ESTD: 1946

THE NATIONAL INSTITUTE OF ENGINEERING

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
Recognised by AICTE, New Delhi, Grant-in-Aid by Government of Karnataka,
Accredited by NAAC, New Delhi

2021 Outcome Based EDUCATION

BLOWN UP SYLLABUS (DRAFT)

2021-22

I Year B.E.

Common to All Branches

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TABLE OF SCHEME AND EXAMINATION FOR I SEMESTER (2021 Batch)

SCHEME OF TEACHING & EXAMINATION

I SEMESTER - Physics Cycle

Sl. No.	Course Code	Course Title	Teaching Department	Teaching Hours / Week				Examination			Credits
				Theory Lecture	Tutorial	Practical/ Drawing	Self-study Component				
				L	T	P	S	CIE Marks	SEE Marks	Total Marks	
1	21MA1C01	Calculus and Differential Equations	Maths	4	0	0	0	50	50	100	4
2	21PH1C01	Engineering Physics	Phy	3	0	0	0	50	50	100	3
3	21CV1C01	Engineering Mechanics	CE	3	0	0	0	50	50	100	3
4	21ME1C01	Mechanical Engineering Sciences	ME	3	0	0	0	50	50	100	3
5	21EE1C01	Basic Electrical Engineering	EEE	3	0	0	0	50	50	100	3
6	21PH1L01	Engineering Physics Laboratory	Phy	0	0	2	0	50	50	100	1
7	21EE1L01	Basic Electrical Sciences Laboratory	EEE	0	0	2	0	50	50	100	1
8	21HS1C01	Technical English -I	Hum.	1	0	0	0	50	50	100	1
9	21AE1C01	Innovation & Design Thinking	ME	1	0	0	0	50	50	100	1
							TOTAL	**450**	**450**	**900**	**20**

SCHEME OF TEACHING & EXAMINATION

I SEMESTER - Chemistry Cycle

Sl. No.	Course Code	Course Title	Teaching Department	Teaching Hours / Week				Examination			Credits
				Theory Lecture	Tutorial	Practical/ Drawing	Self-study Component				
				L	T	P	S	CIE Marks	SEE Marks	Total Marks	
1	21MA1C01	Calculus and Differential Equations	Maths	4	0	0	0	50	50	100	4
2	21CH1C01	Engineering Chemistry	Che	3	0	0	0	50	50	100	3
3	21CS1C01	Problem Solving through Programming	CSE	3	0	0	0	50	50	100	3
4	21EC1C01	Basic Electronics & Communications Engineering	ECE	3	0	0	0	50	50	100	3
5	21ME1C02	Computer Aided Engineering Drawing	ME	1	0	4	0	50	50	100	3
6	21CH1L01	Engineering Chemistry Laboratory	Che	0	0	2	0	50	50	100	1
7	21CS1L01	Computer Programming Lab	CSE	0	0	2	0	50	50	100	1
8	21HS1C01	Technical English -I	Hum.	1	0	0	0	50	50	100	1
9	21AE1C02	Sustainable Rural Development	CV	1	0	0	0	50	50	100	1
							TOTAL	**450**	**450**	**900**	**20**

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TABLE OF SCHEME AND EXAMINATION FOR II SEMESTER (2021 Batch)

SCHEME OF TEACHING & EXAMINATION
II SEMESTER - Physics Cycle

Sl. No.	Course Code	Course Title	Teaching Department	Teaching Hours / Week				Examination			Credits
				Theory Lecture	Tutorial	Practical/ Drawing	Self-study Component				
				L	T	P	S	CIE Marks	SEE Marks	Total Marks	
1	21MA2C01	Numerical Analysis and Linear Algebra	Maths	4	0	0	0	50	50	100	4
2	21PH2C01	Engineering Physics	Phy	3	0	0	0	50	50	100	3
3	21CV2C01	Engineering Mechanics	CE	3	0	0	0	50	50	100	3
4	21ME2C01	Mechanical Engineering Sciences	ME	3	0	0	0	50	50	100	3
5	21EE2C01	Basic Electrical Engineering	EEE	3	0	0	0	50	50	100	3
6	21PH2L01	Engineering Physics Laboratory	Phy	0	0	2	0	50	50	100	1
7	21EE2L01	Basic Electrical Sciences Laboratory	EEE	0	0	2	0	50	50	100	1
8	21HS2C01	Technical English -II	Hum.	1	0	0	0	50	50	100	1
9	21AE2C01	Innovation & Design Thinking	ME	1	0	0	0	50	50	100	1
							TOTAL	**450**	**450**	**900**	**20**

SCHEME OF TEACHING & EXAMINATION
II SEMESTER - Chemistry Cycle

Sl. No.	Course Code	Course Title	Teaching Department	Teaching Hours / Week				Examination			Credits
				Theory Lecture	Tutorial	Practical/ Drawing	Self-study Component				
				L	T	P	S	CIE Marks	SEE Marks	Total Marks	
1	21MA2C01	Numerical Analysis and Linear Algebra	Maths	4	0	0	0	50	50	100	4
2	21CH2C01	Engineering Chemistry	Che	3	0	0	0	50	50	100	3
3	21CS2C01	Problem Solving through Programming	CSE	3	0	0	0	50	50	100	3
4	21EC2C01	Basic Electronics & Communications Engineering	ECE	3	0	0	0	50	50	100	3
5	21ME2C02	Computer Aided Engineering Drawing	ME	1	0	4	0	50	50	100	3
6	21CH2L01	Engineering Chemistry Laboratory	Che	0	0	2	0	50	50	100	1
7	21CS2L01	Computer Programming Laboratory	CSE	0	0	2	0	50	50	100	1
8	21HS2C01	Technical English -II	Hum.	1	0	0	0	50	50	100	1
9	21AE2C02	Sustainable Rural Development	CV	1	0	0	0	50	50	100	1
							TOTAL	**450**	**450**	**900**	**20**

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Code: 21MA1C01 **Course: Calculus and Differential Equations**
Credits: 4 **L:T:P:S 4:0:0:0**
SEE: 50% **CIE: 50%**
SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	Basic knowledge of Calculus and Trigonometry
Learning objectives	1. To facilitate the students with a strong foundation of differential and integral calculus. 2. To impart knowledge of various methods of solving first and higher order ordinary differential equations

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Compute the radius of curvature and apply the concept of partial differentiation to estimate the extreme values of a function.	Apply
CO2	Apply the concept of multiple integrals to compute area and volume. Also solve certain improper Integrals using Beta -Gamma functions.	Apply
CO3	Solve first and higher order linear differential equations and also non-linear differential equations.	Apply
CO4	Operate vector differential operator 'del' on vector and scalar point functions and compute vector line integral using Green's theorem.	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	1	To be identified for each branch by Course Instructor			
CO2	3	2	-	-	-	-	-	-	-	-	-	1				
CO3	3	2	-	-	-	-	-	-	-	-	-	1				
CO4	3	2	-	-	-	-	-	-	-	-	-	1				

Mapping Strength: Strong– 3 Medium – 2 Low – 1

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Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Self Learning Hours
1.1	Polar curves -angle between the radius vector and tangent, angle between two curves	4	0	0
1.2	Pedal equations	2	0	0
1.3	Radius of curvature-Cartesian and pedal form	2	0	0
	Module – 2			
2.1	Taylor's Series expansion, Indeterminate forms, change of coordinates from Cartesian to cylindrical and spherical coordinates	4	0	0
2.2	Partial differentiation, Total derivatives-differentiation of composite functions	4	0	0
2.3	Maxima and minima of functions of two variables-application problems using Lagrange's multiplier method	2	0	0
	Module – 3			
3.1	Multiple integrals, evaluation of double and triple integrals, evaluation of double integral over a region	4	0	0
3.2	Applications-Area and Volume	1	0	0
3.3	Beta and Gamma functions: definitions, properties (without proof), simple problems	3	0	0
	Module – 4			
4.1	Mathematical modeling of vibrations, Differential equations of first order and first degree-exact and reducible to exact	3	0	0
4.2	Orthogonal trajectories (Cartesian and polar)	3	0	0
4.3	Solution of non-linear differential equations- solvable for p, solvable for y	2	0	0
	Module – 5			
5.1	Solution of higher order homogeneous differential equations	2	0	0
5.2	Solution of higher order non-homogeneous differential equations- P.I. for e^{ax}, sinax/cosax, x^n and $e^{ax}V$	4	0	0
5.3	Applications	2	0	0
	Module – 6			
6.1	Vector differentiation - Gradient, directional derivative- geometrical meaning and problems.	3	0	0
6.2	Divergence, Curl, Laplacian and their Physical meanings, irrotational vectors and applications	3	0	0
6.3	Vector Integration - line integral, Green's theorem (no proof) problems only.	2	0	0
	Total No. of Lecture Hours	**50**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

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Detailed Plan

Sr No. of Module	Number of related learning Objectives	Weeks/ Dates	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
Module-1 1.1	I	Week 1 Week 2	Title: Engineering Mathematics-I Delivered by: Prof. Jitendra Kumar, IIT Kharagpur **URL:** https://www.digimat.in/nptel/courses/video/111105121/L02.html	Video lectures on prerequisites and the summary of each module by internal faculty	Video lectures will be prepared using i-scribe and will be shared through Moodle/ google classroom	-------	**C** **H** **A** **L** **K** **&** **T** **A** **L** **K**
1.2	I	Week 3					
1.3	I	Week 4					
1.4	I						
Module-2 2.1	I	Week 5 Week 6					
2.2	I	Week 7 Week 8					
2.3	I	Week 9					
2.4	I						
Module-3 3.1	I	Week 10 Week 11					
3.2	I	Week 12					
3.3	I	Week12 Week 13					
3.4	I						
Module-4 4.1	II	Week 1 Week 2					
4.2	II	Week 2 Week 3					
4.3	II	Week 4					
4.4	II						
Module-5 5.1	II	Week 5					
5.2	II	Week 6 Week 7					
5.3	II	Week 8					
5.4	II						
Module-6 6.1	II	Week 9 Week 10					
6.2	II	Week 10 Week 11					
6.3	II	Week 12					
6.4	II						

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Assessment Pattern:

Bloom's level			Continuous Internal Examination		End Semester Examination
	Test 1	Test 2	Assignment (5 Marks)	Quiz (5 Marks)	
Remember	✓	✓	-	✓	✓
Understand	✓	✓	✓	✓	✓
Apply	✓	✓	✓	-	✓

Textbooks:

1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley publications, 10th edition.
2. Thomas's Calculus, Maurice D Weir, Joel Hass, Pearson, 13th edition.
3. Advanced engineering mathematics, Jain and Iyyengar, Narosa publications, 5th edition.

Reference Books:

1. Calculus: One variable calculus with an introduction to Linear Algebra, Vol. 1, Tom Apostol, Wiley publications, 2nd edition.
2. Calculus: Multi-Variable Calculus and Linear Algebra with applications to differential equations and Probability, Vol.2, Tom Apostol, Wiley publications, 2nd edition.

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Course Code: 21PH1C01 / 21PH2C01 **Course Name: Engineering Physics**
Credits: 3 **L:T:P:S :- 3: 0: 0: 0**
SEE: 50% Marks **CIE: 50% Marks**
SEE Hours: 3 **Max. Marks: 100**

Prerequisites if any	None
Learning objectives	1. Learn the basic principles of Physics pertaining to Engineering field. 2. To understand and explain the concepts of Physics relevant to Engineering and Technology 3. Applying the knowledge of Physics in solving problems.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Remember the laws of Physics pertaining to Engineering field	Remember
CO2	Discuss the Physical systems using theories in Physics	Understand
CO3	Apply the fundamental concepts to derive the expression and solve the problems	Apply
CO4	Analyze the behavior of photons and material particles by applying the knowledge of Quantum Physics	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	1	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

	Module 1: Modern Physics	No. of Lecture Hours	No. of Tutorial Hours	Self Learning Hours
1.1	Special theory of relativity: Frames of reference, Galilean transformations, Postulates of relativity, Lorentz transformation equations in one dimension (No derivation), Lorentz - Fitzarald length contraction, Time dilation, variation of mass with velocity (no derivation), Einstein's mass energy relation, relationship among the total energy, rest energy and the momentum.	4	0	0
1.2	Particle nature of radiation: Blackbody radiation spectrum, Compton effect, Wave nature of particle: de Broglie hypothesis – de Broglie wavelength, Matter waves, Phase velocity, group velocity, expression for group velocity, relation between group velocity and particle velocity (relativistic method), Characteristic properties of Matter waves. Heisenberg's uncertainty principle and its physical significance (no derivation), Application of uncertainty principle (Non - existence of electron in the nucleus).	4	0	0

Module 2: Quantum Mechanics and Quantum theory of free-electron				
2.1	Wave function: Properties and Physical significance (including Probability density and Normalization of wave function), Setting up of one dimensional time independent Schrödinger wave equation, Application of Schrödinger wave equation: Energy Eigen values and Eigen functions of a particle in a potential well of infinite depth and extension to free particle.	3	0	0
2.2	Classical free-electron theory: Salient features of classical free electron theory, drift velocity, mobility, relaxation time, expression for conductivity, Failure of classical free-electron theory. Quantum free-electron theory – Assumptions, Fermi energy, Fermi factor, Variation of Fermi factor with temperature and energy, Density of states (with derivation), Expression for Fermi Energy at zero Kelvin, Merits of Quantum free electron theory.	5	0	0
Module 3: Physics of Materials				
3.1	**Semiconductors:** Classification - Intrinsic and extrinsic semiconductors, Intrinsic semiconductors: electron and hole concentration (only mention of expression), Fermi level in intrinsic semiconductors, Conductivity of semiconductors (derivation), direct and indirect band gap semiconductors.	3	0	0
3.2	**Dielectrics:** Dielectric constant and polarisation of dielectric materials, Types of polarization, Equation for internal fields in solids (one dimensional), Clausius – Mossotti equation.	3	0	0
3.3	**Superconductors:** Properties, Meissner Effect, Type-I, Type-II superconductors, BCS Theory of superconductors, Applications: superconducting magnets, MAGLEV.	2	0	0
Module 4: Lasers and Optical Fibers				
4.1	Interaction of radiation with matter: absorption, spontaneous emission and stimulated emission; Einstein's coefficients (expression for energy density), Requisites of a Laser system, Condition for Laser action, Principle, Construction and working of Ruby and Carbon dioxide (CO_2) Laser, Applications of Laser - Holography: Principle of Recording and reconstruction of 3-D images, Lasers in defense, LIDAR (measurement of pollutants).	5	0	0
4.2	Propagation mechanism in optical fibers, Angle of acceptance, Numerical aperture, Types of optical fibers and modes of propagation, Attenuation, Applications – Block diagram and discussion of point to point communication: Merits and demerits of optical fiber in communication, optical fiber sensors.	3	0	0
Module 5: Theory of Vibrations and Material Characterization				
5.1	Free vibrations, Damped vibrations: Cases of over damping, critical damping and under damping, Forced vibrations, Amplitude resonance, Ultrasonics: Production of Ultrasonic waves using piezoelectric oscillator, Ultrasonic interferometer.	4	0	0
5.2	Introduction to Nanomaterials: Effect of nanoscale dimension, Classification of nanomaterials, Properties and applications of nanosystems, Carbon Nanotubes (CNTs).	2	0	0
5.3	Principle, construction and working of Atomic Force Microscopy (AFM), Fourier transform infrared spectroscopy (FTIR), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM).	2	0	0
	Total No. of Lecture Hours	**40**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

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Detailed Plan

Sr No. of Module	Number of related learning Objectives	Weeks/ Dates	Online Mode		ICT Tool/ Platform / LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
Module-1 1.1-1.2	3	2	Online Videos in Youtube and Department Youtube channel	-	PPT/ videos/ Moodle	-	Blackboard
Module-2 2.1-2.2	3	2		-		-	
Module-3 3.1-3.3	3	2		-		-	
Module-4 4.1-4.2	3	2		-		-	
Module-5 5.1-5.3	3	2		-		-	

Assessment Pattern:

Bloom's level	Continuous Internal Examination			End Semester Examination
	Test 1	Test 2	Assignment	
Remember	✓	✓	✓	✓
Understand	✓	✓	✓	✓
Apply	✓	✓	✓	✓
Analyze	✓	✓	✓	✓
Evaluate	-	-	-	-
Create	-	-	-	-

Text Books:

1. Concepts of Modern Physics by Arthur Beiser, Shobhit Mahajan & S. Rai Choudhury, Tata Mc Graw – Hill Publication, 7th Edition, 2017
2. Solid State Physics by S O Pillai, New Age International, 9th Edition, 2020

Reference Books:

1. Perspectives of Modern Physics-By Arthur Beizer, Tata McGraw Hill.
2. Quantum Mechanics for Scientist and Engineers by David A B and Miller, *Cambridge Press.*
3. Introduction to solid state physics-By C. Kittel, Wiley India Pvt. Ltd.
4. Introduction to solid state physics- By N.D. Mermin & Aschcroft, Cengage Learning, Inc.
5. Electronic Devices and Circuits - by Jacob Millman and Christos C. Halkias
6. Laser Fundamentals-By Willam T Silfvast, Cambridge University Press.
7. Introduction to Fiber Optics by Ghatak and Thyagarajan.
8. Optoelectronics: An Introduction - by J. Wilson & J. F. B. Hawkes
9. Introduction to sensors - by John Vetelino and Aravind Reghu
10. A Text book of Osicllations, Waves and Acoustics- By M Ghosh and Bhattacharya, S ChandPublication
11. Waves and Oscillations – By N Subramanyam and Brijlal, Vikas Publishing house Pvt. Ltd.
12. Nano systems- Molecular Machinery, Manufacturing and Computation-By K. Eric Drexler, J. Wiley & Sons.

13. Nanotechnology Principles and Practices - by Sulabha K. Kulkarni

14. Engineering Physics – By Gauer & Guptha, Dhanpathrai and Sons, New Delhi

Online Resources

1. Relativity: https://youtu.be/cJeBkJHCPjE
2. CO_2 Laser: https://youtu.be/OXJSXITi1Zw
3. Nanotechnology: https://youtu.be/ebO38bbq0_4
4. Modern Physics & Semiconductors: https://nptel.ac.in/courses/122/101/122101002/#
5. Department YouTube Channel: https://www.youtube.com/channel/UC6_wc9qDjUU6EBicaTeckjQ

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Course Code: 21CV1C01 / 21CV2C01 **Course Name: Engineering Mechanics**
Credits: 3 **L:T:P:S -3:0:0:0**
SEE: 50% Marks **CIE: 50% Marks**
SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	None
Learning objectives	1. Construct "Free Body Diagrams" of real-world problems and apply Newton's Laws of motion and vector operations to evaluate equilibrium of particles and bodies. 2. Identify the moment of a force and calculate its value about a specified axis. Define the moment of a couple. 3. To develop the student's ability to find out the centre of gravity and moment of inertia and their applications 4. Describe the concept of dry friction and analyse the equilibrium of rigid bodies subjected to this force.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Analyze coplanar concurrent forces acting on particles	Apply
CO2	Analyze coplanar non-concurrent forces acting on rigid bodies	Apply
CO3	Compute centroid and moment of inertia of plane geometrical and composite areas	Apply
CO4	Analyze coplanar concurrent and non-concurrent forces acting on bodies causing friction	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	-	-	-	-	-	-	-	-	-		3	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-		3	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-		3	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-		3	-	-	-	-

Strong (3) **Medium(2)** **Low (1)**

Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Self Learning Hours
1.1	Classifications of Mechanics, Definitions – Particle, rigid body, force, mass, time, space force system	1	0	0
1.2	Newton's laws, system of units, sign conventions	1	0	0
1.3	Principle of transmissibility of forces	1	0	0
1.4	Concurrent forces in plane: Introduction	1	0	0
1.5	Resultant forces – Parallelogram law, Triangle law & Polygonal law	2	0	0
1.6	Resolution and component of forces	1	0	0
1.7	Resultant of several concurrent forces, free body diagram	2	0	0
1.8	Equilibrium conditions, Lami's Theorem	1	0	0
1.9	Applications: Analysis of Pin jointed Plane Trusses (Method of Joints)	2	0	0

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Module – 2				
2.1	Introduction, Moment of a force about a point	1	0	0
2.2	Varignon's Theorem, Moment of a couple	1	0	0
2.3	Resolution of a force into force-couple system	1	0	0
2.4	Coplanar parallel force system	1	0	0
2.5	Coplanar Non concurrent system	1	0	0
2.6	Resultant of Coplanar non concurrent system	1	0	0
2.7	Equilibrium of Rigid bodies	1	0	0
2.8	Applications of statics of rigid bodies – Types of support in two dimensions, beams, types of loads, multi-force members.	3	0	0
Module – 3				
3.1	Introduction to centre of gravity, centroid of area	2	0	0
3.2	centroid of basic geometrical figures	2	0	0
3.3	centroid of composite areas	2	0	0
Module – 4				
4.1	Introduction, Second moment of area of plane figures	2	0	0
4.2	Radius of gyration, parallel and perpendicular axis theorem	2	0	0
4.3	Moment of inertia of plane area by integration – Moment of inertia of standard structural sections	2	0	0
Module – 5				
5.1	Types of Friction, characteristics of dry friction, Laws of Frictions	2	0	0
5.2	Angle of Friction, Angle of repose, Cone of Friction	2	0	0
5.3	Application – Body on Horizontal plane and inclined plane subjected to forces, two bodies in contact, ladder friction	2	0	0
	Total No. of Lecture Hours	**40**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

Detailed Plan							
Sr No. of Module	**Number of related learning Objectives**	**Weeks/ Dates**	**Online Mode**		**ICT Tool/ Platform/ LMS**	**Face-to-face Mode**	
			Resource (OER/ URL/ IM/ CP)	**Activity (Describe activity in detail)**		**Resource (OER/ URL/ IM/ CP)**	**Activity**
Module-1 1.1	L1	Week 1	-	-	**Moodle LMS**	IM (PPT)	Blackboard
1.2	L1	Week 1	-	-		-	
1.3	L1	Week 2	-	-		-	
1.4	L1	Week 2	-	-		-	
1.5	L1	Week 2	-	-		-	
1.6	L1	Week 3	-	-		-	
1.7	L1	Week 3	-	-		-	
1.8	L1	Week 3	-	-		-	
1.9	L1	Week 4	-	-		-	
Module-2: 2.1	L2	Week 4	-	-		IM (PPT)	
2.2	L2	Week 4	-	-		-	
2.3	L2	Week 5	-	-		-	
2.4	L2	Week 5	-	-		-	
2.5	L2	Week 5	-	-		-	
2.6	L2	Week 6	-	-		-	
2.7	L2	Week 6	-	-		-	
2.8	L2	Week 6	-	-		-	
Module-3: 3.1	L3	Week 7	-	-		IM (PPT)	
3.2	L3	Week 7	-	-		-	
3.3	L3	Week 7	-	-		-	
Module-4: 4.1	L3	Week 8	-	-		IM (PPT)	
4.2	L3	Week 8	-	-		-	

4.3	L3	Week 8	-	-		-	
Module-5: 5.1	L4	Week 9	-	-		IM (PPT)	
5.2	L4	Week 9	-	-		-	
5.3	L4	Week 9	-	-		-	

Assessment Pattern:

Bloom's level	Continuous Internal Examination			End Semester Examination
	Test 1	Test 2	Activity	
Remember	✓	✓	✓	✓
Understand	✓	✓	✓	✓
Apply	✓	✓	✓	✓
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

Text Books:

1. S. Rajasekharan, G. Sankarsubramanian, ***"Engineering Mechanics- Statics and Dynamics"-*** Vikas Publishing House, 2011

Reference Books:

1. Stephen Timoshenko, D. Young, J Rao **"Engineering Mechanics",** Tata-McGraw Hill, Special Indian edition, 2006
2. Beer FP and Johnson ER, **"Mechanics for Engineers- Dynamics and Statics",** 3rd SI Metric edition, Tata McGraw Hill, 2008
3. Shames IH,**"Engineering Mechanics – Statics & Dynamics",** PHI, 2009
4. J. L. Meriam and L. G. Kraige, **"Engineering Mechanics: Statics",** Don Fowley Publishers, 2006.
5. Prasad IB, "**Text Book of Applied Mechanics",** Khanna Publishers,2001
6. P.N. Chandra Mouli, **Engineering Mechanics"** PHI Learning, 2011

ESTD : 1946

Course Code: 21ME1C01/ 21ME2C01 **Course: Mechanical Engineering Sciences**
Credits: 3 **L:T:P:S 3:0:0:0**
SEE: 50% Marks **CIE: 50% Marks**
SEE Hours: 3 Hrs **Max. Marks: 100**

Prerequisites if any	None
Learning objectives	1. Introduce concept of energy, prime movers, turbomachines, refrigeration, power transmission, manufacturing processes and robotics. 2. Familiarize the recent technologies like e-mobilty, CNC and Additive manufacturing.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Review the sources of energy & summarize the working principle of internal combustion engine.	Remember Understand Apply
CO2	Appraise the working principles of Turbo machines and analyse the working of Refrigeration and Air Conditioning.	Remember Understand Apply
CO3	Categorize the mechanism used in machines and summarize the working principle of typical gear & belt drive transmission systems	Remember Understand Apply
CO4	Compare the properties and applications of Engineering Materials	Remember Understand Apply
CO5	Discuss the principles of operation of a Lathe, CNC and Robotics	Remember Understand Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	-	1	-	-	1	-	1		3	3	-	1
CO2	3	2	1	-	-	-	1	-	-	1	-	1		3	2	-	1
CO3	3	2	1	-	-	-	-	-	--	1	-	1		3	-	-	1
CO4	3	1	1	-	-	-	1	-	-	1	-	1		3	1	-	1
CO5	3	1	1	-	-	-	-	-	-	1	-	1		3	-	-	1

S – Strong (3) M – Medium (2) L – Low (1)

ESTD : 1946

Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Self Learning Hours
1.1	**Introduction:** Role of Mechanical Engineers in technology & society, Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace and Marine sectors	02	-	-
1.2	**Energy Sources:** Review of energy sources; Conventional (hydel energy) and non-conventional (solar flat plate collector) energy sources.	02	-	-
1.3	**Prime Movers:** Classification, internal combustion engines: brief description of 4-stroke, petrol & diesel engines: working principle, simple numerical problems on I.C. engine.	04	-	-
1.4	**Introduction to e-Mobility:** Components of Hybrid & Electric Vehicles, Batteries, Drives & Transmission Systems, Advantages & Disadvantages of e-Mobility.	02	-	-
	Module – 2			
2.1	**Turbomachines:** Hydraulic turbine: introduction, classification, working principle of impulse (Pelton wheel) & reaction (Francis) turbines. Pumps: introduction, classification, working principle of centrifugal and reciprocating pumps.	04	-	-
2.2	**Refrigeration & Air-conditioning:** Introduction, Working principle of Vapour Compression & Air-conditioning systems	02	-	-
	Module – 3			
3.1	**Power Transmission:** Classification of Power transmission system	01	-	-
3.2	***Gear Drives:*** Classification, Spur, Helical, Bevel and Worm Gears, Expression for velocity ratio [without derivations], Gear trains: simple & compound gear trains and Simple numerical	02	-	-
3.3	***Belt Drives:*** Components of belt drive and concept of velocity ratio; Types of belt drives, Flat-Belt Drive, V-Belt Drive, application of Belt Drives.	02	-	-
3.4	**Fundamentals of Mechanical Linkages:** Definitions of Machines and Mechanisms. Four bar mechanism and its inversions (Slider Crank and Slotted Lever).	01	-	-
	Module – 4			
4.1	**Properties, Composition and Industrial Application of Engineering Materials**: *Metals*-Ferrous: Tool steels and stainless steels. Non-ferrous /metals: aluminium alloys. *Ceramics*- Glass, optical fibre glass, cermets. Composites- Fibre reinforced composites, Metal matrix Composites. Smart materials.	03	-	-
4.2	**Manufacturing processes:** Introduction, classification& applications.	01	-	-
4.3	***Casting*:** Principle, sand & die casting procedure, Properties of moulding sands & die steels, applications.	02	-	-
4.4	**Additive Manufacturing:** Need for additive processes and description of a typical process.	02	-	-
	Module – 5			
5.1	***Fundamentals of Machine Tools and Operations:*** Fundamentals of Machining and machine tools, Material removal operations: Drilling, Milling &Grinding	02	-	-
5.2	**Lathe:** Working Principle of a typical lathe, Components of a lathe and operations on a lathe: Turning, facing, and drilling. Comparison of conventional & CNC Lathes.	03	-	-
5.3	**Introduction to Modern Manufacturing Tools:** CNC: Introduction, components of CNC, advantages and applications of CNC, CNC Machining Centres and Turning Centres	02	-	-
5.4	**Robotics:** Robot anatomy, Joints & links, common Robot configurations. Applications of Robotics in Material Handling, Processing, Assembly and Inspection. Concepts of Smart Manufacturing and Industrial IoT.	03	-	-
	Total No. of Lecture Hours	**40**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

Detailed Plan

Sr No. of Module	Number of related learning Objectives	Weeks	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
1.1	1	02	-	-	PPT, Smart Board, Moodle	-	-
1.2	1	02	-	-		-	Demo in RET Lab
1.3	1	04	-	-		-	Demo in IC Engine Lab
1.4	2	02	-	-		-	-
2.1	1	04	-	-		NOC: Introduction to Turbo machinery by IIT Madras – NPTEL	Demo in Fluid Mechanics Lab
2.2	1	02	-	-		-	Demo in Heat Transfer Lab
3.1	1	01	-	-		-	Demo on models of mechanisms
3.2	1	02	-	-		-	
3.3	1	02	-	-		-	
3.4	1	01	-	-		NOC: Theory of Mechanisms by IIT Madras – NPTEL	
4.1	1	03	-	-		NOC: Basics of Materials Engineering by IIT Madras – NPTEL	Demo in CMR
4.2	1	01	-	-		NOC: Manufacturing Processes _ Casting and Joining by IIT Kanpur – NPTEL	Demo in Foundry
4.3	1	02	-	-			
4.4	2	02	-	-		-	Demo in Robotics studio
5.1	1	02	-	-		NOC: Elements of metal cutting, Machine tools, gear cutting and CNC machining by IIT, Kharagpur – NPTEL.	Demo in Machine Shop
5.2	1	03	-	-			
5.3	2	02	-	-			Demo in CNC Center
5.4	1	03	-	-		NOC: Introduction to Robotics by IIT Kanpur – NPTEL	Demo in Robotics studio

ESTD : 1946

Assessment Pattern:

Bloom's level	Continuous Internal Examination			End Semester Examination
	Test 1	Test 2	Assignment	
Remember	✓	✓	✓	✓
Understand	✓	✓	✓	✓
Apply	✓	✓	✓	✓
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

Text Books:

1. Elements of Mechanical Engineering by K.P. Roy, S K Hajra Choudhury, A K Hajra Choudhury, Media Promoters and Publishers, 2016
2. An Introduction to Mechanical Engineering by Jonathan Wickert, Kemper Lewis, Cengage Learning, 2017, 4th Edition

Reference Books:

1. Elements of Mechanical Engineering by K R Gopalakrishna, Subhash Publishers, Bangalore, 2018
2. Workshop Technology, Vol. I & II, - by SK Hajra Choudhury, A K Hajra Choudhury, Nirjhar Roy, 11th Edition 2001, Media Promoters and Publishers, Mumbai.

ESTD : 1946

Code: 21EE1C01 / 21EE2C01 **Course: Basic Electrical Engineering**
Credits: 3 **L:T:P:S:- 3:0:0:0**
SEE: 50% **CIE: 50%**
SEE Hours: 3 **Max. Marks: 100**

Prerequisites if any	None
Learning objectives	1. Discuss the fundamentals of power generation sources, structure and operation of power system along with safety aspects. 2. Analyse the electrical circuit parameters in DC and AC circuit. 3. Demonstrate the construction, operation and characteristics of DC and AC machines.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand the fundamentals of power generation sources, structure and operation of power system along with safety aspects.	Understand
CO2	Analyse AC and DC circuits	Analyse
CO3	Describe the construction, operation and characteristics of DC and AC machines.	Remember

Mapping with POs and PSOs:

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

PSO1	PSO2	PSO3	PSO4
To be identified for each branch by Course Instructor			

Mapping Strength: **Strong– 3** **Medium – 2** **Low – 1**

Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Self Learning Hours
1.1	Introduction to generation, transmission and distribution of electrical power	1	0	0
1.2	Concept of AC and DC, generation of power from conventional and non-conventional energy sources	2	0	0
1.3	Concept of grid and need for interconnection of grids	1	0	0
1.4	Benefits of integration of renewable energy sources to grid	1	0	0
1.5	Concept of power and energy. Tariff structure for electrical energy consumption	2	0	0
	Module – 2			
2.1	Fundamentals of AC and DC waveforms, representation of AC and DC quantities	1	0	0
2.2	Average and RMS values, form factor, peak factor	1	0	0
2.3	Electric circuit analysis using Ohms law and Kirchhoff's laws. Current and Voltage division rule	1	0	0
2.4	Analysis of single phase AC circuits with R, L, C, RL, RC and RLC series and parallel configuration, Power factor.	5	0	0
	Module – 3			
3.1	Faraday's laws. Static and dynamically induced EMF	1	0	0
3.2	Construction and working principle of DC Machine	1	0	0
3.3	DC Generator EMF equation. Back emf in DC motor	2	0	0
3.4	Classification of DC motor, DC Motor Characteristics and applications	1	0	0
3.5	Construction and working principle of single phase transformer.	1	0	0
3.6	EMF equation and losses in transformer	2	0	0

Module – 4				
4.1	Advantages of three phase circuits	1	0	0
4.2	Relation between line and phase quantities in STAR and DELTA connected systems.	2	0	0
4.3	Construction and working principle of Synchronous Generator, EMF equation.	2	0	0
4.4	Construction and working principle of three phase Induction Motor	2	0	0
4.5	Slip, slip speed and frequency of rotor EMF	1	0	0
Module – 5				
5.1	Construction and working principle of BLDC Motor and Stepper Motor and their applications.	2	0	0
5.2	Introduction to domestic wiring, Fuse, MCB, and Relay.	2	0	0
5.3	Necessity of earthing, difference between earthing and grounding and types of grounding	2	0	0
5.4	Electric shocks, hazards and safety precautions	1	0	0
5.5	standards of wiring as per BIS	1	0	0
	Total No. of Lecture Hours	**39**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

Detailed Plan

Sr No. of Module	Number of related learning Objectives	Weeks	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
1.1	1	1	Online resources from VTU e-learning portal & nptel	-	Moodle LMS	Instructor made resource (PPT & PDF)	Blackboard & PPT
1.2	1			-			
1.3	1	2		-			
1.4	1			-			
1.5	1			-			
2.1	1	1		-			
2.2	1			-			
2.3	1			-			
2.4	1	2		-			
3.1	1	1		-			
3.2	1			-			
3.3	1			-			
3.4	1	1		-			
3.5	1			-			
3.6	1			-			
4.1	1	1		-			
4.2	1			-			
4.3	1	1		-			
4.4	1			-			
4.5	1			-			
5.1	2	1		-			
5.2	2			-			
5.3	2	1		-			
5.4	2			-			
5.5	2	1		-			

ESTD :1946

Assessment Pattern:

Bloom's level	Continuous Internal Examination			End Semester Examination
	Test 1	Test 2	Assignment	
Remember	✓	✓	✓	✓
Understand	✓	✓	✓	✓
Apply	✓	✓	✓	✓
Analyze	✓	✓	✓	✓
Evaluate	-	-	-	-
Create	-	-	-	-

Text Books:

1. Basic Electrical Engineering by D. C. Kulshreshtha, McGraw Hill, Revised 1st Edition, 2013
2. Electrical Engineering by D. P. Kothari and I. J. Nagrath, Tata McGraw Hill, 4th Edition, 2019.

Reference Books:

1. Electrical Engineering Fundamentals by Warren Vincent Del Toro, Prentice Hall Publications.
2. Electrical Technology by H Cotton, CBS Publishers & Distributors, 2004.

Online Resources:

1. Structure of Electric Power Systems: https://electrical-engineering-portal.com/electric-power-systems
2. Kirchoff's Laws: https://nptel.ac.in/courses/108/108/108108076/
3. Analysis of single phase AC circuits: http://elearning.vtu.ac.in/econtent/courses/video/BS/ELE1525.html
4. Working of DC machine:http://elearning.vtu.ac.in/econtent/courses/video/BS/15ELE25.html
5. Construction and working principle of transformer: https://nptel.ac.in/courses/108/108/108108076/
6. Three phase star and delta connected systems: http://elearning.vtu.ac.in/econtent/courses/video/BS/ELE1525.html

ESTD : 1946

Course Code: 21PH1L01 / 21PH2L01 **Course Name: Engineering Physics Laboratory**
Credits: 1 **L:T:P:S :- 0: 0: 2: 0**
SEE: 50% Marks **CIE: 50% Marks**
SET Hours: 2 **Max. Marks: 50**

Prerequisites if any	None
Learning objectives	1. To learn and apply the principles of physics through experiments.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs		**Bloom's level**
CO1	Understand the basic concepts and principles of experimental physics	Understand
CO2	Apply the knowledge of basic concepts and principles of experimental physics in measurements of various physical quantities which in turn give insight into the behavioral properties of radiation and matter.	Apply

Mapping with POs and PSOs:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	-	-	-	-	-	1	-	-	1		-	-	-	-	-
CO2	3	1	-	-	-	-	-	-	1	-	-	1		-	-	-	-	-

Mapping Strength: Strong– 3 Medium – 2 Low – 1

List of Experiments

Sl No	Experiment
1	Determination of Resonant frequency using Series and Parallel LCR Circuits
2	Determination of Dielectric constant by charging and discharging of capacitor
3	Determination of Band Gap of a Semiconductor using four probe method
4	Verification of Inverse Square law using GM counter experiment
5	Determination of Planck's Constant using LED
6	Verification of Stefan's law
7	Determination of wavelength of Laser source using diffraction grating
8	Determination of Moment of inertia of irregular body using Torsional pendulum
9	Determination of Fermi energy of Copper
10	Determination of Spring constant in Series and Parallel Combination
11	Determination of wavelength of a monochromatic light using Newton's rings
12	Determination of thickness of small objects using Air wedge

Detailed Plan

Sr No. of Experiment	Number of related learning Objectives	Weeks / Dates	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode		Duration in Minutes
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity	
Experiment-1	1	1	vlab.co.in and Videos on Department you tube channel	-	-	-	Lab Equipments	180
Experiment-2	1	1		-	-	-		
Experiment-3	1	1		-	-	-		
Experiment-4	1	1		-	-	-		
Experiment-5	1	1		-	-	-		
Experiment-6	1	1		-	-	-		
Experiment-7	1	1		-	-	-		
Experiment-8	1	1		-	-	-		
Experiment-9	1	1		-	-	-		
Experiment-10	1	1		-	-	-		

Assessment Pattern:

Bloom's level	Continuous Internal Examination	End Semester Examination
	CIE	
Remember	✓	✓
Understand	✓	✓
Apply	✓	✓
Analyze	-	-
Evaluate	-	-
Create	-	-

Text Book:

1. Laboratory manual for Engineering Physics Lab.

Online Resources:

1. Virtual labs: vlab.co.in
2. Department YouTube Channel: https://www.youtube.com/channel/UC6_wc9qDjUU6EBicaTeckjQ

ESTD : 1946

Code: 21EE1L01 / 21EE2L01 **Course: Basic Electrical Sciences Laboratory**
Credits: 1 **L:T:P:S:- 0:0:2:0**
SEE: 50% **CIE: 50%**
SEE Hours: 3 **Max. Marks: 100**

Prerequisites if any	None
Learning objectives	1. Practical exposure to various electrical wiring, circuit parameters and safety aspects. 2. Practical exposure to some of the electronic components and their usage

Course Outcomes:
On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Choose type of wiring to control the electrical apparatus	Apply
CO2	Measure the electrical parameters across the given equipment.	Evaluate
CO3	Describe the operation of a diode and its application as a rectifier	Apply
CO4	Analyze and Design operations of logic circuits, multivibrator and amplifiers using ICs	Evaluate

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	-	-	2	-	-	-	-	-	2	To be identified for each branch by Course Instructor			
CO2	3	3	2	-	-	2	-	-	-	-	-	2				
CO3	3	3	2	-	-	2	-	-	1	2	-	2				
CO4	3	3	2	-	2	2	-	-	1	2	-	2				

Mapping Strength: **Strong– 3** **Medium – 2** **Low – 1**

List of experiments

Sl.No.	Experiment	Hands on/Virtual
1.	Two way and Three-way control of Lamp	Hands on
2.	Measurement of Power, current and power factor across different lighting loads	Hands on
3.	Measurement of Resistance and inductance across a choke coil	Hands on
4.	Measurement of earth resistance using Meggar	Hands on
5.	Operating characteristics of fuse	Hands on
6.	Transfer characteristics of RC networks and PN junction Diode	Hands on
7.	AC to DC using Rectifiers - half wave and full wave	Hands on
8.	Duty cycle calculation using Timer (555-IC) Astable and monostable	Hands on/Simulation
9.	Study of Logic gates – AND, OR, NAND, NOR, NOT and XOR	Hands on/Simulation
10.	Design amplifiers using OpAmps (inverting / non-inverting)	Hands on/Simulation

Virtual lab link:

http://vlabs.iitkgp.ac.in/be/

Assessment Pattern:

Bloom's level	Continuous Internal Examination	End Semester Examination
Apply	√	√
Analyze	√	√
Evaluate	√	√

Course Code: 21HS1C01 **Course: Technical English -I**
Credit: 1 **L:T:P:S:- 1:0:0:0**
SEE: 50% **CIE: 50%**
SEE Hours: 2 **Max . Marks: 100**

Prerequisites if any	None
Learning objectives	

Course Outcomes:

COs	Course Outcomes	Bloom's level
CO1	Conceptualize, Design and Develop good visual Presentations using technology. Will be innovative and creative. Voice opinion with confidence, develop good interpersonal and intrapersonal skill	Create
CO2	Interpret different accents and speak comprehensibly to a global audience	Understand
CO3	Apply and analyze concepts in communication through self and peer appraisal for becoming successful professionals	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	-	-	-	-	-	3	3	3	-	3	-	-	-	-	-
CO2	-	-	-	-	-	-	-	3	3	3	-	3	-	-	-	-	-
CO3	-	-	-	-	-	-	-	3	3	3	-	3	-	-	-	-	-

3– Strong 2 – Medium 1 – Low

Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Self Learning Hours
1	Making Video Production / Documentary film : LSRW basics and its application through :- Face to face, telephone and written communication (email and letter); voice over, narration • Presentation skills – Verbal and Visual, extempore and public • speaking • Identifying the topic, people and locations • Script writing with questions and conducting Live interviews. • Using music and effects to add creativity to Presentation • Using subtitles for greater clarity • Editing to bring out the assignment professionally and give proper acknowledgement reference to learn the importance of Plagiarism	1	5	0
	Module – 2			
2.1	Learning with VTU software – E Client	1	1	0
	Module – 3			
3.1	Listening skills: Understand different accents and develop a neutral comprehensible accent. Listening to songs and speeches and filling in the blanks	1	1	0
	Module – 4			
4.1	S-T-A-R: (Speak – Transcribe – Analyze - Record) – learn to speak in comprehensible accent, diction, without Mother Tongue Influence and in correct grammar	1	1	0

Module – 5				
5.1	Analyse for grammar and word usage mistakes Analyse the tone, articulation and eloquence of speech	1	2	0
	Total No. of Lecture Hours	**5**		
	Total No. of Tutorial Hours		**10**	**-**
	Total No. of Self learning Hours			**0**

Sr No. of Module	Number of related learning Objectives	Weeks/ Dates	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
Module-1 1.1		4 weeks		Forming groups Group Discussion Task distribution among group members Verbal and written communication Shooting in identified locales Interviews with identified officials Editing			Forming groups Group Discussion Task distribution among group members Verbal and written communication Shooting in identified locales Interviews with identified officials Editing
Module-2		2 week	Software provided by VTU				
Module 3		2 weeks	Songs and speeches				
Module 4 & 5		3 Weeks	Multimedia installed in the system				

Text Books:

1. Kings English by Henry Watson Fowler and Francis George Fowler, Kessinger Publishing, LLC, 2009
2. A Textbook of English and Communication Skills by Richa Mishra & Ratna Rao, Macmillan Education, 2019

Reference Books:

1. Objective Grammar for competitive exams
2. Common errors
3. IELTS books

ESTD : 1946

Course Code: 21AE1C01 / 21AE2C01 **Course: Innovation and Design Thinking**
Credits: 1 **L:T:P:S:- 1:0:0:0**
SEE: 50% Marks **CIE: 50% Marks**
SEE Hours: 2 Hrs **Max. Marks: 50**

Prerequisites if any	None
Learning objectives	1. To bring awareness on innovative design and new product development. 2. To explain the basics of innovation and design thinking. 3. To train how to identify the needs of society and convert into demand.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Summarize the importance of basic sciences in product development	Remember Understand
CO2	Explain the historical developments in mechanical, electrical and computational engineering	Understand Apply
CO3	Apply systematic approach to innovative designs	Remember Understand Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	-	2	-	1	-	-	1	-	1		-	-	-	-
CO2	3	2	1	-	2	-	1	-	-	1	-	1		-	-	-	-
CO3	3	2	3	-	2	-	1	-	--	1	-	1		-	-	-	-

S – Strong (3) M – Medium (2) L – Low (1)

Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Self Learning Hours
1.1	**Science to Engineering:** Job of engineers, engineering units and measurement, elements of engineering analysis, forces and motion, energy, kinematics and motion, conversion of linear motion to rotary and vice versa, motion transmission.	01	-	-
1.2	**Physics to Engineering:** Application of Newton laws, Pascal's law, Bouncy, Bernoulli's theorem, Ohm's law, electrical induction in engineering products.	02	-	-
1.3	**Historical Development:** Invention wheel, early mechanics in design, mechanical advantages, industrial revolution, steam and petrol for mobility. Electrical energy generation, electrical equipment, electronics and automation, computing for early days to present, innovations in communications.	02	-	-
	Module – 2			
2.1	**Understanding Design Thinking:** Design Thinking, Innovation, Empathize Design Thinking as a systematic approach to Innovation, brainstorming, visual thinking, design challenges, innovation, art of Innovation, strategies for idea generation, creativity, teams for innovation.	03	-	-
2.2	**Solution finding methods:** Conventional, intuitive, discursive, methods for combining solution, decision making for new design.	02		
2.3	**Design Thinking strategy:** Growth, storytelling representation, Strategic Foresight, Rapid prototyping, importance of ergonomics in product development, environmental considerations in design, safety considerations in design.	02	-	-
2.4	**Study of Product Development**: Agriculture: development of machines for separation of corn seeds, peeling of groundnut shells, husk removing from paddy.	03	-	-

	Electrical: Design of burglar alarm, speedometer, water level indicator, smart gates, smart lights. Design of electrical vehicles, unmanned vehicles, design principles in drones.			
		Total No. of Lecture Hours	**15**	
			Total No. of Tutorial Hours	**0**
				Total No. of Self learning Hours	**0**

Detailed Plan

Sr No. of Module	Number of related learning Objectives	Weeks/ Dates	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
1.1	1	1	-	-	PPT, Smart Board, Moodle	-	-
1.2	1	2	-	-		-	-
1.3	1	2	-	-		-	-
2.1	2	3	-	-		-	-
2.2	3	2	-	-		-	-
2.3	2	2	-	-		-	-
2.4	3	3	-	-		-	-

Assessment Pattern:

Bloom's level	Continuous Internal Examination		End Semester Examination
	Presentation	Report	
Remember	✓	✓	✓
Understand	✓	✓	✓
Apply	✓	✓	✓
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

The students will be split into groups of 4 - 6 students. Each group of students will select a problem or a disadvantage facing them at home or in college. They will need to develop a simple/rudimentary product/conceptual design that will help alleviate the issue being faced.

The students will need to create a SWOC analysis for the problem at hand and prepare a report and present the same to a committee of consisting of Course Instructor and/or faculty members identified by Head of the Department. The work done by each group will be evaluated for a total of 50 marks. Each student will be awarded marks based on involvement in the project and presentation of work done to the evaluation committee.

Text Books:

1. Exploring Engineering: An Introduction to Engineering and Design by Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, 4th Edition, Elsevier, 2016.
2. History of Modern Design by David Ralzman, 2nd edition, Laurence King Publishing, Ltd., 2010.
3. Design Thinking: Understand – Improve – Apply by Hasso Plattner, Christoph Meinel and Larry Leifer (eds), Springer, 2011.

Reference Books:

1. Engineering Design: A Systematic Approach by G. Pahl, W.Beitz, J. Feldhusen, KH Grote, 3rd Edition, Springer, 2007.
2. Ten Faces in Innovation, by Tom Kelley, Jonathan Littman, Currency Books, 2006.

Code: 21CH1C01 / 21CH2C01 **Course: Engineering Chemistry**
Credits: 3 **L:T:P:S:- 3:0:0:0**
SEE: 50% Marks **CIE: 50% Marks**
SEE Hours: 3 **Max. Marks: 100**

Prerequisites if any	None
Learning objectives	1. To impart a sound knowledge on the principles of chemistry involving the different application-oriented topics required for all engineering branches.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Explain the basic concept of batteries & fuel cells and their applications.	Apply
CO2	To make the students understand the principles of corrosion and corrosion control.	Understand Apply
CO3	Having a comprehensive knowledge in the Field of the Conventional and non-Conventional energy resources	Apply
CO4	Understand the principles of water characterization and analysis for portable and industrial purposes	Understand Apply
CO5	Explain the processing of high polymers & their applications.	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-
CO2	3	1	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-
CO4	3	1	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-
CO5	3	1	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-

Mapping Strength: Strong – 3 Medium – 2 Low – 1

Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Self-Learning Hours
1.1	Introduction - Galvanic cell, reference electrode (Calomel electrode), electrode potential, EMF of the cell and cell representation. Batteries and their importance,	2	-	-
1.2	Classification of batteries- primary, secondary and reserve batteries with examples. Battery characteristics - voltage, capacity, energy density, power density, energy efficiency, cycle life and shelf life.	2	-	-
1.3	Basic requirements for commercial cells. Construction, working, applications and limitations of: Zn-Ag_2O, Ni-Cd, Zn-air battery.	2	-	-
1.4	**Battery technology for electric vehicles** (Energy devices for electric vehicles), components, construction, working and recycling of Li-ion battery.	1	-	-
1.5	**Green Fuel-** Differences between battery and a fuel cell, Classification of fuel cells -based on type of fuel, electrolyte, and temperature. Construction, working applications and limitations of solid oxide fuel cell.	1	-	-

Module – 2				
2.1	Introduction, Electrochemical theory of corrosion with respect to iron. Factors influencing the corrosion rate: physical state of the metal, nature of the metal, area effect, over voltage, pH, temperature, and nature of the corrosion product.	2	-	-
2.2	**Types of corrosion**: Galvanic series; (i) Differential metal corrosion - Galvanic corrosion (ii) Differential aeration corrosion- Ex: Pitting Corrosion (iii) Stress corrosion-explanation-caustic embrittlement.	3	-	-
2.3	**Methods of corrosion control**: i) Using inhibitors, ii) Cathodic protection-sacrificial anode and impressed current methods iii) Protective coatings-metal coatings- galvanizing and tinning.	3	-	-
Module - 3				
3.1	**Conventional energy sources:** Introduction, classification with examples, calorific value-classification (HCV & LCV), determination of calorific value of solid and liquid fuels using Bomb calorimeter-numerical problems.	2	-	-
3.2	Petroleum cracking -fluidized bed catalytic cracking. Reformation of petrol-explanation with reactions, Knocking in IC engine, its ill effects and prevention of knocking, Octane number.	2	-	-
3.3	Anti-knocking agent: Leaded and unleaded petrol. Power alcohol and its advantages. Synthetic petrol by – Fischer Tropsch process.	2	-	-
3.4	**Non-conventional energy sources:** Solar energy - Photo voltaic cells-definition, working and importance of PV cells. Production of solar grade silicon by chemical vapor deposition. Purification of silicon by zone refining technique	2	-	-
Module - 4				
4.1	Introduction, Polymerization techniques - bulk, solution, suspension, and emulsion polymerization. Preparation, properties and applications of Kevlar, Polyurethane, and Epoxy resin;	3	-	-
4.2	Determination of molecular weight of polymers by number average and weight average method-numerical problems.	2	-	-
4.3	Glass transition temperature (T_g)-meaning - factors affecting T_g (crystallinity, effect of side groups, molecular weight & plasticizers) and significance. Conducting polymers - mechanism of conduction in polyacetylene and applications.	3	-	-
Module - 5				
5.1	**Water analysis -** Introduction, water analysis: i. Hardness-determination by EDTA method-numerical problems, ii. Determination dissolved oxygen by Winkler's method. iii. Determination of chemical oxygen demand - numerical problems.	4	-	-
5.2	**Instrumental Methods of analysis:** Types of instrumental analysis, Electroanalytical techniques: i) Conductometry- principle, Estimation of HCl using standard NaOH, applications of conductometric titrations (acid- base titrations only),	2	-	-
5.3	ii) Potentiometry- principle and applications- a. Potentiometric estimation of iron, iii) Spectroscopic method- Colorimetry -Law of absorbance, Determination of λ_{max} and Colorimetric estimation of copper.	2	-	-
	Total No. of Lecture Hours	**40**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

Detailed Plan

- Mention whether Resources/ Communication/ Collaboration/ Co-operative strategy etc.
- Type of Resources (OER/URL/IM/CP: OER/ Reference URL/ Instructor-made/ Copyright with permission)
- Describe nature of IM, i.e. instructor-made resources (PPT/ Screen-cast/ Video/ Interactive module/ PDF etc.
- Describe activities in detail

Sr No. of Module	Number of related learning Objectives	Weeks/ Dates	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
Module-1 1.1-1.5	1	2	You tube videos	-	PPT, videos and Moodle	-	Blackboard
Module-2 2.1-2.4	1	2		-		-	
Module-3 3.1-3.4	1	2		-		-	
Module-4 4.1-4.4	1	2		-		-	
Module-5 5.1-5.3	1	2		-		-	

Assessment Pattern:

Bloom's level	Continuous Internal Examination			End Semester Examination
	Test 1	Test 2	Assignment	
Remember	✓	✓	✓	✓
Understand	✓	✓	✓	✓
Apply	✓	✓	✓	✓
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

Textbooks:

1. Textbook of Engineering Chemistry by Dr. K. Pushpalatha, published by Wiley publications 2nd edition.
2. A text book of Engineering Chemistry 15th Edition by P. C. Jain and Monica Jain, Dhanpat Rai Publishing Co (P) Ltd., New Delhi.
3. Text book of Engineering Chemistry by S.S. Dara, published by Chand and Co., 2009.

Reference Books:

1. Principles of Physical Chemistry by B. R. Puri, L. R. Sharma and M. S. Pathania, S. Nagin Chand and Co.
2. Text book of Physical Chemistry by Soni and Dharmatha, S. Chand & Sons.
3. Text book of Polymers science by Gowarikar and Vishwanathan.
4. Corrosion Engineering by M. G. Fontana, Mc Graw Hill Publications.

Code: 21CS1C01 / 21CS2C01 **Course: Problem Solving through Programming**
Credits: 3 **L:T:P:S:- 3:0:0:0**
SEE: 50% **CIE: 50%**
SEE Hours: 3 **Max. Marks: 100**

Prerequisites if any	No Prerequisites
Learning objectives	1. To learn the fundamentals of C Programming. 2. To acquire knowledge of different constructs, data types and use them to solve problems. 3. To gain insights into applying modular programming and pointers for problem solving.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Interpret the problems using flowchart/algorithm and then code them using basic constructs of 'C'	Understand
CO2	Illustrate the concepts of decision making and branching statements.	Analyze
CO3	Illustrate the concepts of looping statements and demonstrate the use of derived data types like arrays and structures.	Analyze
CO4	Demonstrate the different operations performed on strings and implement the different categories of user defined functions.	Apply
CO5	Demonstrate the use of pointers and I/O operations on files.	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	To be identified for each branch by Course Instructor	
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	-	-	-	-	-	-	-	-	-	-	-		
CO5	3	-	-	-	-	-	-	-	-	-	-	-		

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Self Learning Hours
1.1	**Algorithms, Flowcharts:** Writing algorithms and drawing flowcharts for simple exercises	2	-	0
1.2	**Constants, Variables, and Data types**: Structure of C, Characters set, C tokens, Keywords and Identifiers, Variables, Data types, Declaration of variables.	3	-	0
1.3	**Operators and Expressions:** Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment and decrement operators, conditional operator, Bitwise operators, Special operators, Arithmetic expressions, Precedence of arithmetic operators, Type conversions in expressions.	3	-	0
	Module – 2			
2.1	**Managing Input and Output Operations:** Reading a character, writing a character, Formatted Input, Formatted Output.	4	-	0
2.2	**Decision making and Branching:** Decision making with if statement, Simple if statement, The if...else statement, Nesting of if else statements, The else ... if ladder, The switch statement.	4	-	0

Module – 3				
3.1	**Decision making and Looping:** The while statement, the do statement, the For statement.	3	-	0
3.2	**Arrays:** One-dimensional Arrays, Declaration of one-dimensional Arrays, Initialization of one-dimensional Arrays, Two-dimensional Arrays, Initializing two-dimensional Arrays.	3	-	0
3.3	**Structures:** Defining a Structure, Declaring Structure Variables, Accessing Structure Variables, Structure Initialization, Copying and Comparing Structure Variables, Arrays of structures.	2		0
Module – 4				
4.1	**Strings:** Introduction to Strings, Declaring and initializing, reading a String, Writing a String, operations on strings without using built-in functions.	3	-	0
4.2	**User-defined Functions:** Elements of User-defined Functions, Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions. Parameter passing technique-call by value and call by reference.	5		0
Module – 5				
5.1	**Pointers:** Introduction to pointers, understanding pointers, accessing the address of the variables, declaring pointer variables, initializing of pointer variables, Accessing a variable through its pointer, Pointers and Arrays.	4	-	0
5.2	**File Management:** Introduction, Defining and Opening a file, Closing a file, Input/output operations on files.	4	-	0
	Total No. of Lecture Hours	**40**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

Detailed Plan

Sr No. of Module	Number of related learning Objectives	Weeks	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
1.1	2	2	Online lectures on Department's YouTube Channel	-	E-BOX Moodle LMS	-	Blackboard & Sketch Book for Drawings
1.2	2	3		-		-	
1.3	2	3					
2.1	2	4		-		-	
2.2	2	4		-		-	
3.1	2	3		-		-	
3.2	2	3		-		-	
3.3	2	2		-		-	
4.1	2	3		-		-	
4.2	1	5		-		-	
5.1	1	4		-		-	
5.2	1	4					

ESTD : 1946

Assessment Pattern:

Bloom's level	Continuous Internal Examination			End Semester Examination
	Test 1	Test 2	Assignment	
Remember	✓	✓	✓	✓
Understand	✓	✓	✓	✓
Apply	✓	✓	✓	✓
Analyze	✓	✓	✓	✓
Evaluate	-	-	-	-
Create	-	-	-	-

Text Books:

1. Programming in ANSI C, E Balaguruswamy, 7thEdition,2017
2. Fundamentals of Computers, V Rajaraman, 6thEdition,2014

Reference Books:

1. The C programming language, Brian w. Kernighan,Dennis Ritchie, 2ndEdition.,2015
2. How to Solve it by Computer ,R,G. Dromey ,2nd Edition.2008
3. Introduction to C Programming ,Reema Thareja,2nd Edition.,2015

Resource (OER/ URL/ IM/ CP)

1. https://www.youtube.com/watch?v=iT_553vTyzI
2. https://www.youtube.com/watch?v=8PopR3x-VMY
3. https://sites.google.com/site/tojomathew/course-1/c-prgmng2020-21?authuser=0

ESTD : 1946

Code: 21EC1C01 / 21EC2C01 **Course: Basic Electronics & Communications Engineering**
Credits: 3 **L:T:P:S:- 3:0:0:0**
SEE: 50% **CIE: 50%**
SEE Hours: 3 **Max. Marks: 100**

Prerequisites if any	None
Learning objectives	1. Explain the concepts of elementary analog and digital circuits, embedded systems, and communication systems 2. Apply the concepts to compute the specified parameter 3. Analyze the given circuit/system and comment on its performance 4. Implement the specified circuit/system on Multisim Live and observe its performance

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Explain the concepts of elementary analog and digital circuits, embedded systems, and communication systems	Understand
CO2	Apply the concepts to compute the specified parameter	Apply
CO3	Analyze the given circuit/system and comment on its performance	Analyze
CO4	Implement the specified circuit/system on Multisim Live and observe its performance	Evaluate

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	-	-	-	-	-	-	-	To be identified for each branch by Course Instructor			
CO2	3	2	-	-	-	-	-	-	-	-	-	-				
CO3	3	3	3	-	-	-	-	-	-	-	-	-				
CO4	3	3	3	3	3	-	-	-	-	-	-	-				

Mapping Strength: Strong – 3 Medium – 2 Low – 1

Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Self-Learning Hours
1.1	**Electronic circuits:** Power Supplies–Block diagram, Rectifiers, Reservoir and smoothing circuits, Full-wave rectifiers, Bi-phase rectifier circuits, Bridge rectifier circuits, Voltage regulators, Output resistance and voltage regulation, Amplifiers – Types of amplifiers, Class of operation, Input and output resistance, Frequency response, Bandwidth, Phase shift, Negative feedback.	5	0	0
1.2	Operational amplifiers - Operational amplifier parameters, Operational amplifier characteristics, Operational amplifier configurations, Operational amplifier circuits. Oscillators – Positive feedback, Conditions for oscillation, Ladder network oscillator, Wein bridge oscillator	4	0	0
	Module – 2			
2.1	**Logic circuits:** Logic gates, Bistables, R-S, J-K, D-type flip flops. Data representation, Data types, Data storage, A microcontroller system. Realization of circuits using basic gates and truth table the Half Adder, Multiplexer and decoder Shift registers and its types – operation and truth table	5	0	0
2.2	Counters and synchronous counters Sensors and Interfacing – Instrumentation and control systems, Transducers, Sensors. Actuators, LED, Optocoupler, Piezo Buzzer, Push Button Switch, Keyboard	4	0	0

Module – 3				
3.1	**Embedded System:** Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller	4	0	0
3.2	Harvard vs Von-Neumann, Memory, Program storage memory (ROM), RAM, Embedded Communication Interface, UART, Parallel Interface, Bluetooth, Wi-Fi, GPRS.	5	0	0
Module – 4				
4.1	**Analog and digital communication:** Modern communication system scheme, Information source and input transducer, Transmitter, Channel, Noise, Receiver, Multiplexing. Types of modulation (only concepts) – AM, FM, Phase Modulation, Pulse Modulation, PAM, PWM, PPM, PCM. Concept of Radio wave propagation	5	0	0
4.2	Concepts of Sampling theorem, Nyquist rate, Digital Modulation Schemes ASK, FSK, PSK Radio signal transmission, Multiple access techniques, Multipath and fading, Error Management, introduction to Antenna	4	0	0
Module – 5				
5.1	**Cellular and wireless communication:** Introduction, cellular telephone system, cellular concept and frequency reuse. Wireless Network Topologies - First Generation (1G) Technology, Second Generation (2G) Technology, GSM Communications, GSM System architecture, Third Generation (3G) Technology, CDMA Technology, , Fourth Generation (4G) Technology, Wireless LAN.	4	0	0
5.2	Satellite Communication – Nature of Satellite Communication, Elements of Satellite Communication, Types of satellites, satellite subsystems, configuration of earth stations Optical Fiber Communication - A fiber optic Communication (analog) system, system design considerations for point – to -point links. Microwave Communication - Frequency modulated microwave communication system. Phase Modulation, Concepts of Sampling theorem, Nyquist rate, Pulse Modulation- PAM, PWM, PPM.	4	0	0
	Total No. of Lecture Hours	**44**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

Detailed Plan

Sr No. of Module	Number of related learning Objectives	Weeks	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
1.1	2	1	Nptel video lectures	-	Moodle LMS	-	¦
1.2	2	1		-		-	
2.1	2	1		-		-	
2.2	2	2		-		-	
3.1	2	2		-		-	
3.2	2	2		-		-	
4.1	2	1		-		-	
4.2	2	1		-		-	

ESTD : 1946

Assessment Pattern:

Bloom's level	Continuous Internal Examination			End Semester Examination
	Test 1	Test 2	Assignment	
Remember	✓	✓	✓	✓
Understand	✓	✓	✓	✓
Apply	✓	✓	✓	✓
Analyze	-	-	✓	✓
Evaluate	-	-	-	✓
Create	-	-	-	-

Text Books:

1. Electronic Circuits, Fundamentals & Applications, Mike Tooley, 4thEdition, Elsevier, 2015
2. Basic Electronics D.P. Kothari, I. J. Nagrath,, McGraw Hill Education (India) Private Limited, 2014.
3. Introduction to Embedded Systems K V Shibu, 2nd Edition, McGraw Hill Education (India), Private Limited, 2016

Reference Books:

1. An Introduction to Analog and Digital Communications S Haykin, M Moher, 2nd Edition, Wiley, 2006.
2. Communication Systems S L Kakani and Priyanka Punglia, New Age International Publisher, 2017

Note: Suggested experiments to be executed using Multisim/Pspice/EDA/Proteus or any suitable Software. Some experiments can be done using vlabs (https://www.vlab.co.in/)

1. Half / full wave rectifier using diodes
2. Voltage multipliers
3. Op-amp circuits – inverting, non-inverting amplifiers, summers, differentiators, oscillators, etc.
4. Flip-flops
5. Shift registers and counters
6. AM and FM modulation and demodulation

ESTD : 1946

Code: 21ME1C02 / 21ME2C02 **Course: Computer Aided Engineering Drawing**
Credits: 3 **L:T:P:S:- 1:0:4:0**
SEE: 50% **CIE: 50%**
SEE Hours: 3 **Max. Marks: 100**

Prerequisites if any	None
Learning objectives	1. Provide a fundamental understanding of Engineering Drawings and their creation using instruments. 2. Familiarization of a typical drafting software and its applications.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Use all drawing instruments & software commands to construct basic Geometric sketches.	Apply
CO2	Illustrate the concepts of Orthographic Projections of Points & Lines.	Apply
CO3	Draw projections of regular plane surfaces	Apply
CO4	Draw projections of right & regular solids	Apply
CO5	Prepare developments of solids.	Apply
C06	Illustrate isometric projections & views of solids & combinations of solids	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	1	-	2	2	-	-	-	-	-	-
CO2	2	3	-	-	1	-	-	1	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	2	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-
C06	2	-	-	-	-	-	-	-	-	-	-	-

PSO1	PSO2	PSO3	PSO4
To be identified for each branch by Course Instructor			

S - Strong (3) M - Medium (2) L - Low (1)

Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Self Learning Hours
1.1	Introduction to Computer Aided Sketching: Drawing Instruments and their uses, BIS conventions, Dimensioning, Drawing Scales and free hand practicing. (All sketching to be done on A4 Grid Sheets, Mini Drafter not required)	1	0	0
1.2	Introduction to Solid Edge standard tool bar/menus. Co-ordinate system, points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning conventions.	2	0	0
	Module – 2			
2.1	Orthographic Projections: Introduction to Orthographic Projections, Projections of points	4	0	0
2.2	Projections of straight lines (First Angle Projection), True and apparent lengths and applications of Projections of Lines.	6	0	0

Module – 3				
3.1	Orthographic Projections of Plane Surfaces: Projections of plane surfaces viz. triangle, square, pentagon, hexagon, & circular laminae.	7	0	0
Module – 4				
4.1	Projections of Solids: Projections of right regular prisms, pyramids, cylinders, cones, and tetrahedron in different positions.	10	0	0
Module – 5				
5.1	Development of Surfaces: Development of lateral surfaces of right, regular prisms, cylinders, cones & pyramids resting with base on HP. Representation of section planes & section points, Development of frustum, truncation & transition pieces	4	0	0
5.2	Isometric Projection: Isometric scale, projection of plane figures, solids: tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, truncated solids, combination of two simple solids.	4	0	0
5.3	Demonstration of drawing views in 3D environment.	1	0	0
5.4	Demonstration of a typical Civil Building, Mechanical Production or Electrical Wiring Drawing.	1	0	0
	Total No. of Lecture Hours	**40**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

Detailed Plan

Sr No. of Module	Number of related learning Objectives	Weeks	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
1.1	2	1	Online lectures on Department's YouTube Channel	-	SolidEdge ST6, Moodle LMS	-	Blackboard & Sketch Book for Drawings
1.2	2	1		-		-	
2.1	2	1		-		-	
2.2	2	2		-		-	
3.1	2	2		-		-	
4.1	2	3		-		-	
5.1	2	1		-		-	
5.2	2	1		-		-	
5.3	2	1		-		-	
5.4	1	1		-		-	

ESTD : 1946

Assessment Pattern:

Bloom's level	Continuous Internal Examination			End Semester Examination
	Test 1	Test 2	Assignment	
Remember	✓	✓	✓	✓
Understand	✓	✓	✓	✓
Apply	✓	✓	✓	✓
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

Text Books:

1. Engineering Drawing by N.D. Bhatt & V.M. Panchal, Charotar Publishing House, 53rd edition, 2019
2. Engineering Graphics by K.R. Gopalakrishna, Subash Publishers, 32nd Edition, 2010.

Reference Books:

1. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production by Warren J Luzadder, John M Duff, Prentice Hall of India Pvt. Ltd, Eastern Economy Edition, 2005.

Online Resources:

1. Mechanical Engineering Department's YouTube channel: https://youtube.com/channel/UCXOY3X4xcbTFIczaNVhESQw
2. Projections of Points: https://youtube.com/playlist?list=PLSYYrV4OuACSlPD3LHQBT5huxrb3o8HM1
3. Projections of Lines: https://youtube.com/playlist?list=PLSYYrV4OuACSmvN5qnKdvM3yzldjp5238
4. Projections of Planes: https://youtube.com/playlist?list=PLSYYrV4OuACTL9RO6NjXdrw3EktYjpfZX
5. Projections of Solids: https://youtube.com/playlist?list=PLSYYrV4OuACSAbmbyoKV33NxB9gCDPsao
6. Development of Surfaces: https://youtube.com/playlist?list=PLSYYrV4OuACTb68S2CT0ncIQl353poXo8
7. Isometric projections: https://youtube.com/playlist?list=PLSYYrV4OuACTGMtF0X3QGT-av0V02jnTr

ESTD : 1946

Code: 21CH1L01 / 21CH2L01 **Course: Engineering Chemistry Lab**
Credits: 1 **L:T:P:S:- 0:0:2:0**
SEE: 50% Marks **CIE: 50% Marks**
SET Hours: 3 **Max. Marks: 50**

Prerequisites if any	None
Learning objectives	To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Perform accurate quantitative measurements and equipment handling.	Apply
CO2	Analyze the data and interpret result to arrive at a conclusion.	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-

Mapping Strength: Strong – 3 Medium – 2 Low – 1

List of experiments

Sl. No.	Experiment	Hands on / Virtual
	PART - A	
1	Estimation of total hardness in water by EDTA method	Hands on
2	Estimation of sodium thiosulphate by Iodometric method	Hands on
3	Estimation of percentage of copper in brass	Hands on
4	Estimation of Iron in the Haematite ore by external indicator method	Hands on
5	Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample	Hands on
6	Determination of Calcium Oxide (CaO) in the given sample of cement by Rapid EDTA method	Hands on
	PART - B	
1	Estimation of Mohr's salt by Potentiometric titration.	Hands on
2	Estimation of an acid (weak/strong) by Conductometric titration.	Hands on
3	Determination of pKa of a weak acid using pH meter.	Hands on
4	Estimation of copper by using Colorimeter.	Hands on
5	Determination of viscosity coefficient of a given liquid using Ostwald's viscometer.	Hands on
6	Estimation of Iron by using Colorimeter.	Hands on

ESTD : 1946

Assessment Patterns:

Bloom's level	Continuous Internal Examination	End Semester Examination
Apply	✓	✓
Analyze	✓	✓
Evaluate	✓	✓

Text Books:

1. Vogels textbook of quantitative inorganic analysis, revised by J. Bassett, R. C. Denny, G. H. Jeffery, 4th Ed.

ESTD : 1946

Course Code: 21CS1L01 / 21CS2L01 **Course Name: Computer Programming Lab**
Credits: 02 **L:T:P:S:- 0:0:2:0**
SEE: 50% Marks **CIE: 50% Marks**
SET Hours: 02 Hours **Max. Marks: 50**

Prerequisites if any	No Prerequisites
Learning objectives	1. To apply the knowledge of C Programming fundamentals to solve problems. 2. To use different constructs and data types to solve problems. 3. To apply functions and pointers for problem solving.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs		**Bloom's level**
CO1	Demonstrate the ability to solve simple problems using basic 'C' constructs.	Apply
CO2	Understand the problem and apply appropriate branching statement.	Apply
CO3	Illustrate the usage of different decision making and looping statements.	Apply
CO4	Illustrate basic operations that can be performed on arrays, structures and strings.	Apply
CO5	Demonstrate the different categories of functions and usage of pointers.	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-		To be identified for each branch by Course Instructor	
CO2	3	2	-	-	-	-	-	-	-	-	-	-			
CO3	3	2	-	-	-	-	-	-	-	-	-	-			
CO4	3	2	-	-	-	-	-	-	-	-	-	-			
CO5	3	2	-	-	-	-	-	-	-	-	-	-			

S – Strong-3 M – Medium-2 L – Low-1

ESTD : 1946

List of experiments

Sl.No.	Experiment	Hands on/Virtual
1	a) Write a C program to print "Hello World!" b) Write a C program to print the size of various data types in C. c) Write a c program to find simple and compound interest. d) Write a C program to simulate Celcius to Fahrenheit Converter e) Write a program to find area of circle. f) Write a program to find area of circle. g) Write a program to find the sum of two numbers	**Hands on**
2	a) Write a C program to find and output all the roots of a given quadratic equation, for non-zero coefficients. (Using if…else statement) b) Write a C program to simulate a simple calculator that performs arithmetic operations like addition, subtraction, multiplication, and division only on integers. Error message should be reported, if any attempt is made to divide by zero. (Using switch statement) c) Write a program that accepts the marks in 3 subjects of a student, calculates the average mark of the student and prints the student's grade. If the average mark is greater than or equal to 90, then the grade is 'A'. If the average mark is 80 and between 80 and 90, then the grade is 'B'. If the average mark is 70 and between 70 and 80, then the grade is 'C'. If the average mark is 60 and between 60 and 70, then the grade is 'D'. If the average mark is 50 and between 50 and 60, then the grade is 'E'. If the average mark is less than 50, then the grade is 'F'.	**Hands on**
3	a) Write a C program to find the GCD and LCM of two integers and output the results along with the given integers. Use Euclid's algorithm. (Using looping constructs) b) Write a C program to reverse a given integer number and check whether it is a palindrome or not. Output the given number with suitable message. (Using While statement) c) Write a C program to reverse a given integer number and check whether it is a palindrome or not. Output the given number with suitable message. (Using While statement) d) Write a C program to generate and print first 'N' Fibonacci numbers. (Using do-While statement)	**Hands on**
4	a) Write a C program to generate and print first 'N' Fibonacci numbers. (Using do-While statement) b) Write a C program to generate and print first 'N' Fibonacci numbers. (Using do-While statement) c) Write a program to help Patrick to print the pattern given pattern using while loop? d) Write a program to print Multiplication tables till 10 for given range "N" starting from 1 (Using Nested for loop statement).	**Hands on**
5	a) Write a C program to input N real numbers in ascending	**Hands on**

	order into a single dimension array. Conduct a binary search for a given key integer number and report success or failure in the form of a suitable message. b) Write a C program to input N integer numbers into a single dimension array. Sort them in ascending order using bubble sort technique. Print both the given array and the sorted array with suitable headings. c) Write a C program to read two matrices A(M x N) and B(P x Q) and perform addition. Output the input matrices and the resultant matrix with suitable headings and format. (Using two dimensional arrays where array size M, N, P, Q ≤ 4)	
6	Write a C program to create a structure called Employee with members Name, Job, Salary. Create a structure variable. Accept the input values for the structure members at run time. Suitably display the same.	**Hands on**
7	a) Write a C program to determine whether a given word is a palindrome or not. Do not use any string library functions. b) Write a C program to determine whether a given word is a palindrome or not. Do not use any string library functions.	**Hands on**
8	a) Write C program for user-defined functions: 1. To input N integer numbers into a single dimension array. 2. To conduct a linear search. Using these functions, write a C program to accept the N integer numbers & given key integer number and conduct a linear search. Report success or failure in the form of a suitable message b) Write C program for user-defined functions: 1. To input N integer numbers into a single dimension array. 2. To conduct a linear search. Using these functions, write a C program to accept the N integer numbers & given key integer number and conduct a linear search. Report success or failure in the form of a suitable message. c) Write C program for user-defined functions: 1. To input N integer numbers into a single dimension array. 2. To conduct a linear search. Using these functions, write a C program to accept the N integer numbers & given key integer number and conduct a linear search. Report success or failure in the form of a suitable message. d) Write a 'C' Program to find the product of two matrices.	**Hands on**
9	a) Write a program to accept 2 integers and to swap them using functions and pointers. b) Write a program to find the sum of the elements in an array. c) Write a program to copy the content from one file to another file.	**Hands on**

Assessment Patterns:

Bloom's level	Continuous Internal Examination	End Semester Examination
Apply	Applicable for all the lab exercises L3	L3 is Applicable for all the lab exercises

Text Books:

1. Programming in ANSI C, E Balaguruswamy, 7thEdition.,2017
2. Fundamentals of Computers, V Rajaraman, 6thEdition.,2014

Reference Books:

1. The C programming language, Brian w. Kernighan,Dennis Ritchie, 2ndEdition. ,2015
2. How to Solve it by Computer,R,G. Dromey ,2nd Edition.,2008
3. Introduction to C Programming, Reema Thareja,2nd Edition.,2015

ESTD : 1946

Course Code: 21HS2C01 **Course: Technical English -II**
Credit: 1 **L:T:P:S:- 1:0:0:0**
SEE: 50% **CIE : 50%**
SEE Hours: 2 hrs **Max . Marks: 100**

Prerequisites if any	None
Learning Objectives	

Course Outcomes:

Course Outcomes		Bloom's level
CO1	Identify common errors in spoken and written communication and be familiar with English vocabulary and language proficiency	Remember
CO2	Acquire workplace and employment understanding through proficient and sensitivity in all kinds of formal communication	Understand
CO3	Perform well in campus recruitment, engineering and all other general competitive examinations	Evaluate

Mapping with POs and PSOs:

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

Mapping Strength: 3 – Strong 2 – Medium 1 – Low

Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Self Learning Hours
1.1	QUIZ :: Common errors – Grammar	1	1	-
1.2	SENTENCE AUCTION	-	1	-
	Module – 2			
2.1	POSTER MAKING	-	1	-
	Module – 3			
3.1	PICTURE STORY TELLING AND WRITING – All components of Paragraph writing	1	-	-
	Module - 4			
4.1	GROUP TASK – GD	1	2	-
4.2	ROLE PLAY along the lines fof MUN (Model United Nations) in Indian context – Issue based and Corporate scene	1	2	-
	Module – 5			
5.1	BLOGS	-	1	-
5.2	Writing Cover Letters, Resume Building , Mock Interview	1	2	-
	Total No. of Lecture Hours	**5**		
	Total No. of Tutorial Hours		**10**	**-**
	Total No. of Self learning Hours			**0**

Sr No. of Module	Number of related learning Objectives	Weeks/ Dates	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
Module-1 1.1		1		Conduct Quiz on Grammar			
1.2		1		Sentence Auction – The students will bid for the right sentence announced from the sheet and gain points if it is a correct sentence			
Module-2 2.1		1		Make Posters on various grammar aspects and give presentation			
Module- 3 3.1		1		Students will be given a picture and they have to build a story. Introduction and conclusion with at least 3 points have to be written in a paragraph in 50 words. The story could be on any lines – coporate/ current affairs / general interest etc			
Module-4 4.1		2		Group Discussion : Students will be divided in groups and they have to discuss on the topic given. Student judges on various parameters will be selected for peer appraisal and faculty appraisal will also be given			
4.2		**2**		Role Play – To ebable students to understand the corporate world a role play will be conducted with various groups representing the various departments. They have to discuss the issues in the company. Alternately the group will represent different states of the country and put forward the issues that need attention			
Module-5 5.1		1		Creating and content witing for Blogs of their own			
5.2		2		Writing Cover letter, Resume Building, Facing interview – Students will have to apply to a company, Build resumes suitable to the requirement and their ability, face interview. They will be fomally attired to get a feel of Recuitment and industry expectations . Basic format of resume will be provided			

Text Books:

1. Professional Writing Skills in English, Infinite Learning Solutions – (Revised Edition) 2021.
2. Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.

Reference Books:

1. Intermediate Grammar, Usage and Composition by M.L.Tichoo, A.L.Subramanian, P.R.Subramanian, Orient Black Swan – 2016.
2. High School English Grammar & Composition by Wren and Martin, S Chandh & Company Ltd – 2015

ESTD : 1946

Course Code: 21AE1CO2 / 21AE2CO2 **Course Name: Sustainable Rural Development**
Credits: 01 **L:T:P:S:- 1:0:0:0**
SEE: 50% Marks **CIE: 50% Marks**
SEE Hours: 2 Hours **Max. Marks: 50**

Prerequisites if any	No pre requisites
Learning objectives	1. To provide adequate knowledge regarding rural development, government policies and rural government. 2. To equip with knowledge of engineering interventions in terms of infrastructure facilities, and employment innovation trough rural industries and entrepreneurship for sustainable rural development.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs		**Bloom's level**
CO1	Elucidate various issues involved and government policies for rural development	Understand
CO2	Explain approaches to sustainable rural development through proper water management, infrastructure, rural industries and entrepreneurship.	Understand

Mapping with POs and PSOs:

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

Strong (3) **Medium (2)** **Low (1)**

Course Structure

	Module – 1	**No. of Lecture Hours**	**No. of Tutorial Hours**	**Self Learning Hours**
1.1	Agricultural policy and rural development, land reforms, land holding, green revolution, sustainable agriculture and organic farming.	1	0	0
1.2	Rural governance – Panchayat Raj institutions and its role in rural governance, administrative structure at village, panchayat, block and district, e-governance, Bhoomi project, decentralization and its significance in rural development.	1	0	0
1.3	Rural finance – role of local bodies, need for agricultural finance, sources of agricultural finances, kisan credit card, and the role of NABARD in rural development.	1	0	0
1.4	Rural markets and rural marketing system, marketing policies, co –operative marketing – issues, role of corporate sector, strategies for the development of rural markets, emerging issues in rural marketing. retail chain, direct marketing, contract farming.	1	0	0
1.5	Concept of rural communication, nature and scope of rural communication, traditional media of communication, mass media, new media, applications of ICT's for rural development in India, strengths and weaknesses of ICT's in rural India.	1	0	0
1.6	Rural poverty and poverty alleviation programmes, MGNREGA, SGSY, Indira AWAS Yojana, dimensions of rural unemployment and under employment, BPL families, agricultural laborers and social security.	1	0	0
1.7	Role of NGO's in rural development, voluntary action in India, history of voluntarism, the role of	1	0	0

	voluntary organization in India's development processes, the World Bank, and other international agencies.			
	Module – 2			
2.1	Water resources – need for judicious use of water, ground water utilization, tank irrigation, and minor irrigation, Community Based Organizations (CBOs), role of CBOs in sustainable rural development.	1	0	0
2.2	Rural energy system, conventional – fire wood, cow dung, non-conventional – bio gas, solar etc.	1	0	0
2.3	The problem of housing, housing types, low cost houses, the housing schemes in rural area, community buildings- hospitals, schools, community halls etc.	1	0	0
2.4	Rural sanitation- drinking water, drainage, toilets (public and private).		0	0
2.5	Importance of transport system in rural development, transport vehicles, transport to market, Pradhan Mantri Gram Sadak Yojana (PMGSY)	1	0	0
2.6	Rural electrification- policies, achievements and targets.	1	0	0
2.7	Livestock economies - fishery and poultry development, forestry, horticulture and floriculture, issues and problems in rural industrialization and development of agro-based industries, rural non-farm sector, village and cottage industries- Gandhian approach of rural industries, handloom industries –weavers, basket making, bamboo works etc , rural artisans – pottery , carpentry and smithy, Sustaining the rural economy through rural industrialization, development of rural entrepreneurship.	2	0	0
	Total No. of Lecture Hours	**15**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

Detailed Plan							
Sr No. of Module	**Number of related learning Objectives**	**Weeks/ Dates**	**Online Mode**		**ICT Tool/ Platform/ LMS**	**Face-to-face Mode**	
			Resource (OER/ URL/ IM/ CP)	**Activity (Describe activity in detail)**		**Resource (OER/ URL/ IM/ CP)**	**Activity**
1.1	1	Week 1	-	-	**Moodle LMS**	-	**Blackboard**
1.2	1	Week 2	-	-		-	
1.3	1	Week 3	-	-		-	
1.4	1	Week 4	-	-		-	
1.5	1	Week 5	-	-		-	
1.6	1	Week 6	-	-		-	
1.7	1	Week 7	-	-		-	
2.1	2	Week 8	-	-		-	
2.2	2	Week 9	-	-		-	
2.3	2	Week 10	-	-		-	
2.4	2	Week 11	-	-		-	
2.5	2	Week 12	-	-		-	
2.6	2	Week 13	-	-		-	
2.7	2	Week 14	-	-		-	

Assessment Pattern:

Bloom's level	Continuous Internal Examination		End Semester Examination
	Presentation	Report	
Remember	✓	✓	✓
Understand	✓	✓	✓
Apply	✓	✓	✓

The students will be made into groups and in each group; there can be 4 to 6 students. Each group of students will select a village of their choice and visit the village during their free time. They will study life in village and collect data regarding crops grown, rural governance, finance, market, mode of communication and transportation. They will also look into various problems faced by the village people including housing, drinking water, sanitation and live stock.

Based on the observations and data collected students will make SWOC analysis for the village and prepare a report and present the same to a committee of consisting of Course Instructor and another faculty member / expert identified by Head of the Department. The work done by each group will be evaluated for a total of 50 marks. Each student will be awarded marks based on involvement in the project and presentation of work done to the evaluation committee.

Text Books:

1. Laxman and Morayan: Rural Development in India

Reference Books:

1. M.A. Quaraishi: Indian Agriculture and Rural Development
2. K. Ventata Reddy: Rural Development in India- Poverty and Development

ESTD : 1946

Code: 21MA2C01 **Course: Numerical Analysis and Linear Algebra**
Credits: 4 **L:T:P:S:- 4:0:0:0**
SEE: 50% **CIE: 50%**
SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	Knowledge of Errors and approximations, Matrix Theory
Learning objectives	1. To emphasize the need and importance of Numerical methods to solve engineering problems 2. To develop a strong foundation of Linear Algebra in a comprehensive manner

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Compute the numerical solutions of equation, fit interpolating polynomials, estimate derivatives and integrals for a given data.	Apply
CO2	Estimate numerical solutions to ordinary differential equations using various methods.	Apply
CO3	Compute the dimension of four fundamental subspaces and hence find the complete solution to the system of equations.	Understand and Apply
CO4	Diagonalize the given matrix and discuss similarity transformation.	Understand and Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	1	To be identified for each branch by Course Instructor			
CO2	3	2	-	-	-	-	-	-	-	-	-	1				
CO3	3	2	-	-	-	-	-	-	-	-	-	1				
CO4	3	2	-	-	-	-	-	-	-	-	-	1				

Mapping Strength: Strong– 3 Medium – 2 Low – 1

ESTD : 1946

Course Structure

	Module – 1	No. of Lecture Hours	No. of Tutorial Hours	Self Learning Hours
1.1	Numerical solutions of algebraic and transcendental equations- Regula Falsi method, Newton-Raphson method and its rate of convergence	4	0	0
1.2	Finite differences- Forward differences, Backward differences	2	0	0
1.3	Newton's Forward Interpolation Formula- Applications	2	0	0
	Module-2			
2.1	Interpolation for unequal intervals-Newton's Divided difference and Lagrange's formula (without proof)	3	0	0
2.2	Numerical Differentiation- equal and unequal intervals, Errors in numerical differentiation	3	0	0
2.3	Numerical integration- Simpson's 1/3rd, Simpson's 3/8th & Weddle's rules-Applications	2	0	0
	Module-3			
3.1	Numerical solutions of ODE: Picard's method of successive approximations	2	0	0
3.2	Euler's method-Error estimates for the Euler method, Modified Euler's method	3	0	0
3.3	Runge-Kutta method, Milne's predictor-corrector method	3	0	0
	Module-4			
4.1	Vector spaces , The Null space: Solving Ax=0 and Rx =0	4	0	0
4.2	The complete solution to Ax=b, Independence, Basis and Dimension	4	0	0
4.3	Dimension of four fundamental subspaces	2	0	0
	Module-5			
5.1	Linear Transformations, The Matrix of Linear Transformations	3	0	0
5.2	Orthogonality of the four subspaces, Orthonormal Bases	2	0	0
5.3	Projections, Gram-Schmidt Method	3	0	0
	Module-6			
6.1	Introduction to eigenvalues and eigenvectors-properties and problems	3	0	0
6.2	Diagonalization of a matrix	2	0	0
6.3	Similarity transformations	3	0	0
	Total No. of Lecture Hours	**50**		
	Total No. of Tutorial Hours		**0**	**-**
	Total No. of Self learning Hours			**0**

ESTD : 1946

Detailed Plan

Sr No. of Module	Number of related learning Objectives	Weeks/ Dates	Online Mode		ICT Tool/ Platform/ LMS	Face-to-face Mode	
			Resource (OER/ URL/ IM/ CP)	Activity (Describe activity in detail)		Resource (OER/ URL/ IM/ CP)	Activity
Module-1 1.1	I	Week 1 Week 2	Title: Linear Algebra and its Applications Delivered by Prof. Vittal Rao, IISc Bangalore **URL:** https://www.youtube,com/watch?v=NAAaeQQh2s&list=PL05CD03A43AE66 Title : Numerical Analysis Delivered by Prof. R Usha, IIT Madras **URL:** https://nptel.ac.in/courses/111/106/111106101	Video lectures on prerequisites and the summary of each module by internal faculty	Video lectures will be prepared using i-scribe and will be shared through Moodle/ google classroom	-------	**C** **H** **A** **L** **K** **&** **T** **A** **L** **K**
1.2	I	Week 3					
1.3	I	Week 4					
1.4	I						
Module-2 2.1	I	Week5 Week 6					
2.2	I	Week6 Week 7					
2.3	I	Week 8					
2.4	I						
Module-3 3.1	I	Week 9					
3.2	I	Week 10 Week 11					
3.3	I	Week 12 Week 13					
3.4	I						
Module-4 4.1	II	Week 1 Week 2					
4.2	II	Week 3 Week 4					
4.3	II	Week5					
4.4	II						
Module-5 5.1	II	Week 6 Week 7					
5.2	II	Week 7 Week 8					
5.3	II	Week 8 Week 9					
5.4	II						
Module-6 6.1	II	Week 9 Week 10					
6.2	II	Week 11					
6.3	II	Week Week12 Week 13					
6.4	II						

ESTD : 1946

Asessment Pattern:

Bloom's level			Continuous Internal Examination		End Semester Examination
	Test 1	Test 2	Assignment (5 Marks)	Quiz (5 Marks)	
Remember	✓	✓	-	✓	✓
Understand	✓	✓	✓	✓	✓
Apply	✓	✓	✓	-	✓

Textbooks:

1. Linear Algebra and its applications, Gilbert Strang, Cengage learning India edition, 4th edition.

2. Numerical Methods, M K Jain, S R K Iyyengar and R K Jain, New Age International publishers, 6th edition.

Reference Books:

1. Introductory methods of Numerical Analysis, S S Sastry, PHI, 3rd edition.
2. Linear Algebra : A Geometric Approach, S Kumaresan, PHI, 1st edition.

ESTD : 1946