	ET24PCC102	Basics of Electronics Technology Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
10	AI24PCC152	Foundation of Artificial Intelligence Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
11	CE24VSE151	Engineering Exploration Lab - 2	VSE	-	4	-	-	-	50	-	-	50	-	2	-	2
12	SH24AEC104	Communication Skills	AEC	-	-	2	-	-	50	-	-	50	-	-	2	2
13	SH24CCC105	Yoga & Meditation	CCC	-	-	1	-	-	25	-	-	25	-	-	1	1
TOTAL				12	6	7	200	300	250	-	-	750	12	3	7	22

L- Lecture
P- Practical
T- Tutorial
CIE-Continuous Internal Evaluation
ETE- End Term Examination
TW- Term work
PR- Practical
OR- Oral
L : 1 Hr.= 1 credit
P: 2 Hr. = 1 Credit
T: 1 Hr. = 1 Credit

Department of Electrical Engineering

Department Vision

To be center of excellence in electrical engineering by developing globally skilled professionals through innovation, sustainability and technological growth.

Department Mission

M1: To provide quality education in electrical engineering through multidisciplinary, practical and industry oriented learning.

M2: To develop ethical and skilled engineers with expertise in emerging electrical technologies.

M3: To nurture lifelong learning and adaptability for addressing global, societal and future challenge

Program Educational Objectives (PEO)

Engineering Graduates will be able to:

PEO1: Impart innovation and core knowledge to identify, analyse and solve the electrical engineering problems.

PEO2: Excel in Research and enhance their industry oriented professional skills.

PEO3: Demonstrate leadership qualities to lead diverse teams and exhibit commitment towards societal and global needs.

Program Specific Outcomes (PSOs)

After successfully completing the degree program. Electrical engineering graduates will be able to:

PSO1: Design and validate efficient electrical system through core and professional skills.

PSO2: Exhibit multidisciplinary skills in the area of Robotics, AI and Machine Learning for Electrical engineering applications.

PSO3: Formulate sustainable solutions for research in societal and industrial needs pertaining to green technology.

F. Y. B. Tech Electrical Engineering - SEMESTER - I																
Sr. No.	Course Code	Course Name	Course Type	Teaching Scheme (Hrs/week)			Examination Scheme						Credits			
				L	P	T	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
1	SH24BSC151	Applied Physics	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
2	SH24BSC102	Engineering Mathematics -I	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
3	ME24PCC151	Engineering Graphics	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
4	EE24PCC101	Basics of Electrical Technology	PCC	2	-	-	40	60	-	-	-	100	2	-	-	2
5	CE24PCC101	Fundamentals of Programming Languages	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
6	SH24BSC155	Applied Physics Lab	BSC	-	2	-	-	-	25	-	-	25	-	1	-	1
7	SH24BSC107	Engineering Mathematics -I Tutorial	BSC	-	-	1	-	-	25	-	-	25	-	-	1	1
8	ME24PCC152	Engineering Graphics Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
9	EE24PCC102	Basics of Electrical Technology Tutorial	PCC	-	-	1	-	-	25	-	-	25	-	-	1	1
10	CE24PCC102	Fundamentals of Programming Languages Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
11	EE24VSE103	Engineering Exploration Lab -1	VSE	-	4	-	-	-	50	-	-	50	-	2	-	2
12	SH24IKS153	Indian Culture & Civilization	IKS	-	-	2	-	-	50	-	-	50	-	-	2	2
13	SH24CCC154	Performing arts	CCC	-	-	1	-	-	25	-	-	25	-	-	1	1
TOTAL				12	6	7	200	300	250	-	-	750	12	3	7	22

F. Y. B. Tech Electrical Engineering - SEMESTER - II																
Sr. No.	Course Code	Course Name	Course Type	Teaching Scheme (Hrs/week)			Examination Scheme						Credits			
				L	P	T	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
1	SH24BSC101	Applied Chemistry	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
2	SH24BSC152	Engineering Mathematics -II	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
3	SH24ESC103	Geomatics	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
4	ET24PCC101	Basics of Electronics Technology	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
5	AI24PCC151	Foundation of Artificial Intelligence	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
6	SH24BSC106	Applied Chemistry Lab	BSC	-	2	-	-	-	25	-	-	25	-	1	-	1
7	SH24BSC156	Engineering Mathematics -II Tutorial	BSC	-	-	1	-	-	25	-	-	25	-	-	1	1
8	SH24ESC108	Geomatics Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
9	ET24PCC102	Basics of Electronics Technology Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
10	AI24PCC152	Foundation of Artificial Intelligence Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
11	EE24VSE151	Engineering Exploration Lab - 2	VSE	-	4	-	-	-	50	-	-	50	-	2	-	2
12	SH24AEC104	Communication Skills	AEC	-	-	2	-	-	50	-	-	50	-	-	2	2
13	SH24CCC105	Yoga & Meditation	CCC	-	-	1	-	-	25	-	-	25	-	-	1	1
TOTAL				12	6	7	200	300	250	-	-	750	12	3	7	22

L- Lecture P- Practical T- Tutorial CIE-Continuous Internal Evaluation
ETE- End Term Examination TW- Term work PR- Practical OR- Oral
L : 1 Hr.= 1 credit P: 2 Hr. = 1 Credit T: 1 Hr. = 1 Credit

Department of Electronics and Telecommunication Engineering

Department Vision

To cultivate globally competent Electronics and Telecommunication Engineers for developing sustainable solutions

Department Mission

M1: To empower students with foundational and emerging technologies in Electronics and Telecommunication Engineering, fostering global competencies

M2: To foster research and collaborative learning ecosystem that encourages entrepreneurship, holistic and sustainable development

M3: To inculcate ethical values, leadership, adaptability, and a lifelong learnability in a diverse, global engineering

Program Educational Objectives (PEO)

PEO1: Graduates will excel in their professional careers by applying cutting-edge technologies in Electronics and Telecommunication Engineering

PEO2: Graduates will be globally aware, adaptive, and capable of solving real-world problems through multidisciplinary and innovative thinking.

PEO3: Graduates will evolve into professionals with strong communication, teamwork, leadership, and ethical decision-making capabilities with societal and environmental awareness

Program Specific Outcomes (PSOs)

Students will be able,

PSO1: To apply principles of Embedded Systems, VLSI, Communication, and Automation using modern hardware and software tools to develop effective E&TC solutions.

PSO2: To design and develop multidisciplinary, innovative, sustainable solutions through project-based learning to address industrial, societal, and environmental needs.

F. Y. B. Tech Electronics and Telecommunication Engineering - SEMESTER - I																
Sr. No.	Course Code	Course Name	Course Type	Teaching Scheme (Hrs/week)			Examination Scheme						Credits			
				L	P	T	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
1	SH24BSC101	Applied Chemistry	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
2	SH24BSC102	Engineering Mathematics -I	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
3	SH24ESC103	Geomatics	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
4	ET24PCC101	Basics of Electronics Technology	PCC	2	-	-	40	60	-	-	-	100	2	-	-	2
5	AI24PCC151	Foundation of Artificial Intelligence	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
6	SH24BSC106	Applied Chemistry Lab	BSC	-	2	-	-	-	25	-	-	25	-	1	-	1
7	SH24BSC107	Engineering Mathematics - I Tutorial	BSC	-	-	1	-	-	25	-	-	25	-	-	1	1
8	SH24ESC108	Geomatics Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
9	ET24PCC102	Basics of Electronics Technology Tutorial	PCC	-	-	1	-	-	25	-	-	25	-	-	1	1
10	AI24PCC152	Foundation of Artificial Intelligence Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
11	ET24VSE103	Engineering Exploration Lab -1	VSE	-	4	-	-	-	50	-	-	50	-	2	-	2
12	SH24AEC104	Communication Skills	AEC	-	-	2	-	-	50	-	-	50	-	-	2	2
13	SH24CCC105	Yoga & Meditation	CCC	-	-	1	-	-	25	-	-	25	-	-	1	1
TOTAL				12	6	7	200	300	250	-	-	750	12	3	7	22

F. Y. B. Tech Electronics and Telecommunication Engineering - SEMESTER - II																
Sr. No.	Course Code	Course Name	Course Type	Teaching Scheme (Hrs./week)			Examination Scheme						Credits			
				L	P	T	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
1	SH24BSC151	Applied Physics	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
2	SH24BSC152	Engineering Mathematics -II	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
3	ME24PCC151	Engineering Graphics	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
4	EE24PCC101	Basics of Electrical Technology	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
5	CE24PCC101	Fundamentals of Programming Languages	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
6	SH24BSC155	Applied Physics Lab	BSC	-	2	-	-	-	25	-	-	25	-	1	-	1
7	SH24BSC156	Engineering Mathematics -II Tutorial	BSC	-	-	1	-	-	25	-	-	25	-	-	1	1
8	ME24PCC152	Engineering Graphics Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
9	EE24PCC102	Basics of Electrical Technology Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
10	CE24PCC102	Fundamentals of Programming Languages Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
11	ET24VSE151	Engineering Exploration Lab - 2	VSE	-	4	-	-	-	50	-	-	50	-	2	-	2
12	SH24IKS153	Indian Culture & Civilization	IKS	-	-	2	-	-	50	-	-	50	-	-	2	2
13	SH24CCC154	Performing arts	CCC	-	-	1	-	-	25	-	-	25	-	-	1	1
TOTAL				12	6	7	200	300	250	-	-	750	12	3	7	22

L- Lecture P- Practical T- Tutorial CIE-Continuous Internal Evaluation

ETE- End Term Examination TW- Term work PR- Practical OR- Oral

L : 1 Hr.= 1 credit P: 2 Hr. = 1 Credit T: 1 Hr. = 1 Credit

Department of Information Technology

Department Vision

To emerge as a globally competent center in education, research and innovation in Information Technology, fostering sustainable development with a holistic vision.

Department Mission

M1: To impart IT education that develops globally competent professionals.
M2: To promote innovation through research and entrepreneurship.
M3: To encourage lifelong learning and holistic commitment towards societal development.

Program Educational Objectives (PEO)

The students of Information Technology Department after passing out will:
PEO1: Exhibit the capabilities to excel as IT professionals with strong knowledge and innovative thinking.

PEO2: Demonstrate leadership in the IT Industry, pursue lifelong learning and contribute through research & collaboration.

PEO3: Apply innovations and ethical practices for sustainable technological advancement and societal enrichment.

Program Specific Outcomes (PSOs)

Information Technology graduates will be able to:

PSO1: Design and develop information systems using principles of computing to solve real-world problems.

PSO2: Integrate emerging IT technologies to innovate and improve technological ecosystems.

F. Y. B. Tech Information Technology - SEMESTER - I																
Sr. No.	Course Code	Course Name	Course Type	Teaching Scheme (Hrs/week)			Examination Scheme						Credits			
				L	P	T	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
1	SH24BSC101	Applied Chemistry	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
2	SH24BSC102	Engineering Mathematics -I	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
3	SH24ESC103	Geomatics	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
4	ET24PCC101	Basics of Electronics Technology	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
5	IT24PCC101	Programming and Logic Building	PCC	2	-	-	40	60	-	-	-	100	2	-	-	2
6	SH24BSC106	Applied Chemistry Lab	BSC	-	2	-	-	-	25	-	-	25	-	1	-	1
7	SH24BSC107	Engineering Mathematics - I Tutorial	BSC	-	-	1	-	-	25	-	-	25	-	-	1	1
8	SH24ESC108	Geomatics Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
9	ET24PCC102	Basics of Electronics Technology Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
10	IT24PCC102	Programming and Logic Building Tutorial	PCC	-	-	1	-	-	25	-	-	25	-	-	1	1
11	IT24VSE103	Engineering Exploration Lab -1	VSE	-	4	-	-	-	50	-	-	50	-	2	-	2
12	SH24AEC104	Communication Skills	AEC	-	-	2	-	-	50	-	-	50	-	-	2	2
13	SH24CCC105	Yoga & Meditation	CCC	-	-	1	-	-	25	-	-	25	-	-	1	1
TOTAL				12	6	7	200	300	250	-	-	750	12	3	7	22

F. Y. B. Tech Information Technology - SEMESTER - II																
Sr. No.	Course Code	Course Name	Course Type	Teaching Scheme (Hrs/week)			Examination Scheme						Credits			
				L	P	T	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
1	SH24BSC151	Applied Physics	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
2	SH24BSC152	Engineering Mathematics -II	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
3	ME24PCC151	Engineering Graphics	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
4	EE24PCC101	Basics of Electrical Technology	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
5	AI24PCC151	Foundation of Artificial Intelligence	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
6	SH24BSC155	Applied Physics Lab	BSC	-	2	-	-	-	25	-	-	25	-	1	-	1
7	SH24BSC156	Engineering Mathematics -II Tutorial	BSC	-	-	1	-	-	25	-	-	25	-	-	1	1
8	ME24PCC152	Engineering Graphics Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
9	EE24PCC102	Basics of Electrical Technology Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
10	AI24PCC152	Foundation of Artificial Intelligence Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
11	IT24VSE151	Engineering Exploration Lab - 2	VSE	-	4	-	-	-	50	-	-	50	-	2	-	2
12	SH24IKS153	Indian Culture & Civilization	IKS	-	-	2	-	-	50	-	-	50	-	-	2	2
13	SH24CCC154	Performing arts	CCC	-	-	1	-	-	25	-	-	25	-	-	1	1
TOTAL				12	6	7	200	300	250	-	-	750	12	3	7	22

L- Lecture P- Practical T- Tutorial CIE-Continuous Internal Evaluation
ETE- End Term Examination TW- Term work PR- Practical OR- Oral
L : 1 Hr.= 1 credit P: 2 Hr. = 1 Credit T: 1 Hr. = 1 Credit

Department of Mechanical Engineering

Department Vision

To develop globally competent and socially committed mechanical engineers

Department Mission

Our Mission is to

1. Develop competent professionals through center of excellence

2. Strengthen industry-academia collaboration for ethically responding real- world problems

3. Provide an inclusive environment for entrepreneurship, research and innovation.

4. Empower students for higher education and lifelong learning

Program Educational Objectives (PEO)

Graduates from our program will:

1. Apply professional skills for solving the problems in mechanical engineering & related fields.

2. Demonstrate ethics and concern for society and the environment.

3. Embrace lifelong learning through higher studies, research and innovation.

Program Specific Outcomes (PSOs)

Graduates from our program will:

PS0-I: Apply advanced technologies of mechanical and allied engineering to address the challenges faced in Industry 4.0.

PS0-II: Contribute to the project in the core and associated domain by using add-on skills like CAD, CAM and CAE.

PS0-III: Develop the ability to innovate socially relevant products and systems by effectively utilizing resources.

F. Y. B. Tech Mechanical Engineering - SEMESTER - I																
Sr. No.	Course Code	Course Name	Course Type	Teaching Scheme (Hrs/week)			Examination Scheme						Credits			
				L	P	T	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
1	SH24BSC101	Applied Chemistry	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
2	SH24BSC102	Engineering Mathematics -I	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
3	SH24ESC103	Geomatics	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
4	ET24PCC101	Basics of Electronics Technology	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
5	AI24PCC151	Foundation of Artificial Intelligence	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
6	SH24BSC106	Applied Chemistry Lab	BSC	-	2	-	-	-	25	-	-	25	-	1	-	1
7	SH24BSC107	Engineering Mathematics - I Tutorial	BSC	-	-	1	-	-	25	-	-	25	-	-	1	1
8	SH24ESC108	Geomatics Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
9	ET24PCC102	Basics of Electronics Technology Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
10	AI24PCC152	Foundation of Artificial Intelligence Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
11	ME24VSE101	Engineering Exploration Lab -1	VSE	-	4	-	-	-	50	-	-	50	-	2	-	2
12	SH24AEC104	Communication Skills	AEC	-	-	2	-	-	50	-	-	50	-	-	2	2
13	SH24CCC105	Yoga & Meditation	CCC	-	-	1	-	-	25	-	-	25	-	-	1	1
TOTAL				12	6	7	200	300	250	-	-	750	12	3	7	22

F. Y. B. Tech Mechanical Engineering - SEMESTER - II																
Sr. No.	Course Code	Course Name	Course Type	Teaching Scheme (Hrs/week)			Examination Scheme						Credits			
				L	P	T	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
1	SH24BSC151	Applied Physics	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
2	SH24BSC152	Engineering Mathematics -II	BSC	3	-	-	40	60	-	-	-	100	3	-	-	3
3	ME24PCC151	Engineering Graphics	PCC	2	-	-	40	60	-	-	-	100	2	-	-	2
4	EE24PCC101	Basics of Electrical Technology	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
5	CE24PCC101	Fundamentals of Programming Languages	ESC	2	-	-	40	60	-	-	-	100	2	-	-	2
6	SH24BSC155	Applied Physics Lab	BSC	-	2	-	-	-	25	-	-	25	-	1	-	1
7	SH24BSC156	Engineering Mathematics -II Tutorial	BSC	-	-	1	-	-	25	-	-	25	-	-	1	1
8	ME24PCC152	Engineering Graphics Tutorial	PCC	-	-	1	-	-	25	-	-	25	-	-	1	1
9	EE24PCC102	Basics of Electrical Technology Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
10	CE24PCC102	Fundamentals of Programming Languages Tutorial	ESC	-	-	1	-	-	25	-	-	25	-	-	1	1
11	ME24VSE153	Engineering Exploration Lab - 2	VSE	-	4	-	-	-	50	-	-	50	-	2	-	2
12	SH24IKS153	Indian Culture & Civilization	IKS	-	-	2	-	-	50	-	-	50	-	-	2	2
13	SH24CCC154	Performing arts	CCC	-	-	1	-	-	25	-	-	25	-	-	1	1
TOTAL				12	6	7	200	300	250	-	-	750	12	3	7	22

L- Lecture P- Practical T- Tutorial CIE-Continuous Internal Evaluation
ETE- End Term Examination TW- Term work PR- Practical OR- Oral
L : 1 Hr.= 1 credit P: 2 Hr. = 1 Credit T: 1 Hr. = 1 Credit

SEMESTER I

First Year B. Tech

Semester: I/II

Course Code: SH24BSC151 **Course Name: Applied Physics**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
3	-	-	-	-	40	60	-	-	-	100	3	-	-	3

Prerequisites: -

1. Basic knowledge of high-school physics, especially wave phenomena, optics, and electromagnetism.
2. Familiarity with basic algebra, trigonometry, and introductory calculus (integration and differentiation).
3. Exposure to elementary concepts of electric circuits and energy.

Course Objectives:

- To introduce the wave nature of light and its applications in determining material properties using interference, diffraction, and polarization phenomena.
- To develop an understanding of quantum mechanics and the Schrödinger equation for analyzing microscopic systems.
- To impart fundamental concepts of solid-state physics, focusing on semiconductors and sensor technologies relevant to modern electronics.
- To provide insights into material classification based on structural and physical characteristics, and introduce basic characterization techniques.
- To explain the working principles of lasers and explore their practical applications in emerging technologies like photonics and optical communication.

Course Outcomes:

After completing the course, the students will be able to :

CO1: Apply the principles of interference, diffraction, and polarization to determine physical properties such as film thickness and specific rotation

CO2: Use foundational concepts of quantum physics and apply Schrödinger's equation to evaluate energy states in quantum systems

CO3: Apply the principles of physics to analyze semiconductor devices and sensors, and recognize their evolving applications in modern technology

CO4: Organize solid materials into main groups and select suitable characterization techniques to measure their physical properties

CO5: Apply laser principles to analyze and recommend their use in emerging fields like communication, photonics, etc.

Unit	Contents	Duration (Hrs.)
1	**Radiation: Properties and applications:** Interference, Thin film interference, Antireflection coatings, Fraunhofer diffraction, Diffraction grating, Resolving power, Polarization of light, Specific rotation due to optically active solutions, Applications	8
2	**Quantum Physics**: De Broglie Hypothesis, properties of matter waves, Heisenberg's Uncertainty principle, Wave function, Schrodinger's Equation, Particle in an infinite potential well (rigid box), Quantum Tunneling & its application in STM, Fundamentals of Quantum computing	7
3	**Physics of semiconductor devices & sensors:** Hall effect, Formation of energy bands, Types of solids based on band gap, Energy level diagrams of semiconductors, Direct and Indirect band gap semiconductors, Diode, Tunnel Diode, Solar Cell Introduction to various sensors: Optical Sensors, Temperature sensors, Humidity sensor, Pressure sensor, Proximity sensor	8
4	**Materials and Characterization:** Materials: metals, semiconductors, polymers, ceramics, composites and magnetic materials Characterization techniques: XRD, UV spectroscopy, SEM, Differential thermal analysis (DTA), Ultrasonic testing	8

5	**Lasers and Optical fibers:** Stimulated absorption, spontaneous emission, stimulated emission, Essential components of lasers, He-Ne laser, Semiconductor laser, Applications of lasers in holography and other fields Fiber optics: Basic parameters, Types of fibers, Applications in communication	8
	Total Hours	**39**

Text Books

1. M N Avadhanulu , P G Kshirsagar; 'A Textbook of Engineering Physics', S. Chand and Publications, ISBN-81-219-0817-5
2. S.L. Gupta, Sanjeeve Gupta; 'Modern Engineering Physics', Dhanpat Rai Publications, 1st Edition, ISBN-978-93-83182-46-6
3. D. Patranabis; 'Sensors and Transducers', PHI Learning Pvt Ltd, 2nd Edition, ISBN–978-81-203-2198-4

Reference Book

1. B. B. Laud; 'Lasers And Non-Linear Optics', New Age International Publications, ISBN-978-8122430561
2. Malik and Singh; 'Engineering Physics', Tata Mc Graw Hill, ISBN-978-9352606955
3. Kittel C.; 'Introduction to Solid State Physics', Wiley and Sons, ISBN- 0-471-41526-X
4. Jacob Millman, Chirstos Halkias; 'Integrated Electronics, Analog and Digital Circuits and Systems', Tata McGraw Hill, ISBN-978-0070423152
5. C S Rangan, G R Sharma, V S V Mani; 'Instrumentation- Devices and Systems',Tata McGraw Hill, 2nd Edition, ISBN-0-07-463350-3

Online References

1. https://www.electricity-magnetism.org/color-sensors/
2. https://electronics.howstuffworks.com/diode.htm
3. https://science.howstuffworks.com/laser.htm
4. Semiconductor Physics - https://archive.nptel.ac.in/courses/108/106/108106181/
5. Quantum Physics- https://archive.nptel.ac.in/courses/122/106/122106034/
6. Lasers - https://archive.nptel.ac.in/courses/115/102/115102124/
7. Optics - https://archive.nptel.ac.in/courses/122/107/122107035/

First Year B. Tech

Semester - I

Course Code: SH24BSC102 **Course Name: Engineering Mathematics-I**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
3	-	-	-	-	40	60	-	-	-	100	3	-	-	3

Prerequisites:
Linear, quadratic equations and Graphical representation of standard functions, Periodic and trigonometric functions and trigonometric identities, Limits and continuity, differentiation and introduction to integration, Determinants, matrices and its operations.

Course Objectives:

- To develop a comprehensive understanding of matrix theory.
- To introduce the principles of eigenvalues and eigenvectors and explore their practical applications in engineering problems.
- To enhance analytical skills through the study of differential calculus.
- To help students learn how to work with functions of several variables.
- To introduce students to Fourier series and apply this knowledge to solve engineering problems

Course Outcomes: After Completing the course, the students will be able to:
CO1: Apply the knowledge of Matrices for solving systems of linear equations in various fields of Engineering.
CO2: Solve Problems in Engineering using Eigen values and Eigen vectors.
CO3: Apply Mean value theorems and its generalizations leading to Taylor's and Maclaurin's series is useful in the analysis of engineering problems.
CO4: Apply the concept of Partial derivatives to examine maxima / minima of real variable functions and apply the concept of Jacobian to find functional dependence.
CO5: Analyze the Fourier series representation and harmonic analysis for periodic, continuous functions.

Unit	Contents	Duration (Hrs.)
1	**Matrices** Rank of a matrix, Echelon form, System of linear equations, Linear dependence and independence of vectors, **Applications of system of linear equations**.	8
2	**Eigenvalues and Eigen vectors** Linear transformation, Eigen values and Eigen vector, Cayley-Hamilton theorem, Applications of Eigen values and Eigen vectors to Engineering.	8
3	**Differential Calculus:** Mean value theorems, Expansion of a function, Taylor's and Maclaurin's series, Expansion of function using standard expansions, Applications of Mean value theorem.	7
4	**Partial Differentiation and its Applications:** Introduction to functions of several variables, Partial derivatives, Euler's Theorem for Homogeneous functions, Partial derivatives of composite function, Jacobians, Maxima and Minima of a function of two independent variables.	8
5	**Fourier Series:** Definition, Dirichlet's conditions, Full range Fourier series, Half range Fourier series, Harmonic analysis, Applications of Fourier series.	8
	Total Hours	**39**

Text Books

1. Thomas' Calculus (12th edition) by Maurice D. Weir, Joel Hass, Frank R. Giordano, Pearson Education **ISBN** 13: 9780321518927.
2. Greenberg Michael D., "Advanced Engineering Mathematics", 2nd edition, Pearson 2009 **ISBN**, 8177585460
3. Higher Engineering Mathematics by B. S. Grewal, 43e, Khanna Publication, Delhi ISBN 1-84265-086-6.
4. Getting started with MATLAB : A quick Introduction for Scientists and Engineers, By Rudra Pratap **ISBN**-13: 978-0198069195

Reference Book

1. Mathematics-I (Calculus and Linear Algebra) by Leena Garg **ISBN**-10. 9391505279; **ISBN**-13. 978-9391505271
2. David F. Rogers, J. Alan Adams, "Mathematical Elements For Computer Graphics" McGraw-Hill 1976. **ISBN**-13: 978-0070535305
3. Differential Calculus by Shanti Narayan, S. Chand and company, New Delhi. **ISBN**-13. 978-8121904711
4. Advanced Engineering Mathematics by C.R. Wylie, McGraw Hill Publications, New Delhi. ISBN-13 978-0070722064
5. Kreyszig Erwin, "Advanced Engineering Mathematics", 10th edition, Wiley Eastern Limited, 2015 ***ISBN***: 9788126554232

Online References

1. Integral equations, calculus of variation and Its applications, IIT Roorkee: **System of Linear Equations**| Prof. Premananda Bera| **IIT** Roorkee| **NPTEL** (Link)
2. **NPTEL** visit http://**nptel** ... Mod-01 Lec-06 **Eigen Value** and **Eigen Vectors** (Link)
3. **Partial Derivatives** of Functions of Two Variables (Link)
4. **Jacobian** matrix Lecture 10 - Chain rule for ... **Maxima and Minima** for Several Variables Lecture **IIT** KANPUR-**NPTEL** (Link)
5. **Rolle's Theorem**, **Mean value theorem** - Part- 1.**NPTEL**-NOC IITM (Link)
6. **Fourier series** - Examples. **NPTEL**-NOC IITM (Link)

First Year B. Tech

Semester - I / II

Course Code: SH24BSC101 **Course Name: Applied Chemistry**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
3		-	-	-	40	60	-	-		100	3		-	3

Prerequisites: Learners should have understanding of basic chemistry, including concepts such as atomic structure, chemical bonding, states of matter, acids and bases, and redox (oxidation-reduction) reactions.

Course Objectives:

- To explore different specialty polymers and nanomaterials, highlighting their structure and properties based on the applications.
- Recognize and assess different water purification technologies for their effectiveness in promoting a safe and green environment.
- To understand the challenges and future prospects of integrating hydrogen and electrochemical energy systems into modern energy infrastructures.

Course Outcomes: After learning the course, the students will be able to:

CO1: **Classify** relevant material based on properties and performance requirements for engineering applications.

CO2: **Demonstrate** suitable methods to monitor water quality effectively to eliminate and reduce contamination or non-desirable characteristics of water.

CO3: **Apply** appropriate advanced electroanalytical techniques to solve engineering problems using highly specialized instrumentation.

CO4: **Explain** different types of fuels based on their origin, chemical compositions and energy content for environmental impact.

CO5: **Examine** comprehensive understanding of advanced energy storage solutions & environmental monitoring systems by sensor technologies.

Unit	Contents	Duration (Hrs.)
1	**Material Science: Speciality polymers:** 1.Engineering Thermoplastic,2. Conducting Polymer, 3. Electroluminescent polymer, 4. Biodegradable polymer, 5. Liquid Crystal Polymers; **Nanomaterials:** Graphene and carbon nanotubes, quantum dots (semiconductor nanoparticles), Nanotechnology in space.	7
2	**Water & Green Chemistry: Water:** Chemical analysis of water, Ill effects of hard water in boiler, External Water treatment - Zeolite & Demineralization method, Purification Techniques of water, IOT based water quality monitoring system. **Green Chemistry:** 12 principles of green chemistry with examples, numericals on Atom Economy, Real Life applications.	8
3	**Advance Techniques in Electroanalytical Chemistry:** Reference & Indicator electrode; Conductometry: Conductivity cell, & its use in conductometric analysis, pHmetry: Standardization of pH meter & pH metric analysis, UV Visible & IR spectroscopy: Principle, Instrumentation and Applications.	8
4	**Energy Systems & Sustainability: Energy Systems:** Calorific value (CV) & Types, Determination of Calorific value, Solid fuel: Coal: Analysis of Coal, Alternative fuels: Power alcohol, biodiesel, Hydrogen -Energy for the future. **Sustainability:** Pollution, Classification, Global Environmental Issues, Waste management using IOT system.	8
5	**Battery, Fuel cells & Sensor Technology: Batteries:** Classification of Batteries, Internet-of-batteries for electric Vehicles–Architectures, opportunities, and challenges; **Fuel Cells** - Types & its Engineering aspects, **Sensors** - Types & Real time Applications of sensors.	8
	Total Hours	**39**

Text Books

1. Dr. S.S. Dara, Dr. S.S. Umare, "A Textbook of Engineering Chemistry", S Chand & Company Ltd. 2018.
2. O.G. Palanna "Engineering Chemistry", Tata McGraw-Hill Publishing Co. Ltd. 2009.
3. Shashi Chawla "A Textbook of Engineering Chemistry", Dhanpat Rai & Co. 2015.
4. S P Sukhatme and J K Nayak, "Solar Energy", McGraw Hill, 4th Edition 2017.
5. B.R. Puri and L.R. Sharma, "Principles of Physical Chemistry", 45th Edition, Vishal Publishing Co. 2012.

Reference Books

1. Joel.R.Fried "Polymer Science and Technology", Univ.of Cincinnati,Prentice Hall and India Products,2002.
2. S. M. Khopkar "Basic Concepts of Analytical Chemistry by New age International Publishers".
3. A.K.De, "Environmental Chemistry'', 8th edition, New Age International, 2016.
4. David Linden, "Handbook on batteries and fuel cells'' 'McGraw Hill, 1st edition, 1984, ISBN:978-0078378742.
5. Ram D. Gupta 'Hydrogen fuel', C.R.C. Publications (2009).
6. Brown, Lawrence, Holme, Thomas "Chemistry for Engineering Students", 4th Edition 2018.

Online References

1. Materials science | Definition, Types, Study, & Facts | Britannica
2. https://www.watertechonline.com/magazine/62234
3. https://onlinelibrary.wiley.com/doi/book/10.1002/047174199X
4. https://www.nationalgrid.com/stories/energy-explained/what-is-hydrogen
5. https://www.energy.gov/eere/fuelcells/fuel-cell-basics
6. https://chemicals.gov.in/green-chemistry

First Year B. Tech

Semester: I/II

Course Code: SH24ESC103 **Course Name: Geomatics**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
2	-	-	-	-	40	60	-	-	-	100	2	-	-	2

Prerequisites:
1. The concept of electromagnetic spectrum
2. Wavelength, microwave radiation, optical Radiation
3. Basic knowledge of mathematical statistics –mean, median, mode
4. Correlation/Variance between two variables
5. What is data analysis?

Course Objective:

1. Understand the principles and applications of remote sensing and its role in geospatial data acquisition and analysis.
2. Gain foundational knowledge of GIS and GPS technologies and explore their integration for spatial data handling and interpretation.
3. Study the characteristics of aerial photographs and satellite imagery, and learn to interpret spatial and spectral information.
4. Develop skills in map creation and design using cartographic techniques, focusing on effective spatial representation and visualization.
5. Explore the real-world applications of geomatics technologies in domains such as urban planning, disaster management, agriculture, and environmental monitoring.

Course Outcomes: After completing the course, the students will be able to:
CO1: Execute the advanced knowledge of remote sensing
CO2: Illustrate various GIS and GPS tools and techniques within spatial analytical framework
CO3: Determine the relation between aerial photographs and satellite imagery
CO4: Implement the art of making maps through cartography.
CO5: Correlate Geomatics technologies to real-world examples.

Unit	Contents	Duration (Hrs.)
1	**Principles of Remote Sensing** Basic concepts of Remote Sensing, Historical overview, Evolution of satellite, Characteristics and Types of Orbits, Working Principles of Remote Sensing System, Types of sensors (Optical & Microwave), Platforms, Remote Sensing systems, Resolution of sensors, Visual interpretation Techniques, Understanding application based Remote sensing data usage, Data Procurement (Purchase & Download)	6
2	**Geographical Information System & Global Positioning System** Introduction to GIS, Fundamental concepts, Objectives, Importance of GIS, Types & Components of GIS, Spatial Data Representation, Relationships of spatial objects, GIS functions, Database management for geoinformatics: Components GIS Data and Data Models. Introduction to GPS, Components of the GPS system, Coordinates and Reference Systems, Fundamental Concepts of GPS, Operational principle, GNSS System, Introduction to DGPS, Integration of GPS with GIS, Introduction to VPS and its Usage	5
3	**Aerial Photography to Digital Satellite Images** Fundamentals of Aerial photography and types of aerial Photographs, Geometry of aerial photographs, Scale of aerial photographs, Digital satellite image concept, Radiometric correction, Geometric correction, Image enhancement techniques, Digital Satellite image classification, Concept of Digital image processing	5
4	**Cartography** Evolution of cartography, Role of technology in the development of cartography, Concept of Map Scale, Types of Maps, element of cartography, Geodesy and Coordinate System, Digital	5

	Cartography, Type of Maps and its Usage, **Concept of 3D map,** Standard Principles of Cartography, Typography and Labeling, Ethics in Cartography	
5	**Application of Geomatics** • Agriculture and forestry • Urban planning • Disaster Management • Utility GIS (Piped city Gas distribution networks in India) • Telecom Sector use, GIS networking • Location services • Vehicle tracking System • Water Resources and Hydrology	5
	Total Hours	**26**

Text Books

1. Remote Sensing of the Environment: An Earth Resource Perspective by John R. Jensen; ISBN-13:9780131889507
2. G. S. Srivastava (2014) An Introduction to Geoinformatics. McGraw Hill Education (India) Private Limited. New Delhi. India. ISBN: 9781259058462.
3. Michael N. DeMers (2008) Fundamentals of Geographic Information Systems (4th Ed). Wiley. ISBN: 978- 0-470-12906-7.
4. T. M. Lillesand, R. W. Kiefer, J. W. Chipman (2004) Remote Sensing and Image Interpretation (5th Ed). Wiley. ISBN: 0-471-15227-7

Reference Books

1. L. E. Johnson (2009) Geographic Information Systems in Water Resources Engineering. CRC Press. Taylor & Francis Group. ISBN 978-1-4200-6913-6.
2. Brian Tomaszewski (2015) Geographic Information Systems (GIS) for Disaster Management. CRC Press. Taylor & Francis Group. ISBN-13: 978-1-4822-1169-6.
3. Myer Kutz (Ed.) (2004) Gary S. Spring. Applications of GIS In Transportation. In book: Handbook of Transportation. McGraw-Hill Handbooks
4. Digital Image Processing Rafael C. Gonzalez and Richard E. Woods ISBN 10: 1-292-22304-9, ISBN 13:978-1-292-22304-9
5. Global Positioning System: Signals, Measurements, and Performance (Revised Second Edition); Pratap Misra, Ph.D., and Per Enge, Ph.D.

Online References

1. Prof. Arun K. Saraf (2016) Introduction to Geographic Information System. NPTEL https://nptel.ac.in/courses/105/107/105107155/
2. Prof. Arun K. Saraf (2017) Introduction to Remote Sensing. NPTEL https://nptel.ac.in/courses/121/107/121107009/
3. Prof. Rishikesh Bharti (2019) Remote Sensing and GIS. NPTEL https://nptel.ac.in/courses/105/103/105103193/
4. https://www.civil.iitb.ac.in/~dhingra/ce152_files/ce152_MNK.pdf ONING SYSTEM (iitb.ac.in)

First Year B. Tech Electrical Engineering

Semester-I / II

Course Code: EE24PCC101 **Course Name: Basics of Electrical Technology**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
2	-	-	-	-	40	60	-	-	-	100	2	-	-	2

Prerequisite: Ohm's Law, Concept of current, voltage, resistance, electric power, electric energy.

Course Objectives:

- To analyze basic DC resistive circuits and understand AC circuit behavior.
- To explain the relationship line and phase quantities in a balanced three-phase AC system.
- To understand construction and operation of transformer and rotating machines.
- To introduce LT switchgear components and computation of billing for residential consumers.

Course Outcomes: After learning the course, the students will be able to:

CO1: Analyze the resistive circuits using KVL, KCL and different network theorems under DC supply.
CO2: Analyze AC circuit parameters & develop phasor diagram.
CO3: Evaluate relationship between line & phase quantities in three phase networks.
CO4: Explain the operation of single-phase transformer, generator and alternator.
CO5: Identify LT switchgear components and energy bill calculation for residential consumers.

Unit	Contents	Duration (Hrs.)
1	**Introduction to DC Circuits and Network Theorems** Classification of electrical networks, Energy sources – ideal and practical voltage and current sources, Simplifications of networks using series and parallel combinations. Kirchhoff's laws and their applications for network solutions using loop analysis. Verification of Superposition theorem, Thevenin's theorem, Maximum power transfer theorem and Norton's theorem.	6
2	**A.C. Fundamentals** Introduction to generation of sine wave and its terminologies, analysis of series circuits consisting of R, L and C. Concept of impedance, phasor representation of AC quantity, polar and rectangular representation of alternating quantities.	5
3	**Three phase A.C. System** Concept of 3 phase AC symmetrical system, Advantages over single phase system, phase sequence, balanced and unbalanced load. Voltage, current and power relation in three phase star and delta connected load along with phasor diagram.	5
4	**Introduction to Transformer & Rotating Machines** Working principle of transformer, Generator and Alternator, it's types, various parts and applications.	5
5	**LT electrical systems and Energy billing** Components of LT Switchgear, MCB, ELCB, MCCB selection and their rating. Installation procedure, necessity of earthing. Block diagram of electrical power system & Descriptive treatment of single line diagram. Concept of tariff, Reading of single-phase energy electricity bills and load calculation numericals.	5
	Total Hours	**26**

Text Books

1. V.K.Mehta, Rohit Mehta, " Basic Electrical Engineering ", S. Chand Publications. 2009
2. J.B.Gupta, "Basic Electrical Engineering", S.K.Kataria publication.2012
3. B.L.Theraja, "A text book on Electrical technology", Vol- 1 and Volume -2, S. Chand Publications 2007
4. C. L. Wadhwa, "Basic Electrical Engineering", S. Chand Publications.

5. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill Education, 2nd edition 2019
6. Bhalja, Maheshwari ,Chotani " Protection and switchgear" Oxford Higher Education.

Reference Books

1. H.Cotton, " Electrical technology" , CBS Publications, 7th Edition
2. E. Hughes, "Electrical and Electronics Technology," 11th Edition Pearson
3. William Hayt," Engineering Circuit analysis," Tata McGraw Hill
4. D.P.Kothari and I.J.Nagrath, "Electrical Machines," McGraw Hill
5. Dr. B.R.Gupta " Power system analysis and design" S.Chand Publication

Online References

1. NPTEL Course: Dr. Gajendranath Chowdary, IIT Hyderabad, "Basic Electrical Circuits" (Link).
2. NPTEL Course: Prof. Ashok Kumar Pradhan, IIT Kharagpur, "A Basic Course on Electric and Magnetic Circuits" (Link).

First Year B. Tech Electronics and Telecommunication Engineering

Semester-I/ II

Course Code : ET24PCC101 **Course Name: Basics of Electronics Technology**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
2	-	-	-	-	40	60	-	-	-	100	2	-	-	2

Prerequisite:
Atom theory, Valence band structure and energy band gap of an atom, P-N junction, working and characteristics of PN junction Diode in forward and reverse bias condition, Drift and diffusion current

Course Objectives:

- To provide students with fundamental understanding and practical skills to design and implement DC power supplies using diode rectifiers and filter circuits
- To understand the working principles of amplifier and switch circuits utilizing Bipolar Junction Transistor (BJT).
- To develop comprehensive knowledge of MOSFETs, OP-AMPs, and basic digital circuit concepts essential for modern electronic applications
- To introduce the types, working principles, and applications of sensors used in the measurement of physical quantities such as temperature, pressure, and light
- To familiarize students with the fundamental principles, components, and processes involved in electronic communication systems

Course Outcomes: After completing the course, the students will be able to:
CO1: Explain a DC power supply using diode rectifier and filter circuit.
CO2: Describe amplifier and switch circuits using Bipolar Junction Transistors (BJT).
CO3: Demonstrate the knowledge of Metal Oxide Semiconductor Field Effect Transistors (MOSFET), Operational amplifiers (OP AMP) and Basics of Digital Circuits.
CO4: Classify various sensors used for measuring physical parameters.
CO5: Illustrate the basic concepts used in electronic communication systems.

Unit	Contents	Duration (Hrs.)
1	**DC Power Supply** Block diagram of DC Regulated power supply. Half Wave Rectifier, Full wave center tapped and Bridge Rectifier. Full wave rectifier with Capacitor filter, Zener diode with V-I characteristics and their applications. Zener as a voltage regulator	6
2	**Transistors and Biasing** BJT: Bipolar junction transistor, Construction of BJT, Voltage Divider Biasing. CE, CB and CC configurations, characteristics for CE configuration. relationship between α, β and ɣ, transistor as an amplifier and transistor as a switch.	5
3	**Metal Oxide Semiconductor Field Effect Transistors (MOSFET) and Operational Amplifiers (OP AMP)** Difference between FET and BJT. Construction and working of Metal Oxide Semiconductor FET, characteristics of E-MOSFET. Functional block diagram of operational amplifier, ideal operational amplifier Parameters, Op-amp as an Inverting and Non inverting amplifier.	5
4	**Introduction to Digital Circuits** Number System: - Decimal, BCD, Binary, Octal, Hexadecimal, their conversion and arithmetic's, 2's complement subtraction, De-Morgan's theorem. Basic Gates, Universal	7

	Gates, Special Purpose Gates, Half adder, Full adder, 1-bit memory cell, D-Flip flop (Shift Registers), Basic block diagram of Microprocessor and Microcontroller.	
5	**Basics of Sensors and Electronic Communication** Introduction to sensors, Selection criteria and Classification of sensors, Motion Sensors (LVDT), Semiconductor Sensors (Gas Sensors), Optical Sensors (LDR), Biosensors, Basics of Actuators. Block Diagram of communication system, Communication Media: Wired and Wireless, Electromagnetic Spectrum, Mobile Communication System: Cellular concept, Simple block diagram of GSM system	6
	Total Hours	**29**

Text Books

1. Electronics Devices by Thomas. L. Floyd, 9th Edition, Pearson.
2. OP-amp and linear Integrated circuits by Ramakant A.Gayakwad, 4th Edition,Pearson.
3. Electronics Instrumentation by H. S. Kalsi, 3rd Edition.
4. Modern Digital Electronics by R.P. Jain, 4th Edition, Tata McGraw Hill.
5. Electronics Communication System, by John Kennedy,Tata McGraw Hill.

Reference Books

1. Electronic Devices and Circuits by David A. Bell 5th Edition ,Oxford.
2. Sensors and Transducers by D. Patrnabis, 2nd Edition, PHI.
3. Communication Systems by Michael Moher, Simon Haykin, 5th Edition,Wiley.

Online References

1. Swayam Course : Mr. Abhijeet Lal & Dr. Onika Parmar, Chhattisgarh Swami Vivekanand Technical University (CSVTU), Link
2. NPTEL Course: Prof. Anil Mahanta, Prof. Roy Paily Palanthinkal, IIT Guwahati, Link
3. NPTEL Course: Prof. Chitralekha Mahanta, IIT Guwahati, Link

First Year B. Tech Mechanical Engineering

Semester- I/II

Course Code: ME24PCC151 **Course Name: Engineering Graphics**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
2	-	-	-	-	40	60	-	-	-	100	2	-	-	2

Prerequisite: Deviation of line, circle and polygon, Coordinate geometry. Basic Geometric Shapes Computer literacy, Mathematics (Trigonometry), Basic Knowledge of Curves & Geometric constructions

Course Objectives:

- To impart foundational engineering graphics and CAD skills for technical drafting.
- To develop proficiency in orthographic projections of solids and components.
- To enhance spatial visualization for orthographic-isometric conversion.
- To enable construction of engineering curves and surface developments.
- To build competency in interpreting industrial drawings and multidisciplinary schematics.

Course Outcomes: After learning the course, the students will be able to:

CO1: Understand the basic knowledge of engineering graphics and Computer Aided Drawing.
CO2: Construct orthographic projections of geometrical solids and machine components.
CO3: Apply the visualization skill to draw isometric projection from a given orthographic view precisely using drawing equipment.
CO4: Draw various engineering curves and the development of lateral surfaces for the cut section of solids.
CO5: Interpret industrial drawing sheets, standard machine part symbols, and multidisciplinary diagrams such as electric wiring and circuit layouts.

Unit	Contents	Duration (Hrs.)
1	**Fundamentals of Engineering Drawing and Computer Aided Drawing** Principles of Engineering Graphics and its Significance, usage of Drawing instruments, Bureau of Indian Standards (BIS), Drawing layout, Zoning, types of lines, Title block, lettering, Dimensioning & Tolerances. Introduction to AutoCAD & its commands, Reading of industrial drawing sheets.	5
2	**Orthographic Projections** Principles of Orthographic Projections, Quadrant system, difference between first angle and third angle methods, sectional orthographic views of geometrical solids & machine parts (first angle method), Conceptual model of orthographic projection.	6
3	**Isometric Projections** Principles of Isometric projection — Isometric Scale, Isometric Views, Conventions; Conversion of Orthographic Views to Isometric Views, drawing of machine parts (excluding spherical surface). Conceptual model of Isometric Projection	6
4	**Engineering curves & Development of Lateral Surfaces** Conic curves, Rolling curves and Applications of engineering curves. Introduction to development of lateral surfaces and its industrial applications the development of lateral surfaces of cut sections of solids i.e. cone, prism, cylinder etc., Conceptual model of Development of lateral surface.	7
5	**Multidisciplinary Applications of Engineering Drawing.** Symbolic Representation (as per BIS SP: 46-2003), Standard machine parts Introduction of Computer Graphics, Electric Wiring and lighting diagrams, Introduction to Building Information Modelling (BIM).	6
	Total Hours	**30**

Text Books
1. Bhatt N.D., Panchal V.M. and Ingle P.R., Engineering Drawing, Charotar Publishing House, 2022. 2. D A Jolhe, Engineering Drawing with an Introduction to AutoCAD, McGraw Hill Education 2017 3. Shah, M.B. and Rana B.C., Engineering Drawing and Computer Graphics, Pearson Education, 2009
Reference Books
1. Narayana, K.L. and P Kannaiah, Text book on Engineering Drawing, Scitech Publishers, 2020. 2. Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi, 2015 3. Venugopal K., Engineering Drawing — New Age International, 2019 4. Agrawal B. and Agrawal C. M., Engineering Graphics, TMH Publication, 2019. 5. Jensen, C., Helsel, "Engineering Drawing and Design", McGraw-Hill Education 2017
Online References
1. NPTEL Course: Engineering Graphics and Design (Link) 2. NPTEL Course: Introduction and Geometric Construction (Link) 3. NPTEL Course: Computer Aided Design and Manufacturing (Link)

First Year B. Tech Artificial Intelligence and Data Science

Semester I/II

Course Code: AI24PCC151 **Course Name: Foundation of Artificial Intelligence**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	PR	OR	TOTAL	L	P	T	TOTAL
2	-	-	-	-	40	60	-	-	-	100	2	-	-	2

Prerequisite Courses: - Basic Computer Principles

Course Objectives:

- To provide foundational knowledge of Artificial Intelligence
- To develop the ability to analyze and identify suitable intelligent agents
- To equip students with practical programming skills in Python
- To introduce students to classical and informed search strategies
- To enable students to apply AI tools, frameworks, and libraries

Course Outcomes: After completing the course, the students will be able to:

CO1: Understand the key concepts and historical evolution of Artificial Intelligence.

CO2: Identify appropriate intelligent agents for various AI applications.

CO3: Demonstrate Python programming skills of problem solving.

CO4: Apply problem-solving concepts and search strategies.

CO5: Understand the roles of AI tools and libraries in building intelligent systems.

Unit	Contents	Duration (Hrs.)
1	Introduction to Artificial Intelligence: Definition of AI, History of AI, Pillars of AI, Types of AI, State of the Art, Risk & Benefits of AI, AI Techniques, Ethical issues in AI, Future Trends in AI, Agentic AI	5
2	Introduction to AI Agent: Definition and characteristics of intelligent agents, Structure of Agent, Components of AI Agent, 'PEAS' Properties, Types of environment, Types of Agents, Concept of Rationality	6
3	Data Processing & Data Structures: Introduction to Python, Syntax, Data Types, Decision Control Structures, String Operations, Functions and Modules	7
4	Problem Solving and Search Strategies: Problem Solving Concepts, Types of problems, Components of Problem Formulation, State Space, Search Strategies-Uninformed Search Strategies, Informed Search Strategies.	6
5	AI Tools and Libraries: AI Tools: Chat GPT, Gemini, Claude AI Libraries: Pandas, NumPy, Matplotlib, Seaborn, TensorFlow, OpenCV Case Study: Shopify	6
	Total Hours	**30**

Text Books

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Third edition, Pearson, 2003, ISBN :10: 0136042597
2. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Education(India), 2013, ISBN : 978-1-25-902998-1
3. Elaine Rich, Kevin Knight and Nair, "Artificial Intelligence", TMH, ISBN-978-0-07-008770-5
4. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, ISBN 13: 978-0-19-948017-6

5. R. Nageswara Rao, "Core Python Programming", Dreamtech Press; Second edition ISBN-10: 938605230X, ISBN-13: 978-9386052308 ASIN: B07BFSR3LL

Reference Book

1. Nilsson Nils J , "Artificial Intelligence: A new Synthesis", Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4
2. Patrick Henry Winston, "Artificial Intelligence", Addison-Wesley Publishing Company, ISBN: 0-201-53377-4
3. Andries P. Engelbrecht-Computational Intelligence: An Introduction, 2nd Edition-Wiley India- ISBN: 978-0-470-51250-0
4. Dr. Lavika Goel, "Artificial Intelligence: Concepts and Applications", Wiley publication, ISBN: 9788126519934
5. Dr. Nilakshi Jain, "Artificial Intelligence, As per AICTE: Making a System Intelligent", Wiley publication, ISBN: 9788126579945
6. Romano Fabrizio, "Learning Python", Packt Publishing Limited, ISBN: 9781783551712,1783551712
7. Paul Barry, "Head First Python- A Brain Friendly Guide", SPD O'Reilly, 2nd Edition, ISBN:978-93-5213-482-3
8. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education, ISBN-10: 9789387572942, ISBN-13: 978-9387572942, ASIN: 9387572943

Online References

1. An Introduction to Artificial Intelligence, IIT Delhi - https://nptel.ac.in/courses/106102220
2. Artificial Intelligence, IIT Kharagpur - https://nptel.ac.in/courses/106105078
3. Programming, Data Structures and Algorithms using Python, Chennai Mathematical Institute - https://nptel.ac.in/courses/106106145
4. Introduction to Artificial Intelligence (AI) by IBM - https://www.coursera.org/learn/introduction-to-ai

First Year B. Tech Computer Engineering

Semester-I/II

Course Code: CE24PCC101 **Course Name: Fundamentals of Programming languages**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
2	-	-	-	-	40	60	-	-	-	100	2	-	-	2

Course Objectives:

1. To design algorithms and flowcharts to solve simple computational problems.
2. To apply control flow structures to implement decision-making in programs.
3. To design modular solutions using arrays and functions.
4. To use pointers and file handling techniques to manage memory and data effectively.
5. To understand Object-Oriented Programming concepts to create structured and reusable code.

Course Outcomes: After learning the course, the students will be able to:

CO1: Design algorithms and flowcharts for simple computational problems.
CO2: Apply Control Flow structures for decision making.
CO3: Design a solution using Arrays and Functions
CO4: Use concepts of pointers and file handling to solve problems
CO5: Summarize the fundamental concepts of Object-Oriented Programming

Unit	Contents	Duration (Hrs.)
1	**Introduction to C Programming** Problem Solving, Problem Solving Strategies, Program Design Tools, C Programming: Structure of a C Program, Data Types and memory management, formatted input and output functions in C, enumerators	5
2	**Control Structures in C** Conditional Statements, Switch-case statement, Iterative Statements, Break Statement, continue statement, go to statements (Branch specific case studies)	5
3	**Array and Functions** Types of Array, String: Array of Strings, Introduction to Modular Programming, Passing Arguments to a Function: Call by Reference, Call by Value, Recursive Functions. (Branch specific case studies)	5
4	**Pointers and file handling** Pointer Variables, Array of Pointers, Structures and operations on structures, Concept of a File, File opening modes in C, File Operation , Debugging tools(Branch specific case studies)	6
5	**Introduction to Object oriented programming and Data Structures** Programming paradigms, Features of OOP, concept of class and object, Data Structures: data, information, knowledge, Classification of data structures (Branch specific case studies)	5
	Total Hours	**26**

Text Books

1. "Let us C", Yashwant Kanetkar, 20th Edition
2. "C-Programming Language" , Brian W. Keringhan, Dennis M. Ritchie, 2nd Edition
3. "The book of C", Pragati Kumaar Dhingra, Priyanka Bhaskar
4. "Computer Fundamentals and PRogramming in C" , Reema Thareja, 2nd Edition

Reference Books
1. C Programming a Modern Approach by Kim N King 2. Programming in ANSI C by E. Balagurusamy 3. "C: The complete reference", Herbert Schild,4th edition, McGraw Hill publication. 4. Pointer on C by Kenneth A. Reek 5. Maureen Spankle, "Problem Solving and Programming Concepts", Pearson; 9th edition, ISBN-10: 9780132492645, ISBN-13: 978-0132492645
Online References
1. https://nptel.ac.in/courses/106104128v 2. https://nptel.ac.in/courses/1061051711

First Year B. Tech Information Technology

Semester-I

Course Code: IT24PCC101 **Course Name: Programming and Logic Building**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
2	-	-	-	-	40	60	-	-	-	100	2	-	-	2

Prerequisite: Basics of Computers, Basic Mathematics

Course Objectives:

- To apply logic building techniques using algorithms, flowcharts, and pseudo code.
- To apply fundamental C programming concepts with control structures.
- To implement modular programs using functions, recursion, and pointers.
- To design efficient solutions using arrays and strings in C programming.
- To develop programs using structures, unions, and file handling.

Course Outcomes: After learning the course, the students will be able to:

CO1: Apply the Logic Building techniques
CO2: Decide the logical flow & implement C programs using various statements
CO3: Apply modular programming techniques and utilize pointers
CO4: Develop C programs utilizing arrays and strings
CO5: Utilize structures, unions in C programming and Implement File Handling

Unit	Contents	Duration (Hrs.)
1	**Logic Building Techniques:** General Problem-Solving Concepts, Problem Solving Strategies. Flowchart and its types: Process Flowchart, Data Flowchart, System Flowchart, Workflow Diagram, Writing Pseudo codes, Guidelines for Writing Pseudo code, Algorithms and it types, Types of Errors, Testing and Debugging Approaches, Tips for Effective Debugging.	6
2	**Basics of C Programming:** Types of programming languages, Features of C, Structure of a C Program, Constants, Variables, Data Types, Operators and Expressions, Input and Output Functions. **Conditional Statements:** If, If-else, Nested If, If-else if Statements, Switch-case statement, Iterative Statements: While Loop, For Loop, Do While Loop, Nested Loops, Break, Continue, go to operators.	6
3	**Functions & Pointers:** Introduction to Modular Programming, need for functions, Function Call, Passing Arguments to a Function: Call by Reference, Call by Value, Recursive Functions, Command Line Argument. Introduction to pointers, Declaration of Pointers, Address of Operator, Pointer Variables, Array of Pointers, Pointers to Array.	6
4	**Array & Strings:** Declaration & Initialization of Array, Two-Dimensional Arrays, Three-Dimensional Array, Passing Array element to function, Operations with Arrays, Errors in Array. String: Declaration and Initialization of Strings, Array of Strings, String Functions.	6
5	**Structure, Union, and File Handling:** Structure Declaration, Typedef Declarations, Initialization of Structures, Accessing the Members of a Structure, Nested Structures **Unions:** Declaring and Accessing Member of Union, Initializing Unions **File Handling:** Performing basic operations in files using C	6
	Total Hours	**30**

Text Books
1. "Let us C", Yashwant Kanetkar, 20th Edition 2. "C-Programming Language" , Brian W. Keringhan, Dennis M. Ritchie, 2nd Edition 3. "The book of C", Pragati Kumaar Dhingra, Priyanka Bhaskar 4. "Computer Fundamentals and Programming in C" , Reema Thareja, 2nd Edition
Reference Books
1. "C Programming a Modern Approach" by Kim N King 2. "Programming in ANSI C" by E. Balagurusamy 3. "C: The complete reference", Herbert Schild,4th edition, McGraw Hill publication. 4. "Pointer on C" by Kenneth A. Reek 5. "Problem Solving and Programming Concepts", Maureen Spankle, Pearson; 9th edition.
Online References
1. https://www-personal.acfr.usyd.edu.au/tbailey/ctext/ctext.pdf 2. https://vardhaman.org/wp-content/uploads/2021/03/CP.pdf

First Year B. Tech

Semester-I/II

Course Code: SH24AEC104 **Course Name: Communication Skills**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	-	2	-	-	-	-	50	-	-	50	-	-	2	2

Prerequisites: Basic Language Skills (Listening, Reading, Writing & Speaking)

Course Objectives:

- To build a strong foundation in essential communication skills that enable students to express ideas clearly and confidently in academic, professional, and social contexts.
- To develop proficiency in listening, speaking, reading, and writing, fostering both accuracy and fluency in communication.
- To cultivate the ability to create structured and professional technical documents using appropriate vocabulary, grammar, and style.
- To enhance digital literacy and ethical communication practices by equipping students with skills to effectively use digital tools for academic and professional growth.

Course Outcomes: After completing the course, the students will be able to:

CO1: Implement effective communication skills learned in the classroom in the outside world as well as in daily life.

CO2: Demonstrate listening, speaking, reading, and writing skills.

CO3: Design a technical document with correctness of language, appropriate vocabulary and style.

CO4: Evaluate and use digital literacy skills to enhance their professional and personal development through effective communication, ethical behavior, and strategic use of digital tools.

Contents

1	**Introduction to Effective Communication Skills** Principles and Practices of Communication, Types of Communication (Verbal and Non-Verbal), Barriers to Effective Communication, Formal and Informal Communication.
2	**Grammar and Vocabulary** Essential Grammar Skills for Professionals, Technical & General Academic Vocabulary, Common Errors in Speech and Writing
3	**Practical Communication Skills** Effective Listening Skills, Types of Listening and Common Barriers; Components of Effective Speaking and Public Speaking; Effective Reading Skills in Academic and Professional Settings, Graphic Organizers; Introduction to Academic Writing, Professional Written Communication and Documentation.
4	**Introduction to Interpersonal Skills** Communication, Teamwork and Collaboration, Time-Management and Productivity, Problem-Solving and Critical Thinking, Leadership and Responsibility, Adaptability and Flexibility, and Empathy.
5	**Digital Literacy** Digital Literacy and its Importance, Social Media and Networking (LinkedIn), Social Ethics and Etiquette, Awareness of Open- Educational Sources.

List of Tutorials

Sr. No.	Name of the Tutorial	Duration (Hrs.)
1	Competency Test	2
2	Prepared/Extempore Speech	3
3	Skit on Barriers of Communication, Interpersonal Skills and its documentation	4

4	Listening and Speaking Exercises	2
5	Reading, Comprehending, Summarizing and Paraphrasing Research Articles	2
6	Grammar and Vocabulary Practice	2
7	Group Discussions	4
8	Resume Building	2
9	Digital Content Creation on Technical topics	2
10	Professional Networking and Profile Creation on LinkedIn	3
	Total Hours	**26**

Text Books

1. S. Mishra and C. Muralikrishna, *Communication Skills for Engineers*, Pearson, 2011.
2. M. Raman and S. Sharma, *Effective Technical Communication Skills*, Oxford University Press, 2004.

Reference Books

1. CIEFL Hyderabad, *Exercises in Spoken English, Parts I–III*, Oxford University Press, 1997.
2. Ashraf Rizvi, *Effective Technical Communication*, Tata McGraw-Hill, 2017.
3. Herta Murphy, *Effective Business Communication* (7th Ed.), McGraw Hill, 2017.
4. Michael Swan, *Practical English Usage*, Oxford University Press, 1995.
5. Raman and Prakash, *Business Communication*, Oxford, 2006.
6. K. Alex, *Soft Skills: Know Yourself, Know the World*, S. Chand & Company, 2009.
7. Alan and Barbara Pease, *The Definitive Book of Body Language*, Bantam Publications.
8. Dale Carnegie, *How to Develop Self-Confidence & Influence People by Public Speaking*, Fingerprint Publishing, 2017.

Online References

1. NPTEL Course: *Technical English for Engineers*, Prof. Aysha Viswamohan, IIT Madras (sponsored by Aricent), August 19, 2024 – October 11, 2024. https://nptel.ac.in/courses/109106094?utm
2. Cambridge Assessment: *English Language Assessment*. https://www.cambridgeenglish.org/
3. SkillUp: *Discover 130 Skills That Will Help You to Master Business Communication*. https://skillupglobal.com/services/

First Year B. Tech

Semester-I/II

Course Code: SH24IKS153 **Course Name: Indian Culture and Civilization**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	-	2	-	-	-	-	50	-	-	50	-	-	2	2

Prerequisites: A basic understanding of Indian History and Culture

Course Objectives:

- To introduce students to the foundational knowledge system of ancient India.
- To explore the contributions of India in the fields of language, science, medicine, architecture, and art.
- To understand the socio-economic, religious, and educational structures that shaped ancient Indian civilization.
- To analyze the global influence and contemporary relevance of ancient Indian knowledge systems.

Course Outcomes: After completing the course, the students will be able to:

CO1: Apply concepts from ancient Indian philosophies, education systems, and scriptures to contemporary issues and disciplines.
CO2: Analyze the contributions of ancient Indian scholars in linguistics, mathematics, medicine, and architecture.
CO3: Evaluate the impact of ancient Indian socio-economic, artistic, and cultural systems on modern society.
CO4: Apply and integrate knowledge from ancient Indian texts and to understand their global influence and relevance in modern interdisciplinary contexts.

Contents

1. Vedic Period: Vedas and their Significance
2. Upanishads: Philosophy and Knowledge
3. The Six Schools of Indian Philosophy: Overview
4. Indian Linguistics: Panini and Sanskrit
5. Evolution of Other Indian languages - Tamil, Marathi, Hindi etc
6. Ancient Indian Education System: Gurukul System
7. Ancient Indian Mathematics: Overview and Contributions
8. Ancient Indian Astronomy and Astrology: Overview and Contributions
9. Charak & Sushrut Samhita, Ayurveda: Principles and Practices
10. Ancient Indian Architecture: Vastu Shastra and Temple Architecture (Part 1 and 2)
11. Trade and Commerce in Ancient India
12. Arthashastra (Part 1 and 2)
13. Ancient Indian Art and Culture (Part 1 and 2)
14. Ancient Indian Music and Dance (Part 1 and 2)
15. Ancient Indian Farming Practices
16. Ancient Indian Craftsmanship (Part 1 and 2)
17. Ancient Indian Warfare and Weaponry
18. Ancient Indian Engineering and Technology
19. Ancient Indic Religions: Hinduism, Buddhism, Jainism, Sikhism: Teaching & Philosophy
20. Ancient Indian Knowledge Systems: Global Influence

List of Tutorials

Sr. No.	Name of the Tutorial	Duration (Hrs.)
1	**Vedas and Their Contemporary Relevance** The spiritual, philosophical, and scientific insights found in the Vedas and how they can be interpreted in the modern world.	2
2	**The Upanishads: Roots of Indian Metaphysics** Analyse the key philosophical teachings of the Upanishads and their influence on later Indian thought systems, including Buddhism and Vedanta.	2
3	**Six Schools of Indian Philosophy: A Comparative Analysis** Compare any three to four schools (e.g., Nyaya and Vedanta or Samkhya and Yoga) in terms of epistemology, metaphysics, and their impact.	3
4	**Panini and the Scientific Structure of Sanskrit Grammar** Examine Panini's contribution to linguistics and how his work predated many modern linguistic theories.	2
5	**Charaka & Sushruta Samhitas: Science Behind Ayurveda** Discuss the medical knowledge found in these texts and their relevance in the context of integrative medicine today.	2
6	**Ancient Indian Astronomy: Observations Beyond Myth** Explore the scientific techniques used in ancient Indian astronomy and their validation or contradiction by modern astronomy. Instruments, timekeeping, planetary models.	2
7	**Vastu Shastra: Ancient Architecture and Environmental Harmony** Evaluate the principles of Vastu Shastra and how they align with modern ideas of sustainable architecture and environmental design.	2
8	**Ancient Indian Art and Culture: Preserving Identity Through Ages** Discuss how ancient Indian art forms (e.g., sculpture, painting, temple carvings) reflect the socio-religious values of their time.	4
9	**Ancient Indian Farming Practices and Craftsmanship** Explore how traditional Indian agricultural methods and artisanal skills reflect sustainability, community knowledge, and innovation in pre-modern economies.	3
10	**Influence of Ancient Indian Knowledge Systems on the World** Trace how Indian contributions in areas like mathematics, medicine, and linguistics influenced other civilizations or were absorbed into global knowledge systems.	4
	Total Hours	**26**

Text Books

1. Bhat, Vinayak Rajat, and B. Mahadevan. Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning, 2022.
2. Chauhan, Bhag Chand. IKS: The Knowledge System of Bhārata. Prabhat Prakashan, 2023.

Reference Books

1. Singh, Avadhesh K., and Kapil Kapoor, editors. Indian Knowledge Systems: Vol. 1 & 2. Cambridge University Press, 2023.
2. Saluja, Anshul. Indian Knowledge System: Unveiling Traditions, Perspectives and Narratives. Evincepub Publishing, 2023.
3. Jha, Amit. Traditional Knowledge System in India. Notion Press, 2024.
4. Kumar, Alok. Ancient Hindu Science: Its Transmission and Impact on World Cultures. Morgan & Claypool, 2022.
5. Singh, Bal Ram, Nath Girish, and Umesh Kumar Singh. Science and Technology in Ancient Indian Texts. D.K. Printworld, 2022.

Online References

1. NPTEL Course: Prof. Roli Pradhan, Indian Knowledge System ((Link))
2. Narmada College of Management ((Link))

First Year B. Tech

Semester – I/ II

Course Code: SH24CCC105 **Course Name: Yoga and Meditation**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	-	1	-	-	-	-	25	-	-	25	-	-	1	1

Prerequisites: Empty stomach and comfortable clothing, Be calm, focused, and open-minded

Course Objectives:

- Develop skills in basic yoga practices including asanas, pranayama, and meditation.
- Promote physical health, concentration, and relaxation through yogic techniques
- Understand emotions and their psychological basis for better mental health.

Course Outcomes: After completing the course, the students will be able to:

CO1: Explain the concept, definition, and philosophy of Yoga, along with the eight limbs of Ashtanga Yoga.

CO2: Demonstrate basic Yoga practices such as loosening exercises, Suryanamaskara, Asanas, Pranayama, Mudras, and Meditation for holistic health.

CO3: Analyze the relationship between Yoga practices, mental health, and behavioral well-being in daily life.

CO4: Develop self-discipline, concentration, and mind-body awareness through regular Yoga and meditation practice.

Contents

1	**Introduction to Yoga and meditation:** Introduction to yoga, Definition and meaning of yoga. Ashtanga yoga- Brief on Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana, Samadhi
2	**Practices:** Preparatory Practices/ Loosening exercises Suryanamaskara(with Mantra) Standing Asanas,Sitting Asanas, Supine Asanas,Prone Asanas,Pranayama and Meditation,Savasana and Relaxation Hasthamudras to improve concentration and maintain General. Experience Body-Mind Oneness as a result.
3	**Mental Health and well-being:** Understanding of the fact that most of the problems in day-to-day life are a result of one's reactionary behaviour. The tendency for the same is reduced by doing Aasanas in a meditative manner. A regular practice will result in more peaceful behaviour and hence well-being over the long run

List of Tutorial

Sr. No.	Name of the Tutorial	Duration (Hrs.)
1	History of Yoga.	1
2	Bhakti yoga, Jnana yoga, Hatha yoga, Raja yoga – Brief explanation and understanding about these 4 schools of yoga.	2
3	Modern branches/ types of yoga – brief explanation.	1
4	Benefits of yoga practice in daily life.	1
5	Suryanaskara and Chandranamaskara- variations.	2
6	Mid-Semester Activity or Examination	1
7	Difference between Yoga and Exercise.	2
8	Effect of yoga on well-being.	1
9	Yoga practices to improve concentration and memory.	1
10	End-Semester Evaluation	1
	Total Hours	**13**

Text Books

1. Light on Pranayama by B.K.S Iyengar, Harper Collin Publishers
2. Light on Yoga by B.K.S Iyengar, Harper Collin Publishers

3. A Textbook of Yoga Skill Education,Vishvas Publication
4. Yoga for Backache and Neckache by Sadashiv Nimbalkar, Yog Vidya Niketan

Reference Books

1. Yogadeepika (Hindi) - B.K.S Iyengar, Black Swan Publication.
2. Yoga for Kiddos - Dr. Manali Dev, Nithin Prakashan
3. Asana Pranayama Mudra Bandha- Swami Satyananda Saraswati, Bihar School of YogaYoga Publication Trust.
4. Mudras, Yoga with the hand- Guru Vishnu, World peace yoga school editions.
5. Hatha yoga Pradipika- Muktibodhananda Swami,Yoga Publication Trust
6. Hatharatnavali- Dr. M L Gharote and Parimal Devnath, Motilal Banarasidas Publication
7. Anatomy of Hatha Yoga - H David Coulter, Motilal Banarasidas Publication
8. Shrimadbhagavadgita- Gita press

Online References

1. NPTEL Course: Prof. Ashish Pandey Yoga and Positive Psychology for Managing Career and Life. (Link)
2. NPTEL Course:DEVVRAT, Founder and Lead Teacher, Devvrat Yoga (Link)
3. Certificate Programme in Yoga (CPY), EGyankosh (Link)
4. Yoga, Central Board of Secondary Education (Link)
5. YOGA, Healthy way of Living National Council of Educational Research and Training (Link)

First Year B. Tech

Semester-I/II

Course Code: SH24CCC154 **Course Name: Performing Arts**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	PR	OR	TOTAL	L	P	T	Total
-	-	1	-	-	-	-	25	-	-	25	-	-	1	1

Prerequisites: Basic knowledge of the seven notes in Indian Classical System (*Sa*, *Re*, *Ga*, *Ma*, *Pa*, *Dha*, *Ni*)
Basic knowledge about *Taal*, *Swar* and *Raga*

Course Objectives:
1. To develop a strong theoretical foundation in Indian classical music, focusing on key elements such as *Sangeet Paddhati*, *Taal*, *Swar*, *Raga*, and their respective applications.
2. To develop rhythmic competency through *Taal Gyan*—learning *Tritaal* and practicing rhythmic cycles through clapping, recitation, and internalization.
3. To improve vocal technique and pitch control through the practice of *Shudha Swar* and *Swar Alankars*, fostering precision in singing and musical expression.
4. To encourage regular practice, self-reflection, and independent learning to improve musical skills, fostering habits of discipline and self-evaluation.
5. To provide opportunities for students to practice and perform together, developing teamwork and collaborative musical skills.

Course Outcomes: After completing the course, the students will be able to:
CO 1: Understand the basic concepts and terminology of Indian classical music.
CO 2: Develop fundamental skills in performance techniques across multiple performing arts disciplines (Music).
CO3: Demonstrate knowledge of Tritaal by practicing its recitation with rhythmic hand claps.
CO4: Recall Raga Yaman and Raga Bhimpalasi.

Contents

1	**Introduction:** Knowledge of sangeet Paddhati of India, Various terms in Indian classical music
2	**Taal Gyan:** Knowledge of Tritaal. The practice of recitation by clapping hands. **Swar gyan**: Shudha Swar, singing and Preliminary introduction to the Swar Alankars.
3	**Raga Gyan :-**Introduction To Raga Yaman /Bhimpalasi , Raga-Aaroh & Avroh and Pakad, One or more songs in above mentioned Ragas

List of Activities (Any Four)

Sr. No.	Name of the Activities	Duration (Hrs.)
1	Life stories of Artists Like Pt. Bhimsen Joshi, Pt. Birju Maharaj, Pt. Ravi Shankar, Ustad Zakir Hussain, Balgandharva etc	4
2	History Indian Arts (Dance, Music, Theatre)	3
3	MCQ Test On Introduction To Music	1
4	MCQ Test On Taal Gyan & Raga Gyan	1
5	Expert Lectures on Performing Arts	2
6	Viva On Introduction To Music	1
7	Viva On Taal Gyan & Raga Gyan	1
	Total Hours	**13**

Text Books

1. Robert Cohen, "Theatre: Brief Version [9th Edition]", McGraw-Hill Humanities/Social Sciences/ Languages, 2010.
2. Roger Kamien, "Music: An Appreciation", [13th Edition], 2022..
3. Sangita Sampradaya Pradarshini : SubbaramaDikshitar
4. Sangeet Shastra - Vasantrao Rajopadhye
5. Sangeet Visharad

Reference Books

1. Samarth Nagarkar, "Raga Sangeet: Understanding Hindustani Classical Vocal Music", BookBaby 1st edition, 2013.
2. Anupam Mahajan, "Ragas in Hindustani Music-Conceptual Aspects", Gyan Publishing House, 2001.
3. Bimalakanta Roychaudhari, "The Dictionary of Hindustani Classical Music", Motilal Banarasidass Publishing House, 2000.

Online References

1. Prof. Lakshmi Sreeram(2024) **Appreciating Hindustani Music**, IIT Madras https://nptel.ac.in/courses/109106191
2. Dr. Awadhesh Pratap Singh Tomer , Dr. Harisingh Gour Vishwavidyalaya, Sagar (M.P.)(2020) **Indian Vocal Music** https://onlinecourses.swayam2.ac.in/cec20_as04/preview

First Year B. Tech

Semester: I/II

Course Code: SH24BSC155 **Course Name: Applied Physics Lab**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
-	2	-	-	-	-	-	25	-	-	25	-	1	-	1

Prerequisites: -

1. Basic understanding of high-school physics concepts — especially optics, energy, and electronics.
2. Ability to find the least count of a given measuring instrument and to use basic laboratory equipment like multimeters, lenses, polarizers, diffraction gratings, and thermistors.
3. Basic computer literacy for browsing virtual labs and for editing spreadsheets
4. Collaborative attitude and communication skills to participate in group-based experiments and discussions.

Course Objectives:

- To train students in performing precision-based optical experiments involving interference, diffraction, and polarization, enabling them to determine key physical properties.
- To develop experimental skills in semiconductor and quantum physics through hands-on verification of physical constants and device characterization.
- To introduce computational data analysis techniques for curve fitting and regression in experimental contexts.
- To develop teamwork and collaborative learning by engaging students in group-based contextual activity submissions related to the use of sensors.
- To expose students to modern instrumentation and industry-relevant techniques through real-life demonstrations and virtual lab simulations (e.g., laser cutting, UV-Vis spectroscopy).

Course Outcomes: After completing the course, the students will be able to:

CO1: Perform optics-based experiments and determine optical properties using interference, diffraction, and polarization principles.

CO2: Use physics principles and appropriate experimental methods and procedures to verify Planck's constant value, determine energy band gap and analyze solar cell performance.

CO3 Use experimental data to model relationships and plot computational graphs using regression methods.

CO4: Work in teams to perform and analyze sensor-based experiments and submit contextual group activities.

CO5 Apply theoretical knowledge to interpret demonstrations of experiments such as the Industrial cutting by lasers, UV-Vis spectrophotometry and to perform experiments using modern tools like virtual lab simulations.

Sr. No.	List of Laboratory Experiments (Any Ten)	Duration (Hrs.)
1	Introduction to linear regression: slope calculation using experimental data	2
2	Newton's rings: an interference pattern to test the optical perfectness and to determine the radius of curvature of a given plane convex lens	2
3	Diffraction grating: an instrument for the determination of wavelength of given light	2
4	Law of Malus: a general method for solving a problem involving light passing through polarizers	2
5	Determination of the ability to resolve two images - resolving power of telescope	2
6	Energy gap of semiconductor: to determine the band gap in a semiconductor using a junction diode	2
7	Solar cell characteristics: selection of solar cell based on the efficiency	2
8	Measurement of compressibility of liquid through ultrasonic interferometer	2
9	Thermistor: an alternative to thermometer	2
10	Virtual lab experiment-1	2
11	Virtual lab experiment-2	2
12	The power of lasers: real-world engineering applications	2
13	Material characterization using UV-Visible Spectroscopy: exploring absorption properties	2
14	A creative group activity on project-based learning to validate the concepts of physical sciences related to engineering applications	
	Total Hours	**26**

First Year B. Tech

Semester - I / II

Course Code: SH24BSC106 **Course Name: Applied Chemistry Lab**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	2	-	-	-	-	-	-	-	25	25	-	1	-	1

Prerequisite: Knowledge of general chemistry concepts such as chemical bonding, molecular structure and fundamental laboratory safety and techniques.

Course Objectives:

- To enhance skills in designing and visualizing chemical structures using advanced software tools.
- To perform chemical analyses of water and coal for engineering applications.
- To gain hands-on experience with electrochemical cells, polymer synthesis, and virtual lab simulations.
- To apply the concept of green chemistry and clean energy through practical experiments and projects.

Course Outcomes: After learning the course, the students will be able to:

CO1: **Use** of computational chemistry software's (e.g. chemdraw, Avogadro) to draw Chemical structure and analyze chemical properties for problem solving in real world scenarios**.**

CO2: **Perform** an analysis of water quality with a focus on hardness and alkalinity.

CO3: **Apply** principles of electrochemistry in experiments such as electrochemical cell, battery, fuel cell.

CO4: **Interpret** experimental data, draw valid conclusions and present scientific abstract or report.

CO5: **Explore** the applications of polymers to synthesize a specialty polymer in laboratory and understand its industrial relevance.

List of Experiments (Any 8)

Sr. No.	Name of the Experiment	Duration (Hrs.)
1	A conceptual and useful approach to design and visualize chemical structures by chemdraw.	02
2	Evaluation of a coal sample to decide its price, quality, and use in the power generation and fuel optimization.	02
3	An interactive approach to learn the sustainable engineering solutions for molecular geometry optimization driven by Avogadro.	02
4	Chemical analysis of water: hardness and alkalinity for an assessment of boiler feed water quality management.	02
5	For a real world engineering application frame the comprehensive graphical abstract.	02
6	Investigate grey hydrogen with fuel cell for the development of a clean energy system.	02
7	Simulation-based learning in virtual engineering environments for conceptual clarity. (V-Lab Experiments. (any two)	02
8	Construction of electrochemical cells for eco-friendly and long lasting battery performance.	02
9	A creative group activity on project-based learning to validate the concepts of chemical science related to engineering applications.	06
10	Synthesis of a speciality conducting polymer.	02
11	Next-generation material: preparation of resins as a condensation polymer.	02
	Total Hours	**26**

First Year B. Tech

Semester - I

Course Code: SH24BSC107 **Course Name: Engineering Mathematics-I Tutorial**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
-	-	1	-	-	-	-	25	-	-	25	-	-	1	1

Prerequisites: MATLAB Onramp Course

Course Objective:

- To build a strong conceptual understanding of key topics in linear algebra and calculus through practical MATLAB exercises.
- To develop problem-solving skills by using MATLAB to solve systems of linear equations and analyze eigenvalues and eigenvectors.
- To apply MATLAB tools to visualize and interpret mathematical concepts related to real-world engineering problems.
- To explore Fourier series and harmonic analysis using MATLAB for practical engineering applications.

Course Outcomes: After Completing the course, the students will be able to:

CO1: Apply the concept of matrix rank and use MATLAB to solve systems of linear equations with applications in electrical circuits and network problems.
CO2: Solve problems on Eigen values, Eigen vectors and system stability using MATLAB.
CO3: Apply Mean Value Theorem in analyzing traffic behavior and compute instantaneous rates of change in dynamic systems.
CO4: Determine the maxima and minima of mathematical functions by using MATLAB in engineering applications.
CO5: Analyze the Fourier series representation for periodic and continuous functions using MATALB and perform harmonic analysis for engineering problems.
CO6: Examine the role of mathematical concepts in solving engineering problems through collaborative projects using MATLAB or similar software tools.

Contents

1	**Matrices** Rank of a matrix, Echelon form, System of linear equations, Linear dependence and independence of vectors, Applications of system of linear equations.
2	**Eigenvalues and Eigen vectors** Linear transformation, Eigen values and Eigen vector, Cayley-Hamilton theorem, Applications of Eigen values and Eigen vectors to Engineering.
3	**Differential Calculus:** Mean value theorems, Expansion of a function, Taylor's and Maclaurin's series, Expansion of function using standard expansions, Applications of Mean value theorem.
4	**Partial Differentiation and its Applications:** Introduction to functions of several variables, Partial derivatives, Euler's Theorem for Homogeneous functions, Partial derivatives of composite function, Jacobians, Maxima and Minima of a function of two independent variables.
5	**Fourier Series:** Definition, Dirichlet's conditions, Full range Fourier series, Half range Fourier series, Harmonic analysis, Applications of Fourier series.

List of Tutorial

Sr. No.	Name of the Tutorial	Duration (Hrs.)
1	To determine the rank of a matrix and use it to solve a system of linear equations using MATLAB	1
2	Applications of systems of linear equations. (Electrical circuits-KCL and KVL, Network problems)	1

3	Examples on Linear Transformation using MATLAB. (Scaling, Rotation)	1
4	To determine Eigenvalues and Eigenvector of the square matrix by using MATLAB	1
5	Applications of Eigenvalues and Eigenvectors to Engineering.	1
6	Applications of Mean value theorem. (Anomaly detection in traffic flow, Instantaneous rate of change problems)	1
7	To solve problems on Euler's theorem. (Practice session)	1
8	To solve problems of maxima and minima using MATLAB.	1
9	Expansion of Full range and Half Range Fourier series using MATLAB.	1
10	Example based on Harmonic Analysis.	1
11	A creative group activity on project-based learning to validate the concepts of mathematics related to engineering applications.	4
	Total Hours	**14**

Text Books

1. Getting started with MATLAB: A quick Introduction for Scientists and Engineers, By Rudra Pratap **ISBN-**13: 978-0198069195

First Year B. Tech

Semester-I/II

Course Code: SH24ESC108 **Course Name: Geomatics Tutorial**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	-	1	-	-	-	-	25	-	-	25	-	-	1	1

Prerequisite:

Basic computer literacy, Fundamental Geography Concepts, Spreadsheet handling skills, and Introductory Knowledge of GIS and Google earth basics

Course Objectives:

- To introduce students to the basic concepts of GIS through the use of QGIS software.
- To enable learners to create, edit, and manage vector and raster data.
- To develop skills in spatial data visualization, georeferencing, and terrain analysis.
- To apply spatial query tools such as buffer analysis and nearest neighbor techniques for decision-making.

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

CO1: Identify and distinguish between paper-based and digital map representations.

CO2: Create, import, and manage spatial datasets (vector/raster) and attribute data in QGIS.

CO3: Apply georeferencing techniques and conduct terrain analysis using DEM and hillshade tools.

CO4: Execute spatial analysis tasks like buffer generation and nearest neighbor analysis for real-world applications.

Content

1	Principles of Remote Sensing Basic concepts of Remote Sensing, Historical overview, Evolution of satellite, Characteristics and Types of Orbits, Working Principles of Remote Sensing System, Types of sensors (Optical & Microwave), Platforms, Remote Sensing systems, Resolution of sensors, Visual interpretation techniques, Understanding application based Remote sensing data usage, Data Procurement (Purchase & Download)
2	Geographical Information System & Global Positioning System Introduction to GIS, Fundamental concepts, Objectives, Importance of GIS, Types & amp; Components of GIS, Spatial Data Representation, Relationships of spatial objects, GIS functions, Database management for geoinformatics: Components GIS Data and Data Models. Introduction to GPS, Components of the GPS system, coordinates, and reference systems, Fundamental Concepts of GPS, Operational principle, GNSS System, Introduction to DGPS, Integration of GPS with GIS, Introduction to VPS and its Usage
3	Aerial Photography to Digital Satellite Images Fundamentals of Aerial photography and types of aerial photographs, Geometry of aerial photographs, Scale of aerial photographs, Digital satellite image concept, Radiometric correction, Geometric correction, Image enhancement techniques, Digital Satellite image classification, Concept of Digital image processing
4	Cartography Evolution of cartography, Role of technology in the development of cartography, Concept of Map Scale, Types of Maps, element of cartography, Geodesy and Coordinate System, Digital Cartography, Type of Maps and its Usage, Concept of 3D maps, Standard Principles of Cartography, Typography and Labeling, Ethics in Cartography
	Application of Geomatics • Agriculture and forestry

5	• Urban planning • Disaster Management • Utility GIS (Piped city Gas distribution networks in India) • Telecom Sector use, GIS networking • Location services • Vehicle tracking System • Water Resources and Hydrology

List of Tutorials

Sr. No.	Name of the Tutorial	Duration (Hrs.)
1	Observations of paper map and digital map	1
2	Creating and Managing Vector Data	1
3	Adding raster layers	1
4	Adding place marks - Saving KMZ/ KML files in Google Earth	1
5	Making a Map: Importing Spreadsheets or CSV files	2
6	Working with attribute Table	1
7	Working with Terrain Data and Hillshade Analysis	2
8	Georeferencing Toposheets, Scanned Maps	1
9	Managing data tables and Spatial data set	1
10	Working on spatial query (Buffer analysis) and nearest neighbour analysis.	1
11	A creative group activity on project-based learning to validate the concepts related to GIS.	2
	Total Hours	**14**

Online References

1. QGIS Documentation. *User Guide and Training Manual* https://docs.qgis.org
2. Sherin, A. (2019). Learning QGIS (3rd Edition), Packt Publishing.
3. Graser, A. (2016). QGIS Map Design, Locate Press.
4. Lawhead, J. (2017). Getting to Know QGIS, O'Reilly Media.
5. Longley, P.A., Goodchild, M.F., Maguire, D.J., & Rhind, D.W. (2015). Geographic Information Systems and Science, Wiley.

First Year B. Tech Electrical Engineering

Semester-I/II

Course Code: EE24PCC102 **Course Name: Basics of Electrical Technology Tutorial**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	-	1	-	-	-	-	25	-	-	25	-	-	1	1

Prerequisites: Ohm's Law, Concept of current, voltage, resistance, electric power, electric energy.

Course Objectives:

- To develop essential understanding of electrical safety practices and the fundamental principles governing DC electrical circuits
- To analyze and evaluate the performance characteristics of single-phase transformers through experimental testing.
- To develop an understanding of three-phase systems and facilitate the experimental verification of relationships between phase and line parameters in balanced star and delta configurations.
- To measure key electrical parameters and compute various forms of electrical power using modern instrumentation tools.
- To compare and interpret billing patterns in conventional residential systems and grid-connected renewable energy setups
- To enhance competence in using simulation software for analyzing RLC circuits, generating waveforms, and designing practical electrical circuit diagrams.

Course Outcomes: After learning the course, the students will be able to:

CO1: Demonstrate electrical safety practices and verify fundamental network theorems in DC circuits.
CO2: Determine the efficiency and voltage regulation of a single-phase transformer using the direct loading test.
CO3: Verify the relationship between phase and line quantities in a balanced three-phase star or delta connected load through experimental analysis.
CO4: Measure electrical parameters such as voltage, current, frequency, and phase angle using a Power Quality Analyzer, and calculate active, reactive, and apparent power.
CO5: Differentiate billing patterns between a grid-integrated renewable energy system and a conventional residential electrical system.
CO6: Develop and simulate basic electrical circuits using software tools to generate waveforms, analyze RLC circuits, and design wiring/single-line diagrams for practical applications.

Contents

1	**DC Circuits and Network Theorems** Superposition theorem, Thevenin's theorem, Numerical, Experimental Verification.
2	**Single Phase and Three Phase AC Systems** Phase and line quantities in a balanced three-phase star or delta connected load through experimental analysis, Measurement of key parameters using Power Quality Analyzer, efficiency and voltage regulation of a single-phase transformer, Energy calculation and billing patterns of grid-integrated renewable energy system and a conventional residential electrical system.
3	**Simulation of Electrical Circuits** Simulation to generate AC waveforms, analyze RLC circuits, and design wiring/single-line diagrams for practical applications.

From following first six practical are compulsory and any two from the remaining

Sr. No.	Name of the Tutorial	Duration (Hrs.)
1	Prepare a report on safety precautions while working on electrical systems.	1
2	Verify the Superposition theorem in a DC network	2
3	Verify the Thevenin's theorem in a DC network	2

4	To determine efficiency and regulation of transformer by direct loading test of a single-phase transformer.	2
5	To verify the relation between phase and line quantities in three phase balanced star OR delta connections of load.	2
6	Measurement of voltage, current, mains frequency and phase angle using Power Quality Analyzer and calculate active, reactive & apparent power.	2
7	Write a program to generate sine and square waves. Obtain related parameters	1
8	Differentiate energy bill on grid integrated renewable energy system and normal residential consumer bill.	1
9	Develop a wiring diagram for placing fan, tube light and lamp at suitable places of room size 10'x12'.	1
10	Develop a single line diagram of an electrical power system using software	1
	Total Hours	**15**

First Year B. Tech Electronics and Telecommunication Engineering

Semester-I/II

Course Code: ET24PCC102 **Course Name: Basics of Electronics Technology Tutorial**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	-	1	-	-	-	-	25	-	-	25	-	-	1	1

Prerequisite:
Atom theory, Valence band structure and energy band gap of an atom, P-N junction, working and characteristics of PN junction Diode in forward and reverse bias condition, Drift and diffusion current

Course Objectives:

- To introduce students to fundamental electronic components and familiarize them with the operation and usage of basic electronic measuring instruments
- To develop the ability to analyze electronic circuits and compare the performance characteristics of various rectifiers and transistor configurations.
- To enable students to read and interpret component datasheets, perform essential electrical measurements, and understand number systems and their conversions.
- To encourage students to investigate real-world applications and trends in communication systems and semiconductor technologies through case study presentations.

Course Outcomes: After completing the course, the students will be able to:
CO1: Describe the basic electronic components and measuring instruments.
CO2: Compare the performance of rectifiers and transistors.
CO3: Interpret datasheets and perform basic circuit measurements and number system conversions.
CO4: Explore the case studies on communication technologies and semiconductor applications.

	Content
1	DC Power Supply Block diagram of DC Regulated power supply. Half Wave Rectifier, Full wave center tapped and Bridge Rectifier. Full wave rectifier with Capacitor filter, Zener diode with V-I characteristics and their applications. Zener as a voltage regulator
2	Transistors and Biasing BJT: Bipolar junction transistor, Construction of BJT, Voltage Divider Biasing. CE, CB and CC configurations, characteristics for CE configuration. relationship between α, β and ɣ, transistor as an amplifier and transistor as a switch.
3	Metal Oxide Semiconductor Field Effect Transistors (MOSFET) and Operational Amplifiers (OP AMP) Difference between FET and BJT. Construction and working of Metal Oxide Semiconductor FET, characteristics of E-MOSFET. Functional block diagram of operational amplifier, ideal operational amplifier Parameters, Op-amp as an Inverting and Non inverting amplifier.
4	Introduction to Digital Circuits Number System:- Decimal, BCD, Binary, Octal, Hexadecimal, their conversion and arithmetics, 2's complement subtraction, De-Morgan's theorem. Basic Gates, Universal Gates, Special Purpose Gates, Half adder, Full adder, 1-bit memory cell, D-Flip flop (Shift Registers), Basic block diagram of Microprocessor and Microcontroller.

5	**Basics of Sensors and Electronic Communication** Introduction to sensors, Selection criteria and Classification of sensors, Motion Sensors (LVDT), Semiconductor Sensors (Gas Sensors), Optical Sensors (LDR), Biosensors, Basics of Actuators. Block Diagram of communication system, Communication Media: Wired and Wireless, Electromagnetic Spectrum, Mobile Communication System: Cellular concept, Simple block diagram of GSM system

List of Tutorials

Sr. No.	Name of the Tutorial	Duration (Hrs.)
1	Study of Electronic measuring instruments (CRO, DSO, FG and DMM)	2
2	Comparison of different rectifiers based on performance parameters and problem solving on rectifiers	1
3	Study of Active and Passive components a) Resistors (Fixed & Variable), Calculation of resistor value using color code b) Capacitors (Fixed & Variable) c) Inductors, Calculation of inductor value using color code d) Devices such Diode, BJT, MOSFETs, various IC packages	2
4	Study of basic performance parameters of transistors (BJT and MOSFET)	1
5	Measurement of Input-output voltage in Inverting and Non Inverting mode of Operational Amplifier (OP-AMP)	1
6	Study the datasheet of OP-AMP / Sensors and prepare a tabular chart of its specifications	1
7	Problem solving on a number system	1
8	Case study on Semiconductor Memory in Cell phone / Laptop / Batteries/ Electronic chargers /Power Supplies/ Integrated Circuits (ICs)	1
9	Case study on different types of transmission mediums: Wired / wireless	1
10	Study of the Evolution of Mobiles / 4G and 5G Technology / RADAR or Military communication / Aircraft Communication / Cellular concept / GSM	2
	Total Hours	**13**

First Year B. Tech Mechanical Engineering

Semester-I/II

Course Code: ME24PCC152 **Course Name: Engineering Graphics Tutorial**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	-	1	-	-	-	-	25	-	-	25	-	-	1	1

Prerequisite: Deviation of line, circle and polygon, Coordinate geometry. Basic Geometric Shapes Computer literacy, Mathematics (Trigonometry), Basic Knowledge of Curves & Geometric constructions

Course Objectives:

- To develop basic skills in 2D drafting using CAD tools and commands.
- To build the ability to draw orthographic projection of components.
- To improve visualization for isometric drawings.
- To enable plotting of curves and development of solids.
- To develop skills in creating and interpreting diagrams using CAD and programming tools by following standard conventions

Course Outcomes: After learning the course, the students will be able to:
CO1: Draw geometrical figures and layouts using CAD software.
CO2: Apply orthographic projection principles to create pictorial views.
CO3: Draw isometric views from given orthographic projections or components.
CO4: Plot engineering curves and develop lateral surfaces of solids.
CO5: Create and interpret diagrams using CAD and programming tools with standard conventions

Content

1	**Fundamentals of Engineering Drawing and Computer Aided Drawing** Principles of Engineering Graphics and its Significance, usage of Drawing instruments, Bureau of Indian Standards (BIS), Drawing layout, Zoning, types of lines, Title block, lettering, Dimensioning & Tolerances. Introduction to AutoCAD & its commands, Reading of industrial drawing sheets.
2	**Orthographic Projections** Principles of Orthographic Projections, Quadrant system, difference between first angle and third angle methods, sectional orthographic views of geometrical solids & machine parts (first angle method), Conceptual model of orthographic projection.
3	**Isometric Projections** Principles of Isometric projection — Isometric Scale, Isometric Views, Conventions; Conversion of Orthographic Views to Isometric Views, drawing of machine parts (excluding spherical surface). Conceptual model of Isometric Projection
4	**Engineering curves & Development of Lateral Surfaces** Conic curves, Rolling curves and Applications of engineering curves. Introduction to development of lateral surfaces and its industrial applications the development of lateral surfaces of cut sections of solids i.e. cone, prism, cylinder etc., Conceptual model of Development of lateral surface.
5	**Multidisciplinary Applications of Engineering Drawing.** Symbolic Representation (as per BIS SP: 46-2003), Standard machine parts Introduction of Computer Graphics, Electric Wiring and lighting diagrams, Introduction to Building Information Modelling (BIM).

List of Tutorial

Sr. No.	Name of the Tutorial	Duration (Hrs.)
1	Plot the layout of an Exploration Lab	02
2	Prepare a detailed 2D drawing of a screwdriver	01
3	Draw the orthographic elevation view of a water tap.	01
4	Draw the orthographic top and side views of a water tap.	01
5	Generate an isometric view of Machine Component – Part 1	01

6	Generate an isometric view of Machine Component – Part 2.	01
7	Construct an engineering curve using any standard method.	01
8	Develop the lateral surfaces of a hopper	01
9	Write a C++ program using the graphics library to create any drawing.	02
10	Draw an electrical wiring or circuit diagram with standard symbols and drawing conventions.	02
	Total Hours	**13**
Complete above tutorials by using any CAD Software		

First Year B. Tech Artificial Intelligence and Data Science														
Semester I/II														
Course Code: AI24PCC152					**Course Name: Foundation of Artificial Intelligence Tutorial**									
Teaching Scheme (Hours/Week)					**Examination Scheme**						**Credits**			
L	**P**	**T**	**OL**	**ODL**	**CIE**	**ETE**	**TW**	**PR**	**OR**	**TOTAL**	**L**	**P**	**T**	**TOTAL**
-	-	1	-	-	-	-	25	-	-	25	-	-	1	1

Prerequisite: Basic Python Programming

Course Objectives:

- To introduce the fundamentals of Python programming
- To provide a foundation of Artificial Intelligence
- To equip students with skills of data analysis and visualization
- To expose students to contemporary AI tools

Course Outcomes: After completing the course, the students will be able to:

CO1: Apply fundamental Python programming concepts to solve computational problems.

CO2: Implement intelligent agents to solve real-world AI problems.

CO3: Apply Python libraries for data analysis and visualization

CO4: Apply AI tools to real world problems.

Contents

1	**Python Programming Fundamentals and Control Structures** Introduction to Python syntax, variables, data types, and input/output operations, Arithmetic and logical operators, Conditional statements (if, elif, else) and decision-making logic, Loops and iterative processing (for, while), User-defined functions and modular programming
2	**Fundamentals of AI and Conversational Systems** Basics of Artificial Intelligence and intelligent agents, Perception-action cycle and simple agent behavior, Introduction to Conversational AI and chatbots, Hands-on exposure to tools like ChatGPT and Gemini, Ethics and limitations of AI interactions
3	**Data Handling and Scientific Computing in Python** Introduction to structured data and tabular formats, Working with Pandas DataFrames: creation, indexing, manipulation, Introduction to NumPy for matrix and array operations, Arithmetic operations on 2D arrays, Data preprocessing basics
4	**Data Visualization Using Python Libraries** Fundamentals of data visualization, Creating bar charts using Matplotlib, Introduction to Seaborn for statistical plotting, Understanding count plots, axes labels, legends, and titles, Real-world dataset visualization and interpretation

List of Tutorials

Sr. No.	Name of Tutorial	Duration (Hrs.)
1	Implement a basic AI calculator using Python that can perform arithmetic operations.	1
2	Design and implement a Python program that prompts the user to enter three numbers. Using simple decision- making logic, the program should identify and print the largest number among them.	1
3	Write a Python program that reads a list of numbers from the user input, identifies which numbers are palindromes, and displays the palindromic numbers as output.	1
4	Build a basic intelligent agent in Python that acts as a decision maker based on user input.	1
5	Hands-On: Chat GPT and Gemini.	1
6	Implement a Data Frame using weather data.	1

7	Design and implement a Python program using the NumPy library to perform basic arithmetic operations on 2D arrays of the same size. The program should display the original arrays and the result of each operation.	2
8	Develop a Simple Conversational AI Chatbot.	1
9	Create a bar chart using Matplotlib to display the marks scored by a student in 5 different subjects. The chart should include appropriate labels for the x-axis (subjects), y-axis (marks), and a title.	2
10	Using the Titanic dataset available in Seaborn, create a countplot to visualize the number of survivors and non-survivors based on gender and passenger class. The plot should include appropriate axis labels, a legend, and a descriptive title	2
	Total Hours	**13**

Text Books

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Third edition, Pearson, 2003, ISBN :10: 0136042597
2. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Education(India), 2013, ISBN : 978-1-25-902998-1
3. Elaine Rich, Kevin Knight and Nair, "Artificial Intelligence", TMH, ISBN-978-0-07-008770-5
4. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, ISBN 13: 978-0-19-948017-6
5. R. Nageswara Rao, "Core Python Programming", Dreamtech Press; Second edition ISBN-10: 938605230X, ISBN-13: 978-9386052308 ASIN: B07BFSR3LL

Reference Book

1. Nilsson Nils J , "Artificial Intelligence: A new Synthesis", Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4
2. Patrick Henry Winston, "Artificial Intelligence", Addison-Wesley Publishing Company, ISBN: 0-201-53377-4
3. Andries P. Engelbrecht-Computational Intelligence: An Introduction, 2nd Edition-Wiley India- ISBN: 978-0-470-51250-0
4. Dr. Lavika Goel, "Artificial Intelligence: Concepts and Applications", Wiley publication, ISBN: 9788126519934
5. Dr. Nilakshi Jain, "Artificial Intelligence, As per AICTE: Making a System Intelligent", Wiley publication, ISBN: 9788126579945
6. Romano Fabrizio, "Learning Python", Packt Publishing Limited, ISBN: 9781783551712,1783551712
7. Paul Barry, "Head First Python- A Brain Friendly Guide", SPD O'Reilly, 2nd Edition, ISBN:978-93-5213-482-3
8. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education, ISBN-10: 9789387572942, ISBN-13: 978-9387572942, ASIN: 9387572943

Online References

1. An Introduction to Artificial Intelligence, IIT Delhi - https://nptel.ac.in/courses/106102220
2. Artificial Intelligence, IIT Kharagpur - https://nptel.ac.in/courses/106105078

3. Programming, Data Structures and Algorithms using Python, Chennai Mathematical Institute - https://nptel.ac.in/courses/106106145
4. Introduction to Artificial Intelligence (AI) by IBM - https://www.coursera.org/learn/introduction-to-ai

First Year B. Tech Computer Engineering

Semester- I/II

Course Code: CE24PCC102 **Course Name: Fundamentals of Programming Languages Tutorial**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	-	1	-	-	-	-	25	-	-	25	-	-	1	1

Course Objectives:

1. To understand simple C programs with proper structure and syntax.
2. To learn and implement control flow statements for decision-making in C programs.
3. To explore arrays and functions for organizing and modularizing code.
4. To gain knowledge of pointers and file handling techniques for advanced problem-solving.

Course Outcomes: After learning the course, the students will be able to:

CO1: Design simple C programs with proper structure and syntax
CO2: Apply control flow statements to handle decision-making
CO3: Design a solution using Arrays and Functions
CO4: Use concepts of pointers and file handling to solve problems

Contents

1	**Structure of a C Program** Data Types and memory management , formatted input and output functions in C, enumerators
2	**Control Structures in C** Conditional Statements, Switch-case statement, Iterative Statements,Break Statement , Continue statement, goto statements
3	**Array and Functions** Types of Array, String: Array of Strings, Introduction to Modular Programming, Passing Arguments to a Function: Call by Reference, Call by Value, Recursive Functions.
4	**Pointers and file handling** Pointer Variables, Array of Pointers, Structures and operations on structures, Concept of a File, File opening modes in C, File Operation

List of Tutorial

Sr. No.	Name of the Tutorial	Duration (Hrs.)
1	Design a program that calculates the sum of elements in an array.	1
2	Design a C program to check whether a given number is an Armstrong number	1
3	Develop C a program that takes an integer as input from the user and prints its reverse (e.g., input: 123, output: 321).	1
4	Design a C program that calculates the factorial of a given number using both iterative and recursive methods.	2
5	Develop a program to implement basic matrix operations such as addition, subtraction, and multiplication using c programming.	2
6	Develop a C program that uses pointers to swap the values of two integers entered by the user. Print the values before and after swapping	1
7	Develop a quiz application that asks multiple-choice questions and calculates the score for user using C programming	1
8	Create a C program that counts the frequency of each character in a string using pointers and displays the results	1
9	Create a C program to read a text file and count and display the total number of vowels present in the file	1

10	Create a structure STUDENT for storing information(ID ,NAME , AGE ,MARKS) and update the structure for 2 students.	2
Mechanical		
1	Create a C program that converts torque values between different units (e.g., Nm to lb-ft, kgf-m).	1
2	Design a C program to simulate the motion of a simple pendulum. Use the small angle approximation to calculate the period of the pendulum given its length and acceleration due to gravity.	1
3	Develop a C program that calculates the stress on a material given the force applied and the cross-sectional area	1
4	Develop a C program that calculates the gear ratio based on the number of teeth on two gears. Allow the user to input the number of teeth for both gears and output the gear ratio.	1
Electrical		
1	Develop a program that decodes the color bands of a resistor into its resistance value and tolerance. Allow the user to input the color bands and output the corresponding resistance	1
2	Develop a program that calculates the equivalent resistance of resistors in series and parallel. Allow the user to input the number of resistors and their values.	1
3	Design a program that takes a list of voltages and computes the total voltage around a closed loop to verify Kirchhoff's Voltage Law (KVL)	1
4	Develop a program that calculates the output voltage from a voltage divider circuit given input voltage and two resistor values.	1
Electronics and Telecommunication		
1	Develop a C program that takes a frequency value in Hertz as input and converts it to kilohertz and megahertz. Display the converted values.	1
2	Design a C program to simulate a digital logic circuit with basic gates (AND, OR, NOT). Input should be in the form of binary values, and the program should output the resultant output based on the logic gates implemented.	1
3	Design a C program that simulates the process of analog-to-digital conversion using a specified number of bits. The program should read an analog voltage, quantize it into digital steps, and output the corresponding digital value.	1
4	Develop a C program that converts a binary number (entered by the user as a string) to its decimal equivalent. Validate the input to ensure it contains only '0's and '1's	1
	Total Hours	**13**

Note:
1. All 10 tutorials from list of tutorials are compulsory for Computer Engineering and AIDS
2. Mechanical, Electrical and Electronics and Telecommunication Engineering will perform 4 branch specific tutorials and any 6 tutorials from the main list of 10 tutorials

Text Books

1. "Let us C", Yashwant Kanetkar, 20th Edition
2. "C-Programming Language" , Brian W. Keringhan, Dennis M. Ritchie, 2nd Edition

Reference Books

1. Programming in ANSI C by E. Balagurusamy
2. "C: The complete reference", Herbert Schild,4th edition, McGraw Hill publication

Online References

1. https://nptel.ac.in/courses/106104128v
2. https://nptel.ac.in/courses/1061051711

First Year B. Tech Information Technology

Semester-I

Course Code: IT24PCC102 **Course Name: Programming and Logic Building Tutorial**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	-	1	-	-	-	-	25	-	-	25	-	-	1	1

Prerequisites: Basics of Computers, Basic Mathematics

Course Objectives:

- To understand and implement fundamental programming concepts, data types, and control structures in C.
- To develop programs using functions, recursion, and dynamic memory allocation.
- To implement array and string operations effectively in C programming.
- To implement file handling operations for storing and retrieving binary data.

Course Outcomes: After learning the course, the students will be able to:

CO1: To apply arithmetic, conditional, and loop constructs to solve programming problems in C.
CO2: To develop modular programs using functions, recursion, and dynamic memory allocation.
CO3: To apply data manipulation techniques on strings, arrays, structures, and unions.
CO4: To evaluate file handling methods for storing and retrieving data using binary files in C.

Contents

1	**Introduction to Programming and Control Structures** Fundamentals of programming, data types, variables, constants, input/output operations, arithmetic operators and expressions, operator precedence and associativity, conditional statements (if, if-else, nested if-else), looping constructs (for, while, do-while).
2	**Functions, Recursion, and Dynamic Memory Allocation** Concept and advantages of functions, function declaration and definition, parameter passing, return values, recursive functions, iterative vs recursive approaches, dynamic memory allocation using malloc, calloc, realloc, and free, memory management in arrays.
3	**Arrays and String Handling** Array basics, declaration, initialization, traversal, searching elements, insertion and deletion, sorting techniques, multidimensional arrays, string handling concepts, string input/output, string manipulation functions.
4	**Structures, File Handling, and Unions** Definition, declaration, and initialization of structures; arrays of structures; storing and displaying information using structures; file handling basics — opening, reading, writing, and closing files; binary file operations; introduction to unions; declaration and initialization of unions.

List of Tutorial (Any 8 Tutorial Completing 15 Hrs.)

Sr. No.	Name of the Tutorial	Duration (Hrs.)
1	Write a C program to perform and display the results of all arithmetic operations (+, -, *, /, %) on two floating-point numbers provided by the user.	01
2	Determine if a given year is a leap year or not using nested if-else statements.	01
3	Print the first n prime numbers using a while loop and for loop.	02
4	Calculate the GCD and LCM of two numbers using both iterative and recursive functions.	02
5	Dynamically allocate memory for an array of integers, accept values from the user, and find the sum and average of the elements.	02
6	In array do the following: 1. Find given element in array 2. Find Max element	02

	3. Find Min element 4. Find frequency of given element in array 5. Find Average of elements in Array.	
7	Write a C program that takes a string as input and performs the following operations: 1. Reverse the string. 2. Check if the string is a palindrome. 3. Count the frequency of each character in the string and display the results.	03
8	Display information of multiple students (name, age, grade) using an array of structures.	02
9	Write a C program to store and retrieve employee records (name, id, salary) from a binary file.	02
10	Create a program that uses a union to store an integer, a floating-point number, or a string and Display the stored values.	02
	Total Hours	**15**

Text Books

1. "Let us C", Yashwant Kanetkar, 20th Edition
2. "C-Programming Language" , Brian W. Keringhan, Dennis M. Ritchie, 2nd Edition
3. "The book of C", Pragati Kumaar Dhingra, Priyanka Bhaskar
4. "Computer Fundamentals and Programming in C" , Reema Thareja, 2nd Edition

Reference Books

1. "C Programming a Modern Approach" by Kim N King
2. "Programming in ANSI C" by E. Balagurusamy
3. "C: The complete reference", Herbert Schild,4th edition, McGraw Hill publication.
4. "Pointer on C" by Kenneth A. Reek
5. "Problem Solving and Programming Concepts", Maureen Spankle, Pearson; 9th edition.

Online References

1. https://www-personal.acfr.usyd.edu.au/tbailey/ctext/ctext.pdf
2. https://vardhaman.org/wp-content/uploads/2021/03/CP.pdf

First Year B. Tech Artificial Intelligence & Data Science

Semester I

Course Code: AI24VSE101 **Course Name: Engineering Exploration Lab-1**
Domain : Embedded C for IoT

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	4	-	-	-	-	-	50	-	-	50	-	2	-	2

Prerequisite: Basic Programming in C, Fundamentals of Electronics, Introduction to Microcontrollers

Course Objectives:

- To introduce the fundamental concepts of design thinking for problem-solving and innovation.
- To develop skills of C and Embedded C programming for microcontroller-based applications.
- To provide hands-on experience in interfacing sensors and actuators using microcontrollers.
- To enable students to build basic IoT-based systems for real-world applications.

Course Outcomes: After completing the course, the students will be able to:

CO1: Apply the principles of design thinking to develop solutions.

CO2: Apply control structure & array of C programming.

CO3: Implement different programming constructs of embedded C.

CO4: Implement IOT application using microcontroller.

Contents in Association with Pixaflip Technologies, Pune

Content related to assignments: Basics of C Programming, Introduction to IoT and Embedded Systems, Embedded C Basics Review, Microcontroller and Peripherals, Serial Communication, Sensor Integration.

List of Lab Activities

Sr. No.	Activities	Duration (Hrs.)
1	Design thinking Course (Online course)	4
2	Create a program to manage and analyze the performance of 25 students in a class. The program should: Allow the user to enter each student's name and marks. Assign grades (A, B, C, or F) based on the marks. Show the names of students who received each grade.	4
3	Develop a Water Trapping Application that takes an array of N non-negative integers representing an elevation map, where each integer corresponds to the height of a with each bar having a width of 1 unit. The application should calculate and display the total volume of water that can be trapped between the bars after a rainfall event.	4
4	Write a program using Arduino to control LED (One or more ON/OFF). Or Blinking The program demonstrates three basic functionalities: 1. Turning an LED on and off. 2. Blinking an LED. 3. Controlling multiple LEDs.	4
5	Develop a Counter-Based Traffic Light Indicator System for Status Monitoring. This is a simple traffic light indicator system using LEDs to represent different statuses based on a counter value.	4
6	Develop a simple system to measure and display the Air Quality Index (AQI) based on CO_2 levels for both indoor and outdoor environments, providing an overall assessment of air quality related to Carbon Dioxide concentration.	4
7	Develop a Basic Soil Moisture Monitoring System for Precision Agriculture. The system should measure and display soil moisture levels.	4
8	Design a system using a PIR motion sensor to detect human movement and display the motion status on the serial monitor.	4
	Total Hours	**32**

Project Based Learning (PBL) Topics		
P1	Electronic Dice Project: Develop a push-button operated electronic dice that visually displays results using LEDs, an LCD screen, or an 8x8 LED Matrix display, depending on your preference and design requirements.	
P2	Battery Level Indicator Project: Create a battery level indicator that notifies you when the battery charge falls below a predetermined threshold. Design a visual display using multicolor LEDs arranged in a bar configuration. Customize LED colors to reflect different charge levels, and vary the number of illuminated LEDs to indicate the battery's remaining capacity effectively.	
P3	Develop and implement an automated dustbin system, integrating smart technologies for efficient waste management, and conduct a detailed analysis of its components to assess functionality, reliability, and effectiveness in waste collection and disposal.	
P4	Create an automated tap system integrating sensor technology and efficient water management to deliver hands-free and hygienic water dispensing in both public private settings.	
P5	Smart City Infrastructure Monitoring System: Create a comprehensive system to oversee and optimize key urban infrastructure like bridges, roads, and public transport. Utilize IoT sensors for monitoring structural health, analyzing traffic flow, and assessing environmental conditions. Integrate collected data into a unified city management platform for enhanced decision-making and infrastructure maintenance.	
P6	Smart Watch Prototype: Develop a wearable device capable of displaying time, notifications, and sensor data using a compact LCD screen. Integrate functionalities from previous projects and enable the reception of notifications on the smartwatch prototype.	
P7	Sleep Timer for Lights: Automatically deactivate lighting after a specified duration to conserve energy. Always exercise caution and ensure you have a clear understanding of the devices you're interacting with, especially when dealing with electrical appliances.	
P8	Develop a water level monitoring and indication system for residential water tanks, integrating sensors for accurate measurement and visual indicators (LED digital display) to provide real-time feedback on water levels. The system should feature alerts to notify users of low water levels or nearing full capacity, enabling proactive maintenance and efficient water management.	
	Total Hours	**28**

Text Books

1. Yashwant Kanetkar, "Let Us C", 19th Edition, BPB Publication, ISBN: 9788183331630.
2. Kernighan, Brian W., and Dennis M. Ritchie. "The C Programming Language", 2nd Edition, Prentice-Hall, 1988 , ISBN: 0-13-110370-9.
3. Barnett, Richard H., "Embedded C Programming and the Microchip PI", Thomson Delmar Learning, ISBN: 978-1- 4018-3748-8.
4. Michael Barr, "Programming Embedded Systems in C and C++"O'Reilly Media, Inc., ISBN: 9781565923546.

Reference Books

1. Kim N King, "C Programming: A Modern Approach", W.W. Norton, 2008, ISBN : 0393979504.
2. E. Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, 2011, ISBN: 9780070681828.
3. Jonathan Valvano, "Embedded Systems: Real-Time Operating Systems for ARM Cortex-M Microcontrollers", Createspace Independent Publishing Platform; 2nd ed. edition (3 Jan. 2012), ISBN : 978-1466468863.
4. Mark Siegesmund, "Embedded C Programming: Techniques and Applications of C and PIC MCUs", Newnes, Imprint of Butterworth-Heinemann Ltd. 313 Washington St. Newton, MA,United States, ISBN:978-0-12-801314-4.

Online References	
1.	Design thinking Course - https://dsource.in/dti/
2.	C Programming Basics - https://www.simplilearn.com/free-c-course-skillup
3.	C Programming Specialization - https://www.coursera.org/specializations/c-programming
4.	Raspberrypi - https://www.raspberrypi.org/
5.	IoT for All - https://www.iotforall.com/
6.	Adafruit - Adafruit Learning System
7.	Embedded System Design - https://archive.nptel.ac.in/courses/106/105/106105193/

First Year B. Tech Computer Engineering

Semester- I

Course Code: CE24VSE103 **Course Name: Engineering Exploration Lab 1**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	4	-	-	-	-	-	50	-	-	50	-	2	-	2

Course Objectives:

- To apply control structures for effective decision-making in programs.
- To develop modular and reusable code using functions.
- To perform file handling operations including open, read, write, update, and close.
- To design and implement mini projects by applying programming techniques and utilizing appropriate tools

Course Outcomes: After learning the course, the students will be able to:

CO1: Apply Control structures for decision making
CO2: Develop modular programs using functions
CO3: Perform open, read, write, update, and close operations for file handling
CO4: Build mini projects using programming techniques and tools

List of Experiments

Sr. No.	Name of the Experiment	Duration (Hrs.)
1	**Display Student Grade** Develop a C program to calculate the average and grade of each student in the first year B. Tech. program based on their marks obtained in the first semester. The program should prompt the user to input the marks of each student for subjects such as Mathematics, Physics, Chemistry, English, and Computer Science. Using control structures such as loops and conditional statements, the program should calculate the average marks and assign grades to each student according to predefined grading criteria. Finally, the program should display the average marks and grade for each student.	4
2	**Simulation of Electrical Switch** Design a C program to simulate the operation of an electrical switch, where the program takes input values of either '0' or '1' representing the switch being off or on, respectively. Using a suitable conditional statement, the program should interpret the input values and display the corresponding condition as "on" or "off". Additionally, the program should handle invalid input values and provide appropriate error messages.	4
3	**Telephone Directory** Develop a C program to search for the location or area of a person based on their phone number in a telephone directory. The program should utilize an array to store the phone numbers along with their corresponding locations or areas. Upon receiving a specific phone number as input from the user, the program should search the array and display the corresponding location or area if the phone number is found. If the phone number is not found, the program should output a message indicating that the number is not in the directory. Additionally, the program should handle invalid input and provide appropriate error messages.	4
4	**Create Employee Database using Structure and Display Information** Design a C program to display the information of all employees in a company sorted by their salaries, from highest to lowest. Each employee's information, including their employee ID and salary, is stored in a database using arrays and structures. The program should read the employee data from the database, organize it based on the salaries, and then print the details of each employee in descending order of their salaries. Additionally, the program should handle ties in salary and provide a consistent method for sorting the employees.	4

5	**StringOperations** Develop a program to implement following operations on string (without using built in functions, write user defined functions): · Comparison of two strings · Copy of one string into another · Finding the length of the string · Concatenating two strings into one	4
6	**Electricity Bill Generator** Design a system to generate electricity bills based on the units consumed by customers. The system should accept customer information including Customer ID, Customer Name, Customer Telephone Number, Customer Type (Domestic/Commercial), and Number of Units consumed. Implement functions to handle input, calculate the bill, and display it in a proper format. The bill format should include all relevant details such as Customer ID, Customer Name, Customer Telephone Number, Customer Type, Number of Units consumed, and the calculated bill amount.	4
7	**Application of Recursive Function Call** Develop a C program to calculate the sum of the first 10 numbers using recursive function calls and pointers. The program should define a recursive function that takes a pointer to an integer as an argument and returns the sum of the first 10 numbers. Within the function, recursion should be used to compute the sum iteratively. Finally, the program should display the calculated sum	4
8	**Basic File Operations** Create a C program to perform various file operations, including reading from a file, writing to a file, and displaying the contents of a file. The program should provide options for the user to select the desired operation from a menu. Upon selecting an operation, the program should execute the corresponding functionality using appropriate file handling techniques. Additionally, the program should handle errors such as file not found or permission issues gracefully and provide informative messages to the user.	4
	Total Hours	**32**
Project Based Learning (PBL) Topics		
P1	**Create an Innovative Smart Waste Management System** By utilizing Arduino microcontroller and distance measuring sensors to design smart dustbins. The system aims to revolutionize traditional waste collection methods by incorporating real-time monitoring and optimization features. Key objectives include developing a robust sensor-based mechanism for accurately measuring waste levels in dustbins	
P2	**Develop a Real-time Vehicle Tracking System** Using a microcontroller platform to display vehicle locations on Google Earth. The system aims to provide accurate and continuous monitoring of vehicles, enhancing fleet management and asset tracking capabilities. Key objectives include integrating GPS tracking with a microcontroller, establishing communication protocols for data transmission to Google Earth, and ensuring user-friendly access to real-time vehicle location information.	
P3	**Design and Implement a Software Library** That facilitates straightforward matrix multiplication operations, aiming to provide users with a reliable and user-friendly tool for performing essential matrix computations efficiently	
P4	**Create a virtual Piano** To mimic the functionality of a physical piano on a computer platform. The system aims to provide users with a digital interface to play musical notes and chords, offering features such as multi-octave support, sustain pedal simulation, and real-time audio feedback for an immersive musical experience. Key objectives include implementing algorithms for generating sound frequencies, handling user input for note selection, and designing a	

	simple yet intuitive graphical user interface (GUI) for seamless interaction	
P5	**Design a Smart Irrigation System for Agriculture Field** Water motor control, allowing farmers to remotely switch water motors ON/OFF based on real-time soil moisture levels. The system aims to optimize water usage, enhance crop yields, and simplify irrigation management through remote control and monitoring capabilities	
P6	**Develop a User-Friendly and Feature-Rich Text Editor** Utilizing WPF (Windows Presentation Foundation), tailored to meet modern user expectations and enhance text editing experiences on the Windows platform.	
P7	**Create a Cricket Score Sheet** Use file handling to store various information regarding runs, wickets, overs, extras, and many more. The program should display runs, wickets, names of batsmen and bowlers, overs, extras, economy of bowler, strike rate of batsmen, etc. It also displays the date and time of the game	
P8	**Develop a Water Level Monitoring System for Railway Bridges** Utilizing radar technology to detect water levels periodically. The system will transmit data to an electronic unit, which will relay it to a central server. From there, the information will be distributed to local servers at stations neighboring the bridge	
	Total Hours	**28**

First Year B. Tech Electrical Engineering

Semester-I

Course Code: EE24VSE103 **Course Name: Engineering Exploration Lab-1**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	4	-	-	-	-	-	50	-	-	50	-	2	-	2

Prerequisite: Ohm's Law, Concept of current, voltage, resistance, electric power, and electric energy.

Course Objectives:

- To provide a fundamental understanding of LT electrical systems and their protective devices concerning load requirements.
- To build foundational skills in analyzing and calculating electrical parameters in AC circuits for effective power management.
- To develop the ability to assess and improve transformer performance through theoretical and practical approaches.
- To introduce methods for evaluating insulation properties of cables to ensure safety and reliability in power systems.
- To understand the principles affecting inductance in electrical components and how physical variations impact circuit behavior

Course Outcomes:

CO1: Identify and select various LT switchgear protective devices according to load calculation.
CO2: Calculate voltage, current, and power of single-phase and three-phase A.C. circuits
CO3: Analyze the performance of the transformer.
CO4: Calculate the insulation resistance of different types of cables.
C05: Evaluate the effect of air gap variation on the value of self-inductance.

Contents in Association with Polycab India Pvt Ltd, India

Household load calculation, Selection of cables, Selection of switchgear components, Measurement of Phasor and Line quantities, Variation in Inductance due to air gap, Analysis of linear bilateral network having multiple sources, RLC series circuits analysis, Insulation resistance by using megger.

List of Experiments

Sr. No.	Name of the Experiment	Duration (Hrs.)
1	Introduction to various lab Equipment's & Study of Safety Precautions while working on electrical systems.	2
2	Design a household wiring scheme as per IS 732:2019 a) Load Calculations: Calculate the load of Basic Electrical Engineering lab/2 kW sanctioned domestic load. b) Cable size calculations.: To determine the appropriate size of electrical cables for above calculated load, considering current-carrying capacity, and safety factors. c) Selection of components: Select Switches, Sockets, MCB, indicating lamp, for Above calculated load.	6
3	Verify operation of MCB(6A, 16A, 32 A) , ELCB in case of overload, short circuit and earth leakage.	4
4	Determination of efficiency and regulation of single-phase transformer by using direct load test.	2
5	Measurement of voltage, current, mains frequency and phase angle using Power Quality Analyzer then calculate all parameters of power.	2

6	Verify relation between phase and line quantities in three phase balanced star and delta connected load.	4
7	Visit the institute substation (11kV/415 V) & prepare a detailed report on the same.	4
8	Determination of Insulation Resistance for different size of cables by using Megger.	2
9	Perform energy audit of the electrical engineering department	4
10	Determination of the variations in value of self-inductance with variable air gap length.	2
	Total Hours	**32**
Project Based Learning (PBL) Topics		
P1	Design a home automation system for controlling 2 lights and 1 fan using Arduino uno.	28
P2	Design an IoT based smart water quality monitoring system	
P3	Develop Automatic Power Factor Control (APFC) panel for Power factor improvement.	
P4	Comprehensive analysis of motors used in Electric Vehicles & Prepare a report.	
P5	Design an IoT based electricity energy meter using ESP32 to measure single phase voltage, current, power & total units consumed for specific home.	
P6	Perform Case Study: comprehensively evaluate the effectiveness, challenges, and opportunities associated with implementation green building.	
P7	Develop an automatic plant watering system using Arduino UNO and soil moisture sensor module. Implement it on the college campus.	
P8	Develop a circuit for automatic street light control, simulate it using simulation software, develop hardware models of the same.	
	Total Hours	**28**

First Year B. Tech Electronics and Telecommunication Engineering

Semester-I

Course Code: ET24VSE103 **Course Name: Engineering Exploration Lab-1**
Domain: Electronics Skill Development

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	4	-	-	-	-	-	50	-	-	50	-	2	-	2

Prerequisite: Semiconductor atom theory **,** Basic Electronic components (Active & Passive), Basics of Electronics Technology

Course Objectives:

- To train students in using DMM and DSO for precise measurement and analysis of electronic circuit parameters
- To develop the ability to analyze diode and transistor behavior through experimental characteristic plotting
- To build competency in designing and implementing arithmetic circuits using logic gates on breadboards
- To enable students to design, integrate, and test sensor-based automation circuits

Course Outcomes: After completing the course, the students will be able to:
CO1 : Measure electrical parameters of electronic components and circuits using Digital Multimeter (DMM) and Digital Storage Oscilloscope (DSO)
CO2 : Analyze semiconductor diodes and transistors using characteristic plots
CO3 : Implement arithmetic circuits using digital logic gates on breadboard
CO4 : Build and test sensor based automation circuit

Contents in Association with Digitech Engineers, Pune

Content related to assignments: Idea generation for product ,preparing your mind for innovation, Active and Passive components, Measurement of Amplitude and Frequency of a signal, Diode and its applications, Zener diode as a regulator Rectifiers , BJT and MOSFETS working and characteristics, Amplifiers, Implementation of arithmetic digital circuits, selection and working of sensors and transducers, Basic communication system and modulation techniques.

List of Lab Activities

Sr. No	Activities	Duration (Hrs)
1	Understand the concept of Design Thinking for solving Electronics Engineering problems using advanced tools and techniques.	4
2	a) Measurement of Resistance, Inductance and Capacitance by using Digital Multimeter (DMM). b)Measurement of Frequency and Amplitude of a signal by using Digital Storage Oscilloscope(DSO).	4
3	Analysis of Characteristics of P-N junction diode and zener diode using breadboard.	4
4	Implementation of basic electronic circuit and its components (Rectifiers) Developing a DC power supply using full wave diode rectifier and capacitive filter.	4
5	Simulation of BJT as CE amplifier and plotting its frequency response using EDA tool and implementing it on dot PCB	4
6	Build and test arithmetic digital circuits using logic gates on EDA tool	4
7	Build and test a sensor based circuit with transistor and LEDs on a breadboard. (LDR, Thermistor, etc.) and implementing it on dot PCB	4
8	Implement a switching circuit using MOSFET on a breadboard.	4
	Total Hours	**32**

Project Based Learning (PBL) Topics

P1	Lights in the room are continuously ON even if a sufficient amount of light is present. The existing light system needs manual operation to turn it ON/OFF. Develop Smart light system with 12V/6V relay to avoid manual intervention.	
P2	Sometimes there may be inconvenience in transmitting data using the internet. So there is a need for alternative ways of communication in industries.	

	Establish a communication between two microcontrollers placed at least 300 feet apart from each other.	
P3	Fans/ACs in the room are continuously ON even if sufficient air/cooling is present. The existing system needs to be controlled manually. Develop Smart room temperature controller for maintaining temperature 25 to 32 degree Celsius in a lab without manual intervention.	
P4	There is a need for installation of CCTV cameras in the Laboratory. The system aims to detect a person. The CCTV system should have an installed limiting resolution of better than 400 TV lines. A minimum size of the target for recognition shall represent not less than 50% of screen height. Install the CCTV camera for meeting all these requirements for a room of size 27' X 22'.	
P5	The use of Lithium-ion batteries with high energy density is preferred in Electric Vehicles. However, the long range user needs and security issues such as fire and explosion in LIB limits the widespread use of these batteries. Develop an overcharge protection circuit for 12V Lithium-ion battery	**20**
P6	Giving care and health assistance to the bedridden patients at critical stages with advanced medical facilities have become one of the major challenges in the modern hectic world. Develop a system for measurement, monitoring and transmitting the pulse/heartbeat sensor data on a mobile.	
P7	When waking up at night to use the wash basin, you may struggle to find the switchboard to turn ON the light before opening the wash basin tap to wash your hands Develop automatic wash basin tap (tap to hand sensing distance 50cm) with built-in LED light using IR module and timer IC 555	
P8	Perform an analytical survey of any one consumer product : (EV Batteries,Solar inverter,UPS,LED displays).	
	Total Hours	**20**

Text Books

1. Electronics Devices by Thomas. L. Floyd, 9th Edition, Pearson.
2. OP-amp and linear Integrated circuits by Ramakant A.Gayakwad, 4th Edition, Pearson.
3. Electronics Instrumentation by H. S. Kalsi, 3rd Edition, Mc Graw Hill Edition.
4. Mobile Communications by Jochen Schiller,2nd Edition,Pearson.

Reference Books

1. A monograph on Electronics Design Principles by Goyal and Khetan, Khanna Publishers.
2. Electronic Communication Systems by Kennedy and Davis, 4th Edition, TATA McGRAW Hill Edition.
3. LaTeX: A document preparation system , User's guide and reference manual, 2nd Edition, Wesley publisher

Online References

1. Swayam Course, By Prof Kannan Moudgalya, IIT Bombay, Link
2. NPTEL Course, Prof. Avishek Chatterjee, IIT Kharagpur, Link

First Year B. Tech Information Technology

Semester-I

Course Code: IT24VSE103 **Course Name: Engineering Exploration Lab -1**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	4	-	-	-	-	-	50	-	-	50	-	2	-	2

Prerequisite: Basics of Computers ,Basic Mathematics

Course Objectives:

- To implement basic C programming and control structures to solve problems.
- To use functions and recursion to write modular C programs.
- To demonstrate file handling operations like open, read, write, and close in C
- To design and implement real-world C programs considering ethical and societal needs.

Course Outcomes: After learning the course, the students will be able to:

CO1: Understand the fundamentals of C-programming and control structures for problem solving.
CO2: Apply modular programming on real life applications using built-in and user defined functions and recursion.
CO3: Illustrate file handling concepts using open, read, write, update, and close file operations in C programming.
CO4: Design a real life application using fundamentals of programming language considering ethics & society needs.

List of Experiments

Sr. No.	Name of the Experiment	Duration (Hrs.)
1	**Problem Statement: Calculator for Basic Operations** Write a C program that acts as a scientific calculator for performing basic arithmetic operations.	04
2	**Problem Statement: Eligibility Checker** Write a C program to determine the eligibility of a person to vote based on their age and citizenship status.	04
3	**Problem Statement: Student Grade Calculation System** Write a C program to calculate the average and grade of each student.	04
4	**a) Car Rental System using Structure** Create a structure named "Car" to store details like car ID, model, and rental rate per day. Write a C program to input data for three cars, calculate the total rental cost for a specified number of days, and display the results. **b) String Operations:** Write a program in C to i. Count the total number of vowels or consonants in a string. ii. Compare two strings without using string library functions. iii. Count the total number of words in a string. iv. Print individual characters of a string in reverse order.	04
5	**a) Application of Union** Create a union Measurement with members for length in meters, weight in kilograms, and temperature in Celsius, and write a function to print the value. **b) Application of Pointer** Write a C program that uses a pointer to an array of integers and prints all elements of the array using the pointer.	04
6	**Addition and multiplication of matrices** Implement C programs to perform addition and multiplication of two 3X3 matrices using Array.	04
7	**Application of Recursive Function Call** **a)** Write a C program to check whether a number is palindrome or not using recursion. Program will accept a number from the user and display whether the given number is palindrome or not. **b)** Write a C program for i. Calculate the factorial of a number. ii. Generate the nth Fibonacci number	04
8	**Basic File Operations**	04

	Create a C program to perform various file operations, including reading from a file, writing to a file, and displaying the contents of a file.	
	Total Hours	**32**
Project Based Learning (PBL) Topics		
P1	**Typing Tutor** Typing Tutor Project in C to measure users' typing speed and enhance their typing speed.	**28**
P2	**Develop a Real-time Location Tracking System using C Language** Use a microcontroller platform to display user locations on Google Earth. The system aims to provide accurate and continuous monitoring of user, enhancing fleet management and asset tracking capabilities. Key objectives include integrating GPS tracking with a microcontroller, establishing communication protocols for data transmission to Google Earth, and ensuring user-friendly access to real-time user location information.	
P3	**Design and Implement an Expense Tracker using C Language** Develop a comprehensive expense tracker application that records daily expenses,categorizes them, generates detailed monthly and annual reports, and provides budget management features for users to track and optimize their spending habits.	
P4	**Create a Department Diary - department activity monitoring system** In this system users create a department diary. All activities in the semester are added in the diary. You can add, view, edit and delete records. Records can be added with many information such as duration of task, name, address, time and date. File handling has been effectively used to keep the records. Finally, follow-up of the activities is taken from the diary. Develop application using C Language.	
P5	**Design a Cyber Management System** The server module or program is responsible for the management of settings and client requests. On the other hand, the client part gives clients in cyber access to the services provided by the place. Both the programs have different source code, and they run in accordance to one another. So, Cyber Cafe Management System interconnects different computers in a Cyber Cafe, and allows users to communicate over the computer network. It aims at managing Cyber cafes with multiple clients and providing the client's service access to log in. The log-in system provides security from hackers or unauthorized users to gain access to the client-server. In this cyber cafe management system project, clients can log in as guests or members and use the facilities provided by the cyber. Clients can even request services of a typical cafe such as coffee, tea, and other things.	
P6	**Develop a User-Friendly and impactful academic environment** Our academic environment has evolved largely From the days of chalk and board, we've arrived at smart computers that are being handled by children from a rather tender age. Keeping pace with these changes, our learning methodologies also need to be re-envisioned. No longer will students appreciate or gain from rote learning and memorization of pages after pages. In this digital era, visual and graphical demonstration of knowledge has the best impact. So C programming strings and libraries can be utilized to digitize and animate the lessons so that teaching becomes fun and impactful.	
P7	**Design and manage Department Calendar** The Calendar project allows to apply their C programming skills to develop a practical utility tool. It involves concepts like date manipulation, user input processing, and basic graphical user interface design for displaying calendar views and appointment details and to give reminder notifications.	
P8	**Course Registration System** Develop a comprehensive course registration system for students to enroll in classes, view schedules, manage courses, and handle administrative tasks like grading and attendance. This system will be used by students, faculty, and administrators.	
	Total Hours	**28 Hrs**

First Year B. Tech Mechanical Engineering

Semester-I

Course Code: ME24VSE101 **Course Name: Engineering Exploration Lab-1**

Domain: Mechanical Testing & Measurement

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	4	-	-	-	-	-	50	-	-	50	-	2	-	2

Prerequisites: Basics of Physics and Mathematics

Course Objectives:

- To identify appropriate measurement and maintenance tools used in engineering practices.
- To apply the design thinking methodology to address mechanical engineering challenges.
- To develop human-centered products, services, and processes.
- To invent solutions for engineering and social challenges in teams.

Course Outcomes: After completing the course, the students will be able to:

CO1: Select suitable tools for measurement & maintenance in engineering applications

CO2: Apply design thinking approach for solving mechanical engineering problems

CO3: Develop human centric products, services, and processes

CO4: Invent innovative solutions for engineering and social challenges in teams

Contents

Design Thinking - A Primer

Materials and Testing: Investigation of material properties, behavior and applications.

Metrology: Use of measuring instruments to determine the dimensions of mechanical components.

Design: Analyzing the mechanism used in industrial automation and develop the prototype.

Manufacturing: Utilization of mechanical tool kit for installation, alignment and maintenance of mechanical systems.

Thermal: Inspection of industrial parameters like pressure, temperature, flow rate and speed.

Interdisciplinary: Integration of mechanical engineering with electronics, controls and computer applications.

List of Lab Activities

Sr. No.	Activities	Duration (Hrs.)
1	Measure and compare material properties (Young's modulus, ductility, strength).	4
2	Measure dimensions of a Mechanical components using measuring instruments (Vernier caliper, Vernier height gauge and Micrometer).	4
3	Develop mechanisms to trace different paths.	4
4	Maintenance and installation of Lathe tailstock using tool kit.	4
5	Measure the flow rate, pressure and temperature of fluid and speed of rotating link.	4
6	Explore the behavior of fluid flow dynamics through Bernoulli's principle using water flow.	4
7	Assemble a robot using given components.	4
8	Create a program to solve a mechanical problem by using MATLAB.	4
9	A creative group activity on project based learning to validate the concepts of design thinking in engineering applications.	28
	Total Hours	**60**

Project Based Learning (PBL) Topics

(Select any one topic from P1 to P8 OR choose topic of your own for activity number nine)

P1	Develop empathy and understanding of user needs in mechanical systems.
P2	Develop a prototype to assist physically disabled person to lead a better life.
P3	Develop an innovative and user-centric system to address challenges faced by Society.
P4	Identify the recyclable mechanical systems to fulfill sustainability.
P5	Addressing sustainability challenges on campus through a design thinking approach (waste management).
P6	Develop systems that integrate mechanical, electrical, and software components.
P7	Build kinetic sculptures that integrate mechanical motion.

P8	Capstone Project on safety and security (workplace safety, disaster prevention, emergency response, and cyber security.)

Text Books

1. Hazra and Chaudhary, Workshop Technology-I & II, Media promoters & Publisher Pvt. Ltd., 2012.
2. Ulrich, Karl T., Eppinger, Steve D., and Yang, Maria C., "Product Design and Development", 7th Edition, McGraw-Hill Education, 2020.
3. Chitale A. K. and Gupta R. C., "Product Design and Manufacturing", PHI Learning Pvt. Ltd.2023.
4. S. S. Rattan, "Theory of Machines", Third Edition, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2018.

Reference Books

1. Cross,N., "Design thinking: Understanding how designers think and work", Bloomsbury Publishing, 2023.
2. Robert Balmer, William Keat, Exploring engineering: an introduction to engineering and design, 5th edition, 2020.
3. Lee, J. H., Ostwald, M. J., & Gu, N., "Design thinking: creativity, collaboration and culture", Cham: Springer, 2020.
4. Bettiol, M., Di Maria, E., & Micelli, S., "Knowledge Management and Industry 4.0", 2020.

Online References

1. Project-Based Learning, Edutopia, March 14, 2016.
2. www.schoology.com
3. Product Design and Development by Prof. Inderdeep Singh, IIT Roorkee.
4. Design Thinking - A Primer, Prof. Ashwin Mahalingam, Prof. Bala Ramadurai, IIT Madras.

SEMESTER II

First Year B. Tech

Semester - II

Course Code: SH24BSC152 **Course Name: Engineering Mathematics -II**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
3	-	-	-	-	40	60	-	-	-	100	3	-	-	3

Prerequisites: Basic algebra and arithmetic, Functions and their graphs, Limits and continuity, Derivatives and basic differentiation rules, Fundamental integration (indefinite and definite), Basic knowledge of geometry and coordinate systems

Course Objectives:

- To Understand and apply advanced integration techniques
- To Solve various types of first-order differential equations and apply them to real-world engineering problems.
- Use double and triple integrals to compute areas and volumes
- To Apply numerical methods to solve equations and integrals
- To Use numerical techniques like Euler's and Runge - Kutta methods to solve ordinary differential equations in practical situations.

Course Outcomes: After Completing the course, the students will be able to:

CO1: **Apply** advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions and Differentiation under integral sign useful in evaluating multiple integrals and their applications.

CO2: **Utilize** appropriate mathematical techniques to solve first-order differential equations, including exact, non-exact, linear and nonlinear types.

CO3: **Solve** double and triple integrals over the region useful in the analysis of engineering problems.

CO4: **Apply** different numerical methods for solution of ordinary differential equation using modern Scientific computing and solution of algebraic and transcendental equations.

CO5: **Analyze** the accuracy and efficiency of numerical methods such as Trapezoidal and Simpson's rules, and Euler-based and Runge-Kutta methods, in solving integrals and differential equations relevant to engineering problems.

Detailed Syllabus

Unit	Contents	Duration (Hrs.)
1	**Integral calculus** Reduction Formulae, Beta and Gamma functions, Differentiation under Integral sign	7
2	**Differential Equations** Introduction to first order differential equations, Exact differential equation, equations reducible to Exact, linear differential equation, Bernoulli's differential equation, **applications to engineering**	8
3	**Multiple Integral** Double and Triple integration, change of order of integration, **Applications to find Area and Volume**	8
4	**Numerical Methods** Numerical Solution of Algebraic and Transcendental equations: Bisection, Newton-Raphson Method. Interpolation: Finite differences, Newton's and Lagrange's Interpolation formulae	8
5	**Numerical Methods** Numerical Integration: Trapezoidal and Simpson's rules, Solution of Ordinary differential equations: Euler's, Modified Euler's, Runge Kutta 2nd order methods, **Applications of Numerical Methods**	8
	Total Hours	**39**

Text Books

1. Thomas'Advanced Engineering Mathematics by M. D. Greenberg, 2e, Pearson Education ISBN-10: 0133214311
2. Advanced Engineering Mathematics, by Peter V. O'Neil, 7e, Thomson Learning ISBN-10: 1-111- 42741-0
3. Advanced Engineering Mathematics by S.R.K. Iyengar, Rajendra K. Jain, 4e, Alpha Science, International, Ltd ISBN 1-84265-086-6.
4. Higher Engineering Mathematics by B. S. Grewal, 43e, Khanna Publication, Delhi ISBN 1-84265-086- 6

Reference Book

1. Mathematics-I (Calculus and Linear Algebra) by Leena Garg **ISBN**-10. 9391505279; **ISBN**-13. 978-9391505271
2. David F. Rogers, J. Alan Adams, "Mathematical Elements for Computer Graphics" McGraw-Hill 1976. **ISBN**-13: 978-0070535305
3. Differential Calculus by Shanti Narayan, S. Chand and company, New Delhi. **ISBN**-13. 978-8121904711
4. Advanced Engineering Mathematics by C.R. Wylie, McGraw Hill Publications, New Delhi. ISBN-13 978-0070722064
5. Kreyszig Erwin, "Advanced Engineering Mathematics", 10th edition, Wiley Eastern Limited, 2015 ***ISBN***: 9788126554232

Online References

1. https://youtube.com/playlist?list=PLbRMhDVUMngeVrxtbBzn8HvP8KAWBpI5&si=3xAONJdT2ph_jcvG
2. https://nptel.ac.in/courses/111107105/
3. https://youtube.com/playlist?list=PLbRMhDVUMngeVrxtbBzn8HvP8KAWBpI5&si=3xAONJdT2ph_jcvG
4. https://nptel.ac.in/courses/111107105/
5. https://nptel.ac.in/courses/111105122/

First Year B. Tech

Semester - II

Course Code: SH24BSC156 **Course Name: Engineering Mathematics-II Tutorial**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	PR	OR	Total	L	P	T	Total
-	-	1	-	-	-	-	25	-	-	25	-	-	1	1

Prerequisites: MATLAB Fundamentals Course

Course Objective:

- To Understand and visualize curves by exploring Cartesian and polar graphs using GeoGebra to get a clear idea of curve behavior.
- To Apply advanced mathematical functions like Beta and Gamma functions and techniques such as DUIS to solve complex problems.
- To Solve linear differential equations and apply them in engineering problems using MATLAB.
- To Learn numerical methods like Bisection, Newton-Raphson, interpolation, and numerical integration techniques using MATLAB or SCILAB.

Course Outcomes: After Completing the course, the students will be able to:
CO1: Apply the concept of Beta and Gamma functions to solve integrations.
CO2: Solve problems on Linear Differential Equations and its applications using MATLAB.
CO3: Apply Concept of double and triple integration for solving application-based examples using MATLAB.
CO4: Determine numerical Solution of Algebraic and Transcendental equations by Bisection Method / Newton-Raphson Method using MATLAB.
CO5: Analyze the Numerical techniques for getting solutions to ordinary differential equations using MATLAB
CO6: Examine the role of mathematical concepts in solving engineering problems through collaborative projects using MATLAB or similar software tools.

Content

1	**Integral calculus** Reduction Formulae, Beta and Gamma functions, Differentiation under Integral sign.
2	**Differential Equations** Introduction to first order differential equations, Exact differential equation, equations reducible to Exact, linear differential equation, Bernoulli's differential equation, **applications to engineering**.
3	**Multiple Integral** Double and Triple integration, change of order of integration, **Applications to find Area and Volume.**
4	**Numerical Methods** Numerical Solution of Algebraic and Transcendental equations: Bisection, Newton-Raphson Method. Interpolation: Finite differences, Newton's and Lagrange's Interpolation formulae.
5	**Numerical Methods** Numerical Integration: Trapezoidal and Simpson's rules, Solution of Ordinary differential equations: Euler's, Modified Euler's, Runge Kutta 2nd order methods, **Applications of Numerical Methods.**

List of Tutorial

Sr. No.	Name of the Tutorial	Duration (Hrs.)
1	Explore and trace Cartesian and polar curves using GeoGebra for visual understanding of curve behavior.	1
2	Problem-solving using Beta and Gamma functions and DUIS techniques.	1
3	To determine the solution of Linear Differential Equations using MATLAB.	1
4	Analyze applications of differential equations in engineering domains such as electrical circuits, one-dimensional heat conduction, and network traffic modeling using MATLAB.	1
5	Examples on Double and Triple Integrals.	1
6	Use MATLAB to determine area and volume through the application of multiple integrals.	1

7	To determine numerical Solution of Algebraic and Transcendental equations by Bisection Method / Newton-Raphson Method using MATLAB.	1
8	Apply finite differences, Newton's, and Lagrange's interpolation methods using MATLAB	1
9	Use MATLAB or SCILAB to compute numerical integration using Trapezoidal and Simpson's rules.	1
10	Solve ordinary differential equations using Euler's, Modified Euler's, and 2nd-order Runge-Kutta methods in MATLAB	1
11	A creative group activity on project-based learning to validate the concepts of mathematics related to engineering applications.	4
	Total Hours	**14**

Text Books

1. Getting started with MATLAB : A quick Introduction for Scientists and Engineers, By Rudra Pratap **ISBN-**13: 978-0198069195

First Year B. Tech Artificial Intelligence & Data Science

Semester II

Course Code: AI24VSE153 **Course Name: Engineering Exploration Lab-2**
Domain : Design Thinking using Python

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	4	-	-	-	-	-	50	-	-	50	-	2	-	2

Prerequisite Courses : Basic Problem-Solving Skills, Basic Programming Skills.

Course Objectives:

- To introduce students to design thinking principles through practical Python applications.
- To enhance problem-solving abilities using Python programming paradigms.
- To develop skills of modular programming and data handling.
- To enable students to build real-life problem solutions using visualization tools and Python libraries.

Course Outcomes: After completing the course, the students will be able to:

CO1: Apply the programming paradigms of python programming.

CO2: Demonstrate advanced python programming skills.

CO3: Apply various tools and techniques for effective data visualizations.

CO4: Apply Python programming skills to build functional solutions for real-world applications.

Contents

Content related to assignments:

Basics of Python Programming, Decision Control Statements, Functions and Modules, Python visualization libraries.

List of Lab Activities

Sr. No	Activities	Duration (Hrs.)
1	Create a calculator that supports integer and float numbers with basic arithmetic calculations.	4
2	We have a batch of 10 learners who appeared for tests of multiple skills tests. Their scores are recorded. The skills list - aptitude, analytical, verbal. The maximum score for each skill is 50 and the passing criteria are 30. Write a program to analyze to help identify the following a. Identify the number of learners passed in each skill. b. Identify the number of learners who passed in all skills. c. Display the average score per skill d. Assign rank to each learner based on the total score(total of scores of aptitude, analytical, verbal)	4
3	We are a company that is recruiting for developers. The JD(Job description) is as follows Skills – Java, SQL, JDBC Education – BE any branch Experience – 2-4 Years CTC -10L You received 10 applications for the post. Kindly help the HR team to shortlist the profiles.	4
4	You are the owner of a car showroom. The brand offers 3 different variants of the cars. The price of the car differs with the features. a. A 7-seater car will cost 2.5L extra. b. A red color and blue color car will cost 50000 more c. Leather seat covers will cost 30000 more d. EV version will cost 3.0L extra. Write a function to calculate the cost of the car. Take user input for the features the buyers want to have.	4

5	You are working in a bank's credit card system. Your job is to validate the credit card before each online transaction. The user will provide the following details and apply the provided validations. If the card passes all validity checks, display a message that the card is valid, otherwise inform the system that the card is invalid. a. Accept credit card number - it should be a 12-digit input. b. Accept name on the card – there should be two words with only letters c. Accept valid till date – the month number should be less than 12 and the year number should be more than 2024 and less than 2030. d. Accept CVV – a 3-digit number.	4
6	Create a visually appealing and informative pie chart that represents the sales data of different car brands. This pie chart should include customized features such as exploded slices, unique colors, wedge properties, and labels with percentages and absolute values. six different car brands: AUDI, BMW, FORD, TESLA, JAGUAR, and MERCEDES. The number of cars sold for each brand is as follows: AUDI: 23 cars BMW: 17 cars FORD: 35 cars TESLA: 29 cars JAGUAR: 12 cars MERCEDES: 41 cars	4
7	Create a heatmap that visualizes the correlation matrix of independent variables in a heart disease dataset. This will help in understanding the relationships between variables, identifying strong correlations, and making informed decisions about feature selection for predictive modeling.	4
8	Create a line plot with error bars to visualize the price trends of five different stocks over time. Error bars will illustrate the variability or uncertainty in the stock prices, helping to understand the stability of each stock's performance.	4
	Total Hours	**32**
Project Based Learning (PBL) Topics		
P1	To develop a conversational AI-driven chat bot, and investigate their design, functionality across various applications.	**28**
P2	Design and Develop voice assistant systems such as Siri or Alexa.	
P3	Use the following dataset and classify tweets into positive and negative tweets. https://www.kaggle.com/ruchi798/data-science-tweets.	
P4	Develop a movie recommendation model using the scikit-learn library in Refer data set: https://github.com/rashida048/Some-NLP-projects/blob/master /movie_dataset.csv	
P5	Use the following covid_vaccine_statewise.csv data set and perform following analytics on the given data set :https://www.kaggle.com/sudalairajkumar/covid19-in-india?select=covid_vaccine_statewise.csv a. Describe the data set b. Number of persons state wise vaccinated for first dose in India c. Number of persons state wise vaccinated for second dose in d. Number of Males vaccinated e. Number of females vaccinate	
P6	Demonstrate the functionality and capabilities of generative pre-trained transformers, an advanced AI-based language model, through an interactive showcase highlighting its natural language understanding and generation capabilities.	

P7	Design and develop an AI based system for agriculture domain • To analyze historical data and weather patterns, environmental factors • To identify crops to plant based on analyzed data. • To suggest optimal planting times.	
P8	Develop a Handwritten Digit (0-9) image recognition system using AI techniques.	
	Total Hours	**28**

Text Books

1. Matt Harrison, "Design Thinking with Python: Building Human-Centered Applications", O'Reilly Media, ISBN: 978- 1491923101.
2. Tony Gaddis, "Practical Design Thinking with Python", Pearson, ISBN: 978-0134845623.
3. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, ISBN 13: 978-0-19- 948017-6.
4. R. Nageswara Rao, "Core Python Programming", Dream tech Press; Second edition ISBN10: 938605230X, ISBN-13: 978-9386052308 ASIN: B07BFSR3LL.

Reference Books

1. Hasso Plattner, "Design Thinking: Understand – Improve – Apply" , Institute of Design at Stanford University, Springer, ISBN: 978-3837936186
2. Lana Burgess and Sumeet Gulati, "Design Thinking for Data Science: Human-Centered Problem Solving with Python and R", O'Reilly Media, ISBN: 978-1492039592.
3. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly Media, ISBN: 978-1491957660.

Online References

1. Python for Data Science - https://onlinecourses.nptel.ac.in/noc22_cs32/preview
2. Basics of Python - https://www.coursera.org/learn/python-basics
3. The joy of Computing Using Python - The Joy of Computing using Python - Course (nptel.ac.in)

Marathwada Mitramandal's College of Engineering, Pune A.Y. 2025-26

First Year B. Tech Computer Engineering														
Semester- II														
Course Code: CE24VSEC151										**Course Name: Engineering Exploration Lab 2**				
Teaching Scheme (Hours/Week)					**Examination Scheme**						**Credits**			
L	**P**	**T**	**OL**	**ODL**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**TOTAL**	**L**	**P**	**T**	**TOTAL**
-	**4**	**-**	**-**	**-**	**-**	**-**	**50**	**-**	**-**	**50**	**-**	**2**	**-**	**2**

Course Objectives:

- To apply advanced Excel techniques for cleaning and structuring data.
- To design SQL queries for data extraction and aggregation.
- To create interactive visualizations using Tableau.
- To develop a portfolio for applied data analysis skills.

Course Outcomes: After learning the course, the students will be able to:

CO1: Apply advanced data transformation techniques using Excel to clean, structure, and organize raw datasets effectively

CO2: Design SQL queries to extract and aggregate data from relational databases

CO3: Create dynamic and interactive visualizations in Tableau to effectively communicate data insights

CO4: Develop an analytics portfolio that includes a detailed analysis of a dataset

List of Activities

Sr. No.	Name of the Activities	Duration (Hrs.)
1	**Module 1: Data Analytics Projects** 1.0. Introduction 1.1. Analytics in Real-Time 1.2. Data Analytics in Action 1.3. The Project Portfolio 1.4. Data Analytic Projects Summary	03
2	**Module 2: Getting started with Data Gathering and Investigation** 2.0. Introduction 2.1. Tools for Data Understanding 2.2. Basic Excel Concepts and Features 2.3. Use simple functions for data analysis 2.4. Starting the Process Summary	03
3	**Module 3: Preparing and Cleaning Data for Analysis** 3.0. Introduction 3.1. Sources of Data 3.2. Data in Structured Files 3.3. Unstructured Data 3.4. Data Preparation 3.5. Preparing and Cleaning Data for Analysis Summary	03
4	**Module 4: Transforming Data with Excel** 4.0. Introduction 4.1. Sorting and Filtering Data with Excel 4.2. Formatting and Adjusting Data 4.3. Data Calculations 4.4. Transforming Data with Excel Summary	03
5	**Module 5: Analyze the Data Using Statistics** 5.0. Introduction 5.1. Using Statistics to Interpret Data 5.2. Choosing the Right Visualization for the Job 5.3. Creating Visualizations with Excel 5.4. Addressing Anomalies in Data 5.5. Using Excel to Address Issues with Data 5.6. Analyze the Data Using Statistics Summary	04

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6	**Module 6: Introduction to Relational Databases and SQL** 6.0. Introduction 6.1. Basic Data Management 6.2. SQL 6.3. Introduction to Relational Databases and SQL Summary	04
7	**Module 7: Introduction to Structured Queries** 7.0. Introduction 7.1. Relational Database Structures 7.2. Using SQL with Multiple Tables 7.3. Combining SQL Functions to Extract Data 7.4. Management features of SQL and Alternatives 7.5. Introduction to Structured Queries Summary	03
8	**Module 8: Introduction to Tableau** 8.0. Introduction 8.1. Introducing Tableau 8.2. Create Visualizations in Tableau 8.3. Tableau Dashboards	03
9	**Module 9: Ethics and Bias in Data** 9.0. Introduction 9.1. Bias in Data Analysis 9.2. Ethical Use of Data 9.3. Ethics and Bias in Data Summary	03
10	**Module 10: Take the Next Steps** 10.0. Introduction 10.1. Requirements for a Portfolio 10.2. Expanding Your Analytics Skills 10.3. Take the Next Steps Summary	03
	Total Hours	**32**
Project Based Learning (PBL) Topics		
P1	**E-Commerce Sales Analysis** Analyze sales data from an e-commerce platform to understand customer behavior and sales trends. · **Excel:** Clean and organize sales data; perform descriptive statistics to identify key metrics like average order value, total sales by region, and sales trends over time. · **SQL:** Query the database to aggregate sales by product category, customer segment, and time period; analyze sales performance. · **Tableau:** Create a dashboard that visualizes sales trends, top-selling products, and regional performance.	
P2	**Employee Performance and Salary Analysis** Explore employee performance metrics and salary data to assess compensation fairness and performance distribution. · **Excel:** Transform and organize performance and salary data; create pivot tables and charts to analyze salary distribution and performance metrics. · **SQL:** Query to join performance and salary data; calculate average salaries and performance scores by department. · **Tableau:** Develop an interactive dashboard to visualize salary distribution, performance metrics, and departmental comparisons	
P3	**Healthcare Patient Data Analysis** Analyze patient data to identify trends in health metrics and treatment outcomes. · **Excel:** Organize patient data by health metrics and treatments; perform statistical analysis to identify key trends and correlations. · **SQL:** Query the database to aggregate health metrics by treatment type and patient demographics; analyze treatment effectiveness. · **Tableau:** Create a dashboard to visualize patient health trends, treatment outcomes, and demographic patterns.	

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P4	**Retail Inventory Management** Analyze inventory data to optimize stock levels and understand product performance. · **Excel:** Transform and organize inventory data; use pivot tables to analyze stock levels, turnover rates, and reorder points. · **SQL:** Write queries to aggregate inventory data by product category, location, and time period; analyze stock trends and performance. · **Tableau:** Develop a dashboard to visualize inventory levels, turnover rates, and stock-outs across different product categories.	
P5	**Social Media Analytics** Analyze social media engagement data to understand audience behavior and content performance. · **Excel:** Clean and organize social media metrics; use charts and pivot tables to analyze engagement rates, follower growth, and content performance. · **SQL:** Query to aggregate social media data by platform, content type, and time period; analyze engagement and growth metrics. · **Tableau:** Build a dashboard to visualize social media metrics, engagement trends, and performance by content type.	
P6	**Travel and Tourism Data Analysis** Examine travel and tourism data to identify trends in tourist arrivals, popular destinations, and seasonal patterns. · **Excel:** Organize travel data by destination and time period; use pivot tables and charts to analyze tourist trends and seasonal variations. · **SQL:** Query the database to aggregate data by destination, month, and year; analyze tourism trends and patterns. · **Tableau:** Create an interactive map and dashboard to visualize tourist arrivals, popular destinations, and seasonal trends	**28**
P7	**Education and Student Performance Analysis** Analyze student performance data to evaluate academic progress and identify factors affecting performance. · **Excel:** Transform and organize student performance data; use charts and pivot tables to analyze grades, attendance, and academic progress. · **SQL:** Query to aggregate data by student demographics, subjects, and performance metrics; identify patterns and correlations. · **Tableau:** Develop a dashboard to visualize student performance, attendance trends, and academic progress by demographic segments	
P8	**Financial Market Analysis** Analyze financial market data to understand stock performance, market trends, and investment opportunities · **Excel:** Transform stock market data; use statistical functions to analyze stock performance, volatility,and investment returns. · **SQL:** Write queries to aggregate financial data by stock, sector, and time period; analyze market trends and investment metrics. · **Tableau:** Develop a dashboard to visualize stock performance, market trends, and financial indicators	
	Total Hours	**28**

Marathwada Mitramandal's College of Engineering, Pune A.Y. 2025-26

First Year B. Tech Electrical Engineering

Semester-II

Course Code: EE24VSE151 **Course Name: Engineering Exploration Lab-2**

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	4	-	-	-	-	-	50	-	-	50	-	2	-	2

Prerequisite: Basic computer skills, understanding of electrical components.

Course Objectives:

- To cultivate a Design Thinking mindset for creative and user-centered product development.
- To provide foundational knowledge and skills in electrical design software, including installation and use of essential toolsets.
- To enable the identification and extraction of design requirements for creating hardware prototypes.
- To encourage the recognition of real-life challenges and the formulation of effective, practical solutions.

Course Outcomes: After completing the course, the students will be able to:

CO1: Develop Design Thinking approach for product development.

CO2: Understand electrical design software, including its installation and toolsets

CO3: Extract design requirements and develop hardware prototype.

CO4: Identify real life problems and propose suitable solutions.

Contents

Introduction to AutoCAD Electrical: Overview, interface, and basic Commands Project Setup: Creating and managing projects, settings, Drawing Creation: Inserting/editing schematic symbols, wire numbering, Schematic Design: Creating schematics, connecting components, Panel Layout: Panel layout drawings, component arrangement, PLC Modules: Inserting/configuring PLC modules, I/O drawings, Symbol Libraries: Using, managing, and creating custom symbols. Reports: Generating BOM, wire lists, customizing reports, Advanced Features: Cable management, cross-referencing, standards, Testing and Commissioning: Procedures for testing and verifying systems, Installation: Installing hardware according to design schematics, Troubleshooting: Identifying and resolving issues in electrical systems.
The Course is industry driven & approved by Proexcel Systems, Pune.

List of Experiments

Sr. No.	Name of the Experiment	Duration (Hrs.)
1	Understand the concept of Design Thinking for solving Engineering problems creatively through advanced tools and techniques.	4
2	Understand the concept of AutoCAD electrical software including process of installation, use of its toolset and implement it with electrical schematic.	2
3	Draw a single line diagram of the electric supply system & wiring diagram of variable frequency Drive(VFD) in AutoCAD electrical.	2
4	Identification and testing of electrical components required for hardware Setup to be developed.	2
5	Draw a schematic diagram for a Power Interruption Alarm System using AutoCAD Electrical. Translate the schematic into a hardware setup.	6
6	Draw a wiring diagram for Metal Detector System using AutoCAD Electrical & Build the hardware.	6
7	Draw a wiring diagram for a Mobile Phone Charger Circuit using AutoCAD Electrical. After completing the diagram, build the hardware.	6
8	Develop a PLC ladder logic program for a simple traffic light control system using AutoCAD Electrical. Implement the program in hardware, ensuring the system functions correctly.	4
	Total Hours	**32**

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Project Based Learning (PBL) Topics		
P1	Create a schematic diagram for a Water Level Indicator system using AutoCAD Electrical. Build the Water Level Indicator hardware based on the schematic, ensuring it produces sound as expected.	**28**
P2	Design and implement an automatic power changeover switch that can switch between a primary power source (e.g., utility grid) and a backup power source (e.g., generator or battery system).	
P3	Design a Direct On Line (DOL) starter circuit for an electric motor using AutoCAD Electrical. Construct the starter circuit in hardware, ensuring it functions correctly with the motor.	
P4	Design a schematic diagram for an Automated Lighting Control System using AutoCAD Electrical. Implement the program in hardware, ensuring the lighting control functions correctly based on various inputs (e.g., motion sensors, light sensors, and manual switches)	
P5	Design the layout of a Solar Power Bank using AutoCAD Electrical. After completing the schematic, build the Solar Power Bank according to the design.	
P6	Design a wiring diagram for a remote home automation system controlling the AC appliances using AutoCAD Electrical. Build the hardware for the home automation system based on the diagram, ensuring all components are connected and operate as intended.	
P7	Design a schematic diagram for an Automated Fire Alarm and Suppression System using AutoCAD Electrical and implement the program in hardware. The system should ensure fire detection and suppression functions correctly based on various inputs (e.g., smoke detectors, heat sensors, and manual alarms).	
P8	Design a panel layout using AutoCAD Electrical, ensuring the component arrangement is accurate. Build the hardware based on the layout, ensuring all components are properly installed and connected.	
	Total Hours	**28**

Marathwada Mitramandal's College of Engineering, Pune A.Y. 2025-26

First Year B. Tech Electronics and Telecommunication Engineering

Semester-II

Course Code: ET24VSE151 **Course Name: Engineering Exploration Lab-2**
Domain: PCB Design and Development

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	4	-	-	-	-	-	50	-	-	50	-	2	-	2

Prerequisite Courses: Engineering exploration Lab-I

Course Objectives:

- To train students in the effective use of maintenance tools and measuring instruments for assembling and testing electronic circuits
- To develop proficiency in simulating electronic circuits using industry-standard EDA tools
- To build the ability to construct and evaluate electronic circuits tailored to specific functional requirements
- To enable students to design, fabricate, and assemble electronic prototypes using printed circuit board (PCB) technology

Course Outcomes: After completing the course, the students will be able to:
CO1: Demonstrate use of maintenance tools and measuring instruments for building and testing the electronic circuit.
CO2: Simulate electronic circuit using appropriate EDA tools.
CO3: Build and test electronic circuit for specific application.
CO4: Develop electronic product/prototype using printed circuit board (PCB).

Contents in Association with Asha Electronics, Pune

Types of Printed Circuit Boards, Rules for Single and Double Sided Board. Layout Design, Routing methods . Guideline for Artwork Generation. Component Library management in PCB Design tool. Rules of Design for manufacturing. Rules of Design for assembly. Manual Assembly method, Semiautomatic and automatic Assembly method. Tools used in the assembly process. Applications of tools in soldering defects and rectification. Testing for quality Control.
EDA simulation tool - multisim / simulink / falstad / PCBexpresso, Basic communication protocols.

List of Lab Activities

Sr. No	Activities	Duration (Hrs)
1	Introduction to single sided and double sided PCBs.	4
2	Perform Simulation of selected electronic circuit using EDA tool.	4
3	Build and test the circuit on a breadboard.	4
4	Preparation of Layout and artwork of the circuit.	4
5	Preparation of copper clad laminate (Cutting and Etching)	4
6	Assembly of circuit (Drilling, Component mounting and Soldering).	4
7	Testing and troubleshooting of developed prototypes.	4
8	Report writing on the developed prototype	4
	Total Hours	**32**

Marathwada Mitramandal's College of Engineering, Pune A.Y. 2025-26

Project Based Learning (PBL) Topics		
P1	A reliable Fire Alarm/Smoke Detection System with a siren sound provides immediate alerts to occupants, enabling prompt evacuation and fire mitigation actions. Develop a system for Fire/Smoke detection range at least 10 feet with Siren Sound using a controller.	**20**
P2	Temperature monitoring and control are critical in various industries and applications to ensure optimal operation, product quality, and safety. A reliable Temperature Monitoring & Control System (TMCS) provides real-time data on temperature conditions and maintains preset temperature levels through automated control mechanisms. Develop a temperature monitoring & control system for the server room size 10' X 10'	
P3	Battery-powered devices rely on accurate monitoring of battery levels to ensure uninterrupted operation and prevent unexpected shutdowns. A battery level indicator provides users with crucial information about the remaining charge, enabling them to plan recharging or replacement accordingly. Develop a Battery Level Indicator (100% ,50% and below 10%) using electronic circuit	
P4	Solar power panels are essential for renewable energy generation, but their efficiency can vary significantly based on factors such as weather conditions, panel orientation, shading, and temperature. Optimizing the efficiency of solar panels involves studying their behavior under various application scenarios and developing control strategies to maximize energy output. Study efficiency behavior of 21V, 50 Watt solar panels during various climatic conditions.	
P5	Fundamental for interfacing microcontrollers like Arduino with other devices such as sensors, actuators, displays, and computers. Arduino's serial communication capabilities enable data exchange through a UART (Universal Asynchronous Receiver/Transmitter) interface, allowing for versatile applications in IoT, robotics, data logging, and more. Establish a Serial communication with baud rate of 9600 using Arduino.	
P6	In modern electronics, microcontrollers are used for automation, control, and sensing applications. The aim is to develop a versatile microcontroller-based circuit capable of performing automated function. Develop a microcontroller based system for speed control of (5V) DC motor.	
P7	Pollution monitoring systems play a crucial role in environmental management by providing real-time data on air quality, noise levels, water pollution, and garbage accumulation. Develop a microcontroller based data acquisition system for pollution monitoring on Things speak cloud or any other cloud system.	
P8	Now a days parking at public places is a major issue being faced by the people. Develop a smart parking system which displays the free parking slots on display at entry level using sensors (IR/LDR/any other) .	
	Total Hours	**20**

Text Books
1. Electronics Devices by Thomas L. Floyd, 9th Edition, Pearson. 2. Sensors and Transducers by D. Patranabis, 2nd Edition, PHI 3. Microprocessor architecture programming and application with 8085,by Ramesh Gaonkar,5th Edition,PRI.
Reference Books
1. A monograph on Electronics Design Principles, by Goyal and Khetan, Khanna Publishers. 2. Electronic Communication Systems by Kennedy and Davis, 4th Edition, TATA McGRAW Hill Edition. 3. LaTeX: A document preparation system, User's guide and reference manual, 2nd Edition, Wesley publisher
Online References
1. NPTEL Course, Prof. Ankur Gupta, IIT Delhi, Link 2. High Speed PCB design Guide, Amit Bahl Link

Marathwada Mitramandal's College of Engineering, Pune A.Y. 2025-26

First Year B. Tech Information Technology

Semester-II

Course Code: IT24VSE151 **Course Name: Engineering Exploration Lab -2**
Domain : Design Thinking & UI/UX

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	4	-	-	-	-	-	50	-	-	50	-	2	-	2

Course Objectives:

- To analyze user needs and define system requirements through surveys and interviews.
- To design wireframes, task flows, and style guides for user interfaces.
- To develop and test prototypes using design thinking and iterative feedback for continuous improvement.
- To create user personas and journey maps to address diverse user needs across platforms.

Course Outcomes: After learning the course, the students will be able to:
CO1: Comprehend the Fundamentals of UX and Design Thinking
CO2: Conduct User Research and Develop User-Centric Designs
CO3: Ideate, Prototype, and Test the interface Designs
CO4: Implement UI Design Principles and Ensure Accessibility

Contents in Association with Tech Mahindra, Pune

Introduction to UX and Design Thinking, what is UX, importance, introduction to DT, UX process, Understanding Users, Basic research, introduction to empathy, personas, Ideation and Brainstorming, Introduction to ideation, different methods, Prototyping, Introduction to prototyping, tools, sketching, Usability Testing, what is usability testing, importance, methods, UI Design Principles, Elements, principles, introduction to tools, interaction design, Accessibility and Inclusive Design, Introduction to accessibility, importance, principles.

List of Experiments

Sr. No.	Name of the Experiment	Duration (Hrs.)
1	**Understanding User Needs:** Students will work in groups to gather requirements for a new university Portal. • Conduct a survey among students and faculty to identify key features and functionalities. • Analyze the survey data to identify common needs and pain points. Create a list of functional and non-functional requirements based on their findings.	04
2	**Conducting Effective Interviews:** Students will conduct interviews with different stakeholders (e.g., students, professors, administrative staff) about their experiences with the current university portal. • Prepare an interview guide with open-ended questions. • Conduct at least three interviews with different stakeholders. Summarize the findings and identify key insights.	04
3	**Evaluating an Existing System:** Students will perform a UX audit of a popular app or website. • Use Jakob Nielsen's heuristics to evaluate the interface. • Identify usability issues and areas for improvement. Present their findings in a report with screenshots and annotations.	04
4	**Developing User Personas and Journeys:** Students will create user personas and journey maps for a mobile banking app. • Develop at least three personas representing different types of users. • Create a user journey map for each persona, highlighting their goals, actions, pain points, and emotions. Present their personas and journey maps to the class.	04
5	**Designing Task Flows and IA:** Students will design task flows and information architecture for an e- commerce website. • Identify key tasks users need to perform (e.g., searching for products, making a purchase). • Create task flow diagrams for these tasks. Develop a sitemap for the website, organizing the content and navigation structure.	04

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6	**Wireframing a Mobile App:** Students will use Figma to create wireframes for a new mobile app. • Design low-fidelity wireframes for the main screens of the app. • Focus on layout, navigation, and key interactions. Share their wireframes with peers for feedback and make revisions.	04
7	**Developing a Style Guide:** Students will create a style guide for a web application. • Define typography, color schemes, button styles, and other UI elements. • Create a document outlining the style guide using Figma or another design tool. Ensure the style guide is comprehensive and easy to follow.	04
8	**Rapid Prototyping and Testing:** Students will engage in a design thinking workshop to rapidly prototype and test a new feature for a social media app. • Work in teams to brainstorm and sketch ideas. • Create a low-fidelity prototype of their chosen idea. • Conduct guerrilla testing with peers to gather quick feedback. Iterate on their design based on the feedback received.	04
	Total Hours	**32**
Project Based Learning (PBL) Topics		
P1	**E-commerce Website Redesign:** Redesign the user interface and user experience of an existing e-commerce website to improve usability, accessibility, and conversion rates.	**28**
P2	**Mobile App for a Non-Profit Organization:** Design a mobile app that addresses the needs of a non-profit organization, focusing on intuitive navigation, engagement, and accessibility.	
P3	**Educational Platform Enhancement:** Improve the user interface and user experience of an online learning platform, incorporating features for better engagement and learning outcomes.	
P4	**Travel Planning Application:** Design a travel planning app that helps users research destinations, plan itineraries, and book accommodations with a focus on ease of use and visual appeal.	
P5	**Financial Management Tool:** Develop a web-based tool for personal finance management, integrating budgeting, expense tracking, and financial goal setting with a clear and intuitive interface.	
P6	**Gaming Interface Redesign:** Redesign the user interface of a popular video game, focusing on improving navigation, accessibility of controls, and overall gaming experience	
P7	**Social Media Platform Concept:** Develop a concept for a new social media platform with innovative features for content sharing, community building, and personalization.	
P8	**Food Delivery Service App:** Design a user-friendly app for a food delivery service, optimizing the ordering process, delivery tracking, and customer support interactions	
	Total Hours	**28**

Text Books

1. Buxton, B., Sketching User Experiences: Getting the Design Right and the Right Design. Morgan Kaufmann, (2007).
2. Jesse James Garrett, The Elements of User Experience: User-centered Design for the Web, New Riders; 2 edition 2011

Reference Books

1. Russ Unger, Carolyn Chandler, A Project Guide to UX Design: For User Experience Designers in the Field Or in the Making, New Riders; 2nd edition, 2012
2. Don Norman, The Design of Everyday Things, Basic Books; 2nd edition, 2013.
3. Everett N. McKay, UI is Communication: How to Design Intuitive, User Centered Interfaces by Focusing on Effective Communication, Morgan Kaufmann; Illustrated edition, 2013.
4. Dr. Erich Gamma, Ralph Johnson, Richard Helm and John Vlissides, Design Patterns: Elements of Reusable Object - Oriented Software, Pearson, 2008

Online References

1. https://www.coursera.org/specializations/ui-ux-design
2. https://learnux.io/
3. https://www.sketch.com

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First Year B. Tech Mechanical Engineering

Semester-II

Course Code: ME24VSE153 **Course Name: Engineering Exploration Lab-2**

Domain: Design & Manufacturing

Teaching Scheme (Hours/Week)					Examination Scheme						Credits			
L	P	T	OL	ODL	CIE	ETE	TW	OR	PR	TOTAL	L	P	T	TOTAL
-	4	-	-	-	-	-	50	-	-	50	-	2	-	2

Prerequisites: Basics of Mathematics

Course Objectives:

- To develop skills in visualization and modelling techniques.
- To understand and apply sustainability principles in product design and development.
- To implement technical knowledge for designing feasible and effective solutions.
- To select and use appropriate hand tools, cutting tools, and machine tools for manufacturing processes.

Course Outcomes: After completing the course, the students will be able to:

CO1: Apply the techniques of Visualization and Modeling
CO2: Explain sustainability aspect of product design and development
CO3: Implement the technical knowledge to design feasible solutions
CO4: Select appropriate hand tools, cutting tools and machine tools for manufacturing

Contents

Engineering Graphics: Introduction to GUI of CAD software, basic operation of CAD software, draw tools, modify tools, dimensions and properties, orthographic & isometric projection, development of lateral surfaces, CAD customization.

Manufacturing: Lathe machine & operations, CNC machine, machining centers-Principles, working, Parts programming, Additive manufacturing (3D Printing), Laser based manufacturing.

List of Lab Activities

Sr. No.	Activities	Duration (Hrs.)
1	Draw 2D drawing of fasteners by using CAD software.	4
2	Select the mechanical object and draw its orthographic views.	4
3	Draw an isometric view from the 2D drawings.	4
4	Sketch a sheet metal component using AutoCAD (Development of surfaces).	4
5	Perform machining operations using Lathe & CNC machine.	4
6	Perform machining operations using VMC machine.	4
7	Make a solid object using 3D printer.	4
8	Jobs on laser cutting machine.	4
9	A creative group activity on project based learning to validate the concepts of design thinking in engineering applications.	28
	Total Hours	**60**

Project Based Learning (PBL) Topics
(Select any one topic from P1 to P8 OR choose topic of your own for activity number nine)

P1	Capstone project: Common mechanical systems (Automotive, Power Systems etc.).
P2	Create a prototype model to assist mobility of DIVYANG person.
P3	Develop a working model by reuse of components.
P4	Develop an engineering device powered by renewable energy sources.
P5	Solve sustainability issues related to automotive and industrial safety.
P6	Develop prototype for assisting in agricultural applications.
P7	Develop prototype system for reducing environmental pollution.
P8	Develop product based on automation.

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Text Books

1. Bhatt, N. D. and Panchal, V. M., "Engineering Drawing", Charotar Publication, Anand, India, 2016.
2. Rathnam, K., "A First Course in Engineering Drawing", Springer Nature Singapore Pte. Ltd., Singapore, 2018.
3. H.S. Bawa, "Workshop Practice", Tata McGraw Hill Education (Publisher), 2017.
4. S. K. Hajra Choudhary, Nirjhar Roy, "Element of Workshop Technology: Vol.1 and 2", Media Promoters and Publishers Pvt. Ltd., 2012.
5. Ulrich, Karl T., Eppinger, Steve D., and Yang, Maria C., "Product Design and Development", 7th Edition, McGraw-Hill Education, 2020.
6. Chitale A. K. and Gupta R. C., "Product Design and Manufacturing", PHI Learning Pvt. Ltd., 2023.

Reference Books

1. Madsen, D. P. and Madsen, D. A., "Engineering Drawing and design", Delmar Publishers Inc., USA, 2016.
2. Dhawan, R. K., "A Textbook of Engineering Drawing", S. Chand, New Delhi, 2000.
3. John, K. C., "Mechanical Workshop Practice", Prentice Hall Publication, New Delhi,2010.
4. Chua Chee Kai, Leong Kah Fai, "3D Printing and Additive Manufacturing: Principles & Applications", 4th Edition, World Scientific, 2015.
5. M. P. Groover, "Production system & Computer Integrated manufacturing", Person India, 2007.

Online References

1. Project-Based Learning, Edutopia, March 14, 2016.
2. www.schoology.com
3. Product Design and Development by Prof. Inderdeep Singh, IIT Roorkee.
4. Design Thinking - A Primer, Prof. Ashwin Mahalingam, Prof. Bala Ramadurai, IIT Madras.
5. Inderdeep Singh, "Product Design and Development ", IIT Roorkee.
6. Shrikrishna N. Joshi, "laser-based manufacturing", IIT Guwahati.

AICTE Approved Programmes

Branch	Intake			Career Options
	B.Tech.	M.Tech.	Working Professional Direct Second Year	
Computer Engineering	180	Computer Engineering:18	---	Data Science, Artificial Intelligence (AI), Big Data Analytics, High Performance Computing (HPC), Machine Learning, Database Engineering, Computer Networks, Cyber Security, IOT
Electrical Engineering	60	Power Electronics & Drives: 06	30	Public Sector, Power Sector, Software Development, Maintenance Engineering, Contractor & Supervisor, Energy Auditor, Internet of Things (IoT), Robotics and Automation, Industry 4.0, Chartered Engineer, Electric Vehicles,
Electronics & Telecommunications Engineering	180	VLSI and Embedded System: 06	---	Internet of Things (IoT), Robotics and Automation, Industry 4.0, Wireless Communication 4G, 5G, 6G, Artificial Intelligence, VLSI, Embedded Systems, Satellite Communication, Data Science, Power Electronics, Computer Networking, Blockchain Technology, Signal Processing, Electronic Design
Information Technology	180	Data Science: 06	---	Software Development &Testing, Cyber Security, Cloud Computing, Big Data Analytics, IoT, Machine Learning, Artificial Intelligence, Blockchain, Database Management, Data Engineer, Data Science
Mechanical Engineering	120	Design Engineering: 06	30	Machine Design, System Modeling, Simulation, Robotics, Mechatronics, Rapid Prototyping, 3D Printing, Composite Materials, Automotive & Electrical Vehicles, Manufacturing Sector, HVAC Systems, Energy Engineering and Process Industry, Robotics, Data Science, Public Sector, Power Sector, Software Development, Mechanical Design Engineer, Design Quality Assurance Manager, Engineering, Service, Teaching, Designing Machines & Tools
Artificial Intelligence and Data Science	180	---	---	Cyber Security Analyst, Software Development Expert, Artificial Intelligence Engineer, Data Scientist, Data Analysis, Machine Learning Engineer, Machine Learning Architect, Product Analyst, Software Architect, Data Warehouse Engineer, Product Manager, Front-end Developer, Full Stack Developer
Ph.D Research Center in Computer Engineering.				

Industry Connect through Professional Bodies / Students' Chapters

- CII
- ISHRAE
- ACM
- ISRD
- GDSC
- IE(I)
- TATA
- ASHRAE
- IETE
- DICCI
- IEEE
- ISACA
- MCCIA
- SAEINDIA
- CSI
- ISTE
- STP

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