MOHAN BABU UNIVERSITY

Sree Sainath Nagar, Tirupati – 517 102

MBU
MOHAN BABU
UNIVERSITY

DREAM. BELIEVE. ACHIEVE

SCHOOL OF ENGINEERING

B.Tech. Civil Engineering

CURRICULUM AND SYLLABUS

(For 2022-23 Admitted Students)

FULLY FLEXIBLE CHOICE BASED CREDIT SYSTEM (FFCBCS)

MOHAN BABU UNIVERSITY

Vision

To be a globally respected institution with an innovative and entrepreneurial culture that offers transformative education to advance sustainability and societal good.

Mission

- Develop industry-focused professionals with a global perspective.
- Offer academic programs that provide transformative learning experience founded on the spirit of curiosity, innovation, and integrity.
- Create confluence of research, innovation, and ideation to bring about sustainable and socially relevant enterprises.
- Uphold high standards of professional ethics leading to harmonious relationship with environment and society.

SCHOOL OF ENGINEERING

Vision

To be the sought-after destination for engineering education recognised for excellence, innovation and the societal relevance and impact of its pursuits.

Mission

- Instil within our students fundamental engineering knowledge, a broad set of skills, and an inquisitive attitude to create innovative solutions to serve industry and community.
- Provide an experience par excellence with our state-of-the-art research, innovation, and incubation ecosystem to realise our learners' fullest potential.
- Impart continued education and research support to working professionals in engineering fields to enhance their domain expertise in the cutting-edge technologies.
- Inculcate among the engineers of tomorrow with a spirit to solve societal challenges.

DEPARTMENT OF CIVIL ENGINEERING

Vision

To become a leading centre of excellence in the country in Civil Engineering education through teaching, research, innovation, incubation, consultancy and public service for technical development in a knowledge society.

Mission

- Inspire the civil engineers of tomorrow to take on the challenges of creating and sustaining the built environment that support our society.
- Nurture these civil engineers with fundamental engineering knowledge, a broad set of skills, and an inquisitive attitude for creating innovative solutions to serve industry and community through contemporary curriculum, congenial learning environment, pertinent research, innovation and incubation ecosystem, industry-institute interaction, mentoring, training and placement activities, student clubs, co-curricular and extra-curricular activities.
- Encourage faculty and staff to excel in their respective fields and demonstrate the best of their abilities by way of continuing education, research and consultancy.

B.Tech. CIVIL ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES

After few years of graduation, the graduates of B.Tech. CE will:

PEO1. Pursue higher education in civil engineering or other fields of engineering or management or other areas of interest.

PEO2. Address the contemporary issues in Civil Engineering or related field and provide appropriate solutions through professional career in industry/teaching/research.

PEO3. Engage in 'technology innovation and deployment' and engineering system implementation, as an entrepreneur.

PEO4. Exhibit leadership qualities, participate in continuing education programs for lifelong learning and contribute individually and as a member in multidisciplinary teams to meet social and ethical constraints.

PROGRAM OUTCOMES

On successful completion of the Program, the graduates of B.Tech. CE Program will be able to:

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 analyze 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 modeling 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 life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

On successful completion of the Program, the graduates of B.Tech. CE program will be able to:

PS01. Plan, draw, analyze, design, construct, valuate, manage, maintain, retrofit and rehabilitate civil engineering systems and processes by applying suitable materials, tools and techniques.

PS02. Identify minerals, rocks, structural geology problems and understand geological maps; characterize soil; choose foundations; select ground improvement techniques; and plan and design transport systems.

PS03. Perform land survey; plan, design, construct, maintain and manage water resources systems; analyze water and wastewater; manage solid waste; plan, design and execute environmental systems and processes.

B.Tech. Civil Engineering

Basket Wise - Credit Distribution

S. No.	Basket	Credits (Min.- Max.)
1	SCHOOL CORE	50-54
2	PROGRAM CORE	45-61
3	PROGRAM ELECTIVE	24-36
4	SPECIALIZATION ELECTIVE	12-18
5	UNIVERSITY ELECTIVE	9-12
	TOTAL CREDITS	**Min. 160**

School Core (50-54 Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22BS102401	Engineering Chemistry	3	-	2	-	4	-
22EE102401	Basic Electrical and Electronics Engineering	3	-	2	-	4	-
22CS102401	Programming in C and Data Structures	3	-	2	-	4	-
22ME105002	Engineering Workshop	-	-	2	-	1	-
22ME105001	Computer Aided Engineering Drawing	-	1	4	-	3	-
22CE111002	Technology Extension for Societal Problems	-	-	-	4	1	-
22AI105001	Design Thinking	-	1	2	-	2	-
22CE111001	Internship	-	-	-	-	2	-
22CE108001	Capstone Project	-	-	-	-	10	-
Language Basket (Min. 4 Credits to be earned)							
22LG102401	English for Professionals	2	-	2	-	3	-
22LG105402	Soft Skills	-	-	2	-	1	-
22LG101403	German Language	2	-	-	-	2	-
22LG101404	French Language	2	-	-	-	2	-
Mathematics Basket (Min. 9 Credits to be earned)							
22MM101402	Multivariable Calculus and Differential Equations	3	-	-	-	3	-
22MM101404	Transformation Techniques and Linear Algebra	3	-	-	-	3	-
22MM101405	Numerical Methods, Probability and Statistics	3	-	-	-	3	-

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22MM101406	Special Functions and Complex Analysis	3	-	-	-	3	Multivariable Calculus and Differential Equations
Physics Basket (Min. 4 Credits to be earned)							
22MM102451	Applied Physics	3	-	2	-	4	-
22MM102452	Engineering Physics	3	-	2	-	4	-
Computing Tools (Min. 1 Credits to be earned)							
22EE105405	MATLAB Practice for Engineers	-	-	2	-	1	-
22CS105401	Python Programming for Engineers	-	-	2	-	1	-
Management Basket (Min. 5 Credits to be earned)							
22CM101401	Principles of Business Economics and Accountancy	3	-	-	-	3	-
22MG101401	Essentials of Leadership	2	-	-	-	2	-
22MG101402	Organizational Behaviour	2	-	-	-	2	-
22MG101403	Project Management	2	-	-	-	2	-
Mandatory Courses (Min. 8 Credits to be earned - Earned Credits will not be considered for CGPA)							
22LG107601	Professional Ethics and Human Values	2	-	-	-	2	-
22CE107601	Environmental Science*	2	-	-	-	2	-
22CE107602	Disaster Mitigation and Management	2	-	-	-	2	-
22CE107603	Rural Technology	2	-	-	-	2	-
22LG107603	Spoken English	-	1	2	-	2	English for Professionals
22LG107602	Essential Life Skills for Holistic Development	2	-	-	-	2	-

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22AB107601	NCC/NSS Activities	-	-	-	-	2	-
22AB107602	Yoga	-	-	-	-	2	
22MG107401	Innovation, Incubation and Entrepreneurship	2	-	-	-	2	-
22EE107001	Intellectual Property Rights	2	-	-	-	2	-
22EE107002	Fundamentals of Research Methodology	2	-	-	-	2	-

*Compulsory Course

Program Core (45-61Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22CE101001	Engineering Mechanics	3	1	-	-	4	-
22CE102002	Civil Engineering Materials and Concrete Technology	3	-	2	-	4	-
22CE105003	Engineering Geology Lab	-	-	2	-	1	-
22CE102004	Construction, Planning and Project Management	3	-	2	-	4	Civil Engineering Materials and Concrete Technology
22CE102005	Fluid Mechanics and Hydraulic Machinery	3	-	2	-	4	Engineering Mechanics, Multivariable Calculus and Differential Equations
22CE102006	Mechanics of Solids	3	-	2	-	4	Engineering Mechanics
22CE102007	Surveying	3	-	2	-	4	-
22CE101008	Hydrology and Water Resources Engineering	3	-	-	-	3	Fluid Mechanics and Hydraulic Machinery
22CE102009	Environmental Engineering	3	-	2	-	4	Engineering Chemistry
22CE102010	Soil Mechanics	3	-	2	-	4	Engineering Mechanics, Engineering Geology Lab
22CE101011	Structural Analysis	3	-	-	-	3	Mechanics of Solids
22CE101012	Foundation Engineering	3	-	-	-	3	Soil Mechanics
22CE101013	Reinforced Cement Concrete Structures	3	-	-	-	3	Civil Engineering Materials and Concrete Technology, Structural Analysis
22CE102014	Transportation Engineering	3	-	2	-	4	Surveying, Soil Mechanics
22CE105015	Computer Aided Building Planning and Drawing	-	1	4	-	3	-
22CE101016	Steel Structures	3	-	-	-	3	Structural Analysis
22CE103017	Estimation and Quantity Surveying	3	-	-	4	4	Surveying, Computer Aided Building Planning and Drawing, Reinforced Cement Concrete Structures

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22CE105018	Computer Aided Design and Detailing Lab	-	-	2	-	1	Reinforced Cement Concrete Structures, Steel Structures
22CE105019	Civil Engineering Software Lab	-	-	2	-	1	-

Program Elective (24 - 36 Credits)

Course Code	Knowledge Area	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
			L	T	P	S	C	
22CE105020	Construction Engineering	Spread Sheet Applications in Civil Engineering	-	-	2	-	1	-
22CE101021		Rehabilitation and Retrofitting of Structures	3	-	-	-	3	Construction, Planning and Project Management; Reinforced Cement Concrete Structures
22CE101022		Fire Engineering	3	-	-	-	3	
22CE102023		Structural Health Monitoring	3	-	2	-	4	Basic Electrical and Electronics Engineering, Civil Engineering Materials and Concrete Technology
22CE101024		Building Services	3	-	-	-	3	-
22CE101025		Alternate Building Materials	3	-	-	-	3	Civil Engineering Materials and Concrete Technology
22CE101026		Construction Equipment and Automation	3	-	-	-	3	Construction, Planning and Project Management
22CE101027	Geotechnical Engineering	Ground Improvement Techniques	3	-	-	-	3	Foundation Engineering
22CE101028		Advanced Foundation Engineering	3	-	-	-	3	Foundation Engineering
22CE101029	Environmental Engineering	Sustainable Engineering	3	-	-	-	3	-
22CE101030		Air and Noise Pollution and Control	3	-	-	-	3	-
22CE105031		Solid and Hazardous Waste Management	3	-	-	-	3	-
22CE103032		Environmental Impact Assessment and Management	3	-	-	4	4	Environmental Engineering
22CE101033		Sustainable Design of Technology Systems	3	-	-	-	3	Sustainable Engineering
22CE102034	Structural Engineering	Advanced Structural Analysis	3	-	2	-	4	Structural Analysis
22CE101035		Advanced Reinforced Cement Concrete Structures	3	-	-	-	3	Reinforced Cement Concrete Structures

Course Code	Knowledge Area	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
			L	T	P	S	C	
22CE101036		Prestressed Concrete	3	-	-	-	3	Reinforced Cement Concrete Structures
22CE101037		Advanced Steel Structures	3	-	-	-	3	Steel Structures
22CE104038	Surveying	Advanced Surveying	2	-	2	4	4	Surveying
22CE102039		Geospatial Technologies	2	-	2	-	3	
22CE104040		GPS Surveying	2	-	2	4	4	Surveying
22CE101041	Transportation Engineering	Railway Engineering	3	-	-	-	3	
22CE101042		Highway Construction and Maintenance	3	-	-	-	3	Transportation Engineering
22CE102043		Pavement Analysis and Design	3	-	2	-	4	Transportation Engineering
22CE101044		Airport and Harbour Engineering	3	-	-	-	3	Transportation Engineering
22CE101045	Water Resources Engineering	Urban Stormwater Management	3	-	-	-	3	Hydrology and Water Resources Engineering
22CE101046		Irrigation Engineering and Hydraulic Structures	3	-	-	-	3	Hydrology and Water Resources Engineering
22CE101047		Integrated Watershed Management	3	-	-	-	3	Surveying, Hydrology and Water Resources Engineering
22CE101048		Hydropower Engineering	3	-	-	-	3	Fluid Mechanics and Hydraulic Machinery
22CE101049		Groundwater Development and Management	3	-	-	-	3	Hydrology and Water Resources Engineering
22EE104017	Interdisciplinary	Energy Audit, Conservation and Management	3	-	2	4	5	
22ME101023		Optimization Techniques	3	-	-	-	3	
22CM101402		Costing and Finance Management for Civil Engineers	3	-	-	-	3	-

Specialization Elective (12 - 18 Credits)

Course Code	Knowledge Area	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
			L	T	P	S	C	
22CE101050	Construction Engineering	Architecture and Town Planning	3	-	-	-	3	
22CE101051		Smart Materials and Structures	3	-	-	-	3	Civil Engineering Materials and Concrete Technology Reinforced Cement Concrete Structures, Steel Structures
22CE101052		Infrastructure Development and Management	3	-	-	-	3	Construction, Planning and Project Management
22CE101053		Civil Infrastructure for Smart City Development	3	-	-	-	3	-
22CE102054		Advanced Concrete Technology	2	-	2	-	3	Civil Engineering Materials and Concrete Technology
22CE101055	Geotechnical Engineering	Geoenvironmental Engineering	3	-	-	-	3	Soil Mechanics, Environmental Engineering
22CE101056		Soil Dynamics and Machine Foundations	3	-	-	-	3	Foundation Engineering
22CE101057		Geotechnics for Underground Structures	3	-	-	-	3	Foundation Engineering
22CE101058		Rock Mechanics and Tunneling	3	-	-	-	3	Engineering Mechanics, Engineering Geology Lab
22CE103059		Geosynthetics and Reinforced Soil Structures	2	-	-	4	3	Foundation Engineering
22CE101060	Environmental Engineering	Industrial Wastewater Treatment	3	-	-	-	3	Environmental Engineering
22CE101061		Environmental Economics	3	-	-	-	3	
22CE101062		Environmental Sustainability	3	-	-	-	3	Environmental Engineering
22CE101063		Integrated Waste Management for a Smart City	3	-	-	-	3	Environmental Engineering
22CE101064		Waste to Energy	3	-	-	-	3	-
22CE101065	Structural Engineering	Earthquake Resistant Design of Structures	3	-	-	-	3	Reinforced Cement Concrete Structures
22CE101066		Analysis and Design of Composite Structures	3	-	-	-	3	Reinforced Cement Concrete Structures, Steel Structures
22CE101067		Bridge Engineering	3	-	-	-	3	Reinforced Cement Concrete Structures, Steel Structures
22CE102068		Finite Element Methods in Structural Engineering	3	-	2	-	4	Multivariable Calculus and Differential Equations, Structural

Course Code	Knowledge Area	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
			L	T	P	S	C	
								Analysis
22CE101069		Prefabricated Structures	3	-	-	-	3	Reinforced Cement Concrete Structures, Steel Structures
22CE103070	Surveying	Land Surveying and Real Estate Development	3	-	-	4	3	
22CE102071		Digital Land Survey and Mapping	1	-	2	-	2	
22CE102072		Drone Surveying and Mapping	1	-	2	-	2	
22CE102073		Utility Surveying and Mapping	1	-	2	-	2	
22CE102074		Hydrographic Surveying	1	-	2	-	2	
22CE101075	Transportation Engineering	Transportation Planning and Management	3	-	-	-	3	Transportation Engineering
22CE101076		Intelligent Transportation Systems	3	-	-	-	3	Transportation Engineering
22CE101077		Traffic Engineering and Management	3	-	-	-	3	Transportation Engineering
22CE102078		Pavement Materials	3	-	2	-	4	Transportation Engineering
22CE101079		Sustainable Urban Mobility	3	-	-	-	3	Transportation Engineering
22CE101080	Water Resources Engineering	Sustainable Water Resources Development	3	-	-	-	3	Hydrology and Water Resources Engineering
22CE101081		River Engineering and River Basin Management	3	-	-	-	3	Hydrology and Water Resources Engineering
22CE101082		Pipeline Engineering	3	-	-	-	3	Fluid Mechanics and Hydraulic Machinery
22CE101083		Computational Methods in Hydraulics and Hydrology	3	-	-	-	3	Hydrology and Water Resources Engineering
22CE101084		Advanced Hydraulics	3	-	-	-	3	Fluid Mechanics and Hydraulic Machinery

University Elective (9-12 Credits)

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22EC101701	AI in Healthcare	3	-	-	-	3	-
22CM101701	Banking and Insurance	3	-	-	-	3	-
22AI101701	Bioinformatics	3	-	-	-	3	-
22BS101701	Biology for Engineers	3	-	-	-	3	-
22LG101701	Business Communication and Career Skills	3	-	-	-	3	-
22CE101701	Civil Engineering and The Society	3	-	-	-	3	-
22SS101701	Constitution of India	3	-	-	-	3	-
22CM101702	Cost Accounting and Financial Management	3	-	-	-	3	-
22CB101701	Cyber Laws and Security	3	-	-	-	3	-
22EE101701	Electrical Safety and Safety Management	3	-	-	-	3	-
22MG101701	Entrepreneurship for Micro, Small and Medium Enterprises	3	-	-	-	3	-
22CE101702	Environmental Pollution and Control	3	-	-	-	3	-
22EC101702	Essentials of VLSI	3	-	-	-	3	-
22CB101702	Introduction to Ethical Hacking	3	-	-	-	3	-
22CB101703	Forensic Science	3	-	-	-	3	-
22SS101702	Gender and Environment	3	-	-	-	3	-
22ME101701	Global Strategy and Technology	3	-	-	-	3	-
22EE101704	Green Technologies	3	-	-	-	3	-

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22ME101702	Human Resource Management	3	-	-	-	3	-
22SS101703	Indian Economy	3	-	-	-	3	-
22SS101704	Indian History	3	-	-	-	3	-
22SS101705	Indian Tradition and Culture	3	-	-	-	3	-
22EC101703	Instrumentation in Industries	3	-	-	-	3	-
22EC101704	Introduction to Nanotechnology	3	-	-	-	3	-
22AI101702	Introduction to Artificial Intelligence	3	-	-	-	3	-
22AI101703	Introduction to Data Science	3	-	-	-	3	-
22AI101704	Introduction to Machine Learning	3	-	-	-	3	-
22CS101701	Introduction to Python Programming	3	-	-	-	3	-
22CB101704	Introduction to Internet of Things	3	-	-	-	3	-
22ME101703	Management Science	3	-	-	-	3	-
22ME101704	Managing Innovation and Entrepreneurship	3	-	-	-	3	-
22ME101705	Material Science	3	-	-	-	3	-
22LG101702	Personality Development	3	-	-	-	3	-
22CE101703	Planning for Sustainable Development	3	-	-	-	3	-
22EC101705	Principles of Communication Engineering	3	-	-	-	3	-
22EE101702	Reliability and Safety Engineering	3	-	-	-	3	-
22CE101704	Remote Sensing, GIS and GPS	3	-	-	-	3	-
22CE101705	Smart Cities	3	-	-	-	3	-

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
22EC101706	Smart Sensors for Engineering Applications	3	-	-	-	3	-
22LG101703	Stress Management and Well Being	3	-	-	-	3	-
22EE101703	Sustainable Energy Systems	3	-	-	-	3	-
22CS101702	Web Design Fundamentals	3	-	-	-	3	-
22SS101706	Women Empowerment	3	-	-	-	3	-

Note:

1. If any student has chosen a course or equivalent course from the above list in their regular curriculum then, he/she is not eligible to opt the same course/s under University Elective.
2. The student can choose courses from other disciplines offered across the schools of MBU satisfying the pre-requisite other than the above list.

Course Code	Course Title	L	T	P	S	C
22MM102451	**APPLIED PHYSICS**	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on optical fibers with structure and classification, ideas for designing acoustically good halls, production and detection of ultrasonic's with suitable industrial applications, studying the different paths of the particles using kinetics and kinematics relations, heat transfer mechanisms in material media, characteristics, and applications of modern Engineering materials.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the concepts of electromagnetic wave propagation in optical fibers.

CO2. Apply the basic knowledge of acoustics and ultrasonics to provide solutions for various engineering problems.

CO3. Analyze and solve the problems associated with kinetics and kinematics.

CO4. Acquire basic knowledge in several heat transfer mechanisms and heat conduction through the compound media.

CO5. Understand the characteristics and applications of modern engineering materials.

CO6. Work independently and in teams to solve problems with effective communications.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	1	-	-	-	-	-	-	-
CO2	3	2	1	-	-	1	-	-	-	-	-	-
CO3	3	2	-	1	-	-	-	-	-	-	-	-
CO4	3	2	-	1	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	1	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	1	1	1	-	-
Course Correlation Mapping	**3**	**2**	**1**	**1**	**1**	**1**	**-**	**1**	**1**	**1**	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: FIBER OPTICS ***(08Periods)***

Introduction-Structure of optical fiber-Total internal reflection-Acceptance angle, acceptance cone - Numerical aperture-Modes of propagation-Classification of optical fibers-V-number (qualitative)-Fabrication of optical fiber by double crucible technique-Applications of optical fibers-Sensors (temperature, displacement, liquid level detector).

Module 2: ACOUSTICS AND ULTRASONICS ***(09 Periods)***

Acoustics: Introduction-Classification of sound-Sound intensity level (decibel) – Reverberation-Reverberation time- Sabine's formula (qualitative)-Absorption coefficient and its determination -Factors affecting acoustics and their remedies-Basic requirements of an acoustically good hall.

Ultrasonics: Introduction to ultrasonic waves-Production of ultrasonic waves by magnetostriction method-Piezoelectric method-Detection of ultrasonics (qualitative)-Industrial applications (ultrasonic welding, ultrasonic soldering, and ultrasonic drilling).

Module 3: KINEMATICS AND KINETICS ***(10 Periods)***

Kinematics of particles: Introduction- Rectilinear motion (displacement-timecurve, velocity-time curve, acceleration-time curve)- Curvilinear motion (velocity and angle of projection, equation of trajectory path, horizontal range) - Inclined projection (equation of trajectory, maximum height, time of flight of projectile, horizontal range, angle of projection).

Kinetics: Bodies in rectilinear translation- Kinetics of bodies rotating about a fixed axis – Work,Energy,Power –Work-Energy equation for translation.

Module 4: THERMAL PHYSICS ***(8 Periods)***

Introduction-Modes of heat transfer (conduction, convection, and radiation)-Coefficient of thermal conductivity-Rectilinear flow of heat along a uniform bar-Thermal conductivity of bad conductor (Lee's disc method)-Heat conduction through compound media (materials in series and parallel).

Module 5: MODERN ENGINEERING MATERIALS ***(10 Periods)***

Metallic glasses: Introduction-Preparation of metallic glasses by RF sputtering technique-Properties (structural, thermodynamic, mechanical, electrical, chemical, and optical), Applications of metallic glasses.

Shape memory alloys (SMA): Introduction-Shape memory effect and its types-Characteristics of SMA-Properties of NiTi alloy-Applications of SMA.

Composite materials- Introduction-Types and applicationsof composite materials.

Total periods: 45

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS:(Minimum 10 experiments shall be conducted)

1. Estimate the numerical aperture and acceptance angle of an optical fiber.
2. Determination of the moment of inertia of a bar and acceleration due to gravity by using a compound Pendulum.
3. Find the moment of inertia of a Flywheel.
4. Estimate the moment of inertia of a rectangular body using the Bifilar Pendulum.
5. Determine the frequency of electrically driven tuning fork in transverse and longitudinal modes of vibration using Melde's Experiment.
6. Determination of coefficient of thermal conductivity of a bad conductor using Lee's disc apparatus.
7. Verify Newton's Law of Cooling for any two liquids.
8. Estimate the number of charge carriers per unit volume and hall coefficients of a given material using the Hall Effect.
9. Calculate the rigidity Modulus of a material of a wire using Torsional Pendulum
10. Determine the energy gap of material by varying temperatures.
11. Verify the three laws of stretched strings using a sonometer.
12. Estimate the particle size using a monochromatic light source (LASER).

RESOURCES

TEXTBOOKS:

1. M. N. Avadhanulu, P. G. Kshirsagar, T. V. S. Arun Murthy, *A Textbook of EngineeringPhysics* - S. Chand Publications, 11th edition, 2019.
2. S. S. Bhavikatti and K. G. Rajashekarappa, *Engineering Mechanics*, New Age International Publishers, 2nd edition, 2015.
3. R.K. Gaur and S.L. Gupta, *Engineering Physics*, DhanpatRai Publications (P) Ltd, 2015.
4. Serway and Jewett, *Physics for Scientists and Engineers with Modern Physics*, 6th Edition, Thomson Brooks, 2007

REFERENCE BOOKS:

1. B. K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Learning, 2012.
2. Brij Lal and N. Subrahmanyam, *Heat and Thermodynamics,* S. Chand and Company Ltd., 1995.
3. William D. CallisterJr., David G. Rethwisch, *Material Science and Engineering*,9th Edition, Wiley 2013.

VIDEO LECTURES:

1. http://nptel.ac.in/courses/112104212
2. http://nptel.ac.in/courses/105/106/105106053
3. https://nptel.ac.in/courses/115107095
4. https://archive.nptel.ac.in/courses/105/106/105106053/

Web Resources:

1. https://drive.google.com/file/d/1xd2jSCu9Q9SkNC0K6hEPJdwdJlCHR5ZF/view
2. https://www.jntufastupdates.com/jntuk-r20-1-2-engineering-mechanics-material/
3. https://salmanisaleh.files.wordpress.com/2019/02/physics-for-scientists-7th-ed.pdf
4. https://www.researchgate.net/publication/344758634_Short_Notes_on_Engineering_Physics

Course Code	Course Title	L	T	P	S	C
22MM101402	**MULTIVARIABLE CALCULUS AND DIFFERENTIAL EQUATIONS**	3	-	-	-	3

Pre-Requisite Nil

Anti-Requisite Nil

Co-Requisite Nil

COURSE DESCRIPTION: This course contains various topics related to the calculus of the functions of two or more variables and differential equations. In particular, this contains topics like differentiation and integration of the functions of several variables together with their applications. It includes calculus of vector functions with applications. The methods of solving ordinary and partial differential equations are also incorporated for a better exposure.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Determine the extreme values of functions of two variables.

CO2. Evaluate multiple integrals in Cartesian, Polar and Spherical coordinates.

CO3. Demonstrate gradient, directional derivative, divergence, curl and Green's, Gauss, Stoke's theorems.

CO4. Solve higher order linear differential equations related to various engineering fields.

CO5. Identify solution methods for partial differential equations that model physical processes.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3	-	2	1	-	-	-	-	-	-	-
CO2	2	3	-	3	1	-	-	-	-	-	-	
CO3	3	2	-	3	1	-	-	-	-	-		-
CO4	3	2	-	3	1	-	-	-	-	-	-	-
CO5	3	3	-	3	1	-	-	-	-	-	-	-
Course Correlation Mapping	3	3	-	3	1	**-**	**-**	**-**	-	**-**	-	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: Multivariable Calculus (Differentiation) ***(07 Periods)***

Introduction to function of several variables, Jacobian and its properties, Functional dependence, Maxima and minima of functions of two variables, Lagrange's multiplier method.

Module 2: Multivariable Calculus (Integration) ***(10 Periods)***

Evaluation of Double integrals (Cartesian and Polar coordinates), Change of order of integration (Cartesian form only), Evaluation of triple integrals, Change of variables: Double integration from Cartesian to Polar coordinates, Triple integration from Cartesian to Spherical polar coordinates.

Module 3 Multivariable Calculus (Vector Calculus) ***(11 Periods)***

Vector Differentiation: Scalar and Vector fields: Gradient of a scalar field, Directional derivative, Divergence of a vector field, Solenoidal vector, Curl of a vector field, Irrotational vector, Laplacian operator.

Vector Integration: Line, Surface and Volume integrals, Vector integral theorems: Statement of Green's, Stoke's and Gauss divergence theorems, Verification and evaluation of vector integrals using them.

Module 4 Ordinary Differential Equations ***(10 Periods)***

Second and higher order linear differential equations with constant coefficients: Non-Homogeneous equations with R.H.S terms of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials in x, $e^{ax}V(x)$ and $x^n V(x)$, Method of variation of parameters, Equations reducible to linear differential equations with constant coefficients: Cauchy-Euler and Cauchy-Legendre differential equations.

Module 5 Partial Differential Equations ***(07 Periods)***

Formation of partial differential equations by the elimination of arbitrary constants and arbitrary functions, Lagrange's linear equation, Method of separation of variables.

Total Periods: 45

EXPERIENTAL LEARNING

1. American Airlines requires that the total outside dimensions (length + width + height) of a checked bag not exceed 62 inches. Suppose you want to check a bag whose height is equal to its width. What is the largest volume bag of this shape that you can check on an American Airlines flight?

2. An insulated rod of length l has its ends *A* and *B* maintained at 0^0C and 100^0C respectively until steady state conditions prevail. If *B* is suddenly reduced to 0^0C and

maintained at 0^0C, establish an equation to find the temperature at a distance x from *A* at time t under the above conditions.

3. Apply the Gamma function; obtain the mass of an octant of the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ with the density at any point being $\rho = k\,x\,y\,z$.

4. A person weighs 150lb walking exactly one revolution up a circular, spiral staircase of radius x ft. if the person rises 10ft then find the work done by the person. Consider different radii and find the work done by the person in each case.

(Note: It's an indicative one. Course Instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publishers, 44th edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th edition, 2011.

REFERENCE BOOKS:

1. Dennis G. Zill and Warren S. Wright, *Advanced Engineering Mathematics*, Jones and Bartlett, 6th edition, 2011.
2. N.P. Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/111107108 (MVC)
2. https://nptel.ac.in/courses/111106100 (ODE)
3. https://nptel.ac.in/courses/111103021 (PDE)

Web Resources:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.sosmath.com/
3. http://www.mathworld.wolfram.com/

Course Code	Course Title	L	T	P	S	C
22BS102401	**ENGINEERING CHEMISTRY**	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on water technology, multi functional materials, applications of electrochemistry, instrumental methods of analysis, fuel chemistry and lubricants. This course also provides analytical skills for the quantitative estimation of materials through volumetric and instrumental methods of analysis and addresses the societal, health issues related to quality of water.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Solve problems associated with water, and address the societal, health and safety issues related to quality of water

CO2. Acquire basic knowledge on industrial polymers, composites, and Nano materials used in engineering applications.

CO3. Apply and demonstrate competency in the basic concepts of electrochemical cells and sensors.

CO4. Acquire basic knowledge of instrumental methods and their applications in the analysis of materials.

CO5. Identify the quality of fuels and lubricants for their engineering applications.

CO6. Develops independent working ability, through problem solving and effective communication.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	-	-	1	-	2	1	-	-	-	-
CO2	3	-	-	-	-	-	2	-	-	-	-	-
CO3	3	-	-	-	1	-	1	-	-	-	-	2
CO4	3	-	-	-	2	-	-	-	-	-	-	1
CO5	3	2	-	-	-	-	1	-	-	-	-	-
CO6	3	3	-	-	1	1	2	-	3	3	-	1
Course Correlation Mapping	**3**	**3**	**-**	**-**	**2**	**1**	**2**	**1**	**3**	**3**	**-**	**2**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: WATER TECHNOLOGY ***(09 Periods)***

Introduction, types of water, Impurities in water and their consequences. Hardness of water, units of hardness, disadvantages of hardness, determination of hardness by EDTA method, numerical problems, boiler troubles, softening of water– Internal treatment, External treatment (Ion exchange process, zeolite process), desalination of brackish water by reverse osmosis, specifications of potable water as per WHO and BIS standards. Fluoride in ground water: Effects on human health, defluoridation method – Nalgonda method; merits and demerits of various defluoridation methods.

Module 2: CHEMISTRY OF MULTI FUNCTIONAL MATERIALS ***(09 Periods)***

Engineering plastics: Definition, synthesis, properties and applications of PC, PTFE, and PMMA.
Conducting polymers: Definition, types and applications.
Biodegradable polymers: Definition, classification, mechanism of degradation and applications.
Nano Materials: Introduction, size dependent properties (Colour, magnetic and electrical), method of synthesis – CVD, applications of Nano materials.

Module 3: ELECTROCHEMICAL CELLS, STORAGE DEVICES AND SENSORS ***(09 Periods)***

Electrode potential, Electrochemical cell, EMF of an electrochemical cell.
Batteries: Introduction, types of Batteries-Primary battery-dry cell, secondary battery-Lead-acid batteries, Lithium-ion batteries, Lithium- Polymer batteries, Applications of batteries.
Fuel Cells: Definition, H_2–O_2 fuel cell, solid oxide fuel cell, applications of fuel cells.
Sensors: Introduction, Types of Sensors, electrochemical sensors, applications.

Module 4: INSTRUMENTAL METHODS AND APPLICATIONS ***(08 Periods)***

Introduction to spectroscopy–types of energy present in molecules, types of spectra, UV-Vis spectroscopy – principle, types of electronic transitions, Instrumentation and applications; Infrared spectroscopy – principle, types of vibrational modes, Instrumentation and applications; working principle and applications of SEM, TEM, and XRD.

Module 5: FUELS AND LUBRICANTS ***(10 Periods)***

Fuels: Classification of fuels, calorific value, numerical problems; Liquid fuels, cracking of oils (Thermal and Fixed-bed catalytic cracking), Synthetic petrol: Fischer-Tropsch method and Bergius process. Eco friendly fuels-Types, significances.
Lubricants: Definition, functions of lubricants, mechanism of lubrication, classification of lubricants, properties of lubricants – viscosity and viscosity index, flash and fire point, cloud and pour point, Aniline point, neutralization number and mechanical strength.

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXPERIMENTS:(Minimum 10 exercises shall be conducted)

1. Determination of hardness of ground water sample.
2. Determination of alkalinity of Water sample.
3. Estimation of residual chlorine in drinking water.
4. Estimation of Dissolved Oxygen in water by Winkler's method.
5. Estimation of Fe (II) by Dichrometry.
6. Conductometric titration of strong acid Vs strong base.
7. Estimation of Ferrous ion amount by Potentiometry.
8. Synthesis of nano ZnO using sol-gel process.
9. Determination of Viscosity by Ostwald's viscometer.
10. Determination of strength of acid by using P^H metric method.
11. Determination of Strength of an acid in Pb-Acid battery.
12. Determination of percentage of Iron in Cement sample by colorimetry.

(Note: It's an indicative one. Course Instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. P. C. Jain & Monika Jain*, Engineering Chemistry*, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 16th edition, 2013.
2. K.N. Jayaveera, G.V. Subba Reddy and C. Ramachandriah, *Engineering Chemistry,* Mc.Graw Hill Publishers, New Delhi.
3. Engineering Chemistry lab Manual (MBU)

REFERENCE BOOKS:

1. Peter Atkins, Julio de Paula and James Keelar, *Atkins' Physical Chemistry*, Oxford University Press, 10th edition, 2010.
2. Skoog and West, *Principles of Instrumental Analysis*, Thomson, 6th edition, 2007.
3. K. Mukkanti, *Practical Engineering Chemistry*, BS Publications, 2013.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=ly_FS3LZXEY
2. https://www.youtube.com/watch?v=0_ZcCqqpS2o

3. https://www.youtube.com/watch?v=Tye3dcBOqtY
4. https://www.youtube.com/watch?v=tsvIvQJiTL4

Web Resources:

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4851520/
2. https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Analytical_Sciences_Digital_Library/Active_Learning/Shorter_Activities/Electrochemical_Sensor_Project/01_Introduction_To_Electrochemical_Sensors
3. https://www.arsdcollege.ac.in/wp-content/uploads/2020/04/Document-2.pdf
4. https://www.salon.com/2015/10/14/4_outlandish_things_our_ancestors_used_as_lube_partner/

Course Code	Course Title	L	T	P	S	C
22CE101001	**ENGINEERING MECHANICS**	3	1	-	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on statics of particles and rigid bodies, support reactions, analysis of perfect frames, centroid, centre of gravity and moment of inertia, simple stresses and strains and friction.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze complex engineering problems related to statics of particles and rigid bodies for effective solutions using appropriate methods ensuring safety besides communicating effectively in graphical form.

CO2. Analyze complex engineering problems related to pin jointed frames for effective solutions using appropriate methods ensuring safety besides communicating effectively in graphical form

CO3. Analyze complex engineering problems related to sectional properties for effective solutions using appropriate methods besides communicating effectively in graphical form.

CO4. Analyze simple stresses and strains in structural elements to solve complex engineering problems using appropriate methods ensuring safety besides communicating effectively in graphical form.

CO5. Analyze complex friction problems for effective solutions ensuring safety besides communicating effectively in graphical form.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	3	2	2	-	-	-	3	-	-	3	-	-
CO2	2	3	-	3	2	2	-	-	-	3	-	-	3	-	-
CO3	2	3	-	3	2		-	-	-	3	-	-	3	-	-
CO4	2	3	-	3	2	2	-	-	-	3	-	-	3	-	-
CO5	2	3	-	3	-	2	-	-	-	3	-	-	3	-	-
Course Correlation Mapping	**2**	**3**	**-**	**3**	**2**	**2**	-	-	-	**3**	-	-	**3**	-	-

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: STATICS ***(10 Periods)***

Statics of Particles: Basic concepts, System of units, System of concurrent coplanar forces in plane, Resultant of forces, Laws of mechanics, Equilibrium of forces, Lami's theorem, Vectorial representation of forces.

Statics of Rigid Bodies: Moment of a force, Varignon's theorem, Moment of a couple, Vectorial representation of moments and couples, Coplanar non-concurrent forces, Equilibrium of rigid bodies, Types of supports and loads, Types of frames, Perfect frame analysis, Method of joints, Method of sections, Principle of virtual work.

Module 2: FRICTION ***(08 Periods)***

Frictional force, Types of friction, Laws of friction, Co-efficient of friction, Angle of friction, Angle of repose, Cone of friction, Applications: Body on horizontal/inclined plane, Two bodies in contact, Ladder friction, Wedge friction.

Module 3: CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA ***(09 Periods)***

Centroids of simple and composite areas, centre of gravity of bodies, Theorems of Pappus and Guldinus, Parallel axis and perpendicular axis theorems, Moment of Inertia of Composite areas, Radius of gyration – Section modulus, Mass Moment of Inertia of simple and composite masses.

Module 4: SIMPLE STRESSES AND STRAINS ***(10 Periods)***

Elasticity and plasticity, Types of stresses and strains, Hooke's law, Stress-strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio, Volumetric strain, Types of elastic moduli and relations, Bars of varying section, Composite bars, Temperature stresses, Strain energy - Gradual, sudden and impact loadings, Simple applications.

Module 5: THIN AND THICK CYLINDERS ***(08 Periods)***

Thin Cylinders: Thin cylindrical shells, Longitudinal and circumferential stresses; Hoop, Longitudinal and volumetric strains; Changes in dimensions of thin cylinders.

Thick Cylinders: Lame's theory, Distribution of hoop and radial stresses across thickness, Design of thick cylinders, Compound cylinders, Difference of radii for shrinkage.

Total Periods: 45

EXPERIENTIAL LEARNING

1. A Beam Prototype Model: In this assignment, students will be able to understand the concept of reactions induced in different types of supports. The students will next analyze the given beam to determine the support reactions.
2. Practical Visual Learning of a Truss: In this assignment, students will be able to visualize and understand the concept of analyzing the given truss. The objective is to identify the support reactions in the truss and to identify the magnitude and nature of force in the existing steel trusses in the campus.
3. Practical Laboratory Testing of a Steel Bar: In this assignment, students will be able to understand the concept of stress and strain of a given steel bar. The objective is to figure out the behaviour of the steel bar when subjected to a tensile load. The students will next draw the stress-strain relationship of a steel bar through this

laboratory test.

4. Practical Learning of a Friction: In this assignment, students will be able to understand the concept of ladder friction of a given ladder. The objective is to identify the co-efficient of friction for both the contact surfaces of the ladder with the vertical wall.

5. A Prototype Model: In this assignment, students will be able to understand the concept of centroid, centre of gravity and moment of inertia. The students will be given some prototype model to determine its centroid, centre of gravity and moment of inertia.

(Note: It's an indicative one. Course Instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. S. S. Bhavikatti and K. G. Rajashekarappa, Engineering Mechanics, New Age International (P) Ltd., 3rd Edition, 2009.
2. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, Mechanics of Materials, Laxmi Publications Pvt. Ltd., 2001.

REFERENCE BOOKS:

1. J. L. Meriam and L. G. Kraige, Engineering Mechanics: Statics (Vol. 1), Dynamics (Vol. 2), John Wiley & Sons Ltd., 5th Edition, 2008.
2. Junnarkar, S. B. and Shah, H. J., Mechanics of Structures – Vol. I (Strength of Materials), Charotar Publishing House Pvt. Ltd., 27th Revised and Enlarged Edition, 2008.
3. S. Rajasekaran and G. Sankarasubramanian, Engineering Mechanics – Statics and Dynamics, Vikas Publishing House Pvt. Ltd., 3rd Edition, 2009.
4. Bhavikatti, S. S., Strength of Materials, Vikas Publishing House, 3rd Edition, 2010.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/112106286
2. https://nptel.ac.in/courses/105105108
3. https://www.youtube.com/watch?v=tXPks3VXUPY
4. https://www.youtube.com/watch?v=cMdVzMRWZTk&list=PLCiOuVdcDqQVwqV6CDAo_CHyc5hSwW76j

Web Resources:

1. https://pressbooks.library.upei.ca/statics/chapter/method-of-joints/
2. https://www.youtube.com/watch?v=PbQWbx32uak
3. https://www.youtube.com/watch?v=lUJjFm1XhIA
4. https://www.studocu.com/in/document/galgotias-university/structures-and-engineering/simple-stress-and-strains/17493680

Course Code	Course Title	L	T	P	S	C
22ME105002	**ENGINEERING WORKSHOP**	-	-	2	-	1

Pre-Requisite NIL

COURSE DESCRIPTION: Knowledge on various workshop hand and power tools; hands on experience in different manufacturing trades such as fitting, carpentry, sheet metal forming and foundry; Demonstration on dismantling and assembling of various two wheeler parts, power tools in machining and metal joining, basics of plumbing and working of 3D printer.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO1. Design and model various basic prototypes in the trade of fitting such as square/half round mating, V- mating and dovetail mating from the given MS workpieces using fitting tools.

CO2. Develop different prototypes in the carpentry trade such as cross lap joint, dovetail / bridle joints and Mortise and Tenon joint using carpentry tools.

CO3. Design and model different prototypes in the sheet metal forming trade such as rectangular tray, square vessel/cylinder, Funnel as per the dimensions using sheet metal forming tools.

CO4. Develop sand mold using single piece pattern and split piece pattern in the foundry trade using foundry tools.

CO5. Develop electric circuits for series and stair case connections.

CO6. Demonstrate the knowledge on power tools, plumbing operation, 3D printing technology involved in different engineering applications.

CO7. Work independently or in teams to solve problems with effective communication

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1		1						
CO2	3	3	3	1		1						
CO3	3	3	3	1		1						
CO4	3	3	3	1		1						
CO5	3	3	3	1		1						
CO6	3	1	1	1	1	1						
CO7									3	3		
Course Correlation Mapping	3	3	3	1	1	1			3	3		

Correlation Levels: 3: High; 2: Medium; 1: Low

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

1. **FITTING:** Conduct a detailed study on various aspects in fitting trade which includes the details of fitting operations, safety precautions, types of tools, tool holders, miscellaneous tools, care and maintenance of hand tools, marking and measurement tool, and finishing tool.

   Exercises :

   a) Make a square/half round mating from the given MS workpieces

   b) Make a V- mating from the given MS workpieces

2. **CARPENTRY:** Conduct a detailed study on various aspects in carpentry trade which includes the details of types of wood, carpentry tools, wood working techniques, types of joints, safety precautions, and care and maintenance of tools.

   Exercises:

   a) Prepare a cross lap joint

   b) Prepare dovetail / bridle joints

3. **SHEET METAL FORMING:** Conduct a detailed study on various aspects in sheet metal forming which includes the details of sheet materials, hand tools, sheet metal fabrication, and safety and precautions

   Exercises:

   a) Fabricate a rectangular tray as per the dimensions

   b) Fabricate square vessel/cylinder as per the dimensions

4. FOUNDRY: Conduct a detailed study on various aspects in foundry which includes the details of moulding sand, properties of moulding sand, types of patterns and pattern, materials, foundry tools, and safety and precautions
   Exercises:
   a) Prepare a sand mold, using the given single piece pattern (stepped pulley/cube)
   b) Prepare a sand mold, using the given split piece pattern (pipe bent/dumbbell)

5. ELECTRICAL WIRING: Prepare electrical wiring with associated devices such as switches, distribution boards, sockets, and light fittings in a structure considering safety standards for design and installation.
   Exercises:
   a) Prepare electrical circuits with Series.
   b) Prepare electrical circuits with Stair case connections.

6. DEMONSTRATION:
   a) Demonstrate the usage of power tools.
   b) Demonstrate the plumbing operation and identify the essential tool and materials required for plumbing.
   c) Demonstrate the working of 3D printer

RESOURCES

REFERENCES:

1. P. Kannaiah and K. L. Narayana, *Workshop Manual*, SciTech Publishers, 2009.
2. K. Venkata Reddy, *Workshop Practice Manual*, BS Publications, 2008.
3. V. Ramesh Babu, *Engineering Workshop Practice*, V R B Publishers Private Limited, 2009.

ADDITIONAL LEARNING RESOURCES:

1. R. K. Jain, Production Technology, Khanna Publishers, 17th edition, 2012.
2. Kalpakjian, Serope, Manufacturing Engineering and Technology, Pearson Education, 7th edition, 2014.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=ZyN9Tw9VTSo
2. https://www.youtube.com/watch?v=A9m_3onoVV8
3. https://www.youtube.com/watch?v=PkjpmPLNKZs
4. https://www.youtube.com/watch?v=IDajw2S78zg

Web Resources:

1. https://www.jiit.ac.in/sites/default/files/Workshop_Lab.pdf
2. https://mechanicalenotes.com/engineering-workshop/
3. https://www.studocu.com/in/document/indian-institute-of-technology-guwahati/engineering-mechanics/engineering-workshop/8571486
4. https://lecturenotes.in/download/note/25089-note-for-engineering-workshop-ew-by-technical-genius

Course Code	Course Title	L	T	P	S	C
22ME105001	**COMPUTER AIDED ENGINEERING DRAWING**	-	1	4	-	3

Pre-Requisite --

COURSE DESCRIPTION:
Engineering drawing conventions; Importance of engineering drawing; fundamental concepts of sketching; computer aided drafting and different types of projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO1. Apply the principles of engineering drawing, Methods and CAD tools to draw the Geometries and Curves to communicate in engineering field.

CO2. Understand and draw projections of points (0D) lines (1D) and planes (2D) (inclined to both planes of projection) located in first quadrants

CO3. Visualize and draw projections of regular solids (3D) (inclined to both planes of projection) and sections of regular solids (front view, top view and true shape)

CO4. Develop lateral surfaces of solids of given objects for engineering communication using principles of engineering drawing and CAD tools.

CO5. Understand and draw Isometric views of given objects for engineering communication using principles of engineering drawing and CAD tools.

CO6. Work independently or in teams to solve problems with effective communication

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	3	-	-
Course Correlation Mapping	3	2	1	-	-	-	-	-	3	3	-	-

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: INTRODUCTION TO ENGINEERING GRAPHICS AND DESIGN ***(06 Periods)***

Introduction to Engineering graphics: Principles, significance -Conventions in drawing-lettering - BIS conventions-Dimensioning principles and conventional representations – Lettering and dimensioning - Scales: Representative Fraction, Type of Scale, Plain and Diagonal Scale, Scale of chords.

Exercises:

1. Practice exercise on Basic Lettering Practice, Dimensioning Practice,
2. Practice exercise on Conventional representations

Introduction to AutoCAD: Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions.

Exercises:

1. Practice exercise with basic drawing commands
2. Practice exercise with editing commands

Module 2: CONICS, CURVES, PROJECTION OF POINTS, LINES AND PLANES ***(06 Periods)***

Conics & Special Curves: (a) Conic sections: Construction of ellipse, parabola and hyperbola including the rectangular hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle. Drawing of tangents and normal to the above curves.

Exercises:

1. Practice exercises on Ellipse, Parabola, Hyperbola and Rectangular Hyperbola
2. Practice exercises on Cycloid, epicycloids, hypocycloid and Involutes
3. Practice exercises on Projection of points in 3rd angle projections

Projection of points, lines and planes: Projection of points in any quadrant, lines inclined to one or both planes, Traces, finding true lengths, angle made by line. Projections of regular plane surfaces and inclined to both the principal planes by rotating object method.

Exercises:

1. Practice exercises on Projection of points
2. Practice exercises on lines inclined to one plane
3. Practice exercises on lines inclined to both planes
4. Practice exercises on Projections of regular plane surfaces
5. Practice exercises on Projection of polygonal plane surfaces
6. Practice exercises on Projection of circular plane surfaces
7. Practice exercises on Projection of polygonal plane surfaces inclined to both principal planes
8. Practice exercises on Projection of circular plane surfaces inclined to both principal planes

Module 3 PROJECTION OF SOLIDS AND SECTION OF SOLIDS ***(8 Periods)***

Projection of solids:Projection of regular solids in simple position, Projection of solids

with axes inclined to one of the reference planes and parallel to the other, Projections of solids with axes inclined to both H.P. and the V.P.

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone, True shapes of the sections. 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.

Exercises:

1. Practice exercises on Projections of regular solids
2. Practice exercises on Sections of solids
3. Practice exercises on Projection of pentagonal pyramids
4. Practice exercises on Projection of Hexagonal pyramids
5. Practice exercises on Projection of pentagonal pyramids inclined to both principal planes
6. Practice exercises on Projection of Hexagonal pyramids inclined to both principal planes
7. Practice exercises on Projection of pentagonal prism
8. Practice exercises on Projection of Hexagonal prism
9. Practice exercises on Projection of pentagonal prism inclined to both principal planes
10. Practice exercises on Projection of Hexagonal prism inclined to both principal planes

Module 4 DEVELOPMENT OF SURFACES *(6 Periods)*

Development of surfaces: Development of lateral surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts. Development of their frustums and truncations.

Exercises:

1. Practice exercises on Development of surfaces of right regular solids
2. Practice exercises on Development of surfaces of pentagonal pyramids
3. Practice exercises on Development of surfaces of hexagonal pyramids
4. Practice exercises on Development of surfaces of pentagonal prism
5. Practice exercises on Development of surfaces of hexagonal prism

Module 5 ORTHOGRAPHIC AND ISOMETRIC PROJECTIONS *(10 Periods)*

ORTHOGRAPHIC AND ISOMETRIC PROJECTIONS

Orthographic Projections: Systems of projections, conventions and application to orthographic projections. Projections of regular plane surfaces-triangle, square, rectangle, pentagon, hexagon and circle-in simple positions inclined to both the planes; planes in different positions by change of position method only.

Isometric Projections: Principles of isometric projection- of simple solids and truncated solids – Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Isometric scale; Isometric views: lines, planes, simple solids.

Exercises:

1. Practice exercises on Orthographic Projections
2. Practice exercises on Isometric Projections

Total Periods: 36

RESOURCES

TEXT BOOKS:

1. D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi, Revised edition, 2010. 2. 1.. 2.
2. N. D. Bhatt and V. M. Panchal, Engineering Drawing, Charotar Publishing House, Gujarat, 51st edition, 2013.

REFERENCE BOOKS/LABORATORY MANUALS:

1. Sham Tickoo, AutoCAD 2013 for Engineers and Designers, Dreamtech Press, 2013
2. M. H. Annaiah&RajashekarPatil, Computer Aided Engineering Drawing, New Age International Publishers, 4th edition, 2012.
3. T.Jeyapoovan, Engineering Drawing and Graphics Using AutoCAD, Vikas Publishing House, 3rd Edition, 2010.
4. Jolhe, Engineering Drawing, Tata McGraw Hill Education Private Limited, 1st Edition, 2007.
5. Basant Aggarwal, Engineering Drawing, Tata McGraw Hill Education Private Limited, 1st Edition, 2008

VIDEO LECTURES:

1. https://nptel.ac.in/courses/112105294

Course Code	Course Title	L	T	P	S	C
22CE105003	**ENGINEERING GEOLOGY LAB**	-	-	2	-	1

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on physical properties and identification of minerals and rocks, rock forming minerals; ore forming minerals, igneous rocks, sedimentary rocks, metamorphic rocks, geological maps and problems on structural geology. This course also examines norm form calculations, geophysical studies and measurement of groundwater level.

COURSE OUTCOMES: After successful completion of the course, the students will be able to:

CO1. Identify minerals and rocks using appropriate tools and techniques in order to understand the impact of geological features on civil engineering projects considering standard protocols.

CO2. Analyze structural geology problems for feasible inferences associated with civil engineering projects.

CO3. Develop and interpret geological sections from the geological maps for the benefit of civil engineering projects.

CO4. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on geological information.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		2	2			2						3	-
CO2	1	3												3	-
CO3	1	2	3	3										3	-
CO4									3	3				-	-
Course Correlation Mapping	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**2**	3	**3**	**-**	**-**	**-**	3	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

A) MINERALS

1. Study of physical properties and identification of rock forming minerals
2. Study of physical properties and identification of ore forming minerals

B) ROCKS

3. Study of physical properties and identification of common igneous rocks
4. Study of physical properties and identification of common sedimentary rocks
5. Study of physical properties and identification of common metamorphic rocks

C) GEOLOGICAL MAPS

6. Study of geological maps, drawing and interpretation of geological sections in horizontal beds
7. Study of geological maps, drawing and interpretation of geological sections in vertical beds
8. Study of geological maps, drawing and interpretation of geological sections in beds with fault plane
9. Study of geological maps, drawing and interpretation of geological sections in beds with folding

D) STRUCTURAL GEOLOGY PROBLEMS

10. Thickness
11. Strike and dip
12. Bore hole

E) NORM FORM CALCULATIONS

13. Normative minerals analysis (not for the examination)

F) GEOPHYSICAL STUDIES

14. Electrical resistivity survey (not for the examination)
15. Seismic surveys (not for the examination)

G) MEASUREMENT OF GROUNDWATER LEVEL

16. Measurement of groundwater level using water level meter (not for the examination)

RESOURCES

REFERENCES:

1. Engineering Geology Laboratory Manual (SVEC20 Regulations), Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.
2. Chenna kesavulu, N., Engineering Geology, Mc–Millan India Ltd.,3rd Edition, 2018.
3. Subinoy Gangopadhyay, Engineering Geology, Oxford university press, 3rd Edition, 2015.

VIDEO LECTURES:

1. http://www.digimat.in/nptel/courses/video/105105106/L37.html
2. https://mg-nitk.vlabs.ac.in/mining-geology/
3. https://www.youtube.com/watch?v=aTVDiRtRook

Web Resources:

1. https://nptel.ac.in/courses/105105106

2. https://www.geologypage.com/2019/04/engineering-geology.
3. https://en.wikipedia.org/wiki/Engineering_geology
4. https://www.schoolofpe.com/blog/2017/05/importance-of-geology-in-structural-engineering.html

Course Code	PROFESSIONAL ETHICS AND HUMAN VALUES	L	T	P	S	C
22LG107601		2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course deals with personal conviction, and ethics and describes the accepted principles and standards of conduct regarding moral duties and virtues as applied to an organization. Codes of professional ethics guide the stakeholders of an organization about the desirable and undesirable acts related to the profession.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the principles of ethics, professional values, and social responsibility.
CO2. Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
CO3. Develop suitable strategies to resolve problems that arise in practicing professional ethics and Industrial standards.
CO4. Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
CO5. Provide solutions to complex problems associated with professional ethics using analysis and interpretation.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	2	2	2	2	-	-	-
CO2	2	3	2	-	2	2	2	2	2	-	-	-
CO3	2	-	3	-	2	2	2	2	2	-	-	-
CO4	2	-	-	-	-	2	2	2	2	-	3	-
CO5	2	2	3	2	-	3	2	2	2	-	-	-
Course Correlation Mapping	2	3	-	-	2	2	2	2	2	-	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: PROFESSIONAL ETHICS ***(06 Periods)***

Scope and aim of ethics, Senses of ethics, Variety of moral issues, Types of inquiry, Moral dilemmas, Moral autonomy-Kohlberg's theory, Gilligan's theory, Consensus, and controversy.

Module 2: PROFESSIONAL IDEALS AND VIRTUES ***(06 Periods)***

Theories on virtues and ideals, Professions, Professionalism, Characteristics, Expectations, Professional responsibility, Integrity, Self-respect, Sense of responsibility, Self-interest, Customs and religion, Self-interest and ethical egoism, Customs and ethical relativism, Religion and divine command ethics, Use of ethical theories, Resolving moral dilemmas and moral leadership.

Module 3: SOCIAL EXPERIMENTATION ***(06 Periods)***

Experimentation, Similarities to standard experiments, Learning from the past and knowledge gained, responsible experimenters, Conscientiousness, Moral autonomy and accountability, The challenger case, Codes of ethics and limitations, Industrial standards and Problems with the law of engineering.

Module 4: RESPONSIBILITIES AND RIGHTS ***(06 Periods)***

Collegiality and loyalty, Respect for authority, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, Rights of engineers, Professional rights, Whistle-blowing, The BART case, Employee rights, and discrimination.

Module 5: HARMONY WITH PROFESSIONAL ETHICS ***(06 Periods)***

Acceptance of human values; Ethical Human Conduct; Basis for Humanistic Education, Constitution, and Universal Order; Competence in professional ethics; Case studies: Holistic technologies, Management Models and Production Systems; Transition from the present state to Universal Human Order: socially and ecologically responsible engineers, technologists and managers - enriching institutions and organizations.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Demonstrate orally using your experiences of what is naturally acceptable in a relationship – Feeling of respect or disrespect and what is naturally acceptable is to nurture or exploit others.
2. Identify community partners and discuss with a community partner or organization. Prepare a report by identifying and analysing the issues or opportunities.
3. Field experiences may be directed to include a range of time-intensive endeavours that require varying levels of student interaction. Prepare a report on visiting a Juvenile home.
4. Students read a speech in the classroom by former United Nations Secretary-General Kofi Annan on human values.
5. Students are encouraged to bring a daily newspaper to class or to access any news related to the need for human values and note down the points.
6. Bring out the relevance of engineering ethics theory and practice with relevance to current trends.

7. Professional ideals and virtues are important to everyone. Prepare a case study on the professional ideals and virtue of any one of the famous sports personalities from India.
8. Compare the present to the past in engineering experimentations concerning the change in professionalism.
9. Make a study on occupational crime and the role of modern technology in finding solutions.
10. Prepare a case study on how to maintain harmony with different cultural people using professional ethics.

(Note: It's an indicative one. Course Instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXTBOOKS:

1. Gaur R R, Sangal R & G P Bagaria, Human Values and Professional Ethics, Excel Books, New Delhi, 2010.
2. Govindarajan, M., NataGovindarajan, M., Natarajan, S. and Senthilkumar, V. S., *Engineering Ethics*, Prentice Hall of India, 2004.
3. Mike W. Martin and Roland Schinzinger, *Ethics in Engineering*, Tata McGraw-Hill, 3rd Edition, 2007.

REFERENCE BOOKS:

1. S. Kannan and K. Srilakshmi, *Human Values and Professional Ethics*, Taxmann Allied Services Pvt Ltd., 2009.
2. Edmund G. Seebauer and Robert L. Barry, *Fundamental of Ethics for Scientists and Engineers*, Oxford University Press, 2001.
3. Charles F. Fledderman, *Engineering Ethics*, Pearson Education, 2nd Edition, 2004.
4. R. Subramanaian, *Professional Ethics*, Oxford Higher Education, 2013.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=jfGIq_EiXzI
2. https://www.youtube.com/watch?v=QFHOtH54oUc
3. https://www.youtube.com/watch?v=JJshY11nX14
4. https://www.youtube.com/watch?v=TyP09S0UEzA
5. https://www.youtube.com/watch?v=0QMwjV_ZVtc

WEB RESOURCES:

1. https://siiet.ac.in/wp-content/uploads/2020/09/7.1.10-professional-ethics-manual.pdf
2. https://soaneemrana.org/onewebmedia/Professional%20Ethics%20and%20Human%20Values%20by%20R.S%20NAAGARAZAN.pdf
3. https://india.oup.com/productPage/5591038/7421214/9780199475070

Course Code	Course Title	L	T	P	S	C
22EE102401	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	3	-	2	-	4

Pre-Requisite --

Anti-Requisite --

Co-Requisite --

COURSE DESCRIPTION:

This course is designed to provide an overview on the fundamentals of electrical and electrical engineering concepts and hands-on experience for non-electrical graduating students. The course address the fundamentals concepts of electrical circuits, operational aspects of motors, transformers and general electrical wiring systems. The course also emphasis on the illumination design, back-up supplies like UPS and Batteries, sensors and transducers, and principles of fundamental electronic devices and their applications.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO1. Analyze the electrical circuits by applying the principles of electrical circuits.

CO2. Understand the operation of various motors used in domestic application, transformers and general wiring schemes.

CO3. Understand the operational aspects of UPS, batteries and design the appropriate lighting system for various industrial and domestic applications.

CO4. Understand the principle of various sensor and transducers to sense/measure various non-electrical parameters.

CO5. Understand the fundamentals of basic electronic devices, their characteristics and applications of electronic devices.

CO6. Work independently or in teams to solve problems with effective communication.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	-	-	2	-	-	-	-	-	-	-
CO2	3	2	-	-	-	1	-	-	-	-	-	-
CO3	3	2	2	-	-	1	1	-	-	-	-	-
CO4	3	1	-	-	-	1	-	-	-	-	-	-
CO5	3	1	-	1	2	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	3	-	-
Course Correlation Mapping	**3**	**2**	**1**	**1**	**2**	**1**	**1**	**-**	**3**	**3**	**-**	**-**

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: Fundamentals of Electric Circuits (10 Periods)

Classification of network elements; Voltage-Current relations for passive elements; Kirchhoff's laws; Series-Parallel connection; Mesh and Nodal analysis (With DC Independent Sources only).

AC sources–Single loop generator,Phasor representation, Voltage, Current, Impedance, Power factor and Apparent power.

Module 2: Electrical Systems (09 Periods)

Motors: Types of motors, working principle and applications—DC motor, Three Phase Induction motor, Synchronous motor, Stepper motor.

Single Phase Transformer: Construction, principle of operation;EMF equation.

Electrical wiring: Methods of electrical wiring systems; Earthing procedure, Switch fuse unit (SFU), Operation of MCB and Relays.

Module 3: Utilization of Electrical Systems (09 Periods)

Illumination: Light sources, Terminologies, Laws of illumination; Types of lamps, Lighting calculations; Interior Lighting - Industrial lighting; Exterior lighting- Street lighting and Flood lighting.

Uninterruptible Power Supply (UPS) - Components in UPS, Functionality and Calculation of ratings for UPS components to a specific load.

Emergency supply: Batteries -Types of batteries, Elementary calculations for energy consumption for a specified application.

Module 4: Sensors and Transducers (08 Periods)

Sensors- Light sensor, Voltage sensor, Temperature and Humidity sensor, Motion detection sensors, Wireless bluetooth sensors and Distance measurement with Ultrasound sensor.

Transducers -Basic requirements of transducers, Passive transducers - Strain gauge, Hall-Effect transducer, LVDT and Active transducers- Piezoelectric and Thermocouple, Data acquisition system (overview and concept only).

Module 5: Fundamentals of Electronics Engineering (09 Periods)

Half wave and full wave rectifier, Zener diode, characteristics, application – Regulator. BJT—operation; Introduction to Operational amplifier: Inverting and non-inverting amplifier. Application—Adder, Comparator, Integrator and Differentiator; Analog to Digital

Convertors—Flash type and Successive approximation types; Digital to Analog converters—Weighed resistor and R-2R types.

Total Periods: *45*

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

1. Verification of Kirchhoff's laws (Mesh and Nodal Analysis).
2. Performance evaluation by brake test on DC Shunt Motor.
3. Performance evaluation of a 1-Phase Transformer by Load test.
4. Practicing plate and pipe earthing system.
5. Operation and testing of Fuse, MCB and Relays.
6. Design and estimation of wiring for a typical house: One lamp controlled by one switch, Two lamp controlled by two switch and stair case wiring.
7. Calibration of LVDT for linear displacement measurement.
8. Analyze the characteristics of Resistance Temperature Detector (RTD) sensor.
9. Analyze the characteristics of piezoelectric sensor.
10. Investigate ripple factor and load regulations of rectifier with and without filters.
11. Design of inverting and non-inverting amplifiers using op-amp.
12. D-A converter (R-2R ladder) using Op-Amp 741 with required voltage levels.

TEXT BOOKS:

1. AshfaqHussain, Fundamentals of Electrical Engineering, Dhanpatrai& Co. (P) Ltd., 3rd Edition, New Delhi, 2009.
2. R. L. Boylestad and Louis Nashelsky, Electronics Devices and Circuits, PHI, 11th edition, 2009.

REFERENCE BOOKS:

1. Wadhwa, C. L. Basic Electric Engineering. 4th Edition, New Age International Private limited.
2. D. Patranabis, Sensors and Transducers, PHI Learning Private Limited, 2nd Edition, 2003.
3. A.K.Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, DhanpatRai& Co., 19th Edition, 2015.

4. C.L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International Private Limited, 2015.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/108108076
2. https://nptel.ac.in/courses/108105061
3. https://nptel.ac.in/courses/108108147
4. https://nptel.ac.in/courses/108101091

Web Resources:

1. https://www.electrical4u.com/electric-circuit-or-electrical-network/
2. https://www.electronicshub.org/dc-circuits-basics/
3. https://www.electrical4u.com/working-of-electric-motor/
4. https://electricalbaba.com/what-is-ups-working-types-of-ups-explained/
5. https://www.lrc.rpi.edu/resources/publications/pdf/illuminationfund.pdf
6. https://www.sitsitamarhi.ac.in/wp-content/uploads/2020/04/file_5e8ef00b06190.pdf
7. https://www.electronics-tutorials.ws/io/io_1.html
8. https://www.homemade-circuits.com/making-ups-tutorial/
9. https://www.engineersgarage.com/introduction-to-uninterruptible-power-supply-ups-and-its-design-part-1-17/
10. https://www.dfliq.net/blog/the-basics-of-electrical-components/

Course Code	Course Title	L	T	P	S	C
22LG102401	**ENGLISH FOR PROFESSIONALS**	2	-	2	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course deals with listening strategies, reading comprehension, grammar, vocabulary, pronunciation, Written, Verbal and Non-verbal communication, Channels of communication, Barriers to communication, Modes of technology-based communication, and Technical Communication

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the basics of Reading, Writing, Listening, and Speaking skills.

CO2. Analyze the rules of English grammar in speaking and writing.

CO3. Demonstrate knowledge of English pronunciation in speaking.

CO4. Apply the knowledge of reading strategies and vocabulary in communication.

CO5. Apply the strategies of writing in preparing a report.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	-	-	-	3	-	2
CO2	-	3	2	-	-	-	-	-	-	3	-	2
CO3	3	2	-	-	-	-	-	-	-	3	-	2
CO4	-	-	-	-	3	-	-	-	-	3	-	2
CO5	-	-	-	-	3	-	-	-	-	3	-	2
Course Correlation Mapping	3	2	2	-	3	-	-	-	-	3	-	2

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: SUPER HEROES – THE SCIENCE BEHIND SUPER HEROES ***(06 Periods)***

Reading for Comprehension, Grammar, Speaking, Listening, Vocabulary, Writing, Verbal and Non-verbal communication.

Module 2: ALIENS – THE CYLINDER OPENS ***(06 Periods)***

Reading for comprehension, Grammar, Vocabulary, Writing, Listening, and Channels of communication.

Module 3: INVENTORS – THE RAMAN EFFECT ***(06 Periods)***

Reading comprehension, Listening, Writing, Grammar, Speaking, Pronunciation, and communication barriers.

Module 4: HEALTH AND NUTRITION – WHAT SHOULD YOU BE EATING ***(06 Periods)***

Reading comprehension, Listening, Speaking, Grammar,Writing, Pronunciation, and Modes of technology-based communication.

Module 5: NEW-AGE ENTREPRENEURS – HOW A CHINESE BILLIONAIRE BUILT HER FORTUNE ***(06 Periods)***

Reading comprehension, Vocabulary, Listening, Grammar, Writing, and Technical Communication

Total Periods: 30

EXPERIENTIAL LEARNING

PART-A

Any six modules among the following:

1. Conversation starters and role play
2. Reading comprehension
3. Listening comprehension
4. Vocabulary Building (business and job-related vocabulary)
5. Describing people, places, objects, and Events
6. Phonetics - Accent/ Rhythm/ Intonation
7. Tenses
8. Proposal Writing

PART-B

Any four modules among the following:

1. Communicating effectively is important to become successful in any business. Prepare a Case study of successful business personnel regarding communication competence.
2. Prepare a PowerPoint presentation on an orator and analyze the voice dynamics.
3. People face situations to convince or agree with the points they have. The college arranges a 5-day tour program to Goa. Prepare a video on persuasive talk and

convince parents to get permission.

4. Write an article on the famous clichés of our time.
5. Prepare a poster on the effects of social media on youth.
6. Give a short talk on the importance of inventors and their role in present socio, political and economic changes.
7. Prepare a collage of entrepreneurs' pictures and their achievements.
8. NASA released recent photos of the universe with the help of the James Webs Space Telescope. Write down the expected impact on the existing theory on planets and the universe.
9. Obesity is the most common problem for people. List out the reasons for the problem and prepare food habits to overcome.
10. Epics of India deals with superheroes of those days. Compare the weapons used in the battles of Mahabharata with modern weapons.
11. Write a report on your recently invented product so that it should be sold as a hot cake in the market.
12. Illustrate the essential rules for good precis writing.

RESOURCES

TEXTBOOK:

1. N.P. Sudharshana& C.Savitha, "*English for Technical Communication*", Cambridge University Press. 2016.

REFERENCE BOOKS:

1. Kline, J. A. "*Speaking effectively: Achieving excellence in presentations. Upper Saddle River",* NJ: Pearson/Prentice Hall, 2004.
2. Kuiper, "*S. Contemporary business report writing"* (3rd ed.). Cincinnati, OH: Thomson/South,Western, 2007.
3. Locker, K. O. & Kaczmarek, "*S. K. Business communication"*: Building critical skills (3rd ed.). New York: McGraw,Hill/Irwin, 2007.
4. Mascull, "*B. Business vocabulary in use: Advanced. Cambridge": Cambridge University* Press, 2004.
5. Matthews, C. B. & Matthews, and M. Quicksteps to winning business presentations: Make the most of your PowerPoint presentations. New York: McGraw,Hill, 2007.
6. Marsh, C. Strategic writing: Multimedia writing for public relations, advertising, sales and marketing, and business communication. Boston: Pearson/Ally and Bacon, 2005.
7. Munter, M. & Russell, L. Guide to presentations. (2nd ed.). Upper Saddle River: NJ: Pearson/Prentice Hall, 2008.
8. Reardon, K. K. The skilled negotiator: Mastering the language of engagement. San Francisco: Jossey,Bass, 2004.
9. Stiff, J. B. Persuasive communication (2nd ed.). New York: Guilford Press. Engagement. San Francisco: Jossey, Bass, 2003.
10. Stiff, J. B. Persuasive communication (2nd ed.). New York: Guilford Press, 2003.

VIDEO LECTURES:

1. https://learnenglish.britishcouncil.org/general,english/video,zone/the,day,elizabeth,became,queen
2. https://www.youtube.com/watch?v=CscHc8qSn1A

Web Resources:

1. https://galgotiacollege.edu/assets/pdfs/study,material/Notes,english.pdf
2. https://lecturenotes.in/subject/183
3. https://www.fluentu.com/blog/english/professional,english/
4. https://learnenglish.britishcouncil.org/business,english

Course Code	Course Title	L	T	P	S	C
22CS102401	**PROGRAMMING IN C AND DATA STRUCTURES**	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed introduction and hands-on experience to programming in C language. Topics covered in the course include Algorithms, Flowcharts, Operators and expressions, Input and output functions, Control statements, Arrays, Strings, Functions, Pointers, User-defined data types, Linked lists, Overview of data structures, Stack, Queue, Searching algorithms, Sorting algorithms.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Develop flowcharts, algorithms for given problems.

CO2. Design algorithmic solutions by analyzing programming problems and using appropriate C language constructs.

CO3. Apply linear data structures such as arrays, linked lists, stacks, queues for efficient data organization and manipulation.

CO4. Select and apply appropriate techniques for searching and sorting problems.

CO5. Work independently and communicate effectively in oral and written forms.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	2	3	3	2	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	3	3	-	-
Course Correlation Mapping	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	3	**3**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: INTRODUCTION TO C PROGRAMMING ***(08Periods)***

Introduction to Algorithms and Flowcharts: What is an algorithm, Different ways of stating algorithms, Key features of algorithm, What are variables, Subroutines, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

Basis of C Programming: Introduction, Structure of a C program, Concept of a variable, Data types in C, Program statement, Declaration, How does the computer store data in memory, Tokens, Operators and expressions, Expressions revisited, Type conversion in C.

Module 2: INPUT AND OUTPUT, CONTROL STATEMENTS ***(09 Periods)***

Input and Output: Basic screen and keyboard I/O in C, Non-formatted input and output, Formatted input and output functions.

Control Statements: Specifying test condition for selection and iteration, Writing test expression, Conditional execution and selection, Iteration and repetitive execution, goto statement, Special control statements, Nested loops.

Module 3: ARRAYS AND STRINGS, FUNCTIONS ***(10 Periods)***

Arrays and Strings: One-dimensional array – Declaration, Initialization, Manipulation; Multi-dimensional arrays – Declaration, Initialization, Manipulation; Strings – Declaration, Initialization, String input/output, Character manipulation, String manipulation; Arrays of strings – Declaration, Initialization, Manipulation.

Functions: Concept of function, Using functions, Call by value mechanism, Working with functions, Passing arrays to functions, Scope and extent, Storage classes, Recursion.

Module 4: POINTERS, USER-DEFINED DATA TYPES, LINKED LISTS ***(10 Periods)***

Pointers in C: Understanding memory addresses, Address operator (&), Pointer, Arrays and pointers, Pointers and strings, Pointer arithmetic, Pointers to pointers, Array of pointers, Pointers to an array, Two-dimensional arrays and pointers, Dynamic memory allocation.

User-Defined Data Types: Structures - Declaration, Initialization, Accessing members, Arrays of structures, Arrays within structure, Structures and pointers, Structures and functions; Enumeration types.

Linked Lists: Single linked lists – Definition, Representation, Operations, Inserting a node, Deleting a node; Applications of linked lists, Disadvantages of linked lists, Array versus linked list revisited.

Module 5: DATA STRUCTURES ***(08 Periods)***

Basic Data Structures: Overview of data structures, Stack – Definition, Array representation, Implementation of stack operations using arrays; Queue - Definition, Array representation, Implementation of queue operations using array.

Searching and Sorting: Linear Search, Binary Search, Bubble sort, Selection sort.

Total Periods: 45

EXPERIENTIAL LEARNING

1. a) Let a and b are two integer variables whose values are 10 and 13 respectively. Write a program to evaluate the following arithmetic expressions.

   i) a + b ii) a–b iii) a * b iv) a/b v) a % b

   b) Write a program to evaluate the following algebraic expressions after reading necessary values from keyword.

   i) (ax + b)/(ax – b)

   ii) $2.5 \log x + \text{Cos } 32^0 + | x^2 + y^2 |$

   iii) $x^5 + 10\, x^4 + 8$ and $x^3 + 4\, x + 2$

   iv) ae^{kt}

2. a) Mr. Gupta deposited Rs.1000 in a bank. The bank gives simple interest at the rate of 15% per annum. Write a program to determine the amount in Mr. Gupta's account at the end of 5 years. (Use the formula I = PTR / 100)

   b) A cashier has currency notes of denominations Rs.10, Rs. 50 and Rs. 100. If the amount to be withdrawn is input in hundreds, find the total number of notes of each denomination the cashier will have to give to the withdrawer.

   c) In a town, the percentage of men is 52. The percentage of total literacy is 48. If total percentage of literate men is 35 of the total population; write a program to find the total number of illiterate men and women if the population of the town is 8000.

3. a) Write a program that prints the given three integers in ascending order using if - else.

   b) Write a program to calculate commission for the input value of sales amount.

   Commission is calculated as per the following rules:

   i) Commission is NIL for sales amount Rs. 5000.

   ii) Commission is 2% for sales when sales amount is >Rs. 5000 and <= Rs. 10000.

   iii) Commission is 5% for sales amount >Rs. 10000.

   c) If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Also determine how much profit or loss he incurred in percentage.

4. a) An insurance company calculates premium as follows:

   i) If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city and is a male then premium is Rs.4 per thousand and the policy amount cannot exceed Rs.2 lakhs.

   ii) If a person satisfies all the above conditions and is female then the premium is Rs.3 per thousand and the policy amount cannot exceed Rs.1 lakh.

iii) If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then premium is Rs.6 per thousand and the policy cannot exceed Rs. 10000.

iv) In all other cases the person is not insured.

Write a program to determine whether the person should be insured or not, his/her premium rate and maximum amount for which he/she can be insured.

b) Write a program, which takes two integer operands and one operator as input from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, %. Use switch statement)

5. a) Write a program to find the sum of individual digits of a positive integer.

b) A Fibonacci sequence is defined as follows: The first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a program to generate the first N terms of the sequence.

6. a) Write a program to find the largest and smallest number in a given list of integers.

b) Write a program to perform addition of two matrices.

c) Write a program to determine whether the given string is palindrome or not.

7. a) Write a program using functions to perform the following operations:

i) To convert a given decimal number into binary number
ii) To convert a given binary number into decimal number

b) Write a program using functions insert a sub-string in main string at a specified position.

8. a) Write a C program to print the elements of an array in reverse order using pointers.

b) Write a program to accept the elements of the structure as: Employee-name, Basic pay. Display the same structure along with the DA, CCA and Gross salary for 5 employees.

Note: DA=51% of Basic pay, CCA=Rs.100 consolidated.

9. A college has N number of students and the following details of all the students are maintained – register number, name, branch, phone number. Write a program to store the details of the students using a singly linked list. Develop functions to perform the following operations on the data.

i) Insert new student's details
ii) Display the details of the students
iii) Delete a given student's information

10. a) Develop a menu driven program to perform the following operations on a stack of integers (Array implementation of stack with maximum size MAX)

i) Push an element
ii) Pop an element

iii) Display the status
iv) Demonstrate overflow and underflow situations

b) Develop a menu driven program to perform the following operations on a queue of characters (Array implementation of queue with maximum size MAX).

i) Insert an element
ii) Delete an element
iii) Display the status
iv) Demonstrate overflow and underflow situations

11. Store register numbers of students who attended placement training program in a random order in an array. Write a function to search whether a student has attended placement training program or not using

a) Linear Search
b) Binary Search

12. Given marks of N number of students in mathematics subject, write a program to display the marks of students in ascending order using

a) Bubble Sort
b) Selection Sort

RESOURCES

TEXT BOOKS:

1. Pradip Dey and Manas Ghosh, Programming in C,Oxford University Press,2018.
2. Debasis samanta, Classic Data Structures,2nd Edition, PHI Learning, 2009.

REFERENCE BOOKS:

1. Byron S Gottfried and Jitender Kumar Chhabra, *Programming with C*, 4th Edition, McGraw Hill Education, 2019.
2. Yashavant Kanetkar, *Let Us C,* 17th Edition, BPB Publications, 2020.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/106/104/106104128/
2. https://nptel.ac.in/courses/106/103/106103069/
3. https://www.digimat.in/nptel/courses/video/106105171/L01.html
4. https://nptel.ac.in/courses/106102064
5. https://nptel.ac.in/courses/106105171
6. https://archive.nptel.ac.in/courses/106/106/106106127/
7. https://www.youtube.com/watch?v=4OGMB4Fhh50
8. https://nptel.ac.in/courses/106105151

Web Resources:

1. https://www.coursera.org/learn/data-structures
2. https://www.edureka.co/blog/c-data-structures/
3. https://www.coursera.org/specializations/data-structures-algorithms
4. https://www.udemy.com/course/data-structures-and-algorithms-in-c/
5. https://www.udemy.com/course/data-structures-and-algorithms-in-c-for-beginners/
6. http://www.java2s.com/Tutorial/C/0260__Data-Structure/Catalog0260__Data-Structure.htm
7. https://www.programiz.com/dsa

Course Code	Course Title	L	T	P	S	C
22MM101404	**TRANSFORM TECHNIQUES AND LINEAR ALGEBRA**	3	-	-	-	3

Pre-Requisite -

Anti-Requisite Calculus and Transformation Techniques

Co-Requisite -

COURSE DESCRIPTION: This course focus on basic areas of theory and more advanced Engineering Mathematics topics which provide students with the relevant mathematical tools required in the analysis of problems in Engineering and scientific professions. This course includes Fourier series, Fourier Transforms, Laplace transforms, Inverse Laplace transform, solutions for linear systems, Eigen values and Eigen vectors, Linear transformation.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate Fourier series to study the behaviour of periodic functions and their applications and Fourier transform to connect the frequency and time domain systems.

CO2. Apply the techniques of Laplace transform to solve ordinary differential equations.

CO3. Make use of echelon forms in finding the solution of system of linear equations. Compute Eigen values and Eigen vectors of square matrices.

CO4. Use the fundamental concept of a basis for a subspace to give a precise definition of dimensions and rank, and to solve problems in appropriate situations.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3		2	1	-	-	-	-	-	-	-
CO2	3	3		3	1	-	-	-	-	-	-	-
CO3	3	2		1	1	-	-	-	-	-	-	-
CO4	3	2		3	1	-	-	-	-	-	-	-
Course Correlation Mapping	**3**	**3**		**2**	**1**	**-**	**-**	**-**	-	**-**	**-**	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: FOURIER SERIES & FOURIER TRANSFORMS ***(09 Periods)***

Introduction to Fourier series, Convergence of Fourier series (Dirichlet's conditions), Fourier series in $(-\pi,\pi)$, Half-range Fourier sine and cosine expansions in $(0,\pi)$, Fourier integral theorem (statement only), Fourier sine and cosine integrals; Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier transforms.

Module 2: LAPLACE TRANSFORMS ***(09 Periods)***

Definition of Laplace transforms, Existence conditions, Laplace transforms of standard functions, Properties of Laplace transforms (without proofs), Laplace transforms of derivatives, Laplace transforms of integrals, Multiplication by t^n , Division by t , Laplace transforms of periodic functions, Laplace transforms of unit step function and unit impulse function.

Module 3 INVERSE LAPLACE TRANSFORMS ***(09 Periods)***

Inverse Laplace transforms by different methods, Convolution theorem (without proof), Inverse Laplace transforms by convolution theorem, Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

Module 4 LINEAR ALGEBRA -MATRICES ***(09 Periods)***

Rank of a matrix: Echelon form, Linear systems of equations: solving system of Homogeneous and Non-Homogeneous equations; Eigen values and Eigen vectors of a matrix and properties (without proofs), Diagonalization of a matrix by orthogonal transformation, Cayley-Hamilton Theorem.

Module 5 LINEAR ALGEBRA- VECTOR SPACES ***(09 Periods)***

Vector spaces, Linear dependence and independence of vectors, Basis, Dimension, Linear transformations (maps), Range and Kernel of a linear map, Rank and Nullity, Inverse of a linear transformation, Rank-Nullity theorem (without proof).

Total Periods: 45

EXPERIENTAL LEARNING

1. A 100-gm mass is suspended from a spring with constant 50 N/m. It is set into motion by raising it 10 cm above its equilibrium position and giving it a velocity of 1 m/s downward. During the subsequent motion a damping force acts on the mass and the magnitude of this force is twice the velocity of the mass. If an impulse force of magnitude 2 N is applied vertically upward to the mass at t = 3 s, find the position of the mass for all time**.**

2. Develop a differential equation from an LRC circuit connected in series using Kirchoff Voltage law and then solve using Laplace transform. Analyze the result by using any technology**.**

3. Check that the complex numbers $\square = \{x + iy / i^2 = -1, x, y \in \Re\}$, satisfy all of the conditions in the definition of vector space over $\square$. Make sure you state carefully what your rules for vector addition and scalar multiplication.

4. Let Breakfast consists of orange juice, cereal, and eggs with the following nutritional information:

	OJ	Cereal	Eggs
Protein	0%	10%	20%
Vitamin C	20%	15%	0%
Calories	100	120	100

If you must have 30% protein, 30% Vitamin C and 300 calories for your breakfast, How many servings of OJ, Cereal, and Eggs should you have?

(Note: It's an indicative one. Course Instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publishers, 44th edition, 2017.
2. David Poole, *Linear Algebra: A Modern Introduction*, Brooks/Cole, 2nd edition, 2005.

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th edition, 2011.
2. Belkacem Said-Houari, Linear Algebra, Springer International publish, 2017.
3. Bernard Kolman and David, R. Hill, Introductory Linear Algebra- An applied first course, Pearson Education, 9th Edition, 2011.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/111106111 (Module-1,2&3)
2. https://nptel.ac.in/courses/111106051 (Module-4 & 5)

Web Resources:

1. https://www.coursera.org/learn/matrix-algebra-engineers (Module-4 & 5)
2. https://www-users.cse.umn.edu/~mille003/fouriertransform.pdf
3. https://nitkkr.ac.in/docs/12-%20Laplace%20Transforms%20and%20their%20Applications.pdf

Course Code	Course Title	L	T	P	S	C
22CE102002	**CIVIL ENGINEERING MATERIALS AND CONCRETE TECHNOLOGY**	3	-	2	-	4

Pre-Requisite

Anti-Requisite

Co-Requisite

COURSE DESCRIPTION: This course provides a detailed discussion onstones, bricks, tiles; timber, miscellaneous materials in construction; cement, admixtures and aggregates; fresh and hardened concrete; elasticity, shrinkage, creep and concrete mix design.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Evaluate the properties of stones, bricks and tiles using various tools and techniques to solve complex civil engineering problems by following relevant codes of practice, safety, environment and sustainability either individually or in a team besides communicating effectively in graphical form.

CO2. Evaluate the properties of timber and miscellaneous materials using various tools and techniques and through continuous learning to solve complex civil engineering problems by following relevant codes of practice, safety, environment and sustainability either individually or in a team besides communicating effectively in graphical form.

CO3. Evaluate the properties of cement, admixtures and aggregates using various tools and techniques to solve complex civil engineering problems by following relevant codes of practice, safety, environment and sustainability either individually or in a team besides communicating effectively in graphical form.

CO4. Evaluate the properties of fresh and hardened concrete using various tools and techniques to solve complex civil engineering problems by following relevant codes of practice, safety, environment and sustainability either individually or in a team besides communicating effectively in graphical form.

CO5. Evaluate elasticity, shrinkage and creep of concrete using various tools and techniques to solve complex civil engineering problems by following relevant codes of practice, safety, environment and sustainability either individually or in a team besides communicating effectively in graphical form.

CO6. Design a concrete mix using appropriate methods for solving complex concrete technology problems considering codes of practice, safety, environment and sustainability.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	2	3	2	2	2	1	1	-	-	3	-	-
CO2	2	3	-	2	3	2	2	2	1	1	-	2	3	-	-
CO3	2	3	-	2	3	2	2	2	1	1	-	-	3	-	-
CO4	2	3	-	2	3	2	2	2	1	1	-	-	3	-	-
CO5	2	3	-	2	3	2	2	2	1	1	-	-	3	-	-
CO6	2	3	3	2	3	2	2	2	-	-	-	-	3	-	-
Course Correlation Mapping	**2**	**3**	**3**	**2**	**3**	**2**	**2**	**2**	**1**	**1**	**-**	**2**	**3**	-	**-**

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: STONES, BRICKS AND TILES ***(09 Periods)***

Stones: Properties of building stones and structural requirements, Classification of stones, Stone quarrying, Blasting and dressing of stones.

Bricks and Tiles: Composition of good brick earth, Manufacture of bricks, Qualities of a good brick, Efflorescence in bricks, Classification of bricks, Characteristics of good tile, Manufacturing methods, Types of tiles.

Module 2: TIMBER AND MISCELLANEOUS MATERIALS FOR CONSTRUCTION ***(08 Periods)***

Timber: Structure, Properties, Seasoning of timber, Classification of various types of wood used in buildings, Defects in timber, Decay of timber, Mechanical treatment, Alternative materials for wood, Paints, Varnishes, Bituminous wooden products in construction.

Miscellaneous Materials For Construction: Use of Materials like galvanized iron, steel, aluminium, glass, bituminous materials, rubber, fibre–reinforced plastics, ceramic products, asbestos and their quality; Modern building materials; Building materials for low cost housing, Utilisation of waste for alternative building materials, Sustainable materials in construction.

Module 3: CEMENT, ADMIXTURES AND AGGREGATES ***(09 Periods)***

Cement and Admixtures: Ingredients of cement, Manufacture of OPC, Types of cement and their properties, Grades of Cement, Various field and laboratory tests on cement, Admixtures - mineral admixtures, chemical admixtures.

Aggregates: Classification of aggregate, Physical properties, Mechanical properties, Bond strength, Bulking of sand, Deleterious substance in aggregate, Soundness of aggregate, Alkali aggregate reaction, Sieve analysis, Gradation, Maximum aggregate size.

Module 4: FRESH AND HARDENED CONCRETE ***(09 Periods)***

Fresh Concrete: Ingredients of cement concrete and their importance, Manufacture of

concrete, Workability, Factors affecting, Measurement of workability, Setting times of concrete, Effect of time and temperature on workability, Segregation and bleeding, Ready mix concrete, Quality of mixing water.

Hardened Concrete: Water/Cement ratio, Abram's Law, Gel space ratio, Curing, Nature of strength of concrete, Maturity concept, Strength in tension and compression, Factors affecting strength, Tests on hardened concrete, Relation between compressive and tensile strength,Non-destructive testing methods – Rebound hammer, ultrasonic pulse velocity method, codal provisions.

Module 5: ELASTICITY, SHRINKAGE, CREEP AND CONCRETE MIX DESIGN ***(10 Periods)***

***Elasticity, Shrinkage and Creep*:** Modulus of elasticity, Dynamic modulus of elasticity, Poisson's ratio, Shrinkage – Types, factors; Creep of concrete - Factors, Relation between creep and time, Effects.

Concrete Mix Design: Factors in the choice of mix proportions, Durability of concrete, Quality control of concrete, Statistical methods, Acceptance criteria, Proportioning of concrete mixes by various methods – ACI method and IS 10262 method.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

A) Properties and identification of building materials

B) Tests on bricks
- (a) Visual inspection test for colour, shape and size
- (b) Soundness of brick
- (c) Water absorption test of brick
- (d) Efflorescence test of brick
- (e) Compressive strength of brick

C) Tests on timber
- (a) Identification of defects in timber
- (b) Moisture content of timber
- (c) Volumetric shrinkage of timber
- (d) Density of timber

D) Tests on tiles
- (a) Water absorption of vitrified tile & cement concrete floor tile
- (b) Flexural strength of tile
- (c) Compressive strength of paver block tile

E) Determination of fineness of cement
- (a) Dry sieving
- (b) Blaine's air permeability method

F) Determination of standard consistency, and initial and final setting time of cement

G) Determination of specific gravity and soundness of cement

H) Determination of compressive strength of cement

I) Tests on fine aggregate
- (a) Sieve analysis of fine aggregate

(b) Specific gravity of fine aggregate
(c) Bulking of fine aggregate

J) Determination of workability of fresh concrete by
(a) Slump cone test
(b) Compaction factor test
(c) Vee-Bee consistometer test

K) Determination of strength of concrete by
(a) Compressive strength test
(b) Split tensile strength test
(c) Flexural strength test
(d) Modulus of elasticity of concrete

L) Non-destructive tests on concrete
(a) Rebound hammer test
(b) PUNDIT

RESOURCES

TEXT BOOKS:

1. Duggal S.K., *Building Materials*, New Age International Publishers, 4th Edition, 2012.
2. Shetty M.S., *Concrete Technology*, S. Chand and Company Ltd., 7th Revised Edition, 2013.

REFERENCE BOOKS:

1. Varghese P.C., *Building Materials*, PHI Learning Private Ltd., Delhi, 2nd Edition, 2015.
2. Neville A.M., *Properties of Concrete*, 5th Edition, John Wiley and Sons, New Delhi, 2012.
3. Gambhir M.L., *Concrete Technology*, 3rd Edition, Tata McGraw-Hill Publishers, New Delhi, 2008.
4. Santha Kumar A.R., *Concrete Technology*, 7th Edition, Oxford University Press, New Delhi, 2011.

VIDEO LECTURES:

1. https://nptel.ac.in/courses/105106206
2. https://nptel.ac.in/courses/105102012
3. https://www.youtube.com/channel/UCFSVEUyfRszdnA2ej9zdZTQ/videos

Web Resources:

1. https://lecturenotes.in/subject/188/concrete-technology-ct
2. https://backbencher.club/building-material-and-construction/
3. https://www.engineeringcivil.com/low-cost-housing.html
4. https://theconstructor.org/concrete/ready-mixed-concrete-types-advantages/6712/

Course Code	Course Title	L	T	P	S	C
22CE102007	**SURVEYING**	3	-	2	-	4

Pre-Requisite

Anti-Requisite

Co-Requisite

COURSE DESCRIPTION: This course provides a detailed discussion on Chain surveying, Compass surveying, Plane tabling, Levelling and contouring, Theodolite surveying, Tacheometric surveying, Computation of areas and volumes, Curves, Electronic distance measurement, Drone surveying.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Develop survey plots using chain, compass and plane table surveying techniques by measuring distances, horizontal angles and preparing plans to solve complex surveying problems following ethics and considering society, environment and sustainability besides communicating effectively in graphical form as an individual or in a team.

CO2. Develop contour maps using levelling and contouring techniques by finding elevations to solve complex surveying problems following ethics and considering society besides communicating effectively in graphical form as an individual or in a team.

CO3. Develop building layouts and elevations using theodolite and tachometric surveying techniques by finding distances, angles and elevations to solve complex surveying problems following ethics and considering society besides communicating effectively in graphical form as an individual or in a team.

CO4. Develop longitudinal profiles of areas and volumes to solve complex surveying problems associated with civil engineering applications using appropriate techniques following ethics and considering society besides communicating effectively in graphical formas an individual or in a team.

CO5. Design different types of curves to solve transportation engineering problems using appropriate techniques following ethics and considering society besides communicating effectively in graphical form as an individual or in a team.

CO6. Develop orthomosaic maps and contour maps using EDM and drone surveying techniques for various applications following ethics and latest developments considering society besides communicating effectively in graphical form as an individual or in a team.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	2	2	2	1	1	-	2	-	-	-	-	3
CO2	3	3	-	2	2	2	-	2	-	1	-	-	-	-	3
CO3	3	3	-	2	2	2	-	2	-	1	-	-	-	-	3
CO4	3	3	-	2	2	2	-	2	-	2	-	-	-	-	3
CO5	3	2	3	3	2	2	-	2	-	2	-	-	-	-	3
CO6	3	3	-	-	2	2	-	2	-	2	-	2	-	-	3
Course Correlation Mapping	3	3	3	3	2	2	1	2	-	2	-	2	-	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: CHAIN AND COMPASS SURVEYING ***(10 Periods)***

Chain Surveying: Classification of surveying, Objectives, Principles of surveying; Influence of surveying on society, environment and sustainability; Distance measurement, Accuracy and errors, Chain and its types, Optical square, Cross staff, Reconnaissance and site location, Locating ground features by offsets, Field book, Chaining for outline of structures, Methods for overcoming obstacles, Conventional symbols, Plotting chain survey, Computation of areas, Errors in chain surveying and their elimination.

Compass Surveying: Types of compass, Bearings, Included angles, Errors and adjustments.

Module 2: PLANE TABLE SURVEYING, LEVELING ANDCONTOURING ***(09 Periods)***

Plane Table Surveying: Equipment, Methods of plane tabling, Errors, Two and three point problems.

Leveling and Contouring: Types of leveling, Types of leveling instruments, Temporary and permanent adjustments, Height of instrument and rise and fall methods, Plotting longitudinal sections and cross sections, Effect of curvature and refraction, Characteristics of contours, Uses of contour maps.

Module 3 THEODOLITE AND TACHEOMETRIC SURVEYING ***(08 Periods)***

Theodolite Surveying: Description of theodolite, Temporary and permanent adjustments of vernier transit, Measurement of horizontal and vertical angles, Heights and distances, Traversing, Closing error and distribution, Gale's traverse table, Omitted measurements.

Tacheometric Surveying: Principle of stadia method, Distance and elevation formulae for staff held vertical and normal, Instrumental constants, Analytic lens, Tangential method.

Module 4 COMPUTATION OF AREAS AND VOLUMES, AND CURVES ***(09 Periods)***

Computation of Areas: Areas dividing into number of triangles, By offsets to a base line, By coordinates, Areas from maps.

Computation of Volumes: Volume from cross-section, Embankments and cutting for a level section and two level sections with and without transverse slopes, Determination of the capacity of reservoir.

Curves: Different types and their characteristics, Setting out, Design of curves by Rankine's and offset methods - Circular, Transition, Combined and vertical curve.

Module 5 ELECTRONIC DISTANCE MEASUREMENT (EDM) AND DRONESURVEYING ***(09 Periods)***

EDM: EDM Principle, Modern electronic surveying equipment – Digital levels, Digital theodolites, Total station; Total station – Working principle, Applications: Measurement of distance, Area, Height, Angles, Gradients, Traversing, Contouring, Stake out, Data analysis; DGPS; Latest developments in EDM survey techniques.

Drone Surveying: Working principle, Benefits of drones in surveying, Applications, Interior and exterior drone surveying, Calculation of length, area and stockpile volume.

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

1. **CHAIN SURVEY**
   1. Cross staff survey and plotting
   2. Chain traversing and plotting
2. **COMPASS SURVEY**
   3. Determination of area by radiation method and plotting
   4. Compass traversing and plotting
3. **PLANE TABLE SURVEY**
   5a. Resection – Two point problem
   5b. Resection – Three point problem
4. **LEVELLING**
   6a. Longitudinal and cross–sectioning of a road profile and plotting
   6b. Contour plan of given area
5. **THEODOLITE SURVEY**
   7. Measurement of horizontal angles by method of repetition and reiteration
   8a. Trigonometric leveling – Measurement of heights and distances
   8b. Setting out a simple curves by Rankine's method of tangential angles
6. **TOTAL STATION SURVEY**
   9a. Determination of area using total station
   9b. Determination of remote height; distance, gradient and differential height between two inaccessible points using total station.

DEMONSTRATION ONLY:

- Stake-out using total station

- Traversing using total station
- Contouring using total station

7. **AREA BY PLANIMETER**
   10. Determination of area of irregular figure by using planimeter.
8. **DRONE SURVEY**
   11. Determination of length and area using drone survey
   12. Route mapping using drone survey
   13. Contouring using drone survey

RESOURCES

TEXT BOOKS:

1. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, Surveying – Vol. I, II and III, Laxmi Publications (P) Ltd., 17th Edition, 2016.
2. Subramanian, R., Surveying and Levelling, Oxford University Press, 2nd Edition, 2012.

REFERENCE BOOKS:

1. Duggal, S. K., Surveying – Vol. I and II, Tata McGraw–Hill Publishing Co. Ltd., 5th Edition, 2019.
2. Benton, A. R. and Taetz, P. J., Elements of Plane Surveying, McGraw-Hill, 3rd Edition, 2010.
3. Arora, K. R., Surveying – Vol. I and II, Standard Book House, 15th Edition, 2018.
4. Kanetkar, T. P. and Kulakarni, S. V., Surveying and Leveling, Pune Vidyarthi Griha Prakashan, Pune, 24th Edition, 2013.
5. Venkatramaiah, C., Textbook of Surveying, Universities Press (India) Limited, Hyderabad, 2nd Edition, 2011.
6. Nathanson, J. A, Lanzafama, M. T. and Kissam, P., Surveying Fundamentals and Practices, Pearson Publications, 7th Edition, 2017.

SOFTWARE/TOOLS:

1. STADD Pro
2. AutoCAD
3. SurvCE
4. Access

VIDEO LECTURES:

1. https://nptel.ac.in/courses/105104101
2. https://nptel.ac.in/courses/105103176

3. https://nptel.ac.in/courses/105107158

Web Resources:

1. https://theconstructor.org/surveying/surveying-principles-methods-civil-engineering/13048/
2. https://www.researchgate.net/publication/277179669_Importance_of_Surveying_to_Civil_Engineers_and_Some_Practical_Examples
3. https://civilsnapshot.com/applications-surveying-civil-engineering/
4. https://www.alexander.com.au/case-studies/

Course Code	Course Title	L	T	P	S	C
22CE107601	**ENVIRONMENTAL SCIENCE**	2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and environment, human population and environment.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze natural resources to solve complex environmental problems and natural resource management considering society, environment and sustainability.

CO2. Analyze ecosystems and biodiversity to solve complex environmental problems by following environmental ethics considering society, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze various types of pollution and their control measures to solve environmental problems through appropriate tools and techniques following latest developments considering society, ethics, environment and sustainability.

CO4. Analyze social issues and its impact on environment, environmental acts to solve complex environmental problems considering society, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze human population and its impact on environment to solve complex environmental problems through team work and using appropriate tools and techniques considering ethics, society, environment and sustainability.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		2		1	1				1				3
CO2	3	3		2		1	1	1		1					3
CO3	3	3		2	1	1	1	1				1			3
CO4	3	3		3		1	1	1		1					3
CO5	3	3		2	1	1	1	1	1						3
Course Correlation Mapping	3	3	-	3	1	1	1	1	1	1	1	1	-	-	3

Correlation Levels: ***3: High;*** ***2: Medium;*** ***1: Low***

COURSE CONTENT

Module 1: NATURAL RESOURCES ***(07 Periods)***

Multidisciplinary nature of environment; Natural Resources: Renewable and non-renewable resources; Forest, Water, Mineral, Food and Energy resources -Causes, Effects, Remedies, Case studies; Role of an individual in conservation of natural resource and equitable use of resources for sustainable lifestyles.

Module 2: ECOSYSTEMS AND BIODIVERSITY ***(07 Periods)***

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem - Producers, Consumers, Decomposers; Food chains, Food webs, Ecological pyramids – Types; Characteristic features, Structure and functions of forest ecosystem, Desert ecosystem, Aquatic ecosystem.

Biodiversity: Concept and value of biodiversity, Role of biodiversity in addressing new millennium challenges, Hot spots of biodiversity, Threats to biodiversity, Man-wild life conflicts, Endemic, Endangered and extinct species of India, Conservation of biodiversity – In-situ and ex-situ.

Module 3 ENVIRONMENTAL POLLUTION AND CONTROL ***(06 Periods)***

Causes, Adverse effects and control measures of pollution - Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear pollution, Solid waste management – Urban waste, industrial waste; Latest developments in pollution control, Hazards and disaster management – Floods, Earthquakes, Tsunamis, Case studies.

Module 4 SOCIAL ISSUES AND THE ENVIRONMENT ***(06 Periods)***

Sustainable development, Urban problems related to energy, Environmental ethics – Issues, Solutions; Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and case studies, Wasteland reclamation, Consumerism and waste products, Concept of green technologies, Environment justice: National Green Tribunal and its importance; Environment protection act, Air act, Water act, Wildlife protection act, Forest conservation act, Issues involved in enforcement of environmental legislation, Public environmental awareness.

Module 5 HUMAN POPULATION AND THE ENVIRONMENT ***(04 Periods)***

Population growth, Population characteristics and variation among nations, Population explosion, Family welfare programme, Environment and human health, Human rights, Value education, HIV/AIDS, Women and child welfare, Role of information technology in environment and human health; Case studies - Field Work/Assignment/Seminar on Environmental assets – Water bodies/Forest/Grassland/Hill/Mountain.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Visit a nearby villages and know the status of availability of local resources that can be improved through proper education.
2. Make an awareness program in the villages for the development of natural resources, ecosystems and biodiversity.

3. Prepare a document by visiting a local urban waste dumping yard near to the Tirupati city.
4. Visit a local village and find a barren land and make the land into a useful land by planting plants or providing the soil and fertilizers required to improve the soil.
5. Visit a local zoological park and identify the species variety and variability.

(Note: It's an indicative one. Course Instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. Anubha Kaushik and Kaushik, C.P., *Perspectives in Environmental Studies*, New Age International (P) Ltd. Publications, 6thEdition, 2018.
2. Erach Barucha, *Environmental Studies,* Orient Blackswan, 3rdEdition, 2021.

REFERENCE BOOKS:

1. Cunningham, W.P. and Cunningham, M.A., *Principles of Environmental Science*, Tata McGraw-Hill PublishingCompany, New Delhi, 8th Edition,2016.
2. Benny Joseph, *Environmental Studies*, Tata McGraw-Hill, 2ndEdition, 2009.
3. Anji Reddy, M., *Text Book of Environmental Science and Technology*, BS Publications, Revised Edition, 2014.
4. Rajagopalan, R., *Environmental Studies*, Oxford University Press, 3rd Edition, 2015.

VIDEO LECTURES:

1. http://nptel.ac.in/courses/109/104/109104047
2. https://www.youtube.com/watch?v=mIPBPG-5dUw

Web Resources:

1. https://nptel.ac.in/courses/122102006
2. https://www.flame.edu.in/academics/ug/program-structure/major-minor-courses/environmental-studies
3. https://www.tutorialspoint.com/environmental_studies/environmental_studies_environment.html

Course Code	Course Title	L	T	P	S	C
22EE105405	**MATLAB FOR ENGINEERS**	-	-	2	-	1

Pre-Requisite --

Anti-Requisite --

Co-Requisite --

COURSE DESCRIPTION: This course is emphasized on the fundamental concepts of MATLAB, visualization by interacting with MATLAB, advanced programming concepts decisions, loops and their control, debugging methods and applications of MATLAB for fundamental data analysis. The course also provides an overview of MATLAB integrated SIMULINK tool box and its application.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Develop syntax for creating vectors, matrices and perform operations on the arrays using MATLAB.

CO2. Create script and function m-files for developing MATLAB programs and syntax for visualizing the plots.

CO3. Develop syntax for advanced programming concepts such as decision and iterative programs, and tools for debugging and data analysis.

CO4. Apply the programming skills of MATLAB for solving engineering problems.

CO5. Develop Simulink models for modelling real world systems and understand their simulation in the SIMULINK environment.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	-	-	3	-	-	-	-	-	-	2
CO2	3	2	-	-	3	-	-	-	-	-	-	2
CO3	3	2	2	-	3	1	-	-	-	-	-	2
CO4	3	1	2	-	3	1	-	-	-	-	-	2
CO5	3	1	2	-	3	1	-	-	-	-	-	2
Course Correlation Mapping	**3**	**2**	**3**	**-**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**2**

Correlation Levels: **3: High;** **2: Medium;1: Low**

EXPERIENTIAL LEARNING

Perform a minimum of two exercises from each section.

1. Salient features, The MATLAB Environment; MATLAB Basics – Variables, Rules for Naming of Variables; Numbers, formats; Input and output.

   Exercise: Perform all of the following.

   i. Defining variables in MATLAB.
   ii. Swapping of variables.
   iii. Special variable in MATLAB.
   iv. Input and output formats on the command window.

2. Matrices and Vectors: Creating, Indexing, Extracting, Manipulation.

   Exercise: *Perform all of the following.*

   i. Methods of generating vectors using linspace and colon operator.
   ii. Create a vector spanning the range from 0 to 2π, containing 100 equally spaced components, so that the first value is 0, and the last value is 2π.
   iii. Create a vector that goes at equal steps from −2 to +2 with an increment of 0.01.
   iv. Create the matrices with the help of the matrix generation functions: zeros, eye, and ones.
   v. Creating Matrices of different size and access the data form matrix, manipulate the matrix elements.

3. Operations: Operators, Arithmetic Operations; Elementary math functions.

   Exercise: *Perform all of the following.*

   i. Create two matrix of order 3x3 and perform the addition, subtraction, multiplication on the matrices on the command window.
   ii. Find the inverse, determinant and transpose of the matrix using math functions.
   iii. Perform dot operator on the matrix/vector elements.

4. Relational operations, Logical operations.

   Exercise: *Perform all of the following.*

   Create a matrix of size 10x10 and identify the elements of the matrix based on the

following criteria.

<	All the elements whose value is less than a specified number
<=	All the elements whose value is less than or equal to a specified number
>	All the elements whose value is greater than a specified number
>=	All the elements whose value is greater than or equal to a specified number
==	All the elements whose value is equal to a specified number
~=	All the elements whose value not equal to a specified number
&	*And operator*: elements between two specified limits.
|	*Or operator*: elements satisfying either of two criteria.

5. The Current Directory and Search Path; M-Files: Basic rules and anatomy of Script and Function M-Files, Creating, Saving and Executing Script and Function M-Files.

   Exercise: *Perform any two of the following (One script file and one function file).*

   i. Create a script file and write the program for addition, subtraction, multiplication and division of the numbers/Matrices and display them using formatted print.

   ii. Crate a script file and write a program to evaluate the following $\pi r^2; x^2 + 2x - 3; \sin(2t)$ by taking the input from the key board interactively.

   iii. Develop a function file to take a vector as an input argument and return minimum and maximum numbers as an output arguments.

   iv. Develop a function file to take a temperature in degrees as an input argument and return it in Fahrenheit as an output argument.

6. Basic 2-D Plots: Graphing with plot—Labels, title, legend, and other text objects, Modifying plots with the plot editor; Subplot for Multiple Graphs; 3-D Plots: Mesh and surface plots.

   Exercise: *Perform all of the following.*

   i. A simple sine plot: Plot $y = \sin(2x)\ 0 \le x \le 2\pi$, taking 100 linearly spaced points in the given interval. Label the axes and put title, xlabel, ylabel, grid, line options and legend on the plot.

   ii. Write a script file to plot overlay plots on a same figure window and apply the plotting options on the graph.

   iii. Write a script file to create multiple plots using subplot function and apply the plotting option on the graph.

   iv. Write a script file to create 3-D plot and apply the plotting option on the

graph.

7. **Data analysis functions**: isinteger, islogical, isnumeric, length, min, max, size, sort, sum, mean, std, corrcoef, roots, polyval, polyfit functions.

   Exercise: *Perform all of the following.*

   Write a script files to validate the applications of various data analysis functions mentioned.

8. **Conditional Statements**: if, if else, elseif and nested if conditions, switch.

   Exercise: *Perform all of the following.*

   i. Write a MATLAB if statement to calculate y where y = 1 if x > pi/2, y = sin(x) if x is in [0, pi/2] and y = 0 otherwise, by taking the input for x from the keyboard.
   ii. Write a script file to validate if else and elseif syntax for decision making.
   iii. Write a script file to apply switch and perform various tasks based on the switch input.

9. **Loops Structures**: *For* loop, *While* loop; Loop controls: *break*, *continue;* nested loops;

   Errors and Debugging: Syntax errors, Errors in logic, Numerical Errors, Rounding error.

   Exercise: *one exercise using for loop, one using While loop and one on loop control programs.*

   i. Create a matrix A of size m × n, whose elements a(i, j) are calculated from the row and column indices as follows: $a(i,j) = (j-4)^2 (i+1) + ij$
   ii. Create a random matrix of order 10x10 and replace the upper triangle elements by the number 5, the lower triangle numbers by 4 and the diagonal elements by 1.
   iii. Find and display all integers between 1 and 10000 which divide by 37.
   iv. Write a program to terminate the iterations if the error is less than the specified tolerance limit.
   v. Write a script to find the sum of n natural numbers, sum of squares of n natural numbers, sum of cubes of n natural numbers or a series.
   vi. Write a program to exit the loop and to skip the loop base on the criteria mentioned.

10. Applications of MATLAB: introduction to images and types, two dimensional signals and gradient method of solving the linear equations and linear regression.

    Exercise: *one on image/signal processing and one on numerical techniques.*

    i. Load a JPEG image and plot the histograms of the red, green and blue planes of the image. Note; the histograms should appear on one figure.
    ii. Load an audio signal and plot the spectral information of the signal.
    iii. Solution to differential equations using *dsolve*function; integration using *int* function.
    iv. Gradient method of solving linear equations.
    v. Develop a linear regression line based on least square errors for fitting the given data and perform interpolation/extrapolation on the data set.

11. Basics of SIMULINK; Operating Principle And Management of Simulink: Constructing a Simulink Block Diagram, Parametrizing Simulink Blocks, Simulink Simulation; Solving Differential Equations with Simulink; Simplification of Simulink Systems: Construction of Subsystems.

    Exercise: *any one exercise.*

    i. A certain model of the motion light plastic ball tossed into the air is given by $mx'' + cx' + mg = 0;\ x'(0) = v_0 \ and \ x(0) = 0$ Here m is the mass of the ball, $g=9.8\ m/s^2$ is the acceleration due to gravity and *c* is a measure of the damping.
        a. Model this problem using Simulink.
        b. Determine how long it takes for the ball to reach it's maximum height?
        c. Assume that $c/m = 5\ s^{-1}$. For v_0 = 5, 10, 15 and 20 m/s, plot the solution, x(t), versus the time.
        d. From your plots determine the rise time. Do these answers agree?
        e. What can you say about the time it takes for the ball to fall as compared to the rise time?
    ii. Develop a Simulink model to simulate the aircraft dynamics modelled as a transfer function $G(s) = \frac{964}{976s2 + 11.25s + 1}$ and the sensor for feedback as $H(s) = \frac{1}{0.01s + 1}$. Control the dynamics using an optimal PID controller to

improve the dynamics. Investigate various time domain specifications before and after the use of PID controller.

12. Introduction to toolboxes

Exercise: *Demonstrate any one toolbox.*

i. Demonstration of *genetic algorithm* toolbox and its application to solve a test problem.

ii. Demonstration of *fuzzy logic* toolbox and its application to solve a test problem.

iii. Demonstration of *Neural Networks* toolbox and its application to solve a test problem.

TEXT BOOKS:

1. Chapman, Stephen J, *MATLAB Programming for Engineers*, Cengage Learning, 2015.
2. Pratap, Rudra, *Getting Started with MATLAB 5-A Quick Introduction for Scientists and Engineers*, 1998.

REFERENCE BOOKS:

1. Otto, Stephen Robert, and James P. Denier. *An introduction to programming and numerical methods in MATLAB*. Vol. 1. London: Springer, 2005.
2. Hunt, Brian R., Ronald L. Lipsman, and Jonathan M. Rosenberg. *A guide to MATLAB: for beginners and experienced users*. Cambridge university press, 2014.
3. McMahon, David. *MATLAB demystified*. New York, NY: McGraw-Hill, 2007.
4. Beucher, Ottmar, and Michael Weeks. *Introduction to MATLAB & SIMULINK (A Project Approach)*. Laxmi Publications, Ltd., 2008.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=qGiKv3-02vw
2. https://www.youtube.com/watch?v=EtUCgn3T9eE
3. https://www.youtube.com/watch?v=1PSFLKiEV7U
4. https://www.youtube.com/watch?v=pFICO_syIIs

Web Resources:

1. https://matlabacademy.mathworks.com/

2. http://jeti.uni-freiburg.de/vorles_stat_num/getstart.pdf
3. https://www.geeksforgeeks.org/variable-names-in-matlab/
4. https://www.educba.com/loops-in-matlab/
5. https://uomustansiriyah.edu.iq/media/lectures/6/6_2020_05_02!10_51_42_AM.pdf
6. https://www.tutorialspoint.com/matlab/matlab_plotting.htm
7. https://www.fsd.ed.tum.de/wp-content/uploads/Training_TUM_GS_Simulink_14b.pdf
8. https://eelabs.faculty.unlv.edu/docs/guides/Simulink_Basics_Tutorial.pdf
9. https://www.cs.uic.edu/~jbell/CourseNotes/Matlab/Functions.html
10. https://www.cs.uic.edu/~jbell/CourseNotes/Matlab/

Course Code	Course Title	L	T	P	S	C
22CS105401	**PYTHON PROGRAMMING FOR ENGINEERS**	-	-	2	-	1

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides hands-on practice on Python programming fundamentals, Control structures, Sequences, Modular programming, Data representation and Data visualization.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the practical knowledge on python programming constructs.

CO2. Apply python programming constructs to provide solutions for logical and societal problems.

CO3. Use python modules for data representation and visualization.

CO4. Work independently or in teams to solve problems with effective communication.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	3	-	-	-	-	-	-	-
CO2	3	3	2	2	3	-	-	-	-	-	-	-
CO3	3	3	2	1	3	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	-
Course Correlation Mapping	2	2	3	3	3	-	-	-	3	3	-	-

Correlation Levels: 3: High; 2: Medium;1: Low

EXPERIENTIAL LEARNING

1) a) Write a python program to perform the arithmetic operations on two integer numbers.

   b) Write a python program to evaluate the following expressions by reading necessary inputs from the keyboard.

   i) $ax^2 + bx + c$ ii) $ax^4 + bx^2 + c$ iii) (ax - b) / (ax * b) iv) be^{kt}

2) a) Write a python program to swap two variable values without using a third variable.

   b) Write a python program to read four integer values separated with commas and display the sum of those four numbers.

3) a) Write a python program that computes amount payable after discount from the price and quantity. The discount on amount is as follows:
   i) No discount when the amount less than or equal to 2000.
   ii) 5% discount when the amount exceeds 2000.
   iii) 10% discount when the amount exceeds 5000.
   iv) 15% discount when the amount exceeds 10000.

   b) Write a python program to print the following pattern.

```
        1
    1   2   1
1   2   3   2   1
    1   2   1
        1
```

4) a) Write a python program to find Armstrong numbers between *N1* and *N2*, where *N1* and *N2* are two integer numbers and *N1*<*N2*.

   b) Write a python program to sort *n* numbers without using a predefined function.

5) a) Write a python program to read *n* student details like name, roll number, branch and age. Sort the student details based on their names and display.

   b) Write a python program to delete duplicate strings from a list of strings. (Insertion order should maintain after deleting duplicate string).

6) a) Write a python program to read *n* number of student details into nested list and convert that as a nested dictionary.

   b) Write a python program to generate a dictionary that contains numbers between 1 and *n* in the form (x, x+x).

7) a) Write a python function to perform the sum of integers that are sent to a function as variable length arguments.

   b) Write a python program to calculate GCD of two numbers using recursion.

8) a) Write a python program to perform arithmetic operations on NumPyarrays.

   b) Write a python program to perform following matrix operations using NumPy.

   i) Dot product ii) Matrix product iii) Determinant iv) Inverse

9) a) Write a python program to create Pandas DataFrameusing list of lists.

   b) Write a python program to load data from a CSV file into a Pandas DataFrame and perform basic operations on it.

10) a) Draw a Scatter Plot by considering an appropriate data set.

b) Draw histograms by considering an appropriate data set.

RESOURCES

REFERENCES:

1. R. Nageswara Rao, *Core Python Programming*, 3rd Edition, Dreamtech Press, 2021.
2. Paul J. Deitel, Harvey Deitel, Python for Programmers with Big Data and Artificial Intelligence Case Studies, Pearson, 2019.
3. Charles Dierbach, *Introduction to Computer Science using Python: A Computational Problem Solving Focus*, Wiley India, 2016.
4. Christian Hil, Learning Scientific Programming with Python, 2nd Edition, Cambridge University Press, 2020.

SOFTWARE/TOOLS:

1. Python 3.10
2. Jupyter Notebook/JupyterLab/IDLE/Google CoLab

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc19_cs41/preview
2. https://www.coursera.org/specializations/python
3. https://www.coursera.org/learn/python-for-applied-data-science-ai
4. https://www.youtube.com/watch?v=WGJJIrtnfpk
5. https://www.youtube.com/watch?v=_uQrJ0TkZlc
6. https://www.udemy.com/topic/python/
7. https://freevideolectures.com/course/2512/python-programming

Web Resources:

1. https://www.w3schools.com/python/
2. https://www.programiz.com/python-programming
3. https://www.geeksforgeeks.org/python-programming-language/
4. https://www.javatpoint.com/python-lists
5. https://www.learnpython.org/