Meenakshi Sundararajan Engineering College

(An Autonomous Institution)

Managed by I.I.E.T Society, Approved by AICTE, New Delhi,
Affiliated to Anna University, Chennai,
Accredited by NAAC with 'A' grade and NBA for programs applied,
Recognized by UGC with 2(f) & 12(B) status

B.E. CIVIL ENGINEERING
CURRICULUM AND SYLLABUS
REGULATIONS 2024
CHOICE BASED CREDIT SYSTEM

Powered by

Meenakshi Sundararajan Career Development Cell

Achievers Excellence Program

Meenakshi Sundararajan Innovation and Incubation Centre

MSEC JAPANESE CLUB

Institutions' Innovation Council

Societal Beneficial Innovation

MATLAB Enabled Campus

363, Arcot Road, Kodambakkam, Chennai - 600 024.
www. msec.edu.in

Meenakshi Sundararajan Engineering College

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Prof. K. R. Sundararajan, a well-known educationalist, established the Indian Institute of Engineering Technology (I.I.E.T) society in the year 1947 in Chennai. The total area of 14 acres was purchased with enormous hardship and was donated to the IIET Society for the cause of education. The society's main objective is to provide quality education and it has been ensured since 1951.

The IIET Society has the following to its credit :-

- An uninterrupted and continuous education since 1951 in its premises
- All Colleges run by the institution are ranked among the top 5 – top 10 programs in Tamil Nadu
- 350 KW Solar Power Plant Generating upto 70% of its electricity needs
- Significant portion of the students are first generation learners
- Campus holds approximately 7000 plus students from the ages of 4 to 35 plus.
- Large Green Campus in the heart of the city of Chennai, Tamil Nadu
- In existence since 1947 – Completed 75 years
- Targeting to be Carbon Neutral from the end of the year 2025

The society currently has the following institutions :-

- **Meenakshi Sundararajan Engineering College(MSEC)** - established in 2001 & affiliated to Anna University offering engineering programs with about 2000 plus students.
- **Meenakshi Sundararajan School of Management(MSSM)** - established in 2000 & affiliated to University of Madras offering MBA programs with about 100 plus students.
- **The NEST School (TNS)**- established in 2022 offering IB (International Baccalaureate) & CAIE (Cambridge) boards.

All of the institutions have earned an enviable name and are rated as one among Top 10 colleges in the Tamil Nadu state in their respective programs. Efforts are on to make the campus carbon neutral in 2 years (end of 2025) by using our community of staff and students.

Meenakshi Sundararajan Engineering College (MSEC) was established by the IIET Society in 2001. MSEC is defined by two keywords "Industry Ready" & "Vibrancy". Creating a new generation of self- actualized learners is our raison d'etre. If children are our future, then education is the key to their future. When education is shaped around them, and not the other way around, we are laying the foundation for a future/world where creativity, diversity and caring, independent-thinkers thrive. Our curricula thrive on continuous learning while interacting with and incorporating real-world situations and challenges.

MSEC's Hallmark of Quality

- Affiliated to Anna University, Chennai
- Approved by AICTE, New Delhi
- Accredited by NBA for programs in:
  - Civil Engineering
  - Computer Science and Engineering
  - Electronics and Communication Engineering
  - Mechanical Engineering
  - Electrical and Electronics Engineering
  - Information Technology
- Accredited by NAAC with a prestigious "A" grade
- Declared under Section 2(f) and 12(B) of the UGC Act
- Conferred with Autonomous status for 10 years (2024-25 to 2033-34) by the University Grants Commission (UGC) on February 1, 2024
- Meenakshi Sundararajan Innovation and Incubation Centre (MSIIC)
- Meenakshi Sundararajan Career Development Cell (MSCDC)
- MSEC Research Centre (MSEC RC)
- Center of Excellence – Industry Tie Up in Specialized Labs
- Industry MOU's – 200 Plus

Vision of the Institute

To impart state-of-the-art technical education, including sterling values and shining character, producing engineers who contribute to nation building thereby achieving our ultimate objective of sustained development of an unparalleled society, nation and world at large.

Mission of the Institute

Meenakshi Sundararajan Engineering college, Chennai constantly strives to be a Centre of Excellence with the singular aim of producing students of outstanding academic excellence and sterling character to benefit the society, our nation and the world at large.

To achieve this, the college ensures

- Continuous upgradation of its teaching faculty to ensure a high standard of quality education and to meet the ever-changing needs of the society
- Constant interaction with its stakeholders
- Linkage with other educational institutions and industries at the national and international level for mutual benefit
- Provision of research facilities and infrastructure in line with global trends
- Adequate opportunities and exposure to the students through suitable programs, to mould their character and to develop their personality with an emphasis on professional ethics and moral values.

We offer following courses:

S.No	Course	Intake
	Undergraduate courses in B.E / B. Tech	
01	B.E Civil Engineering	60
02	B.E Computer Science and Engineering	120
03	B.E Electronics and Communication Engineering	120
04	B.E Electrical & Electronics Engineering	60
05	B.E Mechanical Engineering	60
06	B. Tech Information Technology	120
07	B. Tech Artificial Intelligence & Data Sciences	120
	Postgraduate courses in M.E / M. Tech	
08	M.E. Construction Engineering and Management	18
09	M.E. Computer Science and Engineering	18
10	M.E. Embedded System Technologies	18
11	M.E Energy Engineering	18

DEPARTMENT OF HUMANITIES AND SCIENCE

The H&S Department stands out for its commitment to providing a well-rounded academic experience for first-year students. Covering key subjects like Physics, Chemistry, Mathematics, English, and Tamil. The department boasts a high pass percentage in semester exams, a testament to the hard work and dedication of the faculty. This year, the department enhanced offerings with industry and alumni talks, foreign language courses, engaging games, and specialized coaching for AEP and ICS. Additionally, the department introduced an industry-oriented and department-specific syllabus to better prepare students for future challenges and opportunities

DEPARTMENT OF CIVIL ENGINEERING

The Civil Engineering Department at our college, established in 2002, is a beacon of academic excellence and research innovation. Offering both undergraduate program and postgraduate program in M.E. Construction Engineering and Management, the department is committed to integrating advanced technologies and sustainable practices into its curriculum. The department boasts state-of-the-art laboratories and strong industry collaborations. Graduates of the department have made significant contributions to civil engineering, both nationally and internationally, and continue to shape the future of the discipline through unwavering commitment to excellence.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

The Department of Computer Science and Engineering was established in 2001. It has its mission to inculcate innovative thinking and analytical abilities in addition to imparting quality education in the theory and application of Computer Science and Engineering. The department offers UG and PG programmes with State-of-the-art Computer laboratories equipped with high end hardware and software packages provided with high-speed leased line connectivity. The department takes pride in its academic excellence and outstanding placement records. It has consistently produced 68 university rank holders till 2023 batch and accredited by National Board of Accreditation.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

The Electrical and Electronics Engineering Department, established in 2003, is expanding its offerings to M.E. program in Embedded System Technologies from the 2024-25 academic year. With a focus on knowledge - based training, the department faculty empowers students with a deep understanding of concepts and industry - ready skills. The department forged partnerships with 22 companies through MOUs, facilitating collaboration and knowledge exchange.

The Electrical Technocrats Association (ETA) is a vibrant platform for technical activities, including the publication and showcasing of newsletters by staff and students every fortnight. Our mission is to drive technological advancements, foster research, and address industry needs.

DEPARTMENT OF MECHANICAL ENGINEERING

Meenakshi Sundararajan Engineering College inaugurated the Department of Mechanical Engineering in the academic year 2011-12. The department has well qualified faculties with excellent teaching, training and industrial experience. It has state-of-the-art laboratories which include VMC, CNC Wire Cut, Spark Erosion, 3D CMM etc catering to academic, consultancy and research requirements. The department's endeavor is to develop its students to be industry ready when they graduate. Students of mechanical engineering department gain industrial exposure and are prepared to face future challenges by carrying out their Final Year Project work in various PSU/Private sectors as per their field of interest relevant to their program. The department has a memorandum of understanding with various Institutions, Industries and Research organizations for collaborative research and development work. There is a huge potential in the department for Consultancy as well as Technology and Product incubation.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

The Department of Electronics and Communication Engineering, established in 2001, has grown significantly increasing its sanctioned intake from 60 to 120 in 2010. With NBA accreditation, the department is committed to delivering quality education, producing graduates who excel technically, socially, and professionally. Its state-of-the-art infrastructure, featuring ICT-enabled classrooms and advanced laboratories with cutting-edge tools like Cortex M4, Spartan 6, IoT kits, MATLAB, Cadence and PSPICE that supports academic excellence.

The Department's industry linkages with renowned organizations including ISRO, DRDO, NLTVC, and Ericson enhance students' technical skills through interactive events.

The Department's achievements include academic excellence, impressive placement records, and students' accomplishments in sports, arts, and culture, with alumni globally represented in top companies like Intel, Yahoo, and Apple.

DEPARTMENT OF INFORMATION TECHNOLOGY

The department of Information Technology was started in the year 2001 with an intake of 60 students focusing on the area. The department has won laurels to to the college. The department constantly strives with the singular aim of producing students with outstanding academic excellence and sterling character to benefit the society, our nation and the world at large. The department's commitment to high academic standards and successful student placements. It has consistently produced 65 university rank holders till 2023 batch and accredited by National Board of accreditation. Campus Agreement has been signed with leading software and hardware giants like Microsoft, IBM, Adobe and HP. The department has received a certificate partnership as a "Center of Excellence" with Virtusa Technology.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

The Department of Artificial Intelligence & Data Science was established in 2021 with an initial intake of 60 students, which was subsequently increased to 120 in 2024. Our department boasts a team of highly qualified, experienced, and competent faculty members and features spacious infrastructure with modern amenities, including six well-equipped computer laboratories with backup and internet facilities. We emphasize continuous knowledge enrichment through seminars, guest lectures, workshops, and skill enhancement programs for both students and faculty, and engage in meticulous academic planning to ensure a well-structured approach to each semester. Additionally, our student-driven club, serves as an incubation center, nurturing innovative ideas and fostering creativity.

INTERNAL QUALITY ASSURANCE CELL (IQAC)

MSEC established the Internal Quality Assurance Cell (IQAC) in 2016 to develop and implement quality standards and benchmarks in key performance areas. In alignment with the National Education Policy (NEP) 2020 and subsequent reforms, the IQAC has been further strengthened to ensure compliance with the new policy directives.

Through IQAC, the institute strive to:

- Maintain and enhance the quality of education and services
- Align with our institution's vision and mission
- Foster a culture of continuous improvement and excellence
- Ensure accountability and transparency in institutional functioning
- Promote innovative practices in teaching, learning, and research
- Develop and implement effective quality benchmarks and parameters
- Facilitate student-centered learning and feedback mechanisms
- Enhance faculty development and capacity building
- Strengthen industry-academia partnerships and collaborations
- Ensure efficient governance and administrative processes
- Promote a culture of sustainability and social responsibility
- Facilitate accreditation and ranking processes
- Identify and mitigate quality assurance risks

CONTROLLER OF EXAMINATION

The institution, granted autonomous status by UGC and Anna University from the academic year 2024-2025, has established the Controller of Examinations (COE) office to oversee assessment processes with confidentiality, ensuring quality and standards. The COE conducts fair examinations, declares results, and manages examination activities for Internal Assessment Tests (IATs) and Semester End Examinations (SEE). Their yearly schedule includes planning, coordinating, conducting, evaluating, and reviewing exams, as well as issuing certificates and transcripts. The COE ensures smooth conduct, maintains exam integrity, and coordinates with stakeholders, adapting to the institution's specific needs and exam cycle.

MEENAKSHI SUNDARARAJAN RESEARCH CENTRE(MSRC)

The MSEC Research Centre has a steadfast commitment to fostering a strong research culture. It empowers students and faculties in their intellectual exploration and discovery. The center aims to advance knowledge, drive neoteric innovation, and contribute to the broader academic and industrial fraternity ultimately aimed at uplifting humankind.

THE MEENAKSHI SUNDARARAJAN CAREER DEVELOPMENT COMMITTEE (MSCDC)

The Meenakshi Sundararajan Career Development Committee (MSCDC) is a strategic group dedicated to fostering students' professional growth and development. Our mission is to support students in achieving their career goals, fostering a culture of professional growth and development.

The MSCDC plays a vital role in aligning individual career goals through various initiatives, including:

1. Career Pathways
2. Specialised Expert Talk & Guidnace on Different Career Pathways
3. Higher Education – Awareness Sessions on various Geographical Locations
4. University Fairs
5. Training / Coaching Programs for different Competitive Exams
6. Repository / Text Books for various Competitive Exams

By providing a career pathway, we help students understand the opportunities available to them and what is required to achieve their career goals. We encourage students as they navigate their professional journey, providing them with the tools, knowledge, and opportunities needed for successful career development.

OFFICE OF STUDENTS AFFAIRS

Our mission is to create a supportive and inclusive educational environment that empowers students to succeed in their academic, personal, and professional lives. We achieve this by:

- Providing individualized support and responding to student needs
- Fostering a culture of academic integrity and excellence
- Promoting personal hygiene, cleanliness, discipline and sprucing
- Encouraging a moral code of conduct and respect for others
- Cultivating a sense of campus decency and decorum
- Modeling exemplary behavior and attitudes

By fulfilling these responsibilities, the institution aims to inspire students to become responsible, successful, and compassionate individuals who make a positive impact in their communities.

COLLEGE COUNSELING SERVICES

College counseling services are essential in supporting students' overall well-being and academic success. These services often encompass various areas, including healthy mind well-being, career guidance, and academic counseling. Here's a breakdown of the typical counseling services available for college students in the institution:

Individual Counseling: One-on-one sessions with RCI registered counselors or psychologists to address personal issues such as stress, anxiety, depression, relationship problems, and any other psychological concerns.
Group Counseling: Support groups where students with similar issues can share experiences and strategies for coping in a safe and supportive environment.
Crisis Intervention: Immediate support for students in distress, trauma response, and any emergency psychological concerns.

TRAINING AND PLACEMENT CELL

Meenakshi Sundararajan Engineering College training and placement cell is committed to providing exceptional placement opportunities for its students. The Placement Cell takes meticulous efforts to ensure that students are recruited by top-notch companies in the industry.
The training pathway is established starting from the first semester with 180 Hours of Placement training which includes Communications Skills, Aptitude Training. Specialised Programming, Guidance on Certifications, Projects, Competitions, Grooming, Etiquette, Group Discussion and Mock Interviews.

The Placement Cell functions under the leadership of Placement Officer, Faculty representatives and Coordinators from each department. The Cell's ultimate aim is to achieve 100% placement. Its Other Functions include

1. Implementation of the training pathway at appropriate semesters
2. Industry Talks
3. Alumni Talks
4. Arranging Internships & Projects
5. Centers of Excellence with Industry
6. Industry Specialised training & guidance

This comprehensive training empowers students to face the campus interviews with confidence through enhancing their employability skills for a successful future.

DEPARTMENT OF PHYSICAL EDUCATION

Our college campus boasts an array of sports facilities, including

- Basketball Court
- Badminton Court
- Pickle Ball Court
- Volleyball
- Cricket / Foot Ball / Athletics Ground
- Tennis Court
- Kho Kho

The institution is much dedicated in nurturing the talent through specific college sports teams :

- Expert coaching and mentorship
- Formation of new sports teams
- Dedicated Sports Hour (1 hour/week)
- Regular Sports Day events - that are meticulously planned for maximum student participation.

DEPARTMENT OF SAFETY AND SECURITY

MSEC's Safety Department include the Chief Security Officer (Retd. Lt. Col), Trained & Certified Safety Officers (18) and Chief Safety Officer.

The department ensures a secure and hazard-free environment within the campus through:

- Monitoring all areas of the campus to ensure a secure environment
- Conducting daily reviews and maintaining a register to track and address any safety issues
- Performing maintenance tasks such as securing compound walls, replacing damaged fencing, and ensuring proper drainage
- Educating the community through regular safety awareness programs and training sessions
- Organizing fire drills and evacuation procedures to prepare for emergencies
- Identifying and mitigating potential hazards to prevent accidents
- Developing and implementing comprehensive safety policies to guide the community
- Continuously monitoring CCTV cameras to quickly respond to any security incidents

The department's proactive approach helps to prevent accidents, minimizes risks, and fosters a culture of safety among students, staff, and faculty members.

MEENAKSHI SUNDARARAJAN INNOVATION AND INCUBATION CENTRE (MSIIC)

Meenakshi Sundararajan Innovation and Incubation Centre (MSIIC) is a dynamic and forward-thinking organization dedicated to fostering innovation, entrepreneurship, and skill development etc. Our center serves as a catalyst for a transformative change - providing aspiring entrepreneurs with the resources, mentorship, and support that is needed to turn their ideas into successful ventures. MSIIC is dedicated to promoting entrepreneurship and an innovative mindset among students and entrepreneurs at institutions. Through mentorship MSIIC helps to develop talents and support their initiatives, provide knowledge on market access and funding, and empower individuals to identify opportunities, take risks, and create positive change. The institution solely believes in entrepreneurship as a catalyst for innovation and societal impact, providing resources and a supportive environment for individuals to thrive and make a difference in their communities and beyond. Its activities include

1. Managing the 100 Seat Innovation & Incubation Center
2. Guidance to both Internal & External Start-ups from Ideation to Funding
3. Competitions – Identification & Mentoring
4. Conducting Competitions :- 30 Hour Hackathons, All India Hackathons etc.
5. Managing Student Clubs
6. Art & Music Festival
7. Skill Development / Value Added Courses
8. Societal Beneficial Projects

MSEC STUDENTS CLUBS

MSEC Students Clubs were initiated with the objective to provide a platform for students to discover, showcase and improve their interests, strengths and passion. There are 7 clubs in our college namely, AI Epoch Club, Eco Design Club, Adyant Coding Club, Renewables Club, Nodenova IOT Club, Dev Dynasty Web App Development Club and Product Development Club. Clubs foster vibrant student community in the campus by conducting variety of events and activities which include workshops, seminars, technical and non-technical events, campus benefit projects, long term projects such as SAE Baja etc that cater to diverse interests. Clubs help the students to collaborate with different disciplines and exchange knowledge with peer groups.

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Department: Civil Engineering, R2024, CBCS

Vision of the department	Mission of the department
To develop technical man power by facing challenges in emerging technologies through excellence in education, research and scientific training with socio-economic involvement.	● Transcending, disseminating and integrating knowledge of engineering, science and technology. ● Developing and innovating in applications through interdisciplinary research and development projects in collaboration with stakeholders. ● Acting as problem solvers by acquiring relevant skills required for a wide range of career challenges. ● Creating opportunities in a collaborative and sustainable environment and encouraging students and staff to achieve the best.

PROGRAM OUTCOMES (PO) and PROGRAM SPECIFIC OUTCOME (PSO)

PO1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO2	Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO3	Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
PO5	Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO6	The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO7	Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO11	Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO12	Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change

PSO1	Able to apply the engineering fundamentals to analyze and design various Civil Engineering Structures.
PSO2	Catering to the changing industrial needs and adapting green concepts for different applications.
PSO3	Understand the civil engineering solutions in the social context.

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Department: Civil Engineering, R2024, CBCS

Curriculum for I to VIII semesters

BE CIVIL ENGINEERING CURRICULUM - R2024								
SEMESTER I								
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIOD PER SEMESTER**	**CREDITS**
				L	**T**	**P**		
1	U24IP101	Induction Programme - Universal Human Values						
THEORY								
2	U24EN101	Technical English	HSMC	2	0	0	30	2.0
3	U24MA101	Mathematical foundation for Engineers	BSC	3	1	0	60	4.0
4	U24PH101	Physics for Civil Engineering -I	BSC	3	0	0	45	3.0
5	U24CY101	Chemistry for Civil Engineering	BSC	3	0	0	45	3.0
6	U24TA101	மரபுத்தமிழ்/Heritage of Tamils	HSMC	1	0	0	15	1.0
THEORY CUM LAB								
7	U24CS101	Programming in C	ESC	2	0	4	90	4.0
8	U24EE101	Basics of Electrical ,Electronics & instrumentation Engineering	ESC	3	0	2	75	4.0
PRACTICAL								
9	U24BS101	Physics and Chemistry Laboratory	BSC	0	0	4	60	2.0
10	U24TP110	Communication Skills Lab I	EEC	0	0	2	30	1.0
11	U24ED111	Design Thinking -Building Innovation and Solutioning Mindset	EDI	0	0	1	15	0.5
TOTAL								**24.5**

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SEMESTER II								
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIOD PER SEMESTER	CREDITS
				L	T	P		
1	U24CE202	Value Added Course - I (Biology for Civil Engineers)					24	
THEORY								
2	U24EN201	Professional English	HSMC	2	0	0	30	2.0
3	U24MA201	Probability and Statistics for Civil Engineers	BSC	3	1	0	60	4.0
4	U24PH201	Physics for Civil Engineering II	BSC	3	0	0	45	3.0
5	U24CE201	Elements of Civil Engineering and Mechanics	ESC	3	1	0	60	4.0
6	U24TA201	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	1	0	0	15	1.0
THEORY CUM LAB								
7	U24CS201	Python Programming	ESC	3	0	3	90	4.5
8	U24CE207	Engineering Graphics for Civil Engineering	ESC	2	0	3	75	4.0
PRACTICAL								
9	U24ME101	Engineering Practices Laboratory	ESC	0	0	4	60	2.0
10	U24TP210	Communication Skills Lab II	EEC	0	0	2	30	1.0
11	U24ED211	Design Thinking-Decoding Innovation Opportunity	EDI	0	0	1	15	0.5
TOTAL								**26.0**

SEMESTER III								
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIOD PER SEMESTER**	**CREDITS**
				L	**T**	**P**		
1		Value Added Course II						
THEORY								
2	U24MA301	Transforms and Partial Differential Equations and Numerical methods	BSC	3	1	0	60	4.0
3	U24CY201	Green and Sustainable Chemistry	BSC	2	0	0	30	2.0
THEORY CUM LAB								
4	U24CE302	Fluid Mechanics	PCC	3	0	2	60	4.0
5	U24CE303	Strength of Materials I	PCC	3	0	2	60	4.0
6	U24CE304	Engineering Surveying	PCC	3	0	2	60	4.0
7	U24CE305	Water Supply Engineering	PCC	3	0	2	60	4.0
LAB								
8	U24TP310	General Aptitude & Logical Reasoning	EEC	0	0	2	30	1.0
9	U24ED311	Innovation tool kits	EDI	0	0	1	15	0.5
10	U24RM312	Research Overview	RMC	0	0	1	15	0.5
11	U24MC313	Foreign Language (Japanese/French)	MC	2	0	0	30	0.0
TOTAL								24.0

#Mandatory Course is a Non-credit.

SEMESTER IV								
SL. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIOD PER SEMESTER**	**CREDITS**
				L	**T**	**P**		
1		Value Added Course III						
THEORY								
2	U24CE405	Strength of Materials II	PCC	3	0	0	45	3.0
3	U24CE504	Highway and Railway Engineering	PCC	3	0	0	45	3.0
4		Professional Elective I	PEC	3	0	0	45	3.0
THEORY CUM LAB								
5	U24CE401	Applied Hydraulics Engineering	PCC	3	0	2	75	4.0
6	U24CE403	Waste Water Engineering	PCC	3	0	2	75	4.0
7	U24CE404	Construction Materials	PCC	3	0	2	75	4.0
LAB								
8	U24TP410	Critical and Creative Thinking Skills	EEC	0	0	2	30	1.0
9	U24ED411	Idea & simulation	EDI	0	0	1	15	0.5
10	U24RM412	Conceptualization	RMC	0	0	1	15	0.5
11	U24MC413	Indological Studies	MC	2	0	0	30	0.0
TOTAL								23.0

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SEMESTER V								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIOD PER SEMESTER	CREDITS
				L	T	P		
1		Value Added Course IV						
THEORY								
2	U24CE501	Design of Reinforced Concrete Structural Elements	PCC	3	1	0	60	4.0
3	U24CE502	Structural Analysis I	PCC	3	1	0	60	4.0
4	U24CE503	Foundation Engineering	PCC	3	0	0	45	3.0
5		Professional Elective II	PEC	3	0	0	45	3.0
6		Professional Elective III	PEC	3	0	0	45	3.0
7		Open Elective I	OEC	3	0	0	45	3.0
LAB								
8	U24CE504	Computer Aided Building Drawing	PCC	0	0	3	45	1.5
9	U24CE505	Summer Internship	EEC	0	0	2	30	1.0
10	U24TP510	Analytical and Logical Thinking Skills	EEC	0	0	2	30	1.0
11	U24ED511	Prototype & Market Validation	EDI	0	0	1	15	0.5
12	U24RM512	Data Exploration	RMC	0	0	1	15	0.5
13	U24MC513	Fitness for Life-Yoga, Food nutrition	MC	1	0	1	30	0.0
TOTAL								24.5

***Two weeks Summer Internship carries one credit and it will be done during IV semester summer vacation and same will be evaluated in V semester.**

#Mandatory Course is a Non-credit.

SEMESTER VI								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIOD PER SEMESTER	CREDITS
				L	T	P		
1		Value Added Course V						
THEORY								
2	U24CE601	Design of Steel Structural Elements	PCC	3	1	0	60	4.0
3	U24CE602	Structural Analysis II	PCC	3	1	0	60	4.0
4	U24CE603	Concrete Technology	PCC	3	0	0	45	3.0
5		Professional Elective IV	PEC	3	0	0	45	3.0
6		Professional Elective V	PEC	3	0	0	45	3.0
7		Open Elective II	OEC	3	0	0	45	3.0
LAB								
7	U24CE604	Concrete and Highway Laboratory	PCC	0	0	4	60	2.0
8	U24TP610	Employability Skills & Problem Solving Techniques	EEC	0	0	2	30	1.0
9	U24ED611	Building a Business Model, GTM and Market Journey	EDI	0	0	1	15	0.5
10	U24RM612	Design & Modelling	RMC	0	0	2	30	1.0
11	U24MC613	Integrated Disaster Management	MC	2	0	0	30	0.0
TOTAL								24.5

#Mandatory Course is a Non-credit.

SEMESTER VII								
S.No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIOD PER SEMESTER**	**CREDITS**
				L	**T**	**P**		
1		Value Added Course VI						
THEORY								
2	U24CE701	Estimation, Costing and Valuation Engineering	PCC	3	0	0	45	3.0
3	U24CE702	Irrigation and Water Resources Engineering	PCC	3	0	0	45	3.0
4	U24CE703	Construction Planning and Management	PCC	3	0	0	45	3.0
5		Professional Elective VI	PEC	3	0	0	45	3.0
LAB								
6	U24CE704	Computer Aided Design and Drawing	PCC	0	0	4	60	2.0
7	U24CE705	Internship	EEC	0	0	0	0	1.0
8	U24RM712	Testing	RMC	0	0	1	15	0.5
9	U24MC713	Constitution of India	MC	2	0	0	30	0.0
TOTAL								15.5

SEMESTER VIII								
S.No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIOD PER SEMESTER**	**CREDITS**
				L	**T**	**P**		
		Value Added Course VII						
LAB								
1	U24CE801	Project Work	EEC	0	0	16	270	8.0
TOTAL								8.0
TOTAL CREDITS								**170.0**

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***Two weeks Summer Internship carries one credit and it will be done during VI semester summer vacation and same will be evaluated in VII semester.**

VERTICAL 1: Structures

SI.NO.	COURSE CODE	COURSE TITLE	CATEGORY	TCP	PERIODS PER WEEK			CREDITS
					L	T	P	
1	U24CEP01	Concrete Structures	PEC	3	3	0	0	3
2	U24CEP02	Steel Structures	PEC	3	3	0	0	3
3	U24CEP03	Prefabricated Structures	PEC	3	3	0	0	3
4	U24CEP04	Prestressed Concrete Structures	PEC	3	3	0	0	3
5	U24CEP05	Rehabilitation/Heritage Restoration	PEC	3	3	0	0	3
6	U24CEP06	Dynamics and Earthquake Resistant Structures	PEC	3	3	0	0	3
7	U24CEP07	Introduction to Finite Element Method	PEC	3	3	0	0	3
8	U24CEP08	Earthquake and Wind Engineering	PEC	3	3	0	0	3

VERTICAL 2: CONSTRUCTION TECHNIQUES AND PRACTICES

SI. NO.	COURSE CODE	COURSE TITLE	CATEGORY	TCP	PERIODS PER WEEK			CREDITS
					L	T	P	
1	U24CEP08	Formwork Engineering	PEC	3	3	0	0	3
2	U24CEP09	Construction Equipment and Machinery	PEC	3	3	0	0	3
3	U24CEP10	Sustainable Construction And Lean Construction	PEC	3	3	0	0	3
4	U24CEP11	Digitalized Construction Lab	PEC	6	0	0	6	3
5	U24CEP12	Construction Management and Safety	PEC	4	2	0	2	3
6	U24CEP13	Advanced Construction Techniques	PEC	3	3	0	0	3
7	U24CEP14	Energy Efficient Buildings	PEC	3	3	0	0	3

VERTICAL 3: GEOTECHNICAL

SI. NO.	COURSE CODE	COURSE TITLE	CATEGORY	TCP	PERIODS PER WEEK			CREDITS
					L	T	P	
1	U24CEP15	Geo environmental Engineering	PEC	3	3	0	0	3
2	U24CEP16	Ground Improvement Techniques	PEC	3	3	0	0	3
3	U24CEP17	Soil Dynamics and Machine Foundations	PEC	3	3	0	0	3
4	U24CEP18	Rock Mechanics	PEC	3	3	0	0	3
5	U24CEP19	Earth and Earth Retaining Structures	PEC	3	3	0	0	3
6	U24CEP20	Pile Foundation	PEC	3	3	0	0	3
7	U24CEP21	Tunnelling Engineering	PEC	3	3	0	0	3

VERTICAL 4: GEO-INFORMATICS

SI. NO.	COURSE CODE	COURSE TITLE	CATEGORY	TCP	PERIODS PER WEEK			CREDITS
					L	T	P	
1	U24CEP22	Total Station and GPS Surveying	PEC	3	3	0	0	3
2	U24CEP23	Remote Sensing Concepts	PEC	3	3	0	0	3
3	U24CEP24	Satellite Image Processing	PEC	3	3	0	0	3
4	U24CEP25	Cartography and GIS	PEC	3	3	0	0	3
5	U24CEP26	Photogrammetry	PEC	3	3	0	0	3
6	U24CEP27	Airborne and Terrestrial Laser Mapping	PEC	3	3	0	0	3
7	U24CEP28	Hydrographic Surveying	PEC	3	3	0	0	3

VERTICAL 5: TRANSPORTATION INFRASTRUCTURE

SI. NO.	COURSE CODE	COURSE TITLE	CATEGORY	TC P	PERIODS PER WEEK			CREDITS
					L	T	P	
1	U24CEP29	Airports and Harbours	PEC	3	3	0	0	3
2	U24CEP30	Traffic Engineering and Management	PEC	3	3	0	0	3
3	U24CEP31	Urban Planning and Development	PEC	3	3	0	0	3
4	U24CEP32	Smart Cities	PEC	3	3	0	0	3
5	U24CEP33	Intelligent Transportation Systems	PEC	3	3	0	0	3
6	U24CEP34	Pavement Engineering	PEC	3	3	0	0	3
7	U24CEP35	Transportation Planning Process	PEC	3	3	0	0	3

VERTICAL 6: ENVIRONMENT

SI. NO.	COURSE CODE	COURSE TITLE	CATEGORY	TC P	PERIODS PER WEEK			CREDITS
					L	T	P	
1	U24CEP36	Climate Change Adaptation and Mitigation	PEC	3	3	0	0	3
2	U24CEP37	Air and Noise Pollution Control Engineering	PEC	3	3	0	0	3
3	U24CEP38	Environmental Impact Assessment	PEC	3	3	0	0	3
4	U24CEP39	Industrial Wastewater Management	PEC	3	3	0	0	3
5	U24CEP40	Solid and Hazardous Waste Management	PEC	3	3	0	0	3
6	U24CEP41	Environmental Policy and Legislations	PEC	3	3	0	0	3
7	U24CEP42	Environmental Health and Safety	PEC	3	3	0	0	3

VERTICAL 7: WATER RESOURCES

SI. NO.	COURSE CODE	COURSE TITLE	CATEGORY	TCP	PERIODS PER WEEK			CREDITS
					L	T	P	
1	U24CEP43	Irrigation Engineering and Drawing	PEC	3	3	0	0	3
2	U24CEP44	Ground Water Engineering	PEC	3	3	0	0	3
3	U24CEP45	Water Resources Systems Engineering	PEC	3	3	0	0	3
4	U24CEP46	Watershed Conservation and Management	PEC	3	3	0	0	3
5	U24CEP47	Integrated Water Resources Management	PEC	3	3	0	0	3
6	U24CEP48	Urban Water Infrastructure	PEC	3	3	0	0	3
7	U24CEP49	Water Quality and Management	PEC	3	3	0	0	3

VERTICAL 8: OCEAN ENGINEERING

SI. NO.	COURSE CODE	COURSE TITLE	CATEGORY	TCP	PERIODS PER WEEK			CREDITS
					L	T	P	
1	U24CEP50	Ocean Wave Dynamics	PEC	3	3	0	0	3
2	U24CEP51	Marine Geotechnical Engineering	PEC	3	3	0	0	3
3	U24CEP52	Coastal Engineering	PEC	3	3	0	0	3
4	U24CEP53	Offshore Structures	PEC	3	3	0	0	3
5	U24CEP54	Port and Harbour Engineering	PEC	3	3	0	0	3
6	U24CEP55	Coastal Hazards and Mitigation	PEC	3	3	0	0	3
7	U24CEP56	Coastal Zone Management and Remote Sensing	PEC	3	3	0	0	3

VERTICAL 9: SUSTAINABLE INFRASTRUCTURE

SI. NO.	COURSE CODE	COURSE TITLE	CATEGORY	TC P	PERIODS PER WEEK			CREDITS
					L	T	P	
1	U24CEP57	Resilient structures	PEC	3	3	0	0	3
2	U24CEP58	Sustainable construction materials	PEC	3	3	0	0	3
3	U24CEP59	Sustainable Urban Planning	PEC	3	3	0	0	3
4	U24CEP60	Sustainable Transportation	PEC	3	3	0	0	3
5	U24CEP61	Smart Infrastructure and Sustainability (using AI, IOT, Data Analytics)	PEC	3	3	0	0	3
6	U24CEP62	Renewable Energy Integration in Civil Engineering	PEC	3	3	0	0	3
7	U24CEP63	Energy Efficiency in Buildings	PEC	3	3	0	0	3

EDIC – Entrepreneurial and Innovation Courses								
SL. No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**TCP**	**PERIODS PER WEEK**			**CREDITS**
					L	**T**	**P**	
1	U24ED111	Design Thinking - Building Innovation and Solutioning Mindset	EDIC	15	0	0	1	0.5
2	U24ED211	Design Thinking - Decoding Innovation Opportunity	EDIC	15	0	0	1	0.5
3	U24ED311	Innovation tool kits	EDIC	15	0	0	1	0.5
4	U24ED411	Idea & simulation lab	EDIC	15	0	0	1	0.5
5	U24ED511	Prototype& Market Validation	EDIC	15	0	0	1	0.5
6	U24ED611	Business Management - Go To Market & Start-up Journey	EDIC	15	0	0	1	0.5
Placement Training by EduTech								
SL. No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**TCP**	**PERIODS PER WEEK**			**CREDITS**
					L	T	P	
1	U24TP110	Interpersonal skills Laboratory	HSMC	30	0	0	2	1
2	U24TP210	Professional Communication Laboratory	HSMC	30	0	0	2	1
3	U24TP310	General Aptitude & Logical Reasoning	EEC	30	0	0	2	1
4	U24TP410	Critical and Creative Thinking Skills	EEC	30	0	0	2	1
5	U24TP510	Analytical and Logical Thinking Skills	EEC	30	0	0	2	1
6	U24TP610		EEC	30	0	0	2	1

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RMC – Research Methodology Courses								
SL. No.	COURSE CODE	COURSE TITLE	CATEGORY	TCP	PERIODS PER WEEK			CREDITS
					L	T	P	
1	U24RM312	Research Overview	RMC	15	0	0	1	0.5
2	U24RM412	Conceptualization	RMC	15	0	0	1	0.5
3	U24RM512	Data Exploration	RMC	15	0	0	1	0.5
4	U24RM612	Design & Modelling	RMC	30	0	0	2	1
5	U24RM712	Testing	RMC	15	0	0	1	0.5

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CATEGORY OF COURSES AND CREDIT DISTRIBUTION

S. No.	Subject Area	Credits per Semester								Total Credits
		1	2	3	4	5	6	7	8	
1	HSMC	3	3							6
2	BSC	12	7	6						25
3	ESC	8	14.5							22.5
4	PCC			16	18	12.5	13	11		70.5
5	PEC				3	6	6	3		18
6	OEC					3	3			6
7	EEC	1	1	1	1	2	1	1	8	16
8	MC									0
9	EDIC	0.5	0.5	0.5	0.5	0.5	0.5			3
10	RMC			0.5	0.5	0.5	1	0.5		3
Total		24.5	26	24	23	24.5	24.5	15.5	8	170

HSMC - Humanities, Social Sciences and Management Courses

BSC - Basic Sciences Courses

ESC - Engineering Sciences Courses

PCC - Professional Core Courses

PEC - Professional Elective Courses

OEC - Open Elective Courses

EEC - Employability Enhancement Courses

MC - Mandatory Courses / Non-Credit

EDIC - Entrepreneurship, Design and Innovation Courses

RMC - Research Methodology Courses

U24IP101	Induction Programme - Universal Human Values
Modules	
1	**Universal Human Values I (UHV I)**
To help the student to see the need for developing a holistic perspective of life.	
To sensitize the student about the scope of life – individual, family (interpersonal relationship), society and nature/existence.	
Strengthening self-reflection.	
To develop more confidence and commitment to understand, learn and act accordingly.	
2	**Physical Health and Related Activities**
To understand the basic principles to remain healthy and fit.	
To practice them through exercise, games etc.	
Involving health center, staff, sports coaches, faculty, staff, students sports team etc.	
3	**Familiarization of Department/ Branch and Innovation**
To get a broad perspective about goals of institution, department/branch in the context of the world, the nation, the state, and region.	
To get an idea of how the institution operates to fulfil its goals through various disciplines of education, research, development, and practice.	
To get an idea of how students can connect /participate in it.	
4	**Visit to a Local Area**
For a student to relate to the social environment of the educational institution as well as the surroundings, a place wherein their most significant years students will scribble some indelible memories, an absolute necessity is generated for city visits to let students understand the environment through interaction with the people, place and history.	
5	**Lectures by Eminent People**
Guest lectures are a great way to help the students gain a perspective on many different things in the world. Eminent personalities in different fields of expertise like academics, sports, industry, business etc. can share their story and talk about important subjects like career, entrepreneurship, government policies and technology	
6	**Proficiency Modules**
This module is to help fill the gaps in basic competency required for further inputs to be absorbed. It includes efforts to make the student proficient in interpersonal communication and expression.	
7	**Literature / Literary Activities**
To develop the clarity of humanistic culture and its expression through literature, students may be exposed to local, regional, national, or international literature. It will help them in understanding traditional and contemporary values and thought.	
8	**Creative Practices**
This module is to help develop the clarity of humanistic culture and its creative, joyful expression. The students can choose one skill related to visual arts or performing arts.	

9	**Extra-Curricular Activities**
Wellness Sessions	
10	**Extra Activities**
Anti-Ragging Briefing	
Informal Interactions	
Club / Council / Committee/ Scholarship Briefings	

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U24EN101	TECHNICAL ENGLISH	L	T	P	C
		2	0	0	2

Course Objectives

1	To improve the communicative competence of learners
2	To develop the basic reading and writing skills of first year engineering and technology students.
3	To improve understanding of key grammar concepts and apply those concepts in both reading and writing tasks.
4	To help learners use language effectively in professional contexts.
5	To equip students with the skills to write clearly and concisely in a variety of context.

UNIT 1 EFFECTIVE READING AND WRITING COMMUNICATION	**6**
Reading: Comprehension of short technical texts – Skimming and scanning **Writing:** Precis Writing, Email Writing **Grammar:** Tenses, Question types: Why/ Yes or No **Vocabulary development:** Root words – Prefixes & Suffixes, Standard Abbreviations & Acronyms.	
UNIT 2 NARRATION AND SUMMATION	**6**
Reading: Reading biographies, travelogues, newspaper reports **Writing:** Paraphrasing, Formal and informal Letter **Grammar:** Prepositions, Subject-verb Agreement **Vocabulary development:** One-word substitution	
UNIT 3 LANGUAGE DEVELOPMENT	**6**
Reading: Reading reviews, advertisements **Writing:** Writing Instructions, Report writing (Industrial report, Survey report & Accident report) **Grammar:** Discourse Markers, Degrees of comparison **Vocabulary development:** Compound nouns, Homophones and homonyms	
UNIT 4 RECOMMENDATIONS AND TRANSCODING	**6**
Reading: Non-verbal communication (tables, pie charts etc.) **Writing:** Writing recommendations, Transferring information (chart, graph etc.) **Grammar:** Error corrections **Vocabulary development:** Fixed and semi fixed expressions	
UNIT 5 LANGUAGE FOR WORKPLACE	**6**
Reading: Reading Editorial columns **Writing:** Writing minutes of meeting **Grammar:** Simple, compound and complex sentences **Vocabulary development:** Verbal analogies	
TOTAL PERIODS	**30**

Course Outcomes

At the end of the course, the student will be able to

CO1	To use appropriate words in a professional context
CO2	To gain understanding of basic grammatical structures and use them in right context.
CO3	To read and infer the denotative and connotative meanings of technical texts
CO4	To write definitions, descriptions, narrations and essays on various topics
CO5	To expand vocabulary and technical language competency

TEXT BOOKS

English for Engineers & Technologists Orient Black swan Private Ltd. Department of English, Anna University, (2020 edition)

English for Science & Technology Cambridge University Press, 2021.

English for Science & Technology Cambridge University Press, 2021. Authored by Dr. VeenaSelvam, Dr. Sujatha

Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES

Technical Communication – Principles And Practices By Meenakshi Raman &Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.

A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.

English For Technical Communication (With CD) By AyshaViswamohan, McGraw Hill Education, ISBN: 0070264244.

Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.

Developing Communication Skills by Krishna Mohan, Meera Banerji - Macmillan India Ltd. 1990, Delhi.

CO-PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	3	3	-	-	2	2	-
CO2	-	-	-	-	-	-	-	-	2	3	-	-	2	2	-
CO3	-	-	-	-	-	-	-	-	1	1	-	-	2	2	-
CO4	-	-	-	-	-	-	-	-	2	3	-	-	1	1	-
CO5	-	-	-	-	-	-	-	2	-	3	-	2	2	2	-
AVG	-	-	-	-	-	-	-	0.4	1.6	2.6	-	0.4	1.8	1.8	-

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U24MA101	MATHEMATICAL FOUNDATION FOR ENGINEERS	L	T	P	C
		3	1	-	4

Course Objectives

1	To develop the use of matrix algebra techniques that are needed by engineers for practical applications.
2	To familiarize the students with differential calculus.
3	To familiarize the student with functions of several variables. This is needed in many branches of engineering.
4	To make the students understand various techniques of integration.
5	To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT 1 MATRICES — **9+3**

Introduction - characteristic equation - Eigenvalues and Eigenvectors of a real matrix –Properties of Eigenvalues and Eigenvectors (without proof) – Cayley - Hamilton theorem (statement and applications only) – Diagonalization of matrices by orthogonal transformation –Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms . MAT LAB: to find matrix operations addition,multiplication ,transpose and inverse of the matrix and also to find eigen value and corresponding eigen vectors.

UNIT 2 DIFFERENTIAL CALCULUS — **9+3**

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum,product, quotient, chain rules) - The equations of tangent line and normal line, velocity and acceleration - Interval of increasing and decreasing functions-Maxima and Minima of functions of one variable - Intervals of concavity and convexity. MAT LAB:To determine maxima and minima for one variable.

UNIT 3 FUNCTIONS OF SEVERAL VARIABLES — **9+3**

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables - Lagrange's method of undetermined multipliers. MAT LAB:To determine maxima and minima for two variable.

UNIT 4 INTEGRAL CALCULUS — **9+3**

Definite and Indefinite integrals - Substitution rule - Techniques of Integration : Integration by parts, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals. MAT LAB:To find the area using single integral.

UNIT 5 MULTIPLE INTEGRALS — **9+3**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed byplane curves – change of variables from cartesian to polar in double integrals - Triple integrals – Volume of solids . MAT LAB:To find the area and volume using double and triple integral.

TOTAL HR — **60**

Course Outcomes

At the end of the course, the student will be able to

CO1	Use the matrix algebra methods for solving practical problems
CO2	Apply differential calculus tools in solving various application problems.
CO3	Able to use differential calculus ideas on several variable functions.

CO4	Apply different methods of integration in solving practical problems
CO5	Apply multiple integral ideas in solving areas, volumes and other practical problems

TEXT BOOKS

1.Veerarajan.T,"Engineering Mathematics, for semester I and II", Updated second Edition, Tata Mcgraw Hill Education , private Limited ,2019.

2.Grewal B.S and Grewel J.S .“Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 45th Edition, 2020.

3.Won Y.Yang,YoungK.Choi,JaekwonKim,ManCheol Kim, H.JinKim,Taeho lm, "Engineering Mathematics with MATLAB" CRC Press Publishers , I st Edition , 2017.

REFERENCES

1.Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

2.Kandasamy.P.,Thilagavathy.K and Gunavathy.K., "Engineering Mathematics For First Year B.E/B.Tech,Seventh Edition 2008 S.Chand and Co.,New Delhi.

3.Bali. N.P and Manish Goyal, “A Textbook of Engineering Mathematics,semester-I”, ninth Edition, Laxmi Publications Pvt. Ltd, 2016.

4. Engineering Mathematics: First year.Calculus and analytical geometry,volume 2,M.K.Venketaraman,National Publishing company,1965.

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	1	-	-	-	-	-	-	-	1	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	1	-	-
CO3	3	3	3	1	-	-	-	-	-	-	-	-	1	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	1	-	-
CO5	3	3	3	1	-	-	-	-	-	-	-	-	1	-	-
AVG	3	2.6	2.6	1	1	-	-	-	-	-	-	-	1	-	-

U24PH101	PHYSICS FOR CIVIL ENGINEERING I	L	T	P	C
		3	-	-	3

Course Objectives

1	Effective learning to ensure students grasp the fundamental principles of mechanics, including concepts such as force, motion, and equilibrium.
2	Illustrate the elastic properties of materials and the factors influencing their behavior under stress
3	Introduce students to the concept of heat energy and its transmission mechanisms, such as conduction, convection, and radiation
4	Familiarize students with the principles of sound insulation and its applications in controlling noise transmission
5	Provide students with an appreciation for the significance of quantum physics in modern science and technology.

UNIT 1 Dynamics of system of bodies	**9**

Multiparticle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of the system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I –moment of inertia of sphere, disc – M.I of a diatomic molecule - torque (Torque) – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule

UNIT 2 Properties of Matter	**9**

Properties of matter: Stress and strain- Hooke's Law - classification of elastic modulus - Poisson's Ratio- Relationship between three modulii of elasticity - Stress - Strain Diagram and its uses- Factors affecting elastic modulus and tensile strength - Expression for bending moment and depression - Cantilever - Expression for Young's modulus by Non uniform bending and its Experiential determination.

UNIT 3 Thermal Physics	**9**

Transfer of heat energy - Thermal expansion of solids and liquids - expansion joints- bimetallic strips - Heat conduction in solids - Theory of heat conduction in solids- Rectilinear flow of heat flow- Determination of thermal conductivity in good conductors (Forbes method) and bad conductors - (Lee's disc method) - Heat conduction through compound media.

UNIT 4 Acoustics of Building	**9**

Classification of sound - decibel- Weber Fechner law- Sabines formula Reverberation time - derivation using growth and decay of sound- Factors affecting acoustics of Buildings (Loudness, Focusing, Echoes and Echelon Effect and Resonance). Absorption coefficient and determination of absorption coefficient - sound absorbing material

UNIT 5 Quantum Physics	**9**

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans' Law from Planck's theory – Compton Effect. Theory and Experiential verification - Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box and extension to three dimensional box – Degeneracy of electron energy states .

TOTAL HR	**45**

Course Outcomes

At the end of the course, the student will be able to

CO1	Explore how principles of mechanics underlie various fields such as engineering, physics, etc and emphasize its role in solving real-world problems.
CO2	Gain an understanding of the elastic properties of materials and their resilience.
CO3	Infer the concepts of heat energy and its relevance to structural engineering.
CO4	Develop an understanding of the fundamental principles of sound absorption
CO5	Investigate key quantum concepts such as wave-particle duality, black body radiation, the Compton effect, and the wave equation for matter waves.

TEXT BOOKS

1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017

2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.

3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGrawHill (Indian Edition), 2017.

REFERENCES

1. Mechanics Part I and Part II, Narayanamoorthy National Publishing Company, 2001

2. Fundamental of Physics, D. Hallidary , Resnick and J Walker, 6th Edition, Wiley, New York 2001

3. Properties of matter – Brijlal and Subramanian S. Chand & Co., 2006.

4.. Physics – Volume 1 & 2, Paul A. Tipler,CBS, (Indian Edition), 2004

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

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

CO4	3	-	2	2	2	1	-	-	-	-	-	-	-	-	-
CO5	3	1	-	-	1	3	-	-	-	-	-	-	-	-	-
AVG	3	1.75	2	2	1.2	1.4	-	-	-	-	-	-	-	-	-

Meenakshi Sundararajan Engineering College
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Department: Civil Engineering, R2024, CBCS

U24CY101	CHEMISTRY FOR CIVIL ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives

1	To make the students be aware of various treatment processes of water for potable and industrial purposes..
2	To make the students have a real time application on Engineering materials and nanomaterials.
3	To make the students know the basic concepts of surface chemistry and catalysis with its applications.
4	To make the students have a deep knowledge on corrosion and alloys.
5	To make the students understand the importance of studying abrasives and lubricants with its various applications.

UNIT1 WATER TECHNOLOGY — **9**

Introduction-Characteristics of water – Hardness – Types of hardness - Estimation by EDTA (problems on hardness) –Alkalinity – Determination (problems on alkalinity) – Boiler feed water – Requirements – Priming and foaming, Scales and sludges Caustic embrittlement and Boiler corrosion – Application - External conditioning (Ion exchange,zeolite) – Internal conditioning (Carbonate, phosphate, calgon, sodium aluminate conditioning) — Brackish water treatment - Reverse osmosis.

UNIT 2 ENGINEERING MATERIALS AND NANOMATERIALS — **9**

Refractories: Definition, characteristics, classification, properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; magnesite and silicon carbide, Portland cement- manufacture and properties.Nanomaterials-Classification-Properties and uses-. Synthesis–Top down method(ball milling), Bottom up methods –Laser Evaporation method - chemical vapour deposition - Manufacturing of Nanocement -Applications of nanomaterials

UNIT 3 SURFACE CHEMISTRY AND CATALYSIS — **9**

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - Applications-Adsorption on pollution abatement.Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters – enzyme catalysis– Michaelis – Menten equation.

UNIT 4 CORROSION AND ALLOYS — **9**

Corrosion- causes- factors- types- chemical, electrochemical corrosion (galvanic, differential aeration), Electrochemical protection – sacrificial anode method and impressed current cathodic method. Paints- constituents and function. Electroless plating of nickel.Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements-Nichrome and stainless steel (18/8) – Heat treatment of steel.

UNIT 5 LUBRICANTS AND ABRASIVES — **9**

Abrasives: Definition, classification or types, grinding wheel, Application - abrasive paper and cloth. Glass - manufacture, types, properties and uses.

Lubricants -Classification of lubricants : solid, semisolid and liquid lubricants with examples,Type of lubricants – Physical properties- viscosity, viscosity index, cloud point, pour point.

TOTAL HR	**45**

Course Outcomes

At the end of the course, the student will be able to

CO1	Understand the basic principles of water quality parameters, their analysis and various water treatment processes for domestic and industrial applications.
CO2	To understand the synthesis and various applications of engineering materials and nano materials.
CO3	The knowledge gained on Surface Chemistry to facilitate better understanding on Adsorption of gases and Catalysis
CO4	Correlate the various corrosion mechanisms and applications of alloys.
CO5	Develop a deep knowledge on abrasives and lubricants with its applications..

TEXT BOOKS

1. P. C. Jain and Monica Jain, “Engineering Chemistry”, 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.

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

3. S.S. Dara, “A Textbook of Engineering Chemistry”, S. Chand Publishing, 12th Edition, 2018.

4.Water supply engineering,B C Punmia,Ashokkumarjain,Arunkumarjain 2016

REFERENCES

1.P L Soni, Text book of inorganic chemistry, Chand publishers, New Delhi, 2017

2. J.D. Lee, Concise inorganic chemistry, Blackman Science Ltd, France, Wiley-India, 5th edition (Reprint), 2016

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

4. ShikhaAgarwal, “Engineering Chemistry-Fundamentals and Applications”, Cambridge University Press, Delhi, Second Edition, 2019.

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

6.Environmental Engineering- I,S.K.Garg 2016

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO1	3	2	1	-	-	1	2	-	2	1	-	3	-	-	-
CO2	3	2	2	-	-	1	2	-	2	1	-	3	-	-	-
CO3	3	-	-	-	-	1	2	-	-	1	-	1	-	-	-
CO4	3	1	-	-	-	1	2	-	-	1	-	1	-	-	-
CO5	3	-	-	-	1	3	2	-	2	1	-	3	-	-	-
AVG	3	1.6	1.5	-	1	1.4	2	-	2	1	-	2.2	-	-	-

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U24TA101	தமிழர்மரபு/LANGUAGE AND LITERATURE	L	T	P	C
		1	-	-	1

அலகு I மொழிமற்றும்இலக்கியம்/LANGUAGE AND LITERATURE	**3**

இந்திய மொழிக் குடும்பங்கள் – திரொவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செல்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயசார்பற்றதன்மை –சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மை கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் – சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ்இளகியவளர்ச்சியில்பாரதியார்மற்றும்பாரதிதாசன்ஆகியோரின்பங்களிப்பு.

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

அலகு II மரபு - பாறைஓவியங்கள்முதல்நவீனஓவியங்கள்வரை - சிற்பக்கலை /HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	**3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்பைகள் - தேர்செய்யும்கலை - சுடுமண்சிற்பங்கள் – நாட்டுப்புற தெய்வங்கள் – குமரி முனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

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

அலகு III நாட்டுப்புறக்கலைகள்மற்றும்வீரவிளையாட்டுகள் /FOLK AND MARTIAL ARTS	**3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின்விளையாட்டுகள்.

Therukoothu, Karakattam, VilluPattu, KaniyanKoothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

அலகு IV தமிழர்களின்திணைக்கோட்பாடுகள் /THINAI CONCEPT OF TAMILS	**3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்கஇலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்தநாடுகளில் சோழர்களின் வெற்றி.

Flora and Fauna of Tamils &Agam and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils -

Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during SangamAge - Overseas Conquest of Cholas.	
அலகு V **இந்தியதேசியஇயக்கம்மற்றும்இந்தியபண்பாட்டிற்குத்தமிழர்களின்பங்களிப்பு / CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**	**3**
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிற பகுதிகளில் தமிழ் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ் புத்தகங்களின் அச்சு வரலாறு. Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.	

THEORY	**TOTAL**	**15**

TEXTBOOK CUM REFERENCE BOOKS

1. தமிழகவரலாறு – மக்களும் பண்பாடும் – கே கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2.கணினித்தமிழ் – முனைவர் இல. சுந்தரம் (விகடன்பிரசுரம்)

3.Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

4.Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies

5.Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies)

6.The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)

7.Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by:DepartmentofArchaeology& Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

8.Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

9.Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

10.Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

THEORY CUM LAB

U24CS101	Programming in C	L	T	P	C
		2	-	4	4

Course Objectives	
1	To understand the structure and syntax of C Language
2	To develop C programs using arrays and strings
3	To develop modular applications in C using functions
4	To develop applications in C and apply the concept code reusability using pointers and structures
5	To do input/output and understand the basics of file handling mechanisms in C .

UNIT 1 BASICS OF C PROGRAMMING	**6+12**

Introduction to Problem Solving: Algorithm, Flowchart, Pseudocode. Programming Basics: Applications of C Language- Structure of C program -Identifiers-Data Types – Variables-Constants – Keywords – Operators – Input/output statements, Decision making statements - Looping statements - Expressions-Precedence and Associativity – Expressions Evaluation, Type conversions.
Practicals:
1.Algorithm, pseudocode, flowcharts for simple scientific and statistical problems
2.I/O statements, operators, expressions and decision-making constructs(if, if-else, break, continue
3.C Programming using Simple statements and expressions
4.Create Looping statements- for, while, do-while.

UNIT 2 ARRAYS AND STRINGS	**6+12**

Arrays: Introduction – Declaration of Arrays – Storing Values in Array – Accessing elements of the Array– Calculating the length of the Array – Operations on Array – one dimensional arrays – Two dimensional Arrays –String: Declaring, Initializing, Printing and reading strings, String input and output functions, String handling functions, Arrays of strings.
Practicals:
1.Create simple programs for one dimensional and two dimensional arrays.
2.Practice all string handling functions.

UNIT 3 Function and Storage class	**6+12**

Library functions: Math functions, other miscellaneous functions such as getchar(), putchar(), malloc(), calloc(). User defined functions - function definition, functions declaration, function call, scope of variables - local variables, global variables. Function parameters: Parameter passing- call by value & call by reference, function return values, Passing arguments to Functions. Recursive functions. Storage classes-auto, register, static, extern, scope rules.
Practicals: 1.Implementation of C Program using user defined functions (Pass by value and Pass by reference).
2.Implementation of Recursion Function

UNIT 4 STRUCTURES AND POINTERS	**6+12**

Basics of structures-structure data types, type definition, accessing structures, Structure operations, Complex structures-nested structures, structures containing arrays, Array of structures, Structures and Functions, Unions. Pointers: Understanding Computer Memory –Memory Management-Dynamic memory Allocation-Memory leaks- Introduction to Pointers – declaring Pointer Variables – Pointer Expressions and Pointer Arithmetic – Null Pointers – Generic Pointers - Passing Arguments to Functions using Pointer – Pointer and Arrays –Use of pointers in self-referential structures, notion of linked list Practicals: 1.C Programming using Pointers. 2.Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.

UNIT 5 MACROS AND FILE PROCESSING	**6+12**
Preprocessor Directives: Introduction to preprocessor directives in Simple macros using `#define`, conditional macros using `#ifdef`, `#ifndef`, `#endif`, `#else`, and `#elif`. Files: Introduction to Files – Opening a file – Reading Data from Files – Writing Data to Files – Detecting the End-of-file –Closing a file – Sequential access file-Random Access Files – Binary Files – Command line arguments. Practicals: 1.Programming using macros and storage classes 2.Implementation of Command line Arguments like argc,argv 3.Files- reading and writing, file operations, random access 4.Develop an application for any one of the following scenarios : Student Management System /Stock Management System/ Banking Application / Ticket Reservation System	
TOTAL HR	**90**

Course Outcomes

At the end of the course, the student will be able to	
CO1	Create simple applications in C using basic constructs
CO2	Create C programs using arrays and strings
CO3	Create modular applications in C using functions.
CO4	Create modular applications in C using structures and pointers.
CO5	Create applications using macros and file processing

TEXT BOOKS

1. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.

2. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016

REFERENCES

1. Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, Eighth edition, Pearson Education, 2018.

2. YashwantKanetkar, Let us C, 17th Edition, BPB Publications, 2020

3. Byron S. Gottfried, “Schaum’s Outline of Theory and Problems of Programming with C”, McGraw-Hill Education, 1996.

4.. PradipDey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013.

5. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, 1st Edition, Pearson Education, 2013.

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

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

U24EE101	BASICS OF ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING	L	T	P	C
		3	0	2	4

Course Objectives

1	To introduce the basics of electric circuits and analysis
2	To impart knowledge in domestic wiring
3	To impart knowledge in the basics of working principles and application of electrical machines
4	To introduce analog devices and their characteristics
5	To introduce the functional elements and working of sensors and transducers.

UNIT 1 ELECTRICAL CIRCUITS — **9+6**

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only), Three-phase balanced circuits, voltage and current relations in star and delta connections.

Practical

1. Verification of Kirchhoff's Laws.

UNIT:2 MAGNETIC CIRCUITS AND ELECTRICAL INSTALLATIONS — **9+6**

Magnetic circuits-definitions-MMF, flux, reluctance, Magnetic field intensity, flux density, fringing, self and mutual inductances-simple problems.

Applications : Domestic wiring , Construction of Cables, earthing, protective devices- switch fuse unit- Miniature circuit breaker-moulded case circuit breaker- earth leakage circuit breaker, safety precautions and First Aid-

Unit - 3 ELECTRICAL MACHINES — **9+6**

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator and Three Phase Induction Motor. BLDC motor.

Practical

1. Load test on DC Shunt Motor.
2. Load test on Single phase Transformer
3. Load Test on Induction Motor

UNIT: 4 ANALOG ELECTRONICS — **9+6**

Semiconductor Materials: Silicon & Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET, IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters.

Practical

1. Characteristics of PN and Zener Diodes
2. Characteristics of BJT
3. Characteristics of SCR and MOSFET
4. Design of Half wave and Full Wave rectifiers

UNIT: 5 SENSORS AND TRANSDUCERS — **9+6**

Sensors, solenoids, pneumatic controls with electrical actuator, mechatronics, types of valves and its applications, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, hall effect, photo sensors, Strain gauge, LVDT, differential pressure transducer, optical and digital transducers, Smart sensors.

Practical

1. Measurement of displacement of LVDT

TOTAL PERIODS — **75**

Course Outcomes	
At the end of the course, the student will be able to	
CO1	Compute the electric circuit parameters for simple problems
CO2	Explain the concepts of domestics wiring and protective devices
CO3	Explain the working principle and applications of Electrical Machines
CO4	Analyze the characteristics of analog electronic devices
CO5	Explain the types and operating principles of sensors and transducers

TEXT BOOKS

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

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

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

4.A.K. Sawhney, PuneetSawhney , "A Course in Electrical & Electronic Measurements & Instrumentation", DhanpatRai and Co, New Delhi, 19th edition 2019.

5.D.P Kothari, J.SDhillon,"Digital Circuits & Design", Pearson India Education, 2015

REFERENCES

1. John Bird, "Electrical Circuit theory and technology", Routledge; 2017.

2. Thomas L. Floyd, 'Electronic Devices', 10th Edition, Pearson Education, 2018.

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

4. Muhammad H.Rashid, "Spice for Circuits and electronics", 4th Edition., Cengage India,2019.

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

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

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

U24BS101	PHYSICS & CHEMISTRY LABORATORY	L	T	P	C
		-	-	4	2

	Course Objectives
1	This session aims to provide the learners hands-on-training on the practical applications of the concepts learnt in the theoretical sessions on bending of beams,application of laser,. The course will also train the learner to observe good lab practices, record readings and analyse and interpret the results.
2	This session aims to provide the learners hands-on-training on the practical applications of the concepts learnt in the theoretical sessions on water treatment, electrochemistry, lubricants, composites and nanomaterials using simple chemical methods. The course will also train the learner to observe good lab practices, record readings and graphically represent the results, as well as analyse and interpret the influence of reaction conditions on the results.
	PHYSICS LABORATORY
1	Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects
2	Simple harmonic oscillations of cantilever.
3	Uniform bending – Determination of Young's modulus
4	Laser- Determination of the wavelength of the laser using grating
5	Ultrasonic Interferometer-Determination of compressibility of given liquid
6	a) Optical fibre -Determination of Numerical Aperture and acceptance angle b) Compact disc- Determination of width of the groove using laser.
7	Non-uniform bending - Determination of Young's modulus
	CHEMISTRY LABORATORY
1	Estimation of mixture of acids by conductometric titration
2	Estimation of iron by potentiometric titration
3	Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
4	Determination of alkalinity in a water sample
5	Estimation of hardness of water by EDTA method
6	Estimation of hydrochloric acid by pHmetric method
7	Determination of chloride content of water sample by Argentometric method
8	Determination of viscosity of a polymer using ostwald's viscometer

9	Estimation of iron content using spectrophotometer.
TOTAL HR	**60**

Course Outcomes

At the end of the course, the student will be able to

CO1	Gain knowledge about torque and rigidity modulus of a material and understand the principles of simple harmonic motion and bending of beams
	Estimate the strength of given mixture of acids using conductance measurements under the principle of conductometric titration and Estimate the strength of given iron using EMF measurements with the help of potentiometer and have a knowledge on redox reaction
CO2	comprehend the principles of stress,strain& elasticity of the given materials & Gain knowledge about diffraction of laser light
	Estimate the strength of given salt using conductance measurements under the principle of precipitation titration and Determine and estimate the amount of different types of alkalinities in water.
CO3	Understand how sound waves are travelling in liquid medium & comprehend the light accepting power of given optical fibre and its transmission
	Employ complexometric titrations to estimate total hardness of a water sample and Determine the amount of chloride present in water using Argentometric method.

Text book

1. Mechanics Part I and Part II, Narayanamoorthy National Publishing Company, 2001

2.Optics -Dr.Murugesan

3.J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Textbook of Quantitative Chemical Analysis.

Reference

1.Engineering physics visvesvaraya technological university

2.Vogel's Textbook of Quantitative Chemical Analysis (2009)

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

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

CO2	3	-	2	-	-	-	-	-	-	-	-	3	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	3	-	-	-
AVG	3	-	2	-	-	-	-	-	-	-	-	3	-	-	-

U24TP110	COMMUNICATION SKILLS LAB I	L	T	P	C
		0	0	2	1

Course Objectives	
1	To improve the communicative competence of learners
2	To help learners use language effectively in academic /work contexts
3	To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
4	To use language efficiently in expressing their opinions via various media.
5	To build on students' English language skills by engaging them in listening and speaking activities that are relevant to authentic contexts.

UNIT I	**6**
Listening: Listening as a key skill- its importance -Listening for general information-specific details - Introduction to classmates – Audio / video (formal & informal) **Speaking:** Making telephone Calls, Introducing a friend, Making polite requests, polite offers and replying to polite requests - Understanding basic instructions for filling out a bank application	
UNIT II	**6**
Listening: Listen to a process information **Speaking:** Small talk on general topics and current scenario	
UNIT III	**6**
Listening: Listen to event narration and stories **Speaking:** Picture description- describing locations in workplaces	
UNIT IV	**6**
Listening: Listening to discussions and debates **Speaking:** Role Play	
UNIT V	**6**
Listening: Listening/watching documentaries **Speaking:** Formal and informal talk -making predictions- talking about a given topic-giving opinions	
TOTAL PERIODS	**30**

Course Outcomes	
At the end of the course, the student will be able to	
CO1	To listen and comprehend complex academic texts
CO2	To speak fluently and accurately in formal and informal communicative contexts
CO3	To express their opinions effectively in both oral and written medium of communication
CO4	Ability to listen/view and comprehend different spoken discourses/excerpts different accents and to speak clearly in simple language
CO5	Ability to read and evaluate texts critically

List of experiments	
1	Self-Introduction / Introducing a friend
2	Small talk
3	Narrating an event or story
4	Discussion/debate on a given topic

5	Listening to TED Talks (Being an active listener: giving verbal and non-verbal feedback)

ASSESSMENT PATTERN

End Semester speaking & Writing will be conducted in the classroom

TEXT BOOKS

1. Brooks,Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.

2. Richards,C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCES

1. Bhatnagar, Nitin and MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010

2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014

3. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014

4. English and Soft Skills, Dr. S.P. Dhanavel, Orient BlackSwan, 2013

5. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	2	3	-	3	2	2	-
CO2	-	-	-	-	-	-	-	-	2	3	-	3	2	2	-
CO3	-	-	-	-	-	-	-	-	2	3	-	3	2	2	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
AVG	-	-	-	-	-	-	-	-	1.2	3	-	1.8	1.2	1.2	-

Meenakshi Sundararajan Engineering College
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Department: Civil Engineering, R2024, CBCS

U24ED111	DESIGN THINKING - BUILDING INNOVATION SOLUTIONING MINDSET	L	T	P	C
		-	-	1	0.5

Course Objectives

1	Expose the students to the fields of innovation and entrepreneurship and strengthen their interest in these fields.
2	To discuss the relevance and importance of innovation and entrepreneurship to the students to improve their everyday life and future careers.
3	Illustrate the macro perspective of innovation in entrepreneurship .
4	To Design the entrepreneurship process.
5	Develop innovation and entrepreneurship processes to improve students to the skill set .

UNIT 1	**1**
What is innovation - Why is innovation important -Types of innovation -The Innovation process	
UNIT 2	**2**
Introduction to Problem Solving-The role of problem - solving in innovation and product development -The importance of real-time problem statements- Problem Identification and Definition	
UNIT 3	**2**
What is entrepreneurship (and how is it different from innovation) -Types of entrepreneurship -The Human side of entrepreneurship	
UNIT 4	**2**
Misconceptions about entrepreneurship -The process of developing entrepreneurship- Module building entrepreneurship mindset- Developing a solution thinking mind set to identify tools and techniques	
UNIT 5	**8**
● 5 Hours: 60 Students * 5 Minutes Each – Team of Three Students (15 Minutes Per Team) – Collaborative Work To Research & Present 20 Case Studies: ○ Design Thinking (8 Case Studies), ○ Innovation (4 Case Studies) & ○ Entrepreneurship (8 Case Studies) ● 3 Hours: Faculty Facilitated `Design Thinking' Case Studies	
TOTAL HR	**15**

Course Outcomes

At the end of the course, the student will be able to

CO1	Understand basic concepts in the fields of innovation and entrepreneurship

CO2	Understand what a business model is and the process of problem solving.
CO3	Summarize the learning in developing an entrepreneurial idea, formed through innovative practices.
CO4	Model the correct problem solving methodologies with tools and techniques.
CO5	Design innovative solutions for real time problems.

TEXT BOOKS

1 Lorraine Marchand,"The Innovation Mindset: Eight Essential Steps to Transform Any Industry",Columbia Business School Publishing (13 September 2022)

REFERENCES

1. Peter F. Drucker," Innovation and Entrepreneurship" .

2.Martha Corrales-Estrada "Innovation and Entrepreneurship: A New Mindset for Emerging Markets",Emerald Publishing Limited (27 September 2019)

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

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

U24CE202	Biology for Civil Engineers	L	T	P	C
		2	-	-	-

Unit 1 Trends in Bioengineering	**8**
Self-healing Bio concrete, microbial digestion, Bioremediation, Bio mining, composting.	
Unit 2 Bio mimicry	**8**
Bio mimicry and Systems-Bio mimicry Approach to Change a Focus on Shelters, Designing and Acting to Change Systems, application to structures– Case studies	
Unit 3 Bio construction	**8**
Green buildings, climate resilience, circular economy, case studies, plants for clean indoor environment	
TOTAL HR	**24**

At the end of the course, the student will be able to

CO1	To understand the trends in bioengineering
CO2	To know about bio mimicry and applications
CO3	To analyse the application of bio construction

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

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

Meenakshi Sundararajan Engineering College
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Department: Civil Engineering, R2024, CBCS

U24EN201	Professional English	L	T	P	C
		2	0	0	2

Course Objectives

1	To engage learners in meaningful language activities to improve their reading and writing skills.
2	To enhance learners' vocabulary with a focus on technical terms and enabling them to communicate more effectively in both technical and professional contexts.
3	To master key grammar concepts and apply those concepts to produce clear and correct written communication
4	To help learners understand the purpose, audience, contexts of different types of writing.
5	To demonstrate an understanding of job applications and interviews for internship and placements.

UNIT 1 APPLIED LANGUAGE SKILLS	**6**

Reading: Reading user manuals, brochures, posters, pamphlets
Writing: Review Writing (Book Review and Movie Review)
Grammar: Tenses, Prepositional phrases
Vocabulary Development: Technical vocabulary (synonyms and antonyms)

UNIT 2 PRACTICAL WRITING AND GRAMMAR SKILLS	**6**

Reading: Reading longer technical texts
Writing: Writing response to a complaint letter
Grammar: Active and passive voice, Infinitives and Gerunds
Vocabulary Development: Sequence words, Misspelled words

UNIT 3 PROFESSIONAL WRITING AND ANALYTICAL READING	**6**

Reading: Case Studies, Excerpts from literary texts, news reports etc.
Writing: Letter to the Editor, Checklists
Grammar: If Conditionals, Articles
Vocabulary Development: Collocation, Cause and effect expression

UNIT4 DEVELOPING WRITING AND LANGUAGE SKILLS	**6**

Reading: Reading for detailed comprehension, newspaper articles
Writing: Essay writing
Grammar: Reported speech, Modals
Vocabulary Development: Conjunctions

UNIT 5 LANGUAGE SKILLS FOR CAREER SUCCESS	**6**

Reading: Company profiles, Statement of purpose, an excerpt of interview with professionals
Writing: Job / Internship application – Cover letter & Resume
Grammar: Relative Clauses, Numerical adjectives
Vocabulary Development: Single sentence definition

TOTAL PERIODS	**30**

Course Outcomes

At the end of the course, the student will be able to

CO1	Read and comprehend various forms of technical and informational texts and extract the necessary information for application or analysis.
CO2	Improve their vocabulary to articulate ideas clearly and effectively in professional and academic contexts.
CO3	Use grammar accurately in written communication.
CO4	Demonstrate proficiency in writing clear, structured responses, reviews, essays, and professional documents using appropriate tone, format, and language.
CO5	Create professional documents as well as communicate effectively in professional scenarios, ensuring success in job and internship applications.

TEXT BOOKS

English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)

English for Science & Technology Cambridge University Press, 2021.

English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.

2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi

3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003

4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.

5. Developing Communication Skills by Krishna Mohan, Meera Bannerji - Macmillan India Ltd. 1990, Delhi.

CO-PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

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

CO3	-	-	-	-	-	-	-	-	-	3	-	2	2	2	-
CO4	-	-	-	-	-	-	-	-	-	3	-	2	2	2	-
CO5	-	-	-	-	-	-	-	-	-	3	-	2	2	2	-
AVG	-	-	-	-	-	-	-	-	-	3	-	2	2	2	-

Meenakshi Sundararajan Engineering College

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Department: Civil Engineering, R2024, CBCS

U24MA201	PROBABILITY AND STATISTICS FOR CIVIL ENGINEERS	L	T	P	C
		3	1	-	4

Course Objectives

1	To introduce the basic concepts of probability and random variables.
2	To introduce the concepts of standard distributions.
3	To introduce the basic concepts of two dimensional random variables.
4	To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
5	To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT 1 PROBABILITY AND RANDOM VARIABLE	**9+3**

Axioms of probability - Conditional probability - Total probability - Bayes theorem - Random variable - Probability mass function - Probability density functions – Properties - Moments - Moment generating functions and their properties.

UNIT 2 STANDARD DISTRIBUTIONS	**9+3**

Discrete distributions: Binomial - Poisson - Negative Binomial - Continuous distributions: Uniform - Exponential - Gamma - Normal distributions and their properties.

UNIT 3 TWO-DIMENSIONAL RANDOM VARIABLES	**9+3**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables-Central limit theorem (for independent and identically distributed random variables- STATEMENT ONLY)

UNIT 4 TESTING OF HYPOTHESIS	**9+3**

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample test based on normal distribution for single mean and difference of means - Small sample tests: t-test for mean -F- test - Chi-square test for Goodness of fit and Independence of attributes.

UNIT 5 DESIGN OF EXPERIMENT	**9+3**

One way and two way classifications - Completely Randomized Design - Randomized Block Design - Latin Square Design.

TOTAL HR	**60**

Course Outcomes

At the end of the course, the student will be able to	
CO1	Understand the fundamental concepts of probability .
CO2	Understand the fundamental concepts of probability with a thorough knowledge of standard distributions that can describe certain real-life phenomenon.
CO3	Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
CO4	Apply the concept of testing of hypothesis for small and large samples in real life problems.
CO5	Apply the basic concepts of classifications of design of experiments in the field of agriculture.

TEXT BOOKS

1.Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata Mc Graw Hill,4th Edition, 2007.

2.Johnson, R.A., Miller, I and Freund J., “Miller and Freund’s Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, Jan 2020.

3.Won Y.Yang,Young K.Choi,Jaekwon Kim,Man Cheol Kim, H.Jin Kim,Taeho lm, "Engineering Mathematics with MATLAB" CRC Press Publishers , I st Edition , 2017.

REFERENCES

1.Gupta. S.C. and Kapoor. V. K., “Fundamentals of Mathematical Statistics”, Sultan Chand &Sons, New Delhi, 12th Edition, 2020.

2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences”, Cengage Learning,New Delhi, 8th Edition, 2014.

3.Ross. S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 5thEdition,Elsevier, 2014.

4.Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum’s Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.

5.Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9th Edition, 2010.

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	-	1	-	-	-	-	-	1	1	-	-
CO2	3	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO3	3	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO4	3	2	2	1	-	-	-	-	-	-	-	-	1	-	-
CO5	3	2	2	1	-	1	-	-	-	-	-	-	1	-	-
AVG	3	2.6	2	1	-	2	-	-	-	-	-	-	1	-	-

U24PH201	PHYSICS FOR CIVIL ENGINEERING II	L	T	P	C
		3	-	-	3

Course Objectives

1	Explore concepts such as stress, strain, and modulus of elasticity, and discuss how materials behave under various loads
2	Explore strategies for enhancing energy efficiency and comfort through proper insulation and thermal design.
3	Impart knowledge on the principles of ventilation and air conditioning systems in buildings.
4	Introduce concepts of sound insulation and lighting design in building environments.
5	Raise awareness about natural disasters and the importance of safety measures in mitigating their impact.

UNIT 1 THERMAL APPLICATION **9**

Principles of Heat transfer, steady state of heat flow, conduction through compound media-series and parallel-conductivity of rubber tube. Heat through fenestrations, thermal insulation and its benefits - heat gain and heat loss estimation - factors affecting the thermal performance of buildings, Thermal measurements - central heating.

UNIT 2 VENTILATION AND REFRIGERATION **9**

Principles of natural ventilation - ventilation measurements , design for natural ventilation Window types and packaged air conditioners Chilled water plant - fan coil systems - water piping - cooling load Air conditioning systems for different types of buildings - Protection against fire to be caused by A. C. Systems.

UNIT3 LIGHTING DESIGN **9**

Visual field glare-Colour - day light calculations - day light design of windows, measurement of day-light and use of models and artificial skies, principles of artificial lighting, supplementary artificial lighting.

UNIT4 NEW ENGINEERING MATERIALS **9**

Composites - definition and classification - Fibre reinforced plastics (FRP) and fiber reinforced metals (FRM) - Metallic glasses - Shape memory alloys - Ceramics - Classification - Crystalline - Non Crystalline - Bonded ceramics, Manufacturing methods - Slip casting - Isostatic pressing - Gas pressure bonding - Properties - thermal, mechanical, electrical and chemical ceramic fibres - ferroelectric and ferromagnetic ceramics - High Aluminium ceramics.

UNIT5 PHYSICAL PHENOMENA OF SEISMIC WAVES AND SEISMIC DESIGN **9**

The Earth and it's interior -the circulation of the Earth's mass - Elastic rebound theory - Strain Energy and Energy transmission - Strong ground motion - Peak ground acceleration - inertia forces on structure - inertia force and relative motion within a building - Flow of inertia forces - Twist in buildings - Structural dynamics - D' Alembert's principle - Building ductile - Vibration and oscillation - Free and forced vibration

TOTAL HR **45**

Course Outcomes

At the end of the course, the learner will

CO1	acquire knowledge about heat transfer through different materials, thermal performance of building and thermal insulation
CO2	gain knowledge on the ventilation and air conditioning of buildings
CO3	understand the concepts of sound absorption, noise insulation and lighting designs
CO4	gain knowledge about the processing and applications of composites, metallic glasses, shape memory alloys and ceramics
CO5	get an awareness on natural disasters such as earthquake, cyclone, fire and safety measures

TEXT BOOKS

T1. Marko Pinteric, Building Physics, Springer 2017

T2. D.S. Mathur, Elements of properties of matter. S. Chand and Company 2010

T3. Hugo Hens, Building Physic: Heat, air and moisture Wiley 2017

T4. Severns, W.H. & Fellows, J.R. “Air conditioning and Refrigeration”, John Wiley and Sons, London, 1988

T5. Stevens, W.R., “Building Physics: Lighting: Seeing in the Artificial Environment, Pergamon Press, 2013

REFERENCES

R1. Reiter, L. “Earthquake hazard analysis - Issues and insights”, Columbia University Press, 1991

R2. Shearer, P.M. “Introduction to Seismology”, Cambridge University Press, 1999

R3. Budinski, K.G. & Budinski, M.K. “Engineering Materials Properties and Selection”, Prentice Hall, 2009

R4. C.V.R. Murthy, Earthquake tips and learning earthquake design and construction

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	1	1	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	1	1	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	1	1	-	-	-	-	-	-	-	-	-
CO4	3	-	2	2	2	1	-	-	-	-	-	-	-	-	-
CO5	3	1	1	1	1	1	-	-	-	-	-		-	-	-
AVG	3	1.75	1.8	1.2	1.2	1	-	-	-	-	-	-	-	-	-

Meenakshi Sundararajan Engineering College
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Department: Civil Engineering, R2024, CBCS

U24CE201	Elements of Civil Engineering and Mechanics	L	T	P	C
		3	1	-	4

Course Objectives

1	Instil fundamental knowledge of fields of civil engineering and principles of mechanics
2	Determining the resultant forces acting on a particle in 2D and 3D and for applying methods of equilibrium on a particle in 2D and 3D.
3	Assessing the centroids of 2D sections / center of gravity of volumes and for calculating area moments of inertia for the sections and mass moment of inertia of solids
4	Evaluating the frictional forces acting at the contact surfaces of various engineering systems and for applying the work-energy principles on a particle.
5	Determining kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

UNIT 1 Introduction to Civil Engineering and Principles of Mechanics — **12**

Importance of Civil Engineering in the Infrastructure Development of the Country - Specialized Sub-Divisions within Civil Engineering - Role of Civil Engineers in Nation-Building - Recent Advancements and Future Scope in the Field of Civil Engineering. Fundamental concepts and principles of Mechanics - System of units- conversion from one system of units to another—Method of Problem solution - Numerical Accuracy.

UNIT 2 Analysis of force systems - Statics of Particles — **12**

Resolution, and composition of forces, Law of Parallelogram of forces, polygonal law,
Resultant of concurrent coplanar force system, coplanar non-concurrent force system, a moment of forces, couple, Varignon's theorem, resultant of coplanar non-concurrent force system, free body diagram, Lamis theorem. Equivalent system of forces. Equilibriums of rigid bodies.

UNIT 3 Distributed Forces — **12**

Centroid: Introduction, methods of determining the centroid, locating the centroid of simple figures from first principle, the centroid of composite and built-up sections.
Theorems of Pappus - Guldinus.

Moment of inertia: Introduction, method of determining the second moment of area of plane sections from first principles, parallel axis theorem and perpendicular axis theorem section modulus, the radius of gyration, moment of inertia of composite area and built-up sections, concept of product of inertia(no problems).

UNIT 4 Friction — **12**

Types of friction, laws of friction, limiting friction, coefficient of friction concept of static and dynamic friction, numerical problems on impending motion on horizontal and inclined planes along with connected bodies, wedges and ladder friction.

UNIT 5 Dynamics of Particles — **12**

Kinematics: Displacement, average velocity, instantaneous velocity, speed, acceleration, average acceleration, variable acceleration, acceleration due to gravity, Newton's Law of Motion, rectilinear motion and numerical problems, curvilinear motion, superelevation, projectile motion, relative motion, numerical problems, motion under gravity, numerical problems.

Kinetics: D 'Alembert's principle and its application in-plane motion and connected bodies including pulleys.

TOTAL HR	**60**

Course Outcomes

At the end of the course, the student will be able to

CO1	To understand the various fields of engineering
CO2	To determine the resultant forces acting on a particle in 2D and 3D and to apply methods of equilibrium on a particle in 2D and 3D
CO3	Assess the centroids of 2D sections / center of gravity of volumes and to calculate area moments of inertia for the sections and mass moment of inertia of solids.
CO4	Evaluate the reaction forces for bodies under equilibrium, to determine moment of a force, moment of a couple, to resolve force into a force-couple system and to analyze trusses
CO5	Determine kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

TEXT BOOKS

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 12th Edition, 2019.

2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

3. Engineering Mechanics– Statics and Dynamics, I. H. Shames, Fourth Edition, Prentice Hall of India.

REFERENCES

1. Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008

2. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.

3. Timoshenko S, Young D H, Rao J V and SukumarPati, Engineering Mechanics, 5thEdition, McGraw Hill Higher Education, 201

4. . Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	-	-	2	-	-	-	-	-	-	-	-	-
CO2	-	2	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	2	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	-	2	3	3	-	-	-	-	-	-	-	-	-	-	-
AVG	0.6	2	2.8	3	-	2	-	-	-	-	-	-	-	-	-

U24TA201	தமிழரும் தொழில்நுட்பமும்/Tamils and Technology	L	T	P	C
		1	-	-	1

அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம்:	**3**

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியிடுகள்

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

அலகு II வடிவமைப்பு மற்றும் கட்டிடக் தொழில்நுட்பம்:	**3**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோவில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் கால கோவில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாடு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சரோசெனிக் கட்டிடக் கலை

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

அலகு III உற்பத்தித் தொழில் நுட்பம் :	**3**

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

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

அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்:	**3**

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்

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

அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ் :	**3**

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இனையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்

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

TOTAL HR	**15**

TEXT BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

4. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies

5. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies)

6. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)

7. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by:Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

8. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

9. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

THEORY CUM PRACTICAL

U24CS201	Python Programming	L	T	P	C
		3	-	3	4.5

Course Objectives

1	To understand the basics of python programming .
2	To define Python functions and strings.
3	To use Python data structures - lists, tuples, dictionaries to represent complex data.
4	To perform file operations in Python.
5	To learn & use python libraries.

UNIT 1 Introduction to Python	**9+9**

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions,
statements, tuple assignment, precedence of operators, comments; Illustrative programs: circulate the values of n variables, distance between two points.

Practicals:
1.Implement a python program to print an Electricity Bill .(for domestic usage.)
2.Implement a Python program to exchange the values of two variables. (using simple statements and expressions)

UNIT 2 CONTROL FLOW, FUNCTIONS, STRINGS	**9+9**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else),chained conditional (if-elif-else);Iteration: state, while,for, break, continue, pass; Fruitful functions, return values, parameters, local and global scope, function composition,Lambda functions, recursion; Strings: string slices, immutability, string functions and methods, string module; Illustrative programs: square root, sum of individual digits of a number.

Practicals:
1.Implement a Python program to print a Number series & Number Patterns.(using Iterative loops).
2.Implement a Python program to find Factorial and largest number in a list(using Functions.).
3.Implement a Python program to perform operations on strings like string reverse,string concatenation & substring .(use switch case).

UNIT 3 LISTS, TUPLES, DICTIONARIES	**9+9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs:Students marks statement,Linear Search, Binary Search.

Practicals:
1.Implement a Python program using Lists & Tuples. (operations of list & tuples - Book Catalogue)
2.Implement a Python program using Sets, Dictionaries. (operations of Sets - Product Categories , operations on Dictionaries - Product Categories)

UNIT 4 FILES, EXCEPTIONS AND MODULES	**9+9**

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages, Python Itertools & functools modules, Illustrative programs: Marks range validation.

Practicals:
1.Implement a Python program to perform file operations (copy from one file to another, word count, longest word).
2.Implement a Python program to handle Exceptions.(voter's age validity).

UNIT 5 LIBRARIES,PACKAGES	**9+9**

Python libraries - NumPy -Array manipulations, numeric ranges, Slicing, indexing, Searching, Sorting, and splitting, Pandas - Data Analysis, Data-frame, Data selection, group-by, Series, sorting, searching, and statistics, dask (pandas wrapper) ,Matplotlib- Data visualization , Line plot, Style properties, multi line plot, scatter plot.

Practicals:
1.Implement a Python program to create a weather data chart using Python Standard Libraries (pandas, numpy. Matplotlib, scipy) .

TOTAL HR	**90**

Course Outcomes

At the end of the course, the student will be able to

CO1	Develop and execute simple Python programs
CO2	Learn to handle strings and functions in python.
CO3	Represent compound data using Python lists, tuples, dictionaries
CO4	Read and write data from/to files in Python programs.
CO5	Perform basic operations using python Libraries

TEXT BOOKS

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

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

REFERENCES:

1.Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021

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

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

4.Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.

5.Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**

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

U24CE207	Engineering Graphics for Civil Engineering	L	T	P	C
		3	-	2	4

Course Objectives	
1	To learn the construction of engineering curves and projection techniques for constructing conic curves, points, and lines.
2	To understand the techniques for projecting and visualizing surfaces and solids in various orientations.
3	To determine the true shape of sectioned solids and develop their lateral surfaces.
4	To develop skills in 3D projection and perspective projection techniques for simple solids.
5	To introduce building drawing concepts, including floor plans, elevations, sections, conventions, and detailing for residential buildings.

UNIT 1 PLANE CURVES , PROJECTION OF POINTS AND STRAIGHT LINES	**6+9**
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method. Orthographic projection- principles-Principal planes-First angle projection-projection of points and straight lines inclined to both the principal planes	
UNIT 2 PROJECTION OF PLANES AND SOLIDS	**6+9**
Projection of planes inclined to both the principal planes -. Projection of simple solids like prisms, pyramids, cylinder, and cone. When the axis is inclined to one of the principal planes and parallel to the other by rotating object method.	
UNIT 3 PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES	**6+9**
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other —obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones.	
UNIT 4 ISOMETRIC AND PERSPECTIVE PROJECTION	**6+9**
Principles of isometric projection — isometric scale —Isometric projections of simple solids - Freehand sketching of multiple views from pictorial views of objects. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.	
UNIT 5 FUNDAMENTALS OF BUILDING DRAWING	**6+9**
Introduction to Building Drawing – Terms used in Drawing as per NBC - Understanding floor plans and scales – types of elevations – representation of building features – sectional views in building drawing – conventions – detailing – Drawing floor plans of simple residential buildings – Drawing elevation of basic building forms – Drawing sections through simple building models – Creating detailing of selected building components	
TOTAL HR	**75**

Course Outcomes	
At the end of the course, the student will be able to	
CO1	Master basic geometric constructions essential for engineering applications and projecting straight lines.
CO2	Acquire skills in planes, and solids using first angle projection.
CO3	Learn techniques for sectioning solids and developing their surfaces.
CO4	Understand principles of isometric and perspective projection for realistic representation.
CO5	Familiarize with terminology and drafting skills specific to building drawing in civil engineering.

TEXT BOOKS

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House,53 Edition, 2019.

2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.

3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015

4. John Molnar P E, "Building Construction Drafting and Design", CBS, 1987

5.Civil Engineering Drawing by Rangwala Charotar Publishing House Pvt.Ltd 3 rd Edition 2017.

6. Building Planning and Drawing by M. V. Chitawadagi and S.S. Bhavikatti I K International Publishing House Pvt. Ltd

REFERENCES

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.

2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.

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

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

5. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.

6. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

7. Brain W Boughton, "Building and Civil Engineering Construction", Harper Collins Publishers Ltd, 1983.

8. William J Hornug, "Metric Architectural Construction Drafting and Design Fundamentals" Prentice Hall, 1981

9. Drawing imagining building: embodiment in architectural design practices by Emmons, Paul Routledge, Year: 2019

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

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

PRACTICAL

U24ME101	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

Course Objectives	
The main learning objective of this course is to provide hands on training to the students in:	
1	Draw pipe line plan; layout and connect various pipe fittings used in common household plumbing work
2	To make wood joints commonly used in household wood.
3	To make various electrical connections in typical household electrical wiring installations.
4	Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipment; Make a tray out of metal sheet using sheet metal work.
5	Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.
PART I CIVIL ENGINEERING PRACTICES	
PLUMBING WORK	
	Theory
1	Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in households.
2	Connecting pipes of different materials: Metal, plastic and flexible pipes
	Experiment
1	Preparing plumbing line sketches.
2	Laying pipe connection to the suction side of a pump
3	Laying pipe connection to the delivery side of a pump.
	Demo
1	**In-Campus -** - Water supply lines (RO plant) - Drainage systems - Water Harvesting
	Self-Study
1	Household Appliances.- pipes of different materials: Metal, plastic and flexible pipes are utilized in various applications, such as: - Water supply lines - Drainage systems - Gas lines(if any) - Heating and cooling systems - Solar water heating (if any) - Chimney
WOOD WORK	
	Theory
1	Tools used in Carpentry & safety measures.
2	Studying common industrial trusses
	Experiment

1	Sawing,
2	Planing and
3	Making joints like T-Joint Mortise joint and Tenon joint and Dovetail joint.
	Demo
1	Studying joints in door panels and wooden furniture
2	Study of truss in workshop
	Self-study
1	In house- Types of joints used in window, door, chair, table, specific type of furniture or fixture
ELECTRICAL ENGINEERING PRACTICES 15	
	Theory
1	Electrical Installation tools, equipment & safety measures.
2	Introduction and application of switches, fuses, boards, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
	Demo
1	Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box,
2	Electrical wiring system from the Electricity Board (EB) to a classroom on a campus
3	Earth Pit & its maintenance in campus
4	Hands-on session of electrical connections for Motors & Uninterruptible Power Supply.
5	Bringing Renewable Energy to the Classroom: A Solar Smart Grid Demonstration
	Experiment
1	Fluorescent Lamp wiring with introduction to CFL and LED types.
2	Energy meter wiring and related calculations/ calibration
3	Iron Box wiring and assembly
4	Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
5	emergency lamp wiring/Water heater
	Self-Study
1	House - electrical wiring system from the Electricity Board (EB) to a dining Room
2	Building (Common area)- electrical wiring system from the Electricity Board (EB) to a staircase of the building & water pump
3	Types of fuse / MDB/ MCB/RCD/CU/Switchboard
4	Earth Pit at house
MECHANICAL ENGINEERING PRACTICES	
	Theory
1	Tools and its handling techniques & safety measures.
2	Welding Procedure, Selection & Safety Measures.
3	types of Welding joints Butt Joints, Lap Joints, and Tee Joints
4	Basic of foundry operations- Various types of casting processes Types of patterns used in casting processes Types of moulding sand and materials used for pattern making

5	Making of a cone using sheet metal
	Demo
1	Demonstrating basic foundry operations.- Mold Cavity, Air Vents, Liquid Passages Gates, Runners, Sprues
2	Demonstrating components made out of casting at workshop
3	Demonstration of shaft in gearbox of lathe machine
4	Demonstration of screws RH, LH (Turning, Facing and Thread)
5	Demonstration of Bolted joint
6	Demonstration of sheet metal fabricated components
7	Making of a cone using sheet metal
	Experiment
1	Dis-assembly and assembly of a centrifugal pump.
2	Dis-assembly and assembly of a household mixer /Grinder Mixer
3	Dis-assembly and assembly of an air conditioner.
4	Dis-assembly and assembly of a Ceiling Fan/Table Fan
5	Simple Turning using Lathe machine
6	Drilling & Tapping in Plate (Simple Bolted joint)
7	Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
8	Making of a square tray
	Self-Study
1	List examples of sheet metal fabricated component used in house
2	Application of shaft
3	List examples of welded components commonly used in a house
4	List components made by foundry - casting process
ELECTRONIC ENGINEERING PRACTICES 15	
	Theory
1	Electronic components, equipment & safety measures.
2	Soldering simple electronic circuits and checking continuity.
	Demo
1	Study an elements of smart phone
2	Assembly and dismantle of LED TV
	Experiment
1	Soldering simple electronic circuits and checking continuity.
2	Hands-on session of Soldering Practices in a Printed Circuit Breaker.
3	Assembling and testing electronic components on a small PCB
4	Assembly and dismantle of computer/ laptop
5	Hands-on session of integration of sensors and actuators with a Microcontroller.
6	Hands-on session of Bridge Rectifier, Op-Amp and Trans impedance amplifier.
	Self-Study (mini Project)
1	Sensor-based projects: Create projects using sensors like temperature, humidity, or motion sensors

2	Automatic Fan Controller: Create a system that turns on a fan when the temperature exceeds a certain limit
3	Automatic Night Light: Design a circuit that turns on an LED light when it gets dark.
4	Water Level Indicator
5	Door Alarm: Create a simple alarm system that triggers when a refrigerator door is open for a more than a one minute

Course Outcomes

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

CO1	To practice and experience the plumbing work
CO2	To gain practical experience in carpentry by crafting a variety of joints.
CO3	To acquire knowledge in the methodology and techniques of wiring for electrical connections.
CO4	To gain knowledge in welding, sheet metal fabrication, and lathe operations.
CO5	To learn about electronic components, equipment, and their functions—such as resistors, color coding, measuring AC signal parameters, gates, circuits, and more.

CO-PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Program Outcomes (POs) and Program Specific Outcomes PSOs'

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
CO2	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
CO3	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
CO4	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
CO5	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1
AVG	3	2	-	-	1	1	1	-	-	-	-	2	2	1	1

U24TP210	COMMUNICATION SKILLS LAB II	L	T	P	C
		0	0	2	1

Course Objectives	
1	To enhance their ability to understand spoken English in various contexts and take part in effective discussions in a professional context.
2	To enhance speaking and presentation skills
3	To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
4	To develop students' critical thinking skills
5	To prepare for real-life communication situations and workplace discussions through the practice of mock interviews.

UNIT I	**6**
Listening: Listening to voicemail & messages, Audio texts, for writing short answers **Speaking:** Conversation between the interlocutor and each candidate	
UNIT II	**6**
Listening: Listening to podcasts, anecdotes and identifying topics, context etc.. **Speaking:** Presentation on any given topic (Non - Technical)	
UNIT III	**6**
Listening: One extended conversation or monologue - interview, discussion, lectures and educational videos **Speaking:** Group Discussion.	
UNIT IV	**6**
Listening: Listening to presentation and 5 min informal talk **Speaking:** Presentation on any given topic (Technical)	
UNIT V	**6**
Listening: Listening to interview skills **Speaking:** Mock interview	
TOTAL PERIODS	**30**

At the end of the course, the student will be able to	
CO1	Understand accurately and respond to a variety of spoken content to showcase their ability to capture both main ideas and supporting details.
CO2	Enhance the students to make effective presentations.

CO3	Speak effectively in group discussions held in a formal/semi-formal context.
CO4	Ability to interpret different genres of texts, infer implied meanings and evaluate it for ideas as well as for methods of presentation relevant in different situations
CO5	Motivate and prepare the students to attend job interviews and be successful in their pursuit.

List of experiments

1	Conversation
2	Presentation on any given topic (Non - Technical)
3	Group Discussion
4	Presentation on any given topic (Technical)
5	Mock interview

ASSESSMENT PATTERN

End Semester speaking & Writing will be conducted in the classroom

TEXT BOOKS

1. Debra Daise, CharlNorloff, and Paul Carne Reading and Writing (Level 4) Oxford University Press: Oxford, 2011

2. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011

REFERENCES

1. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012

2. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge University Press: Cambridge, 2004

3. English and Soft Skills, Dr. S.P. Dhanavel, Orient BlackSwan, 2013

4.Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015

5.Interact English Lab Manual for Undergraduate Students,. Orient Black Swan: Hyderabad, 2016

6 E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015

7.Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014

8.S. Hariharan et al. Soft Skills. MJP Publishers: Chennai, 2010.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO1	-	-	-	-	-	-	-	-	-	3	-	2	2	2	-
CO2	-	-	-	-	-	-	-	-	-	3	-	2	2	2	-
CO3	-	-	-	-	-	-	-	-	3	3	-	2	2	2	-
CO4	-	-	-	-	-	-	-	-	-	3	-	2	2	2	-
CO5	-	-	-	-	-	-	-	-	-	3	-	2	2	2	-
AVG	-	-	-	-	-	-	-	-	1.8	3	-	2	2	2	-

U24ED211	DESIGN THINKING – DECODING INNOVATION OPPORTUNITY	L	T	P	C
		0	0	1	0.5

Course Objectives

1	Understand and apply the five phases of the Stanford Design Thinking Framework (Empathize, Define, Ideate, Prototype, and Test) to identify user needs and create innovative solutions.
2	Gain knowledge of the five stages of the IDEO Design Thinking Framework (Discover, Interpret, Ideate, Experiment, and Evolve) and explore how to iteratively refine solutions through a human-centered approach.
3	Learn the application of Design Thinking tools such as visualization, journey mapping, value chain analysis, brainstorming, and rapid prototyping to generate and refine ideas that meet customer needs.
4	Apply Design Thinking methodologies to identify opportunities for innovation, scope projects, conduct research, generate ideas, and create business case studies and prototypes for real-world problem-solving.
5	Analyze and clarify innovation opportunities by understanding the problem, stakeholders, and solution context through frameworks like Doblin's Ten Types of Innovation and RACI, focusing on the 'Who', 'What', 'How', and 'Why' aspects of problem-solving.

UNIT – 1: STANFORD DESIGN THINKING FRAMEWORK	**3**

- How To `Empathize'?
- How To `Define'
- How To `Ideate'?
- How To `Prototype'?
- How To `Test'?

UNIT – 2: IDEO DESIGN THINKING FRAMEWORK	**3**

- How To `Discover'?
- How To `Interpret'?
- How To `Ideate'?
- How To `Experiment'?
- How To `Evolve'?

UNIT – 3: DESIGN THINKING & DESIGN DOING	**2**

- `What Is'? - Overview About Visualization, Journey Mapping, Value Chain Analysis & Mind Mapping
- `What If'? - Overview About BrainStorming& Concept Development
- `What Wows'? - Overview About Assumption Testing & Rapid Prototyping
- `What Works'? - Overview About Customer Co-Creation & Learning Launch

UNIT – 4: DESIGN THINKING IN PRACTICE – Identify An Opportunity & Becoming Aware Of Next Steps For Innovation – Overview	**2**

- Before You Begin: Identify An Opportunity – Scope Your Project – Draft Your Design Brief – Make Your Plans
- `What Is' Focus: Do Your Research – Identify Insights – Establish Design Criteria
- What If' Focus: Brainstorm Ideas – Develop Concepts – Create Business Case Studies
- `What Wows' Focus: Surface Key Assumptions – Make Prototypes
- `What Works' Focus: Get Feedback From Stakeholders – Run Learning Launches – Design The On-Ramp

UNIT – 5: CLARIFYING PROBLEM STATEMENT & PRIORITIES BY IDENTIFYING & DECODING THE INNOVATION OPPORTUNITY	**5**

- Overview Of Doblin's Ten Types Of Innovation With Brief-Cases Towards Identifying Innovation Opportunity & Clarifying Problem Statement and Priorities
- Opportunity / Problem Clarity About `Who'? (Who're we solving the problem for?)
- Opportunity / Problem Clarity About `What'? (What is the Problem Or EGO – Expectation, Goal & Objective?)
- Opportunity / Problem Clarity About `HOW'? (How's the Overall Problem Solving Approach Help Highlighting RACI – Who's Responsible, Accountable, Consulted & Informed?)
- Opportunity / Problem Clarity About `WHY'? (Why's this Solution or Product or Service or Process beneficial to the stakeholders?)

TOTAL PERIODS	**15**

Course Outcomes

At the end of the course, the student will be able to

CO1	Apply Design Thinking frameworks, tools, and techniques to real-world problems, identifying opportunities for innovation and creating effective solutions.
CO2	Empathize with users, define problems, ideate solutions, prototype, and test, ensuring that solutions meet customer needs and are feasible, viable, and desirable.
CO3	Analyze problems, stakeholders, and solution contexts using frameworks like Doblin's Ten Types of Innovation and RACI, focusing on the 'Who', 'What', 'How', and 'Why' aspects of problem-solving.
CO4	Generate and refine ideas using Design Thinking tools like visualization, journey mapping, value chain analysis, brainstorming, and rapid prototyping, creating innovative solutions that meet customer needs.
CO5	Develop effective problem-solving skills, including the ability to scope projects, conduct research, generate ideas, and create business case studies and prototypes, preparing them to tackle complex real-world problems..

TEXT BOOKS

1	Tim Brown, "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", Harper Publications, 2009
2	Don Norman, "The Design of Everyday Things", Basic Books, 2013
3	Tom Kelley, David Kelley, "Creative Confidence: Unleashing the Creative Potential Within Us All", Currency, 2013

REFERENCES

1	HassoPlattner, Christoph Meinel, Larry Leifer, "Design Thinking: Understand – Improve – Apply (Understanding Innovation)", Springer, 2011
2	Jakob Schneider, Marc Stickdorn, "This Is Service Design Thinking: Basics, Tools, Cases", John Wiley & Sons, 2011
3	Tom Kelley, The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm, Currency, 2001

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Program Outcomes (POs) and Program Specific Outcomes PSOs'

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

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

Meenakshi Sundararajan Engineering College

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department: Civil Engineering, R2024, CBCS

U24MA301	TRANSFORMS,PARTIAL DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS	L	T	P	C
		3	1	-	4

Course Objectives

1	To introduce Fourier series analysis which is vital to many applications in engineering apart from its use in solving boundary value problems.
2	To introduce the basic concepts of Partial differential equation and to find its solutions.
3	To acquaint the student with Fourier series techniques to solve heat and wave flow problems in engineering.
4	To introduce the effective mathematical tools for the solutions of difference equations that model several physical processes and to develop transform techniques for discrete time systems
5	To introduce the Interpolation operators and numerical techniques of interpolation in various intervals, numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.

UNIT 1 FOURIER SERIES	**9+3**
Dirichlet's conditions -Necessary and sufficient condition for existence of Fourier series –General Fourier series – Odd and even functions – Half range sine series –Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.	
UNIT 2 PARTIAL DIFFERENTIAL EQUATION	**9+3**
Formation of partial differential equations – Singular integrals – Solutions of standard types of first order partial differential equations (except f(xmzkp,ynzkq)=0 – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous type.	
UNIT 3 APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS	**9+3**
Classification of PDE – Method of separation of variables – Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.	
UNIT 4 INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION	**9+3**
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method.	
UNIT 5 Z – TRANSFORMS AND DIFFERENCE EQUATIONS	**9+3**
Z-transforms – Elementary properties – Inverse Z-transform (using partial fraction and residues) –Initial and final value theorems – Convolution theorem – Formation of difference equations – Solution of difference equations using Z – transform	
TOTAL HR	**60**

Course Outcomes

At the end of the course, the student will be able to

CO1	Evaluate Fourier series of periodic functions.
CO2	Understand to formulate and solve partial differential equations.
CO3	Apply the method of separation of variables to find the solution of heat and wave equation.

CO4	Examine Z transform techniques and solve difference equations.
CO5	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.

TEXT BOOKS

1.Grewal B.S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2017

2.Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016

3.Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi Publications Pvt. Ltd, 2014.

4.Veerarajan.T,"Transforms and Partial Differential Equations", second Edition,TataMcgraw Hill Education , private Limited ,2014.

5.Won Y.Yang,YoungK.Choi,JaekwonKim,ManCheol Kim, H.JinKim,Taeho lm, "Engineering Mathematics with MATLAB" CRC Press Publishers , I st Edition , 2017.

REFERENCES

1.Dass, H.K., and Er.RajnishVerma, "Higher Engineering Mathematics", S.Chand Private Ltd.,2011.

2.Peter V.O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning,2012

3.James, G., "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.

4.Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	1	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	1	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	1	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	1	-	-
AVG	3	3	2.6	-	-	-	-	-	-	-	-	-	1	-	-

Meenakshi Sundararajan Engineering College
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Department: Civil Engineering, R2024, CBCS

U24CY201	Green and Sustainable Chemistry	L	T	P	C
		1	0	2	2

Common to all branches

Course Objectives

1	To give the basic knowledge on role of chemistry to mitigate environmental and global challenges.
2	To understand the global climatic change and the necessity for the preservation of ecosystem.
3	To become familiar with the safe design of synthesis and to minimize the generation of hazardous substances.
4	To understand the need of various energy resources for sustainable development.
5	To integrate the chemistry with environment ,technology and public health.

UNIT1 Role of Chemistry Current Challenges for Sustainable Development	**6**

Role of chemistry in addressing the challenges for sustainable development and solving global issues. Nexus among biosphere environment, human and animal health. Introduction to bio-diversity-threats and conservation of bio-diversity .Millenium development goals (MDG) and sustainable development goals(SDG),clean development mechanism(CDM).

UNIT2 Sustainable Environmental Chemistry	**6**

Climate change – green house effect - gobal warming - sea level rise - intrusion and inundation, , ozone layer depletion, Elnino and LaNina – carbon credits, carbon trading ,carbon foot print, legal provision for environmental protection, coastal zone management-soft and hard measures, Ecosystem – estuaries - corals, mangroves, wetlands, sand dunes etc.

UNIT3 Principles Of Sustainable Green Chemistry	**6**

Sources, reactions and effect of chemicals in environments – Factory effluent and treatment, Handling of Hazards-Design of green pesticides for agriculture.- Introduction to Biocides: types and applications, Organic Insecticides – Carbamates, Chlorinated hydrocarbons, cypermithrin, Pyrethrin,silicagel,rotenone-synthesis properties and practical applications. -reduction of toxicity, improved recycling and improved product performance.

UNIT4 SUSTAINABLE STRATEGY	**9**

Present energy challenges and the possible energy solutions - Solar energy- Solar panel-Solar water heater- solar heat collector and applications- Wind energy- Types – production - advantages and disadvantages- applications. Nuclear energy – production - advantages and disadvantages- applications. Geothermal energy – Production and applications – Bio fuels.

UNIT 5 Good Health and Well Being -Water-Soil-Air	**9**

Groundwater contamination and contamination of water bodies. The role of chemistry in developing appropriate technological solutions for water treatment using Electrodialysis, Forward osmosis and advanced oxidation using photocatalysis and waste water treatment. Reclamation of soil. Current air pollution situation and trends. Factors responsible for air pollution. Air pollution assessment, monitoring and mitigation.

TOTAL HR	**45**

Course Outcomes

At the end of the course, the student will be able to

CO1	Understand the ability to face the current challenges across globe with the aid of chemistry.
CO2	Identify the climatic challenges and to contribute for sustainable transformation.
CO3	Understand the safe design of products with the principles of green chemistry.
CO4	Understand to analyze the energy challenges for sustainable resource management.
CO5	Integrate chemistry with environmental science and public health.

TEXT BOOKS

1.Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.

2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.

3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.

5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.

7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCES:

1. M.Karpagam, Geetha Jaikumar, "Green Manmagement Theory and Application", ANE Publishers, First Edition, 2010

2. Matlack,A.S.Introduction to green chemistry,MarcelDekker:New York,2001..

3.Anastas,P.T:Warner,J.C.Green chemistry:Theory and practice,Oxforduniv press:oxford,1998.

4. Fankte,peter,etal."Exposure and toxicity characterization of chemical emissions and chemical in products:Global recommendations and implementation in USEtox"The international journal of life cycle assessment,26.5(2021):899- 915.

5. Rajagopalan,R,'Environmental Studies - From Crisis to Cure',Oxford University Press, 2005.

6.Erach Bharucha “Text book of Environmental Studies for Undergraduate Courses” Orient Blackswan Pvt. Ltd. 2013.

	CO/PO, PSO Mapping (3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak Programme Outcomes (POs) and Programme Specific Outcomes PSOs'														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	-	1	1	2	2	1	2	-	3	-	-	-
CO2	3	1	1	-	1	1	3	1	2	2	-	2	-	-	-
CO3	3	1	1	-	1	1	2	1	2	2	-	2	-	-	-
CO4	3	-	1	-	2	2	3	2	2	2	-	3	-	-	-
CO5	3	1	1	-	2	2	3	2	1	2	-	3	-	-	-
AVG	3	1	1	-	1.4	1.4	2.6	1.6	1.6	2	-	2.6	-	-	-

Meenakshi Sundararajan Engineering College
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Department: Civil Engineering, R2024, CBCS

U24CE302	FLUID MECHANICS	L	T	P	C
		3	0	2	4

Course Objectives

1	To understand the properties of fluid and its behaviour at rest
2	To acquire knowledge on kinematics and dynamics of fluid through equations of motion
3	To enhance knowledge on dimensional analysis and to be exposed to the applications of model studies
4	To analyze the flow of real fluids through pipes in series and parallel
5	To examine the concept of boundary layer thickness and separation

UNIT1 FLUID PROPERTIES AND FLUID STATICS — **12**

Introduction to fluid mechanics– Methods of analysis – Continuum hypothesis – System and Control volume approach – Reynold's transportation theorem – Fluid properties – Fluid statics – Manometry – Forces on plane and curved surfaces – Buoyancy and floatation – Stability of floating bodies.

Lab Components

PRACTICALS: Metacentric height of floating bodies, Manometers (only demonstration)

UNIT2 FLUID KINEMATICS AND DYNAMICS — **12**

Classification of flows - Streamline, streak-line and path-lines - Stream function and velocity potential functions - Flow nets; mass, energy and momentum conservation - Euler's equation of motion - Bernoulli's equation - Applications to velocity and discharge measurements - Linear momentum equation - Application to pipe bends

Lab Components

PRACTICALS: Calibration of Rotameter and Venturimeter, and bernouli's theorem (only demonstration)

UNIT3 DIMENSIONAL ANALYSIS AND MODEL STUDIES — **12**

Fundamental dimensions – Dimensional homogeneity – Rayleigh's method and Buckingham Pi theorem – Dimensionless parameters – Similitude and model studies – Distorted and undistorted models.

Lab Components

PRACTICALS: Physical model study of a hydraulic flume (demonstration only)

UNIT4 FLOW THROUGH PIPES — **12**

Reynolds experiment – Laminar flow in pipes and between parallel plates – Development of laminar and turbulent flows in pipes – Darcy-Weisbach equation – Moody diagram – Major and minor losses of flow in pipes – Total energy line – Hydraulic grade line – Siphon – Pipes in series and parallel – Equivalent pipes.

Lab Components

PRACTICALS: Determination of friction factor in pipes, Determination of minor losses

UNIT5 BOUNDARY LAYER FLOW — **12**

Definition of boundary layers – Laminar and turbulent boundary layers – Displacement, momentum and energy thickness – Momentum integral equation – Applications – Separation of boundary layer – Drag and Lift forces.

Lab Components

PRACTICALS: Demonstration of viscous friction through models

TOTAL — **60 Periods**

Course Outcomes

At the end of the course, the student will be able to

CO1	Demonstrate the difference between solid and fluid, its properties and behaviour in static conditions

CO2	Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics
CO3	Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performance of prototypes by model studies.
CO4	Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.
CO5	Explain the concept of boundary layer and its application to find the drag force excreted by the fluid on the flat solid surface.
TEXT BOOKS	
1	Modi P.N and Seth Hydraulics and Fluid Mechanics including Hydraulic Machines, 22nd Ed., Standard Book House New Delhi, 2019.
2	Subramanya, K., "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2016.
3	Rajput., R.K. "Fluid Mechanics", S.Chand and Co, New Delhi, 2011.
4	Bansal, R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt.Ltd., New Delhi, 2017.
REFERENCES	
1	S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Pvt. Ltd., 2012.
2	Pani B S, Fluid Mechanics: A Concise Introduction, Prentice Hall of India Private Ltd, 2016.
3	Jain A. K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi, 2014.
4	Narayana Pillai N. Principles of Fluid Mechanics and Fluid Machines, (3rd Ed.) University Press (India) Pvt. Ltd. 2009.

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

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

U24CE303	Strength of Materials I	L	T	P	C
		3	0	2	4

Course Objectives

1	To learn the deformation of prismatic members, thin cylindrical and spherical shell deformation due to internal pressure
2	To know the types of loads, shear and bending moment of statically determinate structure.
3	To find the deflection of beam by various methods
4	To understand the effect of torsion on shafts and behavior of spring due to load.
5	To know the member forces of frames by different methods.

UNIT1 SIMPLE STRESSES AND STRAINS — **12**

Introduction - Elastic constants -Volumetric strain - Analysis of bars of uniform section - Principle of superposition - Analysis of Composite section-Thin cylindrical shell and Spherical shell subject to Internal Pressure.

Lab Components

Compression test on wood,
Tension test on mild steel rod

UNIT2 SHEAR AND BENDING IN STATICALLY DETERMINATE BEAMS — **12**

Introduction- Types of loads, supports and beams- Shear force and Bending moment--Shear force and bending moment diagrams for statically determinate beams (cantilever, simply supported and overhanging beams) with concentrated load, uniformly distributed load, uniformly varying load and moments - Point of contra flexure.

Theory of simple bending - Bending stresses in symmetrical section, Section Modulus, Shear stresses in beams - Shear stress distribution for different sections - Flitched beams.

Lab Components

Double shear test on metal

UNIT3 DEFLECTION OF BEAMS — **12**

Deflection of Beams – Assumptions- Double integration method - Macaulay's methods – Moment area method for computation of slopes and deflections of determinant beams

Lab Components

Deflection test on metal beam
Verification of Maxwell Reciprocal Theorem on Simply Supported beam.

UNIT4 TORSION OF SHAFTS AND SPRINGS — **12**

Torsion of Circular and Hollow Shafts-Assumptions- Stresses in solid and hollow circular shafts-Power transmitted by shafts- Spring - closed and open coiled helical springs- leaf springs – springs in series and parallel.

Lab Components

Torsion test on mild steel rod,
Compression test on helical spring

UNIT5 PERFECT FRAMES — **12**

Types of frames- Assumptions- Reactions of supports of a frame- Analysis of frame- Method of joints- Method of section- Tension coefficient method

Lab Components

Impact test on metal specimen (Izod and Charpy)
Hardness test on metals (Rockwell and Brinell Hardness Tests)

TOTAL — **Periods : 60**

Course Outcomes

At the end of the course, the student will be able to	
CO1	Understand the concepts of stress and strain
CO2	Determine Shear force and bending moment in beams and understand concept of theory of simple bending
CO3	Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.
CO4	Apply basic equation of torsion in design of circular shafts to transmit required power
CO5	Analyze the pin jointed plane and space trusses
TEXT BOOKS	
1	Bansal. R.K. “Strength of Materials”, Laxmi Publications Pvt. Ltd., New Delhi, 2010
2	Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain,"Theory of Structures" (SMTS) Vol -II, Laxmi Publishing Pvt Ltd, New Delhi 2017.
3	Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand& company Ltd., New Delhi, 2018
4	Singh. D.K., “ Strength of Materials”, Ane Books Pvt. Ltd., New Delhi, 2021
5	Rattan . S. S, “Strength of Materials”, Tata McGraw Hill Education Private Limited, New Delhi, 2012
REFERENCES	
1	Vazirani.V.N, Ratwani.M.M, Duggal .S.K Analysis of Structures: Analysis, Design and Detailing of Structures-Vol.1, Khanna Publishers, New Delhi 2014.
2	Egor. P.Popov, Engineering Mechanics of Solids, Prentice Hall of India, Second Edition New Delhi 2015
3	Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

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

U24CE305	Engineering Surveying	L	T	P	C
		3	0	2	4

Course Objectives

1	To impart knowledge on the basic principles of surveying, chain and compass surveying.
2	To integrate the theory and principles of levelling and contouring.
3	To learn the working principle of theodolite and setting of different types of curves.
4	To introduce the concepts of Control Surveying
5	To apply the working principle of modern surveying equipments like total station and GPS.

UNIT1 FUNDAMENTALS OF CONVENTIONAL SURVEYING — **12**

Definition – Classifications – Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging a line– Chain survey of an area - Well conditioned triangles– Compass – Basic principles – Types – Bearing – System and conversions – Sources of errors - local attraction and its elimination– Magnetic declination – Dip – compass traversing

Lab Components

1.Aligning, Ranging, Chaining and Marking Perpendicular offset.
2. Compass Traversing – Measuring Bearings & arriving included angles

UNIT2 LEVELLING — **12**

Principles and theory of Levelling - Level line – Datum – Mean sea level – Bench mark – Types of Bench marks – Leveling instruments – Types of Levelling – Booking and reduction of levels – Curvature and refraction – Contouring – Characteristics and uses of contours

Lab Components

1. Fly levelling using Dumpy level or Tilting level
2. Check levelling

UNIT3 THEODOLITE AND TACHEOMETRIC SURVEYING — **12**

Theodolite - Types - Horizontal and vertical angle measurements - Temporary and permanent adjustments - Trigonometric levelling - Heights and distances - Single plane method - Double plane method - Tacheometric surveying - Stadia tacheometry - Subtense method - Tangential tacheometry.

Lab Components

1.Measurements of horizontal angles by reiteration and repetition and vertical angles
2. Determination of elevation of an object using single plane method when base is Accessible or inaccessible.

UNIT4 CONTROL SURVEYING AND ADJUSTMENT — **12**

Horizontal and vertical control: objectives, methods, triangulation, trilateration and traversing - Gale's table - Errors: sources, classification, true and most probable values, weighted observation - Principle of least squares - Method of equal shifts - Normal equation - Correlates - Level nets - Adjustment of simple triangulation networks.

Lab Components-

1.Determination of Tacheometric Constants
2. Heights and distances by stadia Tacheometry
3. Heights and distances by Tangential Tacheometry

UNIT5 MODERN SURVEYING — **12**

Total Station: Types of EDM instruments - Fundamental quantities measured - Parts and accessories - working principle – Advantages - COGO functions – Field procedure and applications. GPS Surveying: Different segments - space, control and user segments - Hand Held and Geodetic receivers - satellite configuration - Anti Spoofing and Selective Availability.

Lab Components

1. Traverse using Total station and Area of Traverse.
2. Determination of elevation using handheld GPS.

TOTAL	**60 Periods**

Course Outcomes

At the end of the course, the student will be able to

CO1	Gain a solid understanding of the fundamental principles and concepts of surveying, including measurements, surveying instruments
CO2	Imparts knowledge in computation of levels of terrain and ground features
CO3	Imparts concepts of Theodolite and Tacheometric Surveying for complex surveying operations
CO4	Understand the procedure for establishing horizontal and vertical control
CO5	Demonstrate the concept of Total Station and GPS

TEXT BOOKS

1	Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain, Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition, 2016.
2	T. P. Kanetkar And S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune VidyarthiGrihaPrakashan, Pune, 2008.
3	Higher Surveying, Chandra A. M., New Age International Publishers, 2015.
4	Surveying Theory and Practice, James, M Anderson & Edward M., Tata Mc Graw Hill, 2012.
5	Subramaniyam, R. "Surveying and Levelling", Oxford University Press, New Delhi, 2012.

REFERENCES

1	James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, Mc Graw Hill 2001.
2	Duggal S K , "Surveying", 4th Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2013.
3	S. K. Roy, Fundamentals of Surveying, Second Edition, Prenticeˆ Hall of India2010.
4	K. R. Arora, Surveying Vol I & II, Standard Book house, Twelfth Edition 2013.
5	https://nptel.ac.in/courses/105104101

CO/PO, PSO Mapping
(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak
Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

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

CO5	3	2	2	2	3	1	1	1	3	2	1	3	3	2	1
AVG	3	2	2	2	3	1	1	1	3	2	1	3	3	2	1

U24CE305	Water Supply Engineering	L	T	P	C
		3	0	2	4

Course Objectives

1	To familiarize various components of water supply scheme
2	To acquaint the design of intake structure and conveyance system for water transmission
3	To familiarize the process of conventional treatment of water and design of water treatment system.
4	To acquaint various advanced treatment system and knowledge about the recent advances in water treatment process
5	To design and evaluate water distribution system and water supply in buildings

UNIT1 SOURCES AND QUALITY OF WATER — **12**

Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Water demand management techniques- Sources of water and their characteristics – Analytical techniques, Surface and Groundwater – Impounding Reservoir – Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards - Emerging contaminants in water (microplastics, pharmaceuticals, PFAS).

Lab Components
Practicals:
Determination of Turbidity - IS 3025(Part 10)-1984 R(2002)
Determination of pH in water - IS 3025 (Part 11)-1983R(2002)

UNIT2 COLLECTION AND CONVEYANCE OF WATER — **12**

Water supply –Types and design of intake structures – Functions; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials - Leakage detection and non-revenue water control.
Lab Components
Practicals:
Determination of Total Dissolved Solids in water - IS 3025 (Part 16)-1984 R(2006)
Determination of total hardness in water - IS 3025 (Part 21)-R (2009)

UNIT3 CONVENTIONAL WATER TREATMENT — **9+3**

Objectives – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators, flash mixers, Coagulation and flocculation –Design of Clariflocculator, Plate and tube settlers - sand filters - Disinfection - Residue Management – Operation and Maintenance aspects - Energy-efficient water treatment technologies.

Lab Components
Practicals:
Determination of Total Dissolved Solids in water - IS 3025 (Part 16)-1984 R(2006)
Determination of total hardness in water - IS 3025 (Part 21)-R (2009)

UNIT4 ADVANCED WATER TREATMENT — **12**

Water softening – Iron and Manganese removal - Defluoridation - Adsorption - Desalination- R.O. Plant – demineralization process –Ion exchange– Membrane Systems – RO Reject Management - Operation & Maintenance aspects – Water reuse and recycling – Smart water systems using IoT – Climate change impact on water supply systems- Recent advances.

Lab Components

Practicals:

Determination of alkalinity in water - IS 3025 (Part 23)-1986 R (2003)

Determination of Sulphate in water - APHA 23rd Edition-4500-SO42-E

Determination of fluoride in water - IS 3025 (Part 60)-2008

UNIT5 WATER DISTRIBUTION AND SUPPLY	**12**

Requirements of water distribution – Components – Selection of pipe material – Service reservoirs Functions – Network design – Analysis of distribution networks – Appurtenances – Leak detection. Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing – Life cycle cost analysis for water infrastructure – Case studies of global water distribution systems.

Lab Components

Practicals:

Determination of iron in water - IS 3025 (Part 53)- 2003

Determination of free residual chlorine in water - IS 3025 (Part 26)1986 R(2003)

Determination of Optimum Coagulant Dosage by Jar test apparatus - IS 3025 (Part 50) 2002

	TOTAL	**60**

Course Outcomes

At the end of the course, the student will be able to

CO1	Understand the various components of water supply scheme
CO2	Design of intake structure and conveyance system for water transmission
CO3	Understand the process of conventional treatment of water and design of water treatment system.
CO4	Able to Understand and design the various advanced treatment system and knowledge about the recent advances in water treatment process
CO5	Ability to design and evaluate water distribution system and water supply in buildings

TEXT BOOKS

1	Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2010.
2	Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2010.
3	Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009
4	American Public Health Association, American Water Works Association, Water Environment Federation. Lipps WC, Braun-Howland EB, Baxter TE, eds. Standard Methods for the Examination of Water and Wastewater. 24th ed. Washington DC: APHA Press; 2023

REFERENCES

1	Punmia, B.C.,Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2010.
2	Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.

CO/PO, PSO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong 2-Medium, 1-Weak

Programme Outcomes (POs) and Programme Specific Outcomes PSOs'

Meenakshi Sundararajan Engineering College

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department: Civil Engineering, R2024, CBCS

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