NAGARJUNA

COLLEGE OF ENGINEERING & TECHNOLOGY

An Autonomous Institute under VTU

Vision

Leadership and Excellence in Education

Mission

To fulfill the vision by imparting total quality education replete with the philosophy of blending human values and academic professionalism.

Scheme and Syllabus

I & II Semester B.E.

(Curriculum revised as per NEP)

Outcome Based Education (OBE)

and

Choice Based Credit System (CBCS)

Academic Year

2021-2022

First Semester- Physics Cycle

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Paper Setting Board(PSB)	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	BSC	21MAT11	Calculus and Linear Algebra	TD and PSB: Mathematics	2	2	--	--	03	50	50	100	3
2	BSC	21PHY12	Engineering Physics	TD and PSB: Physics	2	2	--	--	03	50	50	100	3
3	ESC	21ELE13	Basic Electrical Engineering	TD and PSB: ECE & EE department	2	2	--	--	03	50	50	100	3
4	ESC	21CEF14	Civil Engineering Foundation	TD and PSB: Civil Engineering	3	--	--	--	03	50	50	100	3
5	ESC	21EGV15	Engineering Graphics and Visualization	TD and PSB: Mechanical Engineering.	2	--	2	--	03	50	50	100	3
6	BSC	21PHL16	Engineering Physics Laboratory	TD and PSB: Physics	--	--	2	--	03	50	50	100	1
7	ESC	21EEL17	Basic Electrical Engineering Laboratory	TD and PSB: ECE & EE, department.	--	--	2	--	03	50	50	100	1
8	HSM	21EGH18	Communication English	TD and PSB: Humanities	1	1	1	--	03	50	50	100	2
9	AEC	21IDT19	Innovation and Design Thinking	All Department	--	2	--	--	02	50	50	100	1
TOTAL					**12**	**09**	**07**		**26**	**450**	**450**	**900**	**20**

Note: BSC: Basic Science Course, **ESC:** Engineering Science Course, **HSM:** Humanity and Social Science & Management Courses, **AEC**–Ability Enhancement Courses.

L–Lecture, **T**–Tutorial, **P**-Practical/Drawing, **S**–Self Study Component, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Examination.

First Semester – Chemistry Cycle

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Paper Setting Board(PSB)	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	BSC	21MAT11	Calculus and Linear Algebra	TD and PSB: Mathematics	2	2	--	--	03	50	50	100	3
2	BSC	21CHE12	Engineering Chemistry	TD and PSB: Chemistry	2	2	--	--	03	50	50	100	3
3	ESC	21PSP13	Problem Solving through Programming	TD and PSB: Computer Science and Engineering	2	2	--	--	03	50	50	100	3
4	ESC	21ELN14	Basic Electronics and Communication Engineering	TD and PSB :ECE	2	2	--	--	03	50	50	100	3
5	ESC	21EME15	Elements of Mechanical Engineering	TD and PSB : Mechanical Engineering.	2	--	2	--	03	50	50	100	3
6	BSC	21CHL16	Engineering Chemistry Laboratory	TD and PSB: Chemistry	--	--	2	--	03	50	50	100	1
7	ESC	21CPL17	Computer Programming Laboratory	TD and PSB: Computer Science and Engineering	--	--	2	--	03	50	50	100	1
8	HSM	21EGH18	Communication English	TD and PSB: Humanities	1	1	1	--	03	50	50	100	2
9	AEC	21SFH19	Scientific Foundations of Health	All Department	--	--	--	4	02	50	50	100	1
TOTAL					**11**	**09**	**07**	**04**	**26**	**450**	**450**	**900**	**20**

Note: BSC: Basic Science Course, **ESC:** Engineering Science Course, **HSM:** Humanity and Social Science & Management Courses, **AEC**–Ability Enhancement Courses.

L–Lecture, **T**–Tutorial, **P**-Practical/Drawing, **S**–Self Study Component, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Examination.

Second Semester - Physics Cycle

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Paper Setting Board(PSB)	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	BSC	21MAT21	Advanced Calculus and Numerical Methods	TD and PSB: Mathematics	2	2	--	--	03	50	50	100	3
2	BSC	21PHY22	Engineering Physics	TD and PSB: Physics	2	2	--	--	03	50	50	100	3
3	ESC	21ELE23	Basic Electrical Engineering	TD and PSB: ECE & EE department	2	2	--	--	03	50	50	100	3
4	ESC	21CEF24	Civil Engineering Foundation	TD and PSB: Civil Engineering	3	--	--	--	03	50	50	100	3
5	ESC	21EGV25	Engineering Graphics and Visualization	TD and PSB: Mechanical Engineering.	2	--	2	--	03	50	50	100	3
6	BSC	21PHL26	Engineering Physics Laboratory	TD and PSB: Physics	--	--	2	--	03	50	50	100	1
7	ESC	21EEL27	Basic Electrical Engineering Laboratory	TD and PSB: ECE &EE, department.	--	--	2	--	03	50	50	100	1
8	HSM	21EGH28	Professional Writing Skills in English	TD and PSB: Humanities	1	1	1	--	03	50	50	100	2
9	AEC	21SFH29	Scientific Foundations of Health	All Department	--	--	--	4	02	50	50	100	1
TOTAL					**12**	**07**	**07**	**04**	**26**	**450**	**450**	**900**	**20**

Note: BSC: Basic Science Course, **ESC:** Engineering Science Course, **HSM:** Humanity and Social Science & Management Courses, **AEC**–Ability Enhancement Courses.

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Second Semester – Chemistry Cycle

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Paper Setting Board(PSB)	Teaching Hours/Week				Examination				Credits
					Theory Lec-	Tutorial	Practical/ Drawing	Self-Study	Duration in hours	CIEM arks	SEE M arks	Total Marks	
					L	T	P	S					
1	BSC	21MAT21	Advanced Calculus and Numerical Methods	TD and PSB: Mathematics	2	2	--	--	03	50	50	100	3
2	BSC	21CHE22	Engineering Chemistry	TD and PSB: Chemistry	2	2	--	--	03	50	50	100	3
3	ESC	21PSP23	Problem Solving through Programming	TD and PSB: Computer Science and Engineering	2	2	--	--	03	50	50	100	3
4	ESC	21ELN24	Basic Electronics and Communication Engineering	TD and PSB :ECE	2	2	--	--	03	50	50	100	3
5	ESC	21EME25	Elements of Mechanical Engineering	TD and PSB : Mechanical Engineering.	2	--	2	--	03	50	50	100	3
6	BSC	21CHL26	Engineering Chemistry Laboratory	TD and PSB: Chemistry	--	--	2	--	03	50	50	100	1
7	ESC	21CPL27	Computer Programming Laboratory	TD and PSB: Computer Science and Engineering	--	--	2	--	03	50	50	100	1
8	HSM	21EGH28	Professional Writing Skills in English	TD and PSB: Humanities	1	1	1	--	03	50	50	100	2
9	AEC	21IDT29	Innovation and Design Thinking	All Department	--	2	--	--	02	50	50	100	1
TOTAL					**11**	**11**	**07**	**-**	**26**	**450**	**450**	**900**	**20**

Note: BSC: Basic Science Course, **ESC:** Engineering Science Course, **HSM:** Humanity and Social Science & Management Courses, **AEC**–Ability Enhancement Courses.

L–Lecture, **T**–Tutorial, **P**-Practical/Drawing, **S**–Self Study Component, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Examination.

Credit definition: 1 hour Lecture **(L)** per week = **1 Credit** 2 hours Tutorial**(T)**per week = **1 Credit** 2 hours Practical/Drawing (P) per week = **1 Credit** 4 hours Self-Study = **2 Credit**	(a) **Four-credit** courses are to be designed for **50** hours of Teaching-Learning process. (b) **Three credit** courses are to be designed for **40** hours of Teaching-Learning process. (c) **Two credit** courses are to be designed for **25** hours of Teaching-Learning process. (d) **One credit** courses are to be designed for **12** hours of Teaching-Learning process.

I Semester-Physics Cycle

CALCULUS AND LINEAR ALGEBRA			
Course Code	21MAT11	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

The goal of the course Calculus and Linear Algebra is

- To facilitate the students with a concrete foundation of differential calculus.
- To solve the first and higher-order ordinary differential equations enabling them to acquire the knowledge of these mathematical tools.
- To develop the knowledge of matrices and linear algebra in a comprehensive manner.

Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning home work, grading assignments and quizzes, and documenting student's progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

Module-1: Differential Calculus – 1	
Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms. Problems. **Self-study:** Center and circle of curvature, evolutes and involutes.	**08 Hours**
Teaching-Learning Process	Chalk and talk method / Power Point Presentation.

Module-2: Differential Calculus – 2	
Taylor's and Maclaurin's series expansion for one variable (Statement only)–problems. Indeterminate forms-L'Hospital's rule. Partial differentiation, total derivative-differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems. **Self-study:** Euler's Theorem and problems. Method of Lagrange undetermined multipliers with single constraint.	**08 Hours**
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation.

Module-3: Ordinary Differential Equations (ODE's) of first order	
Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations. Applications of ODE's-Orthogonal trajectories, Newton's law of cooling. Nonlinear differential equations: Introduction to general and singular solutions; Solvable for p only; Clairaut's equations, reducible to Clairaut's equations. Problems. **Self-Study:** Applications of ODE's: L-R circuits. Solvable for x and y.	**08 Hours**
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation
Module-4: Ordinary Differential Equations of higher order.	
Higher-order linear ODE's with constant coefficients – Inverse differential operator, method of variation of parameters, Cauchy's and Legendre homogeneous differential equations. Problems. **Self-Study:** Applications to oscillations of a spring and L-C-R circuits.	**08 Hours**
Teaching-Learning Process	Chalk and talk method / Power Point Presentation.
Module-5: Linear Algebra	
Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations; Gauss-elimination method, Gauss-Jordan method and Approximate solution by Gauss-Seidel method. Eigen values and Eigen vectors-Rayleigh's power method to find the dominant Eigen value and Eigen vector. **Self-Study**: Solution of system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem**.**	**08 Hours**
Teaching-Learning Process	Chalk and talk method / Power Point Presentation.

Course Outcomes:

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

1. Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.
2. Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian.
3. Solve first-order linear/nonlinear ordinary differential equations analytically using standard methods.
4. Demonstrate various models through higher order differential equations and solve such linear ordinary differential equations.
5. Test the consistency of a system of linear equations and to solve them by direct and iterative methods.

Assessment Details (both CIE and SEE)

Component		Weightage (%)
Best of Two CIE's	CIE 1	40
	CIE 2	
	CIE 3	
AAT's	AAT-1 (Surprise Test/Quiz)	5
	AAT-2 (Self Study Topic Assignment)	5
Semester End Examination **(**SEE)		50

Suggested Learning Resources:

Text Books

1. **B.S.Grewal**:"Higher Engineering Mathematics", Khanna publishers,44th Ed. 2018
2. **E.Kreyszig**:"Advanced Engineering Mathematics",John Wiley & Sons,10th Ed. (Reprint), 2016.

Reference Books

1. **V.Ramana:**"Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed.
2. **Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics" Oxford University Press,3rd Reprint, 2016.
3. **N.P Bali and Manish Goyal:** "A textbook of Engineering Mathematics" Laxmi Publications, Latest edition.
4. **C. Ray Wylie, Louis C. Barrett**: "Advanced Engineering Mathematics" McGraw – Hill Book Co.Newyork, Latested.
5. **Gupta C.B, Sing S.R and Mukesh Kumar**: "Engineering Mathematic for Semester I and II", Mc- Graw Hill Education (India) Pvt. Ltd2015.
6. **H.K.Dass and Er.RajnishVerma:"**Higher Engineering Mathematics" S. Chand Publication (2014).
7. **James Stewart: "**Calculus"Cengage publications, 7th edition, 4th Reprint 2019.

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program

CO-PO Mapping

	Program Outcomes											
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
21MAT11.1	2	1										
21MAT11.2	3	2										
21MAT11.3	3	1										
21MAT11.4	1	2										
21MAT11.5	3	3										

ENGINEERING PHYICS			
Course Code	21PHY12/22	CIE Marks	50
Teaching Hours/Week(L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

- Understand the concept of SHM (Simple Harmonic Oscillation), damped, forced vibration and Shock waves.
- Acquire the knowledge of Quantum Mechanics.
- Learn the concept of Laser and its application.
- Understand the concept of Electrical conductivity in Materials.
- Gain the knowledge about importance of advanced instrumentation for the measurement at Nano scale.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course Outcomes.

- Apart from conventional lecture methods various types of innovative teaching techniques through videos, animation films may be adopted so that the delivered lesson can progress the students in theoretical, applied and practical skills in physics.
- State the necessity of physics in engineering studies and offer real-life examples.
- Seminars and Quizzes may be arranged for students in respective subjects to develop skills.
- Encourage the students for group learning to improve their creativity and analytical skills.
- While teaching shows how every concept can be applied to the real world. This helps the students to expand their understanding level.
- Support and guide the students for self-study.
- Ask some higher-order thinking questions in the class, which promotes critical thinking.
- Inspire the students towards the studies by giving new ideas and examples.

Module-1

Oscillations and Waves **Oscillations**: Basics of SHM, derivation of equation for SHM, Equation of motion for free oscillations, Natural frequency of oscillations. **Damped Oscillations**: Theory of damped oscillations (derivation), over damping, critical & under damping (graphical representation), quality factor. **Forced Oscillations**: Theory of forced oscillations (derivation). **Shock waves**: Mach number, Properties of Shock waves, Construction and working of Reddy shock tube, applications of shock waves, Numerical problems.	**08 Hours**
Teaching-Learning Process	Chalk and talk, Power Point presentation, Videos. **Self-study Component:** Basics of SHM

Module-2

Modern Physics & Quantum Mechanics Wave-Particle dualism, de-Broglie hypothesis, de-Broglie wavelength. Heisenberg's uncertainty principle and its physical significance, Application of uncertainty principle (Non-existence of electron in the nucleus), Wave function- Properties, Physical significance, Probability density, Normalization, Eigen values and Eigen functions. Time independent Schrödinger wave equation. Particle in a box- Energy Eigen values and probability densities. Numerical problems.	**08 Hours**
Teaching-Learning Process	Chalk and talk, Power Point presentation, Videos. **Self-study Component:** Wave-Particle dualism, de-Broglie hypothesis, de- Broglie wavelength.

Module-3	
Lasers & Optical Fibers **Lasers**: Interaction of radiation with matter, Einstein's coefficients (derivation of expression for energy density). Requisites of a Laser system. Conditions for Laser action. Principle, Construction and working of CO_2 Laser. Application of Lasers. **Optical Fibers:** Propagation mechanism, angle of acceptance, Numerical aperture, Modes of propagation, Types of optical fibers, Attenuation, and Mention of expression for attenuation coefficient. Discussion of a block diagram of point-to-point communication, Merits and demerits, Numerical Problems.	**08 Hours**
Teaching-Learning Process	Chalk and talk, Power Point presentation, Videos. **Practical Topics:** 1. Wavelength of LASER source **Self-study Component:** Properties of Laser and comparison with ordinary source.
Module-4	
Electrical Conductivity in Solids: **Classical free electron theory**: Free-electron concept, Drude-Lorentz theory & Assumptions. Drift velocity, mean collision time, Mean free path & Relaxation time (only expression).Expression for electrical conductivity (derivation), Failures of classical free-electron theory. **Quantum free electron theory**: Assumptions, Fermi-energy, Fermi factor& its temperature dependence, Expression for electrical conductivity (no derivation), Merits of Quantum free electron theory. **Physics of Semiconductors**: Expression for Conductivity of semiconductors (derivation), Hall effect, Expression for Hall coefficient (derivation).	**08 Hours**
Teaching-Learning Process	Chalk and talk, Power Point presentation, Videos. **Practical Topics:** 1. Fermi Energy of a material **Self-study Component:** Drift Velocity, mean collision time, Mean free path & Relaxation time.
Module-5	
Materials and Characterization Techniques: **Dielectrics:** Electric dipole, Dipole moment, Polarization of dielectric materials, Types of polarization. Internal field in solids for one dimensional infinite array of dipoles (Lorentz field) (derivation), Numerical problems**.** **Introduction to materials:** Nanomaterials and nanocomposites. Principle, construction and working of X-ray Diffractometer, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), and its applications.	**08 Hours**
Teaching-Learning Process	Chalk and talk, Power Point presentation, Videos. **Self-study Component:** Nanomaterials and nanocomposites.

Course Outcome:

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

1. Understand various types of oscillations and their implications, the role of Shock waves in various fields.
2. Compute Eigen values, Eigen functions, the momentum of atomic and subatomic particles using Time independent 1-D Schrodinger's wave equation.
3. Apprehend the basics of laser & optical fiber with different types and their applications in various fields.

4. Understand electrical conductivity phenomena in solid materials.
5. Understand the various measurement techniques.

Assessment Details (both CIE and SEE)

Component		Weightage (%)
Best of Two CIE's	CIE 1	40
	CIE 2	
	CIE 3	
AAT's	AAT-1 (Surprise Test/Quiz)	5
	AAT-2 (Self Study Topic Assignment)	5
Semester End Examination **(**SEE)		50

Suggested Learning Resources:

Text Books:

1. A Text book of Engineering Physics- M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S. Chand & Company Ltd, New Delhi.
2. An Introduction to Lasers theory and applications by M. N. Avadhanulu and P. S. Hemne revised edition 2012.
3. Engineering Physics-Gaur and Gupta-Dhanpat Rai Publications-2017
4. Concepts of Modern Physics-Arthur Beiser: 6th Ed; Tata McGraw Hill Edu Pvt Ltd-New Delhi 2006.
5. X-ray diffraction- B E Warren published by Courier Corporation.
6. Nano composite materials-Synthesis, properties and applications, CRC Press.

Reference Books:

1. Introduction to Mechanics — M.K. Verma: 2nd Ed, University Press (India) Pvt Ltd, Hyderabad 2009.
2. Lasers and Non Linear Optics –B.B. Laud, 3rd Ed, New Age International Publishers 2011.
3. Lasers Principles, Types and Applications by K.R, Nambiar-New Age International Publishers.
4. Solid State Physics-S O Pillai, 8thEd-New Age International Publishers-2018.
5. Shock waves made simple- Chintoo S Kumar, K Takayama and KPJ Reddy: Willey India Pvt. Ltd. New Delhi 2014.
6. Materials Characterization Techniques-Sam Zhang, Lin Li, Ashok Kumar, CRC Press, First Edition, 2008.
7. Characterization of Materials - Mitra P.K. Prentice Hall India Learning Private Limited.

Web links and Video Lectures (e-Resources):

https://www.britannica.com/technology/laser,k
https://nptel.ac.in/courses/115/102/115102124/
https://nptel.ac.in/courses/115/104/115104096/
http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
https://onlinecourses.nptel.ac.in/noc20_mm14/preview

Activity Based Learning

http://nptel.ac.in
https://swayam.gov.in
https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham

CO-PO Mapping												
Course Outcomes	**Program Outcomes**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
21PHY12/22.1	2											1
21PHY12/22.2	1											1
21PHY12/22.3	2	2										1
21PHY12/22.4	2											1
21PHY12/22.5	2											1

BASIC ELECTRICAL ENGINEERING			
Course Code	21ELE13/23	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

- Explain the laws used in the analysis of DC and AC circuits.
- Analyze the behavior of circuit elements in single-phase and three-phase ac circuits.
- Explain the construction and operation of transformers and DC generators.
- Understand the working principle of motors and synchronous generators.
- Explain electric transmission, distribution, electricity billing equipment and personal safety measures.

Teaching-Learning Process (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby PSUs such as BHEL, NHPC, BESCOM, etc., and small-scale hardware industries to give brief information about the electronics manufacturing industry.
3. Show Video/animation films to explain the functioning of various AC and DC circuits.
4. Encourage collaborative (Group) Learning in the class
5. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits excited by independent voltage sources. Power and energy, maximum power transfer theorem applied to the series circuit and its applications. **Single-phase circuits**: Generation of sinusoidal voltage, frequency of generated voltage, average value, RMS value, form, and peak factors. Voltage and current relationship, with phasor diagrams, in R, L, and C circuits.	**08 Hours**
Teaching-Learning Process	Chalk and talk method.

Module-2

Single-phase circuits (continued): Analysis of R-L, R-C, R-L-C Series and Parallel circuits, Real power, reactive power, apparent power, and Power factor. Measurement of power. **Three-phase circuits:** Generation of three-phase power, representation of balanced star (3 wire and 4 wire system) and delta connected loads, the relation between phase and line values of voltage and current from phasor diagrams, advantages of three-phase systems. Measurement of three-phase power by two-wattmeter method.	**08 Hours**
Teaching-Learning Process	Single-phase circuits: Chalk and talk, Three-phase circuits: (i) For a generation of 3-phase power, video/animation are used. Numerical problems can be solved with the chalk and talk method. (ii) Practical Topics: Relation between the line and phase parameter in 3-phase Connection both delta and Star connections, Power measurement in the 3-phase circuit.

Module-3	
DC Machines: **(a)** Principle of operation, constructional details, induced emf expression, types of generators, and the relation between induced emf and terminal voltage. **(b)** Principle of operation, back emf and torque equations, types of motors, characteristics (shunt and series only), and applications. **Transformers:** Necessity of transformer, the principle of operation, Types, and construction of single-phase transformers, emf equation, losses, variation of losses with respect to load, efficiency, and condition for maximum efficiency.	**08 Hours**
Teaching- Learning Process	DC Machines: Cut out demo/actual machine module, video for working of machine, chalk, and talk. Transformer topic: Demo modules, actual machine cut-out module and chalk and talk method of teaching, YouTube videos.
Module-4	
Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor, slip and problems on the slip, significance of slip, applications. **Three-phase synchronous generators:** Principle of operation, constructional details of salient and non-salient pole generators, synchronous speed, frequency of generated voltage, emf equation.	**08 Hours**
Teaching- Learning Process	Machine cut-out demo/actual models, YouTube videos, chalk, and talk. Practical Topic: Demonstration of working of Induction motor.
Module-5	
Power transmission and distribution: Concept of power transmission and power distribution. Low voltage distribution system (400 V and 230 V) for domestic, commercial, and small-scale industry through block diagrams only. **Electricity bill:** Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. **Equipment Safety measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. **Personal safety measures:** Electric Shock, Earthing and its types, Safety Precautions to avoid shock.	**08 Hours**
Teaching-Learning Process	Chalk and talk, Demonstration of functioning of MCG and Fuse. Visit: Visit nearest area substation/locality pole or pad-mounted transformer. Self-study topic: Safety precautions to avoid shock.

Course outcome:

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

1. Apply the concepts to analyze the behavior of DC and AC electric circuits.
2. Evaluate Single phase and three phase ac circuits.
3. Explain the working principles of transformers and electrical machines.
4. Explain the construction and working of motors and generators.
5. Understand the concepts of power transmission, distribution and safety measures.

Assessment Details (both CIE and SEE)

Component		Weightage (%)
Best of Two CIE's	CIE 1	40
	CIE 2	
	CIE 3	
AAT's	AAT-1 (Surprise Test/Quiz)	5
	AAT-2 (Self Study Topic Assignment)	5
Semester End Examination **(**SEE)		50

Text Books:

1. **Edward Hughes:** "Electrical and Electronic Technology, 12th edition, Pearson,2016 ISBN: 9789332542600
2. **D. C. Kulshreshtha:** "Basic Electrical Engineering", 1th Edition, McGraw-Hill Education, 2019, ISBN:13: 9780071328968.
3. **B.L.Theraja:** "A Textbook of Electrical Technology", Reprint Edition , S Chand and Company, 2014, ISBN: 9788121926607.

Reference Books:

1. P.V. Prasad et al.: "Basic Electrical Engineering", 2nd Edition, Cengage, 2019, ISBN: 9780070151420.
2. D.P. Kothari et al: "Basic Electrical Engineering", 4th Edition, McGraw-Hill Education, 2019, ISBN:9780195693409.
3. V.K Mehata, Rohit Mehta: "Principles Electrical Engineering and Electronics", 2stEdition, S Chand and Company, 2015, ISBN: 9788131732342.

E-Resources:

1. http://vlab.amrita.edu/index.php
2. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-3/introduc-tion-to-diodes-and-rectifiers/
3. http://www.allaboutcircuits.com/video-lectures/transistor-biasing/
4. https://nptel.ac.in/courses/108/102/108102095/

CO-PO Mapping

	Program Outcomes											
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21ELE13/23.1	**3**	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**1**	**1**	**-**	**1**
21ELE13/23.2	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**1**	**1**	**1**	**1**
21ELE13/23.3	**3**	**2**	**2**	**1**	**-**	**1**	**-**	**-**	**1**	**-**	**1**	**1**
21ELE13/23.4	**3**	**1**	**1**	**1**	**-**	**1**	**-**	**-**	**-**	**1**	**1**	**2**
21ELE13/23.5	**3**	**2**	**3**	**1**	**1**	**3**	**1**	**1**	**1**	**1**	**2**	**2**

CIVIL ENGINEERING FOUNDATION

Course Code	21CEF14/24	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

This course will enable students to:

- Learn the importance of infrastructure development and smart city concepts.
- Understand the force and force systems on a structural element under static conditions.
- Analyze the concurrent and non-concurrent force system.
- Study the Equilibrium of Concurrent, on-Concurrent Forces and Support Reactions.
- The Concept of Centroid and Moment of Inertia.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby sites to give brief information about the Civil Engineering structures.
3. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
4. Encourage collaborative (Group Learning) Learning in the class.
5. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
7. Topics will be introduced in multiple representations.
8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
10. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Introduction to Civil Engineering: Scope of different fields of civil engineering-surveying Building materials, Construction technology, Geotechnical engineering, Structural engineering, Hydraulics, Water resources and irrigation engineering, Transportation engineering, Environmental engineering etc. **Types of Infrastructure**: Types of infrastructure, Role of civil engineer in the infrastructural development, effect of infrastructural facilities on socio-economic development of a country. **Roads**: Classification of roads and their functions, Comparison of flexible and rigid pavements (advantages and limitations) **Bridges**: Types of bridges and culverts, RCC, Steel and composite bridges. **Dams**: Different types of dams based on material, structural behavior and functionality with simple sketches. **Smart Cities**: Concept, Features, Advantages and limitations.	**08 Hours**
Teaching-Learning Process	Site visits and report preparation, activity-based learning, PowerPoint presentation, videos.

Module-2

Introduction to Civil Engineering Mechanics: Basic idealizations of Particle, Continuum and Rigid Body and its Characteristics. Types of Forces. Classification of Force System. Introduction to SI Units, Couple, Moment of a Couple. Characteristics of Couple, Moment of a	**08 Hours**

Force. Equivalent Force-Couple System. Numerical Problems on Moment of Forces and Couples and Equivalent Force-Couple System.	
Teaching-Learning Process	Chalk and talk, videos, PowerPoint Presentation, animations

Module-3

Analysis of Force System: Concurrent Force System-Composition of Forces- Definition of Resultant. Composition of Coplanar-Concurrent Force system. Parallelogram Law of Forces Principle of Resolved Parts. Numerical Problems on Composition of Coplanar Concurrent Force System. **Non-Concurrent Force System:** Composition of Coplanar- Non-Concurrent Force System. Varignon's Principle of Moments. Numerical problems on Composition of Coplanar Non-Concurrent Force System.	**08 Hours**
Teaching- Learning Process	Chalk and talk, videos, PowerPoint Presentation, animations

Module-4

Equilibrium of Concurrent and Non Concurrent Forces: Equilibrium of Forces-Definition of Equilibrant, Conditions of Static Equilibrium for Different Force Systems, Lami's Numerical Problem on Equilibrium of Coplanar- Concurrent and Non-Concurrent Force Systems. **Support Reactions:** Types of Loads and Supports. Statically Determinate Beams. Numerical Problems on Support Reactions for Statically Determinate Beams with Point Loads (Normal and Inclined), Uniformly Distributed Loads and Varying Loads.	**08 Hours**
Teaching- Learning Process	Chalk and talk, videos, PowerPoint Presentation, animations

Module-5

Centroid and Centre of Gravity: Definition, Derivation of expressions for Centroidal distances of simple planar laminas like Rectangle, Triangle, Quarter and Semicircle. Determination of Centroidal distances of Compound Laminas. **Moment of Inertia:** Introduction, Definition, Theorems of Perpendicular and Parallel Axis. Concept of Axis of Symmetry, Derivation of expressions for Moment of Inertia of simple planar laminas like Rectangle, Triangle, Quarter, Semicircle and Circle. Definition of Polar Moment of Inertia, Radius of Gyration. Determination of Moment of Inertia.	**08 Hours**
Teaching-Learning Process	Chalk and talk, videos, PowerPoint Presentation, animations

Course Outcomes:

On completion of this course, students will be able to:

1. Understand the various fields of civil engineering, infrastructure development and smart city concepts.
2. Apply the concepts and principles of force system to a given coplanar concurrent force system.
3. Illustrate the problems on concurrent and non-concurrent force system.
4. Determine the Equilibrium of Concurrent, Non-Concurrent Forces and Support Reactions
5. Compute centre of gravity and moment of inertia for a given lamina.

Assessment Details (both CIE and SEE)

Component		**Weightage (%)**
Best of Two CIE's	CIE 1	40
	CIE 2	
	CIE 3	
AAT's	AAT-1 (Surprise Test/Quiz)	5
	AAT-2 (Self Study Topic Assignment)	5
Semester End Examination **(**SEE)		50

Text Books:

1. F. P. Beer and E. R. Johnston: "Vector Mechanics for Engineers – Volume I- Statics", (Chapter 1-5, 7, 9), Tata McGraw Hill, 9th Edition, 2011, ISBN: 978-0077402280.
2. S. S. Bhavikatti, "Elements of civil Engineering and Engineering Mechanics", (Chapter 1-5,8), New Age International Pvt. Ltd., New Delhi, 5th Edition, 2015, ISBN:978-81-224-3003-5.
3. R. C. Hibbbler, Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Bansal R. K., A Text Book of Engineering Mechanics, Laxmi Publications.
5. Andy Ruina and Rudra Pratap, Introducing to Statics and Dynamics, Oxford University Press.
6. Reddy Vijaykumar K and K Suresh Kumar, Engineering Mechanics.
7. Irving H. Shames, Engineering Mechanics, Prentice-Hall.

Reference Books:

1. P. G. Varghese, "A Textbook Building Materials", (Chapter 1, 3,19), PHI Learning publication, 2nd Edition, April 2015, ISBN: 81-203-2848-5.
2. B.K.Kolhapure,"Elements of civil engineering and mechanics"Eastern Book Promoters, 11th Edition 2018,ISBN:978-93-86729-651.
3. M.N.Shesha Prakash and Ganesh B.Mogaveer,"Elements of civil engineering and mechanics", PHI Learning publication, 3rd Edition 2017, ISBN:978-81-203-5001-4.

E-Resources:

1. http://elearning.vtu.ac.in/CV1323.html
2. http://moud.gov.in/model
3. https://en.wikipedia.org/wiki/smart_city
4. www.labour.gov.hk/eng/public/os/D/Constructionsite.pdf

CO-PO Mapping

Course Outcomes	Program Outcomes											
	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21CEF14/24.1	3	2	2	-	1	1	-	-	-	-	-	-
21CEF14/24.2	2	3	1	-	-	-	-	-	-		-	-
21CEF14/24.3	2	3	1	1	-	-	-	-	-	-	-	-
21CEF14/24.4	1	3	2	-	-	-	-	-	-	-	-	-
21CEF14/24.5	2	3		1	-	-	-	-	-	-	-	-

ENGINEERING GRAPHICS AND VISUALIZATION			
Course Code	21EGV15/25	CIE Marks	50
Teaching Hour/Week (L:T:P:S)	2:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

- The course will enable the students to:
- Understand drawing as a communication mode
- Expose students to standards and conventions followed in preparation of engineering drawings
- Develop the ability of conveying the engineering information through drawings.
- Acquire the knowledge of generating the orthographic views of planes and solids.
- Understand the development of surfaces and isometric projections.
- To make them understand the relevance of engineering drawings to different engineering Domains.

Teaching-Learning Process (General Instructions):

Students should be made to aware of powerful communication tool – Drawing. Simple Case studies can be suitably selected by the teacher for hands on practice to induce the feel of fruitfulness of learning. Appropriate Models, Charts, Videos, shall be used to enhance visualization before hands on practice.

Module 1	
Introduction:- Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves. **Orthographic Projections of Points, Lines and Planes:-**Introduction to Orthographic projections, Orthographic projections of points in all the quadrants. Orthographic projections of planes viz. triangle, square, rectangle, pentagon, hexagon and circular lamina. Planes can be resting on HP/VP and inclined to HP/ VP/ (HP and VP). **Problems on applications of projections of planes.**	**08 Hours**
Teaching- Learning Process	Power Point Presentation, Video demonstration, Chalk and Talk.
Module 2	
Orthographic Projection of Solids:-Orthographic projection of right regular solids - prisms and pyramids (triangle, square, rectangle, pentagon, hexagon), cones, cubes, tetrahedron. Solids can be resting on HP/VP and axis inclined to HP/ VP/ (HP and VP). **Problems on applications of projections of Solids.**	**08 Hours**
Teaching- Learning Process	PowerPoint Presentation, Video demonstration, Chalk and Talk.
Module 3	
Isometric Projections:-Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres. Isometric projection of combination of two simple solids. **Problems on applications of Isometric projections of simple engineering components** Introduction to drawing views using 3D environment.	**08 Hours**
Teaching- Learning Process	Power Point Presentation, Video demonstration, Chalk and Talk.
Module 4	

Development of Lateral Surfaces of Solids:-Development of lateral surfaces of right regular prisms, cylinders, pyramids, and cones resting with base on HP only. Development of lateral surface of sphere, Development of frustums and truncations. Problems on applications of development of lateral surfaces.	**08 Hours**
Teaching- Learning Process	Power Point Presentation, Video demonstration, Chalk and Talk.
Module 5	
Engineering Applications of Engineering Graphics:- Sketching and Drawing Simple Mechanisms, Wiring and lighting diagrams using CAD software, Basic Building Drawing.	**08 Hours**
Teaching- Learning Process	PowerPoint Presentation, Video demonstration, Chalk and Talk.

Course Outcome

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

1. Prepare and understand engineering drawings & apply the principals of orthographic of planes.
2. Identify and apply the principles of orthographic projections of lines, planes.
3. Visualize three dimensional objects and develop isometric projections.
4. Identify and apply the principles of orthographic projections and prepare development of lateral surfaces.
5. Generate engineering drawing using CAD software.

Suggested Learning Resources-Books:

1. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd edition, Charotar Publishing House Pvt. Limited,2019.
2. Gopala krishna K.R., Engineering Graphics, 32nd edition, Subash Stores, Bangalore,2005.
3. Luzadder Warren J.,Duff John M., Fundamentals of Engineering Drawing: with an Introduction to Interactive Computer Graphics for Design and Production, Prentice-Hall of India Pvt. Ltd., New Delhi, Eastern Economy Edition,2005.
4. Dhawan R. K., A Textbook of Engineering Drawing, 3/e, S. Chand Publishing, 2019.
5. Venugopal K., Engineering Drawing and Graphics, New Age International publishers,2014.
6. Parthasarathy N. S., Vela Murali, Engineering Drawing, Oxford University Press,2015.
7. Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint2005.
8. Chris Schroder, Printed Circuit Board Design using AutoCAD, Newnes,1997.

Assessment Details both(CIE and SEE):

Component	Weightage (%)
CIE	50
Semester End Examination **(**SEE)	50

Question paper Pattern for SEE:

- Module-1-Introduction (part) and Module-5 are only for practice and CIE and not for SEE.
- Setting of question paper for each batch of students and evaluation of the answer sheets shall be jointly done by the Internal & External examiners.
- 8 Questions shall be set from Modules 1, 2, 3, and 4 with internal choice, preferably at application levels referring books 1 and 2. Student shall answer 4 questions selecting one each from above modules.

Scheme of Evaluation for SEE:-

Module	Questions	Marks allotted for each full question
1	Projections of Planes covering application problems. Two Full Questions (Maximum of two sub bits)	**25**
2	Projections of Solids covering application problems. Sketching of views for first two stages to be considered for evaluation –Two Full Questions	**25**
3	Isometric projections of combination of any two simple solids - - Two Full Questions	**25**
4	Development of lateral surface of simple application problems like, funnels, trays, transition piece -Two Full Questions	**25**
	Total	**100**

Questions	Solution and sketching	Computer display and print out	Total Marks
1 and 2	**10**	**15**	**25**
3 and 4	**10**	**15**	**25**
5 and 6	No sketching	**25**	**25**
7 and 8	No sketching	**25**	**25**
Total	**20**	**80**	**100**

CO-PO Mapping

	Program Outcomes											
Course Outcomes	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21EGV15/25.1	**3**	**2**	**2**	**1**	**3**	**1**	**0**	**0**	**1**	**0**	**1**	**2**
21EGV15/25.2	**3**	**2**	**1**	**3**	**2**	**0**	**1**	**2**	**3**	**0**	**2**	**2**
21EGV15/25.3	**2**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**2**
21EGV15/25.4	**3**	**2**	**1**	**3**	**2**	**0**	**1**	**2**	**3**	**0**	**2**	**2**
21EGV15/25.5	**2**	**2**	**2**	**1**	**2**	**1**	**0**	**1**	**2**	**2**	**1**	**2**

ENGINEERING PHYSICS LABORATORY			
Course Code	21PHL16/26	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	3

Course Objectives:

- Understand the measurement techniques and usage of instruments in physics.
- Demonstrate competency and understanding of the basic concepts found in experimental Physics.
- Construct and analyze the electronic circuits.
- Estimate the error in measurements and the ability to prepare a valid laboratory record.

List of Experiments:

Sl. No	Experiments
1	To verify Stefan's Law
2	Determination of rigidity modulus of the material by the torsional pendulum.
3	Study series LCR resonance and hence calculate inductance, bandwidth, and Quality factor.
4	Study parallel LCR resonance and hence calculate inductance, bandwidth, and Quality factor.
5	I-V Characteristics of Photodiode.
6	Determine the Fermi energy of metal (copper).
7	Determine the wavelength of the laser source using diffraction grating elements.
8	To determine the dielectric constant by charging and discharging the capacitor.
	Virtual Lab Experiments
1	To find the resistivity of a semiconductor using the Four Probe method.
2	Determine acceptance angle and numerical aperture of an optical fiber.

Course Outcomes:

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

1. Apply the knowledge of optics to determine the wavelength of Laser.
2. Understand the characteristics of Photo diode.
3. Apply the knowledge of properties of materials in various applications.
4. Understand the measuring techniques.
5. Operate different instruments and be capable to analyze the experimental results.

Assessment Details both (CIE and SEE):

Component	Weightage (%)
CIE	50
Semester End Examination **(**SEE)	50

Reference books

1. Engineering Lab Manual by WBUT-New Age International Publishers.
2. Applied Physics Lab Manual by Anoop Sing Yadav.

Weblinks, Video lectures, and e resources.

https://vlab.amrita.edu/?sub=1&brch=282&sim=1512&cnt=1
https://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1
https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1 https://bop-

iitk.vlabs.ac.in/basics-of-physics/List%20of%20experiments.html
https://virtuallabs.merlot.org/vl_physics.html,
https://phet.colorado.edu https://www.myphysicslab.com

CO-PO Mapping												
Course Out comes	**Program Outcomes**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
21PHL16/26.1	1											1
21PHL16/26.2	1											1
21PHL16/26.3	1											1
21PHL16/26.4	1											1
21PHL16/26.5	1											1

BASIC ELECTRICAL ENGINEERING LABORATORY			
Course Code	21EEL17/27	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	03

Course Objectives:

This course will enable students to:

- Explain how to verify KCL and KVL for DC circuit and maximum power transfer theorem.
- Explain power and power factor measurement of different types of lamps.
- Explain the measurement of impedance for R-L circuits and power consumed in a 3-phase load.
- Explain methods of controlling a lamp from different places.
- Explain the effect of open and short circuits in sample circuits and suitability of earth resistance.

Syllabus

List of Experiments

1. Verification of KCL and KVL for DC circuits.
2. Verification of maximum power theorem.
3. Measurement of Current, Power, and Power Factor of Incandescent Lamp, Fluorescent Lamp and LED Lamp.
4. Measurement of Resistance and Inductance of a Choke coil using three voltmeter method.
5. Determination of Phase and Line quantities in three-phase star and delta connected loads.
6. Measurement of 3 - phase Power using Two Wattmeter Method.
7. Determination of efficiency of a single-phase transformer by direct load test.
8. Two Way and Three-Way Control of Lamp and Formation of Truth Table.
9. Measurement of Earth Resistance.
10. Study of the effect of Open and Short circuits in simple circuits.

Course Outcomes:

On completion of this course, students will able to:

1. Verify KCL and KVL and maximum power transfer theorem for DC circuits.
2. Compare power factors of different types of lamps.
3. Demonstrate the measurement of the impedance of an electrical circuit and power consumed by a 3-phase load.
4. Analyze two-way and three-way control of lamps.
5. Explain the effects of open and short circuits in simple circuits and interpret the suitability of earth resistance measured.

Assessment Details both(CIE and SEE):

Component	Weightage (%)
CIE	50
Semester End Examination **(**SEE)	50

E-Resources:

1. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-3/introduction-to-diodes-and-rectifiers/
2. http://vlab.amrita.edu/index.php
3. http://www.allaboutcircuits.com/video-lectures/transistor-biasing/
4. http://nptel.vtu.ac.in/ecurses/ECE/Analog_Electronics_Lab/index.phpontent/co

CO-PO Mapping

	Program Outcomes											
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
21EEL17/27.1	**3**	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**1**	**1**	**-**	**1**
21EEL17/27.2	**3**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**1**	**1**	**1**	**1**
21EEL17/27.3	**3**	**2**	**2**	**1**	**-**	**1**	**-**	**-**	**1**	**-**	**1**	**1**
21EEL17/27.4	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**
21EEL17/27.5	**3**	**2**	**3**	**1**	**1**	**1**	**-**	**-**	**1**	**1**	**2**	**2**

COMMUNICATION ENGLISH			
Course Code	21EGH18	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1 : 1: 1: 0	SEE Marks	50
Credits	02	Exam Hours	3

Course Objectives:

The course will enable the students,

- To know about Fundamentals of Communicative English and Communication Skills in general.
- To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for better communication skills.
- To impart Basic English grammar and essentials of important language skills.
- To enhance with English vocabulary and language proficiency for better communication skills.
- To learn about Techniques of Information Transfer through presentation.

Language Lab: To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred as per the AICTE/VT guidelines.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

- ✓ Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.
    1. Direct instructional method (Low /Old Technology),
    2. Flipped classrooms (High/advanced Technological tools),
    3. Blended learning (combination of both),
    4. Enquiry and evaluation based learning,
    5. Personalized learning,
    6. Problems based learning through discussion,
    7. Following the method of expeditionary learning Tools and techniques,
    8. Use of audio visual methods through language Labs in teaching of LSRW skills.
- ✓ Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students. In theoretical applied and practical skills in teaching of communicative skills in general.

Module-1	
Introduction to Communicative English : Introduction, Language as a Tool, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English (Communication Channels). Interpersonal and Intrapersonal Communication Skills, How to improve and Develop Interpersonal and Intrapersonal Communication Skills.	**04 Hours**
Teaching - Learning Process	Chalk and talk method, Videos, Power Point presentation to teach Communication skills (LSRW Skills), Creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with companies real time situations).

Module-2	
Introduction to Phonetics : Introduction, Phonetic Transcription, English Pronunciation, Pronunciation Guidelines Related to consonants and vowels, Sounds Mispronounced, Silent and Non silent Letters, Syllables and Structure, Word Accent and Stress Shift, – Rules for Word Accent, Intonation – purposes of intonation, Spelling Rules and Words often Misspelt – Exercises on it. Common Errors in Pronunciation.	**05 Hours**
Teaching-Learning Process	Chalk and talk method, Videos, Power Point presentation and Animation videos to teach phonetics in Practical method, creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with companies' real time situations).
Module-3	
Basic English Communicative Grammar and Vocabulary PART - I : Grammar: Basic English Grammar and Parts of Speech - Nouns, Pronouns, Adjectives, Verbs, Adverbs, Conjunctions , Articles and Preposition. Preposition, kinds of Preposition and Prepositions often Confused. Articles: Use of Articles – Indefinite and Definite Articles, Pronunciation of 'The', words ending 'age', some plural forms. Introduction to Vocabulary, All Types of Vocabulary –Exercises on it.	**05 Hours**
Teaching-Learning Process	Chalk and talk method, Videos, Power Point presentation to teach Grammar, Animation videos on communication and language skills, creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with companies' real time situations).
Module-4	
Basic English Communicative Grammar and Vocabulary PART - II: Question Tags, Question Tags for Assertive Sentences (Statements) – Some Exceptions in Question Tags and Exercises, One Word Substitutes and Exercises. Strong and Weak forms of words, Words formation - Prefixes and Suffixes (Vocabulary), Contractions and Abbreviations. Word Pairs (Minimal Pairs) – Exercises, Tense and Types of tenses, The Sequence of Tenses (Rules in use of Tenses) and Exercises on it.	**05 Hours**
Teaching-Learning Process	Chalk and talk method, PowerPoint presentation to teach Grammar and phonetics, Animation videos on communication and language skills, creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with companies' real time situations).
Module-5	
Communication Skills for Employment : Information Transfer: Oral Presentation - Examples and Practice. Extempore / Public Speaking, Difference between Extempore / Public Speaking, Communication Guidelines for Practice. Mother Tongue Influence (MTI) – South Indian Speakers, Various Techniques for Neutralization of Mother Tongue Influence – Exercises. Reading and Listening Comprehensions – Exercises.	**06 Hours**
Teaching-Learning Process	Chalk and talk method, Videos, Power Point presentation to teach Grammar and phonetics, Animation videos on communication and language skills, creating real time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with companies' real time situations).

Course Outcome:

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

1. Understand and apply the Fundamentals of Communication Skills in their communication skills.
2. Identify the nuances of phonetics, intonation and enhance pronunciation skills.
3. To impart Basic English grammar and essentials of language skills as per present requirement.
4. Understand and use all types of English vocabulary and language proficiency.
5. Adopt the Techniques of Information Transfer through presentation.

Assessment Details both(CIE and SEE):

Component	Weightage (%)
CIE [Multiple Choice Questions(MCQ)/Quizzes/ written test/Report Writing/ Seminar activities]	50
Semester End Examination **(**SEE) - [Multiple Choice Questions(MCQ)/Descriptive]	50

Suggested Learning Resources:

1) **Communication Skills** by Sanjay Kumar and Pushp Lata, Oxford University Press -2019.
2) **English for Engineers** by N.P.Sudharshana and C.Savitha, Cambridge University Press –2018.
3) **A Textbook of English Language Communication Skills,** Infinite Learning Solutions– (Revised Edition) 2021.
4) **A Course in Technical English – D Praveen Sam, KN Shoba,** Cambridge University Press –2020.
5) **Technical Communication** by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited [Latest Revised Edition] -2019.
6) **English Language Communication Skills – Lab Manual cum Workbook,** Cengage learning India Pvt Limited [Latest Revised Edition] –2019.
7) **Practical English Usage** by Michael Swan, Oxford University Press –2016.
8) **Technical Communication** – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press2017.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ✓ Contents related activities (Activity-based discussions).
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts.
- ✓ Organizing Group wise discussions connecting to placement activities.
- ✓ Quizzes and Discussions.
- ✓ Seminars and assignments.

CO-PO Mapping

	Program Outcomes											
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
21EGH18. 1									**1**	**2**	**2**	**2**
21EGH18. 2									**2**	**2**	**2**	**2**
21EGH18. 3									**1**	**2**	**2**	**2**
21EGH18. 4									**1**	**2**	**2**	**2**
21EGH18. 5									**2**	**2**	**2**	**2**

INNOVATION AND DESIGN THINKING			
Course Code	21IDT19/29	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	0:2:0:0	SEE Marks	50
Credits	01	Exam Hours	02

Course Objectives:

- To explain the concept of design thinking for product and service development.
- To explain the fundamental concept of innovation and design thinking.
- To discuss the methods of implementing design thinking in the real world.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develops thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students understanding.

Module-1	
Process of design **Understanding Design thinking** Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping.	**05 Hours**
Teaching- Learning Process	Introduction about the design thinking: Chalk and Talk method Theory and practice through presentation MVP and Prototyping through live examples and videos.

Module-2	
Tools for Design Thinking Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space– Empathy for design – Collaboration in distributed Design.	**05 Hours**
Teaching- Learning Process	Case studies on design thinking for real-time interaction and analysis. Simulation exercises for collaborated enabled design thinking. Live examples on the success of collaborated design thinking.

Module-3	
Design Thinking in IT Design Thinking to Business Process modeling – Agile in Virtual collaboration environment – Scenario based Prototyping.	**05 Hours**
Teaching- Learning Process	Case studies on design thinking and business acceptance of the design Simulation on the role of virtual eco-system for collaborated prototyping.

Module-4	
DT For strategic innovations Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.	**05 Hours**
Teaching-Learning Process	Business model examples of successful designs Presentation by the students on the success of design Live project on design thinking in a group of 4 students
Module-5	
Design thinking workshop Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test.	**05 Hours**
Teaching- Learning Process	08 hours design thinking workshop from the expect and then presentation by the students on the learning from the workshop

Course Outcomes:

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

1. Appreciate various design process procedure.
2. Generate and develop design ideas through different technique.
3. Identify the significance of reverse Engineering to Understand products.
4. Draw technical drawing for design ideas.
5. Exploring the concepts learned.

Assessment Details both(CIE and SEE):

Component	Weightage (%)
CIE [Multiple Choice Questions(MCQ)/Quizzes/ written test/Report Writing/ Seminar activities]	50
Semester End Examination **(**SEE) - [Multiple Choice Questions(MCQ)/Descriptive]	50

Suggested Learning Resources:

Text Books :

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition,2013.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand –Improve – Apply", Springer, 2011
4. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons2013.

References:

5. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.
6. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business SchoolPublishing)Hardcover–20Sep2013byJeanneLiedtka(Author),AndrewKing(Author), Kevin Bennett (Author).

Web links and Video Lectures (e-Resources):

1. www.tutor2u.net/business/presentations/./productlifecycle/default.html
2. https://docs.oracle.com/cd/E11108_02/otn/pdf/./E11087_01.pdf
3. www.bizfilings.com › Home › Marketing › Product Development
4. https://www.mindtools.com/brainstm.html
5. https://www.quicksprout.com/./how-to-reverse-engineer-your-competit
6. www.vertabelo.com/blog/documentation/reverse-engineering
   https://support.microsoft.com/en-us/kb/273814
7. https://support.google.com/docs/answer/179740?hl=en
8. https://www.youtube.com/watch?v=2mjSDIBaUlM thevirtualinstruc-
   tor.com/foreshortening.html
   https://dschool.stanford.edu/.../design resources/.../ModeGuideBOOTCAMP2010L.pdf
   https://dschool.stanford.edu/use-our-methods/ 6. https://www.interaction-
   design.org/literature/article/5-stages-in-the-design-thinking-process 7.
   http://www.creativityatwork.com/design-thinking-strategy-for-innovation/ 49 8.
   https://www.nngroup.com/articles/design-thinking/ 9.
   https://designthinkingforeducators.com/design-thinking/ 10.
   www.designthinkingformobility.org/wp-content/.../10/NapkinPitch_Worksheet.pdf

CO-PO Mapping

	Program Outcomes											
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
21IDT19/29.1	**2**	**2**	**3**					**1**	**1**	**2**	**1**	
21IDT19/29.2	**1**	**2**	**3**	**2**	**3**	**1**				**2**	**2**	
21IDT19/29.3	**1**	**1**	**2**	**3**	**2**		**1**		**2**			**2**
21IDT19/29.4	**1**	**2**	**3**	**2**	**3**				**2**		**1**	**2**
21IDT19/29.5	**1**	**2**	**3**		**2**	**3**	**2**			**2**		**2**

II Semester-Chemistry Cycle

ADVANCED CALCULUS AND NUMERICAL METHODS			
Course Code	21MAT21	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

The goal of the course Advanced Calculus and Numerical Methods is,

- To facilitate the students with a concrete foundation of integral calculus.
- To facilitate the students with a concrete foundation of vector calculus, partial differential equations, and numerical methods enabling them to acquire the knowledge of these mathematical tools.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods maybe adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students 'progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

Module-1: Integral Calculus	
Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by a double integral. Problems. **Beta and Gamma functions:** Definitions, properties, the relation between Beta and Gamma functions. Problems. **Self-Study:** Centre of gravity.	**08 Hours**
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

Module-2: Vector Calculus	
Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems. **Vector Integration:** Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem and Stoke's theorem. Problems. **Self-Study**: Volume integral and Gauss divergence theorem.	**08 Hours**
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3: Partial Differential Equations (PDE's)	
Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one-dimensional heat equation and wave equation. **Self-Study:** Solution of one-dimensional heat equation and wave equation by the method of separation of variables.	**08 Hours**
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation
Module-4: Numerical methods -1	
Solution of polynomial and transcendental equations: Regula-Falsi and Newton-Raphson methods (only formulae). Problems. Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula (All formulae without proof). Problems. Numerical integration: Simpson's ($1/3^{rd}$) and ($3/8^{th}$) rules (without proof). Problems. **Self-Study:** Bisection method, Lagrange's inverse Interpolation, Weddle's rule.	**08 Hours**
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
Module-5: Numerical methods -2	
Numerical Solution of Ordinary Differential Equations (ODE's): Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth-order, Milne's predictor-corrector formula (No derivations of formulae). Problems. **Self-Study:** Adam-Bashforth method.	**08 Hours**
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

Course Outcomes:

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

1. Apply the concept of change of order of integration and change of variables to evaluate multiple integrals and their usage in computing the area and volume.
2. Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the interdependence of line, surface, and volume integrals.
3. Formulate physical problems to partial differential equations and to obtain solutions for standard practical PDE's.
4. Apply the knowledge of numerical methods in modeling various physical and engineering phenomena.
5. Solve first-order ordinary differential equations arising in engineering problems.

Assessment Details (both CIE and SEE)

Component		Weightage (%)
Best of Two CIE's	CIE 1	40
	CIE 2	
	CIE 3	
AAT's	AAT-1 (Surprise Test/Quiz)	5
	AAT-2 (Self Study Topic Assignment)	5
Semester End Examination **(**SEE)		50

Suggested Learning Resources:

Text Books:

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed.2018.
2. **E.Kreyszig**:"Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed. (Reprint), 2016.

Reference Books

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed.
2. **Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics" Oxford University Press, 3rd Reprint, 2016.
3. **N. P Bali and Manish Goyal**:"A text book of Engineering Mathematics" Laxmi Publications, Latest edition.
4. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co.Newyork, Latested.
5. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education (India) Pvt. Ltd 2015.
6. **H.K.Dass and Er.Rajnish Verma:** "Higher Engineering Mathematics"S. Chand Publication(2014).
7. **James Stewart: "**Calculus" Cengage publications, 7th edition, 4th Reprint2019.

Web links and Video Lectures (e-Resources):

- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program

CO-PO Mapping

	Program Outcomes											
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
21MAT21.1	3	1	2									
21MAT21.2	3	1	2									
21MAT21.3	2	3	1									
21MAT21.4	3	2	1									
21MAT21.5	2	1	2									

ENGINEERING CHEMISTRY			
Course Code	21CHE12/22	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

- The course will enable the students to impart the basic knowledge of chemistry and its principles involved in electrochemistry, energy storage devices and its commercial applications.
- Understand the basic principles of corrosion and its prevention, metal finishing and its technological importance.
- Master the knowledge of synthesis, properties and utilization of engineering materials like polymer and lubricants.
- Apply the knowledge of Green Chemistry principles for the production of chemical compounds. Understanding the concepts of synthesis and characterization of nanomaterials.
- Understand the theory, basic principle and applications of volumetric analysis and analytical instruments.

Teaching-Learning Process (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

- Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
- Show Video/animation films to explain methods of synthesis of nanomaterials.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in multiple representations.
- Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
- Discuss how every concept can be applied to the real world and when that's possible, it helps improve the students' understanding.

Module-1

Electrochemistry and Energy storage systems: Introduction, EMF of the cell, Free Energy, Single electrode Potential-Derivation of Nernst equation, Numerical problems based on Nernst Equation. **Reference Electrodes:** Introduction, construction, working and applications of calomel electrode, ion- selective Electrodes-Glass electrode, determination of pH using a Glass electrode. **Energy Storage Systems:** Introduction, Classification of batteries (primary, secondary and reserved batteries).Construction, working and applications of Li-ion batteries. Advantages of Li-ion battery as an electro chemical energy system for electric vehicles. Recycling of Lithium-ion batteries**.**	**08 Hours**

Teaching– Learning Process	Electrochemistry and energy systems-chalk and talk method, PowerPoint presentation, Practical topic: Determination of p^{Ka} value of weak acid using a glass electrode. Energy storage Systems-Power point presentation, YouTube videos for Li-ion battery construction and working. Self-study material: Construction and working of classical batteries like Zn-MnO_2 and Pb- PbO_2 batteries.

Module-2	
Corrosion and its control: Introduction, Electrochemical theory of corrosion, Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of corrosion product, nature of the medium – pH, conductivity and temperature. Types of corrosion - Differential metal and differential aeration (pitting and waterline). Corrosion control: Anodizing – Anodizing of aluminum, cathodic protection – a sacrificial anode and impressed current methods, Metal coatings – Galvanization and tinning. Corrosion Penetration Rate (CPR). **Metal finishing**: Introduction, Technological importance. **Electroplating**: Introduction, electroplating of chromium (hard and decorative). **Electroless plating**: Introduction, difference between electroplating and electroless plating processes and electroless plating of copper.	**08 Hours**
Teaching- Learning Process	Chalk and talk method and PowerPoint presentation - Electrochemical theory of corrosion, Factors affecting the rate of corrosion, Types of corrosion and corrosion control. Technological importance. Electroplating: Introduction. Videos: Electroplating of chromium, electroless plating of nickel & copper Self-learning material: Organic coatings: Paint, components of paints and their functions. Varnish, definition, differences between paints and varnishes.
Module-3	
Engineering Materials **Cement:** types of cement, constituents, hardening and setting, deterioration of cement. **Polymers:** Introduction, Synthesis, and applications of Polyurethane. Polymer Composites-Kevlar Fibre, **Conducting Polymers**: Synthesis & Mechanism of conduction in polyaniline and factors influencing conductivity of organic polymers. **Biodegradable polymers:** Introduction and their requirements. Synthesis and properties of Polylactic acid. **Nanomaterials:** Introduction, size-dependent properties (Surface area, Electrical, Optical and Catalytic properties). Synthesis of nanomaterials: Top-down and bottom-up approaches, Synthesis by Sol-gel, precipitation and chemical vapor deposition, Nanoscale materials: Carbon nanotubes and graphene's – properties and applications.	**08 Hours**
Teaching- Learning Process	Chalk and talk method and PowerPoint presentation- Polymers, Conducting Polymers, Insulators. Videos: Lubricants. Practical topic: Determination of CaO in cement. Self-learning material: Insulators- Introduction, thermal insulators and electrical insulators or dielectrics.
Module-4	
Green Chemistry and alternative energy resources Introduction, definition, Major environmental pollutants, Basic principles of green chemistry. Various green chemical approaches – Microwave synthesis, Bio catalyzed reactions, Phase transfer catalysis. Supercritical conditions for solvent-free reactions. Synthesis of organic compound Adipic acid by conventional and green route. **Green fuel**: Hydrogen-production (Photo electrocatalytic and photocatalytic water splitting) and applications in hydrogen fuel cells. Construction, working and applications of Methanol-Oxygen fuel cell (H_2SO_4 as electrolyte). **Solar Energy:** Introduction, construction, working and applications of a photovoltaic cell.	**08 Hours**

Teaching -Learning Process	Chalk and talk/powerpoint presentation - Basic principles of green chemistry, size dependent properties of nanomaterials. Nanoscale materials: Carbon nanotubes and graphenes – properties and applications. Videos: Various green chemical approaches, Synthesis of nanomaterials: Top-down and bottom-up approaches, Synthesis by Sol-gel, precipitation and chemical vapor deposition. Self-study material: Design of PV cells.

Module-5

Water chemistry: Introduction, sources, and impurities in water, Potable water; meaning and specifications (as per WHO standards), Hardness of water, types, determination of hardness using EDTA titration. Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD), Numerical problems on COD. **Methods of Chemical Analysis:** **Volumetric Analysis:** Introduction, principles of titrimetric analysis, the requirement of titrimetric analysis, the definition of equivalent weight, acidity, basicity, primary and secondary standards. Requirement of a primary standard solution, units of standard solutions (normality, molarity, molality, mole fraction, ppm). **Instrumental methods of analysis:** Introduction, theory, instrumentation and applications of colorimetry, Flame Photometry, Potentiometry, Conductometry (Strong acid with a strong base, a weak acid with a strong base, a mixture of strong acid and a weak acid with a strong base)	**08 Hours**

Teaching- Learning Process	Chalk and talk/PowerPoint presentation – principles of titrimetric analysis, the requirement of titrimetric analysis, Classification of titrimetric analysis,. Instrumental methods of analysis. Practical topic: Volumetric titrations, instrumental methods. Self-study material- Types of volumetric titrations (neutralization, redox and complexometric)

Course Outcome:

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

1. Discuss the electrochemical energy systems such as electrodes and batteries.
2. Explain the fundamental concepts of corrosion, its control and surface modification methods namely electroplating and electroless plating
3. Enumerate the importance, synthesis and applications of cement, polymers. Understand the properties and application of nanomaterials.
4. Describe the principles of green chemistry; understand properties and application of alternative fuels.
5. Illustrate the fundamental principles and applications of volumetric and analytical instrumentation.

Assessment Details (both CIE and SEE)

Component		Weightage (%)
Best of Two CIE's	CIE 1	40
	CIE 2	
	CIE 3	
AAT's	AAT-1 (Surprise Test/Quiz)	5
	AAT-2 (Self Study Topic Assignment)	5
Semester End Examination (SEE)		50

Suggested Learning Resources:

Books

1. Uppal M.M, Jain and Jain. Engineering Chemistry, Khanna Publishers, 35th Edition, 2013.
2. P.C. Jain and Monica Jain, A test Book of Engineering Chemistry, Dhanpat Rai Publications, New Delhi,

12th Edition, 2012.

3. S.S Dara & Dr. SS Umare, A Text book of Engineering Chemistry, S Chand & Company Ltd., 12th Edition, 2011.
4. R.V. Gadag and Nithyananda Shetty, A Text Book of Engineering Chemistry, I.K. International Publishing house. 2nd Edition, 2016.
5. B.S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Chemistry for Engineering Students", Subash Publications, Bangalore.5th Edition, 2014
6. F.W. Billmeyer, Text Book of Polymer Science, John Wiley & Sons, 4th Edition, 1999.
7. M.G. Fontana, N.D. Greene, Corrosion Engineering, McGraw Hill Publications, New York, 3rd Edition, 1996.
8. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma & M.S. Pathania, S. Nagin Chand & Co., 41 Edition, 2004.
9. G.A. Ozin & A.C. Arsenault, "Nanotechnology A Chemical Approach to Nanomaterials". RSC Publishing, 2005.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=faESCxAWR9k
- https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-9IbHrDMjHWWh
- https://www.youtube.com/watch?v=j5Hml6KN4TI
- https://www.youtube.com/watch?v=X9GHBdyYcyo
- https://www.youtube.com/watch?v=1xWBPZnEJk8

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- https://www.vlab.co.in/broad-area-chemical-sciences
- https://demonstrations.wolfram.com/topics.php
- https://interestingengineering.com/science

CO-PO Mapping

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21CHE12/22.1	3	2	1	1	1	1	1	-	1	-	1	1
21CHE12/22.2	3	2	2	1	1	1	1	-	1	-	1	1
21CHE12/22.3	3	2	2	1	1	1	2	-	1	-	1	1
21CHE12/22.4	3	2	2	1	1	1	3	1	1	-	1	1
21CHE12/22.5	3	2	2	2	1	1	1	-	-	-	1	1

PROBLEM-SOLVING THROUGH PROGRAMMING			
Course Code	21PSP23/13	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

- Elucidate the basic architecture and functionalities of a computer system.
- To learn basic principles of problem solving.
- Apply programming constructs of C programming language to solve the problems.
- Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems.
- Design and develop solutions to problems using modular programming constructs such as functions and procedures.

Teaching-Learning Process (General Instructions):

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain the functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyse information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1	
Introduction to Computer Hardware and Software: Computer generations, computer types, bits, bytes and words, CPU, Primary memory, Secondary memory, ports and connections, input devices, output devices, Computers in a network, Network hardware, Software basics, software types. **Overview of C:** Basic structure of C program, executing a C program. Constant, variable and Data types, Operators and expressions.	**08 Hours**
Teaching-Learning Process	Chalk & board, Active Learning

Module-2	
Managing Input and output operations. Conditional Branching and Loops. Example programs, finding roots of a quadratic equation, computation of binomial coefficients, plotting of Pascal's Triangle.	**08 Hours**
Teaching-Learning Process	Chalk & board, Active Learning, Problem based learning

Module-3	
Arrays: Arrays (1-D, 2-D), Character arrays and Strings, example programs: find whether the given string is palindrome or not and String Matching. Basic Algorithms: Searching and Sorting. **Algorithms** (Linear search, Binary search, Bubble sort and Selection sort).	**08 Hours**
Teaching- Learning Process	Chalk & board, MOOC, Active Learning

Module-4	
User Defined Functions and Recursion. Example programs: Finding Factorial of a positive integer, GCD of two numbers and Fibonacci sequence.	**08 Hours**
Teaching- Learning Process	Chalk & board, Problem based learning

Module-5

Structures and Pointers, Pre-processor Directives and Example Programs like Addition of two complex numbers using structures, program to show the basic declaration of pointers, compute the sum using pointers, store n elements in an array and print the elements using pointers, swapping of 2 elements using call by reference.	**08 Hours**
Teaching-Learning Process	Chalk & board, MOOC

Course Outcomes:

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

1. Elucidate the basic architecture and functionalities of a computer and also recognize the hard ware parts.
2. Apply programming constructs of C language to solve the real-world problem.
3. Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting.
4. Explore user-defined data structures like array,structures and pointers in implementing solutions.
5. Design and Develop Solutions to problems using modular programming constructs using functions.

Assessment Details (both CIE and SEE)

Component		Weightage (%)
Best of Two CIE's	CIE 1	40
	CIE 2	
	CIE 3	
AAT's	AAT-1 (Surprise Test/Quiz)	5
	AAT-2 (Self Study Topic Assignment)	5
Semester End Examination **(**SEE)		50

Books

1. E. Balaguruswamy, Programming in ANSIC,7th Edition, Tata McGraw-Hill
2. Brian W. Kernighan and Dennis M.Ritchie, The'C' Programming Language, Prentice Hall of India.

Reference Books:

1. Reema Thereja , Programming in C, Cengage publication.

Web links and Video Lectures (E-Resources):

Elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
https://nptel.ac.in/courses/106/105/106105171/
MOOC courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Real world problem solving using group discussion. E.g., Electricity bill generation. etc.,
2. Demonstration of solution to a problem through programming.
3. Demonstration of simple project and motivating the students to develop similar type of projects.

CO-PO Mapping

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21PSP13/23.1	**3**	**-**	**1**	**-**	**-**	**1**	**2**	**-**	**1**	**1**	**-**	**2**
21PSP13/23.2	**3**	**3**	**2**	**2**	**1**	**1**	**2**	**-**	**1**	**1**	**-**	**2**
21PSP13/23.3	**3**	**3**	**2**	**2**	**1**	**1**	**2**	**-**	1	1	**-**	**2**
21PSP13/23.4	**3**	**3**	**2**	**2**	**1**	**1**	**2**	**-**	1	1	**-**	**2**
21PSP13/23.5	**3**	**3**	**3**	**3**	**1**	**1**	**2**	-	1	1	**-**	**2**

BASIC ELECTRONICS AND COMMUNICATION ENGINEERING			
Course Code	21ELN14/24	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

- Prepare with the basic knowledge of Electronics Circuits and Op-amp applications.
- Learn the fundamentals of Digital Electronics Circuits, Data types and flip-flop applications.
- Understand the elements of Embedded Systems, Sensors and Actuators, Communication Interfacing.
- Gain knowledge of basics in Analog and Digital Communication engineering fundamentals required for comprehending the operation and application of Communication Systems.
- Interpret the fundamentals of Cellular Wireless Networks, Satellite and Optical Communication.

Teaching-Learning Process (General Instructions):

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby PSUs such as BHEL, BEL, ISRO, etc., and small-scale hardware industries to give brief information about the electronics manufacturing industry.
3. Show Video/animation films to explain the functioning of various analog and digital circuits.
4. Encourage collaborative (Group) Learning in the class.
5. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
7. Topics will be introduced in multiple representations.
8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Electronic Circuits: Power Supplies – Block diagram, Rectifiers, Reservoir circuits, Full-wave rectifiers, Bi-phase rectifier circuits, Bridge rectifier circuits, Voltage regulators, Output resistance and voltage regulation,. **Amplifiers** – Types of amplifiers, Gain, Input and output resistance, Frequency response, Bandwidth, Phase shift, Negative feedback. **Operational Amplifiers** - Operational amplifier parameters, Operational amplifier characteristics, Operational amplifier configurations, Operational amplifier circuits **Oscillators** – Positive feedback, Conditions for oscillation, Wein bridge oscillator, Multi vibrators. (Only Concepts, working, and waveforms. No mathematical derivations).	**08 Hours**
Teaching-Learning Process	Chalk and talk method, PowerPoint Presentation, YouTube videos, Animation of input and output waveforms of the op-amp circuits. Practical Topics: Problems on voltage regulators, op-amp parameters, oscillators. Self-study topics: BJT amplifier types, comparison of BJT & FET.

Module-2

Logic Circuits – Logic gates, Bistables, R-S Bistables, and J-K Bistables. Data representation, Data types, Data storage, A microcontroller system. Realization using basic gates and truth table the Half Adder and Full Adder, Multiplexer and decoder. Shift registers. (No simplification of Boolean algebra, no K-maps. Only logic circuit, working and truth table)	**08 Hours**

Teaching-Learning Process	Chalk and talk method, Power Point Presentation, YouTube videos, Animation of truth table and timing waveforms of the logic circuits especially flip flops, adders, shift registers, and counters. Practical Topics: Problems on data representation and types. Self-study topics: Waveforms of counters, shift registers.

Module-3

Embedded Systems – 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, RISC vs CISC, Harvard vs Von-Neumann. **Sensors and Interfacing** – Instrumentation and control systems, Transducers, Sensors. **Actuators, LED**, 7-Segment LED Display, Relay, Piezo Buzzer, Push Button Switch, Keyboard.	**08 Hours**
Teaching- Learning Process	Chalk and talk method, Power Point Presentation, YouTube videos Pictures of sensors, actuators, microcontrollers (with manufacturer names) Self-study topics: Block diagrams of the architectures of RISC, CISC, Harvard and Von-Neumann, Actuator types, LCD, Touch screen displays.

Module-4

Analog and Digital Communication – Modern communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM, FM, Phase Modulation, Pulse Modulation, PAM, PWM, PPM, PCM. Concept of Radio wave propagation (Ground, space, sky) Concepts of Sampling theorem, Nyquist rate, Digital Modulation Schemes– ASK, FSK, PSK **Antenna, Types of antennas** (only definition and antenna model, exclude radiation patterns).	**08 Hours**
Teaching-Learning Process	Chalk and talk method, PowerPoint Presentation, YouTube videos Self-study topics: Multiplexing techniques – TDM, FDM, CDM, WDM, OFDM

Module-5

Cellular Wireless Networks - 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, Fourth Generation (4G) Technology, Wireless LAN, Bluetooth, Bluetooth Architecture. **Satellite Communication** – Elements of Satellite Communication, Types of satellites – GEO, LEO, MEO. **Optical Fiber Communication** - A fiber optic Communication system	**08 Hours**
Teaching-Learning Process	Chalk and talk method, PowerPoint Presentation, YouTube videos Self-study topics: 5G

Course Outcome:

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

1. Describe the concepts of electronic circuits encompassing power supplies, amplifiers and oscillators.
2. Analyze the basics of digital logic engineering including data representation, circuits and the microcontroller system with associated sensors and actuators.
3. Discuss the characteristics and technological advances of embedded systems.
4. Relate to the fundamentals of communication engineering spanning from the frequency spectrum to the various circuits involved including antennas.
5. Explain the different modes of communications from wired to wireless and the computing involved.

Assessment Details (both CIE and SEE)

Component		Weightage (%)
Best of Two CIE's	CIE 1	40
	CIE 2	
	CIE 3	
AAT's	AAT-1	5
	AAT-2	5
Semester End Examination **(**SEE)		50

Alternate Assessment Tool (AAT)

Proposed Activities to be carried out for 10 marks of AAT:

Students should construct and make the demo of the following circuits in a group of 3/4 students:

- To switch on/off an LED using a diode in forward / reverse bias using a battery cell.
- IC 741 Integrator circuit.
- IC 741 comparator circuit.
- To operate a small loudspeaker by generating oscillations using IC 555.

Using suitable simulation software, demonstrate the operation of the following circuits:

- Half wave rectifier using diodes
- Full-wave rectifier using diodes
- Op-amp circuits – inverting amplifiers
- Op-amp circuits- non-inverting amplifiers
- Flip-flops
- AM modulation.

Text Books:

1. **Mike Tooley,** 'Electronic Circuits, Fundamentals & Applications', 4 th Edition, Elsevier, 2015. ISBN: 978-1-138-82892-6 (pbk)
2. **K V Shibu,** 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited, 2016.ISBN-10 : 9339219686 , ISBN-13 : 978-9339219680
3. **S L Kakani and Priyanka Punglia**, 'Communication Systems', New Age International Publisher, 2017ISBN-13978-9386286512
4. **D P Kothari, I J Nagrath**, 'Basic Electronics', 2nd edition, McGraw Hill Education (India), Private Limited, 2018.ISBN-13978-9352606467.

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning developing electronic applications using Raspberry Pi – Text 1: Chapter 18

E-Resources:

- E-book versions are available at 'https: //www.knimbus.com/' of the VTU consortium. Remote login available through respective college IDs.
- Google Drive Link
- https://drive.google.com/drive/folders/1aTCPv2Bf5Mk40IAYfE0cgZwBjcpAZcR?usp=sharing
- https://doi.org/10.4324/9781315737980. eBook ISBN9781315737980\
- https://elib4u.ipublishcentral.com/pdfreader/communication-systems

CO-PO Mapping

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21ELN14/24.1	3	2	2	1	1	1	1	-	1	3	-	2
21ELN14/24.2	3	2	3	3	2	1	-	-	1	3	-	2
21ELN14/24.3	2	1	1	1	-	-	1	-	1	2	-	1
21ELN14/24.4	3	2	1	1	2	-	-	-	-	2	-	1
21ELN14/24.5	3	2	1	1	-	-	-	-	-	2	-	3

ELEMENTS OF MECHANICAL ENGINEERING			
Course Code	21EME15/25	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	2:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

- Acquire a basic understanding role of Mechanical Engineering in the industry and society
- Acquire a basic understanding of the formation of steam and its industrial application.
- Acquire a basic understanding of renewable energy resources and basic concepts of Hydraulic turbines.
- Acquire knowledge of various engineering materials and metal joining techniques.
- Acquire knowledge on automobile technology in transport application and basics of Refrigeration and Air-Conditioning.
- Acquire essential experience on basic Power transmission systems.
- Acquire knowledge of basic concepts on manufacturing principles and machine tools and their advancement.

Teaching-Learning Process (General Instructions):

1. Adopt different types of teaching methods to develop the outcomes through Power Point presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for Problem Solving.
3. Arrange visits to show the live working models other than laboratory topics.
4. Adopt collaborative (Group Learning) Learning in the class.
5. Adopt Problem Based Learning (PBL), which fosters students Analytical skills and develops thinking skills such as evaluating, generalizing, and analyzing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

Module-1

Introduction to Mechanical Engineering (Overview only): Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors and contribute to the GDP. **Steam Formation and Application:** Formation of steam and thermodynamic properties of steam (Simple Problems using Steam Tables), Applications of steam in industries namely, Sugar industry, Dairy industry, Paper industry, Food processing industry for Heating/Sterilization, Propulsion/Drive, Motive, Atomization, Cleaning, Moisturization, Humidification **Energy Sources and Power Plants:** Review of energy sources; Construction and working of Hydel power plant, Thermal power plant, Nuclear power plant, Solar power plant, Tidal power plant, Wind power plant.	**08 Hours**

Laboratory Components:

1. Visit any one Conventional or Renewable Energy Power Plant and prepare a comprehensive report.
2. Demonstration of Components of any one Turbo-machine through Cut Sections.
3. Visit to an Industry using steam for their process and prepare a comprehensive report.

Teaching-Learning Process	1. Power-point Presentation. 2. Video demonstration or Simulations. 3. Chalk and Talk are used for Problem Solving (In-general). 4. Laboratory Demonstrations and Practical Experiments.

<table>
<tr><th colspan="3">Module-2</th></tr>
<tr><td colspan="2">Properties, Composition, and Industrial Application of Engineering Materials:
Metals-Ferrous: Tool steels and stainless steels. Non-ferrous /metals: aluminum alloys.
Ceramics- Glass, optical fiber glass, cermet’s. Composites- Fiber reinforced composites, Metal matrix Composites. Smart materials- Piezoelectric materials, shape memory alloys, semiconductors, and super-insulators.
Metal Joining Processes:
Soldering, Brazing and Welding: Definitions. Classification and methods of soldering, brazing, and welding. Brief description of arc welding, Oxy-acetylene welding, Introduction to TIG welding and MIG welding.</td><td>08 Hours</td></tr>
<tr><td colspan="3">Laboratory Components:
1. One exercises each involving Welding, Soldering and Brazing.
2. Study oxy-acetylene gas flame structure and its application to gas welding.</td></tr>
<tr><td>Teaching-Learning Process</td><td colspan="2">1. Power Point Presentation.
2. Video demonstration or Simulations.
3. Chalk and Talk are used for Problem Solving (In-general).
4. Laboratory Demonstrations and Practical Experiments.</td></tr>
<tr><th colspan="3">Module-3</th></tr>
<tr><td colspan="2">Fundamentals of IC Engines:
Review of Internal Combustion Engines, 2-Strokes and 4-Strokes engines, Components and working principles, Application of IC Engines in Power Generation, Agriculture, Marine and Aircraft Propulsion, Automobile.
Insight into future mobility technology; Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles, Drives and Transmission. Advantages and disadvantages of EVs and Hybrid vehicles.
Refrigeration and Air-Conditioning:
Principle of refrigeration, Refrigeration effect, Ton of Refrigeration, COP, Refrigerants and their desirable properties. Principles and Operation of Vapor Compression and Vapor absorption, refrigeration. Domestic and Industrial Applications of Refrigerator.</td><td>08 Hours</td></tr>
<tr><td colspan="3">Laboratory Components:
1. Study of Engine Components through Cut Sections.
2. Demonstrate Components and Working principles of Domestic Refrigerator and prepare a comprehensive report OR Study/visit any commercial centralized Air-Conditioning unit, understand various components and operations, and prepare a comprehensive report.</td></tr>
<tr><td>Teaching- Learning Process</td><td colspan="2">1. Power Point Presentation,
2. Chalk and Talk are used for Problem Solving (In-general).
3. Video demonstration or Simulations,
4. Laboratory Demonstrations and Practical Experiments</td></tr>
<tr><th colspan="3">Module-4</th></tr>
<tr><td colspan="2">Mechanical Power Transmission:
Gear Drives: Types - spur, helical, bevel, worm and rack and pinion, velocity ratio,
Gear Trains and their application: simple and compound Gear Trains, Simple numerical problems on Gear trains involving velocity ratios
Belt Drives: Components of belt drive and concept of velocity ratio; Types of belt drives, Flat-Belt Drive, V-Belt Drive and Application of Belt Drives.
Simple numerical problems on Belt drives involving velocity ratios,
Concept of Chain, Rope drives and their applications
Introduction to Robotics:
Robot anatomy, Joints & links, common Robot configurations. Applications of Robotics in Material Handling, Processing, Assembly, and Inspection.</td><td>08 Hours</td></tr>
</table>

Laboratory Components:

1. Demonstration of the machine consists of Gear Trains.
2. Demonstration of various elementary mechanisms and their motion.
3. Demonstration of any one model of Robot

Teaching- Learning Process	1. Power Point Presentation. 2. Chalk and Talk are used for Problem Solving. 3. Video demonstration or Simulations. 4. Laboratory Demonstrations and Practical Experiments.

Module-5

Fundamentals of Machine Tools and Operations: Fundamentals of Machining and machine tools, Construction and Working Principle of Lathe, Various Lathe Operations: Turning, Facing, Taper Turning and Knurling. **Introduction to Modern Manufacturing Tools and Techniques:** **CNC**: Introduction, components of CNC, advantages and applications of CNC, CNC Machining centres and Turning Centers Concepts of Smart Manufacturing and Industrial IoT. **Introduction to Mechatronics**: Concept of open-loop and closed-loop systems, Examples of mechatronic systems and their working principle.	**08 Hours**

Laboratory Components:

1. Demonstration of developing one model involving Lathe, Milling and Drilling
2. Study/Visit an Industry using CNC/ modern techniques and submit a report
3. Carry out a Case study on anyone Mechatronics device and prepare a comprehensive report.

Teaching-Learning Process	1. Power Point Presentation, 2. Chalk and Talk are used for Problem Solving (In-general). 3. Students are encouraged to practice only line diagrams for exams. 4. Video demonstration or Simulations, 5. Laboratory Demonstrations and Practical Experiments

Course Outcomes:

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

1. Understand basic concepts of mechanical engineering in the fields of energy and Its utilization, applications of energy sources in power generation through Demonstrations.
2. Identify various applications of engineering materials and different metal Joining methods.
3. Comprehend the working principles of I C Engines, Future mobility technologies, Refrigeration and Air Conditioning systems.
4. Apply the skills on selection of different mechanical power transmission systems in day to day activities and importance of Robots and their application.
5. Identify and select different conventional and modern machine tools for various metal cutting operations.

Assessment Details both(CIE and SEE):

Component		Weightage (%)
Best of Two CIE's	CIE 1	20
	CIE 2	
	CIE 3	
AAT's	AAT-1	2.5
	AAT-2	2.5
Laboratory Component		25
Semester End Examination **(**SEE)		50

*** Note- Students should secure minimum 40 % of marks in both Theory and Lab component to be eligible for SEE.**

Books:

1. Elements of Mechanical Engineering, KR Gopala Krishna, Subhash Publications, 2008
2. Non-Conventional Energy Sources, G.D Rai, Khanna Publishers, 2003
3. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.
4. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012
5. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003.
6. Internal Combustion Engines, V. Ganesan, Tata McGraw Hill Education; 4th edition, 2017.
7. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1.
8. Turbo Machines, M. S. Govindegowda and A. M. Nagaraj, M. M. Publications 7Th Ed, 2012.
9. Basic and Applied Thermodynamics, P.K.Nag, Tata McGraw Hill 2nd Ed., 2002
10. Standard Handbook of Machine Design, Joseph E Shigley; Charles R Mischke, Thomas H Brown, Jr., McGraw-Hill, New York, 2004.
11. Thermal Management in Electronic Equipment, HCL Technologies, 2010
12. Thermal Management of Microelectronic Equipment, L. T. Yeh and R. C. Chu, ASME Press, New York, 2002.
13. Fundamentals of Robotics: Analysis and Control, Robert J. Schilling, Pearson Education (US).

Web-links

1. (https://www.tlv.com/global/TI/steam-theory/principal-applications-for-steam.html
2. https://www.forbesmarshall.com/Knowledge/SteamPedia/About Steam/Fundamental-Applications-of-Steam.
3. https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing- and-process-industry/
4. Videos | Makino (For Machine Tool Operation)
5. Mechanisms and mechanical devices 4e.pdf (e-book- Mechanical Linkages).

CO-PO Mapping

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21EME15/25.1	2	1	-	-	1	1	2	-	-	2	-	2
21EME15/25.2	2	1	-	-	2	-	1	-	-	2	-	2
21EME15/25.3	2	1	-	-	1	-	2	-	-	2	-	2
21EME15/25.4	2	1	-	-	2	1	1	-	-	2	-	2
21EME15/25.5	2	1	-	-	1	1	2	-	-	2	-	2

ENGINEERING CHEMISTRY LABORATORY			
Course Code	21CHL16/26	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	3

Course Objectives:

1. Quantitative analysis of materials by volumetric and chemical methods.
2. Instrumental methods for developing experimental skills in building technical competence.

Sl. NO	Instrumentation Experiments
1	Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution.
2	Conduct metric estimation of the acid mixture.
3	Determination of Viscosity coefficient of a given liquid using Ostwald's viscometer.
4	Colorimetric estimation of copper.
5	Determination of p^{Ka} value of a given weak acid using a p^{H} meter.
	Volumetric experiments
1	Estimation of Total hardness of water by EDTA complexometric method.
2	Estimation of CaO in cement solution by rapid EDTA method.
3	Determination of percentage of copper in brass using standard sodium thiosulphate solution.
4	Determination of Chemical oxygen demand of industrial waste water.
5	Determination of Total Alkalinity of water sample.
	Demonstration Experiments (For CIE)
1	Synthesis of nanomaterial by Precipitation method.
2	Estimation of percentage of iron in the given rust solution using standard Potassium Dichromate solution (External indicator method).

Course Outcomes:

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

1. Determine the p^{Ka} and coefficient of Viscosity of a given organic liquid.
2. Estimate the amount of substance present in the given solution using Potentiometer Conduct metric and Colorimetric analysis.
3. Determine the total hardness and chemical oxygen demand in the given water sample by volumetric analysis method.
4. Determine the percentage of CaO, copper and Iron in the given analyte solution by titration method.
5. Demonstrate flame photometric estimation of sodium & potassium and the synthesis of nanomaterials by Precipitation method.

Assessment Details both(CIE and SEE):

Component	Weightage (%)
CIE	50
Semester End Examination **(**SEE)	50

Suggested Learning Resources:

Text Books:

1. Vogel's A.I. A text book of quantitative analysis, 35th edition, 2012.
2. Willard, Merit, Dean and Settle, A text book of Instrumental analysis, 6th edition 2012.

Reference books:

1. G.H Jeffery,J Bassett, J Mendham and R.C.Denney Vogel's A. I. A text book of quantitative analysis, Dorling Kindersley (India) Pvt., Ltd. 35th edition, 2012.
2. Gary D Christian, Analytical Chemistry, Wiley India, 6th edition, 2015.
3. T. Pradeep, A Textbook of Nanoscience and Nanotechnology, McGraw Hill Education (India) Pvt., Ltd., 1st edition, 2015.

CO-PO Mapping

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21CHL16/26.1	**3**	**1**	**1**	**-**	**1**	**1**	**-**	**-**	**1**	**-**	**1**	**1**
21CHL16/26.2	**2**	**1**	**-**	**1**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**1**
21CHL16/26.3	**3**	**2**	**2**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**1**
21CHL16/26.4	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
21CHL16/26.5	**1**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**

COMPUTER PROGRAMMING LABORATORY			
Course Code	21CPL27/17	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	3

Course Objectives:

1. Understand problem statements and identify appropriate solutions.
2. Development of algorithms and programs using constructs of C programming language.
3. Demonstrate the use of C Compiler. Identify and rectify the syntax,semantic and logical errors during programming.
4. Record the observations and outcomes.

Sl. No.	Practice Programs
1	Calculation of Simple Interest.
2	Check whether the given number is Even/Odd.
3	Convert string case.
4	Check for the palindrome and prime number.
5	Development of linear search algorithm Etc…
PART A-List of problems for which students should develop the program and execute inthe Laboratory	
1	Write a C program to simulate working of a Simple Calculator and also design the flow chart to illustrate the same.
2	Write a C program compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.
3	An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit: for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of the total amount is charged. Write a program to read the name of the user, the number of units consumed, and print out the charges.
5	Implement Binary Search on Integers / Names.
6	Implement Matrix multiplication and validate the rules of multiplication.
7	Compute sin(x)/cos(x) using Taylor series approximation. Compare your result with the built-in library function. Print both the results with appropriateinferences.
8	Develop an algorithm to Sort the given set of N numbers using Bubble sort and write a C-program for the same.
9	Write functions to implement string operations such as compare, concatenate, String length. Convince the parameter passing techniques.
10	Implement structures to read, write and compute average- marks and the students Scoring above and below the average marks for a class of N students.
11	Write a recursive C function to find the factorial of a number n, defined by fact9n0=1, if n=0. Otherwise fact (n)=n*fact(n-1). Using this function, write a C program to compute the binomial coefficient nCr.
12	Implement Recursive functions for Binary to Decimal Conversion.
PART B – Practical Based Learning	
A problem statement for each batch is to be generated in consultation with the co-examiner and the student should develop an algorithm, program andexecute the program for the given problem with appropriate outputs.	

Course Outcome:

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

1. Define the problem statement and identify the need for computer programming

2. Develop algorithm, flowchart and write programs to solve the given problem.
3. Make use of C compiler for programming, identifying and correcting the syntax, semantic and logical errors in programming.
4. Demonstrate use of functions, recursive functions, arrays, strings, and structures in problem solving.
5. Document the inference and observations made from the implementation.

Assessment Details both (CIE and SEE):

Component	Weightage (%)
CIE	50
Semester End Examination **(**SEE)	50

Suggested Learning Resources:

1. Yashavanth Kanetkar, Let us C, Authentic Guide to C Programming Language, bpb publisher, 17th Edition, 2020.
2. Herbert Schildt, C: The complete reference, Mc Graw Hill, 4th Edition, 2017
3. Programming in C, Reema Theraja.

Web links and Video Lectures (e-Resources):

1. http://elearning.vtu.ac.in/econtent/courses/video/BS/14CPL16.html
2. https://nptel.ac.in/courses/106/105/106105171/

CO-PO Mapping

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21CPL17/27.1	3	3	2	1	2	1	-	1	2	-	-	2
21CPL17/27.2	3	3	2	1	2	1	-	1	2	-	-	2
21CPL17/27.3	3	3	3	2	2	1	-	1	2	-	-	2
21CPL17/27.4	3	3	3	2	2	1	-	1	2	-	-	2

PROFESSIONAL WRITING SKILLS IN ENGLISH			
Course Code	21EGH28	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:1:1:0	SEE Marks	50
Total Hours of Pedagogy	03 Hours/Week	Total Marks	100
Credits	02	Exam Hours	3

Course Objectives:

The course will enable the students ,

- To Identify the Common Errors in Writing and speaking of English.
- To achieve better Technical writing and Presentation skills for employment.
- To read Technical proposals properly and make them to write good technical reports.
- Acquire Employment and Workplace communication skills.
- To learn about Tequniqes of Information Transfer through presentation in different level.

Language Lab : To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred as per the AICTE / VTU guidelines.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

- ✓ Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.
  - (i) Direct instructional method (Low /Old Technology),
  - (ii) Flipped classrooms (High/advanced Technological tools),
  - (iii) Blended learning (combination of both),
  - (iv) Enquiry and evaluation based learning,
  - (v) Personalized learning,
  - (vi) Problems based learning through discussion,
  - (vii) Following the method of expeditionary learning Tools and techniques,
  - (viii) Use of audio visual methods through language Labs in teaching of of LSRW skills.
- ✓ Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of communicative skills in general.

Module-1

Identifying Common Errors in Writing and Speaking English : • Advanced English Grammar for Professionals with exercises, Common errors identification in parts of speech, Use of verbs and phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules with Exercises). • Common errors in Subject-verb agreement, Noun-pronoun agreement, Sequence of Tenses and errors identification in Tenses. Advanced English Vocabulary and its types with exercises–Verbal Analogies, Words Confused/Misused.	**04 Hours**
Teaching - Learning Process	Chalk and talk method, Power Point presentation to teach Communication skills (LSRW Skills), Creating real-time stations in class room discussions, Giving activities and assignments (Connecting Campus & community with companies real time situations).

Module-2	
Nature and Style of sensible writing : • Organizing Principles of Paragraphs in Documents, Writing Introduction and Conclusion, Importance of Proper Punctuation, The Art of Condensation (Precise writing) and Techniques in Essay writing, Common Errors due to Indianism in English Communication, Creating Coherence and Cohesion, Sentence arrangements exercises, Practice of Sentence Corrections activities. Importance of Summarizing and Paraphrasing. • Misplaced modifiers, Contractions, Collocations, Word Order, Errors due to the Confusion of words, Common errors in the use of Idioms and phrases, Gender, Singular & Plural. Redundancies & Clichés.	**05 Hours**
Teaching- Learning Process	Chalk and talk method, Power Point presentation and Animation videos to teach phonetics in Practical method, creating real time stations in classroom discussions, Giving activities and Assignments (Connecting Campus & community with companies real time situations).
Module-3	
Technical Reading and Writing Practices : • Reading Process and Reading Strategies, Introduction to Technical writing process, Understanding of writing process, Effective Technical Reading and Writing Practices , Introduction to Technical Reports writing, Significance of Reports, Types of Reports. • Introduction to Technical Proposals Writing, Types of Technical Proposals, Characteristics of Technical Proposals. Scientific Writing Process. • Grammar – Voice and Speech (Active and Passive Voices) and Reported Speech, Spotting Error Exercises, Sentence Improvement Exercises, Cloze Test and Theme Detection Exercises.	**05 Hours**
Teaching- Learning Process	Chalk and talk method, Power Point presentation to teach Grammar, Animation videos on Communication and language skills, creating real-time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with companies' real-time situations).
Module-4	
Professional Communication for Employment : • The Listening Comprehension, Importance of Listening Comprehension, Types of Listening, Understanding and Interpreting, Listening Barriers, Improving Listening Skills. Attributes of a good and poor listener. • Reading Skills and Reading Comprehension, Active and Passive Reading, Tips for effective reading. • Preparing for Job Application, Components of a Formal Letter, Formats and Types of official, employment, Business Letters, Resume vs Bio Data, Profile, CV and others, Types of resume, Writing effective resume for employment, Model Letter of Application (Cover Letter) with Resume, Emails, Blog Writing, Memos (Types of Memos) and other recent communication types.	**05 hours**
Teaching-Learning Process	Chalk and talk method, Power Point presentation to teach Grammar, Animation videos on Communication and language skills, creating real-time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with companies' real-time situations).
Module-5	
Professional Communication at Workplace : • Group Discussions – Importance, Characteristics, Strategies of a Group Discussions. Group Discussions is a Tool for Selection. Employment/ Job Interviews - Importance, Characteristics, Strategies of a Employment/ Job Interviews. Intra and Interpersonal Communication Skills - Importance, Characteristics, Strategies of a Intra and Interpersonal Communica-	**06 Hours**

tion Skills. Non- Verbal Communication Skills (Body Language) and its importance in GD and PI/JI/EI. • Presentation skills and Formal Presentations by Students - Importance, Characteristics, Strategies of Presentation Skills. Dialogues in Various Situations (Activity based Practical Sessions in class by Students).	
Teaching- Learning Process	Chalk and talk method, Power Point presentation to teach Grammar, Animation videos on Communication and language skills, creating real-time stations in classroom discussions, Giving activities and assignments (Connecting Campus & community with companies' real-time situations).

Course outcome:

At the end of the course the student will be able :

1. To understand and identify the Common Errors in Writing and Speaking.
2. To achieve better Technical writing and Presentation skills.
3. To read Technical proposals properly and make them to write good technical reports.
4. Acquire Employment and Workplace communication skills.
5. To learn about Techniques of Information Transfer through presentation in different level.

Assessment Details both(CIE and SEE):

Component	Weightage (%)
CIE [Multiple Choice Questions(MCQ)/Quizzes/ written test/Report Writing/ Seminar activities]	50
Semester End Examination **(**SEE) - [Multiple Choice Questions(MCQ)/Descriptive]	50

Suggested Learning Resources :

1. **A Course in Technical English,** Cambridge University Press – 2020.
2. **Functional English** (**As per AICTE 2018 Model Curriculam**) Cengage learning India Pvt Limited [Latest Revised Edition] - 2020.
3. **Communication Skills** by Sanjay Kumar and Pushp Lata, Oxford University Press - 2018. **Refer it's workbook** for activities and exercises – "Communication Skills – I (A Workbook)" published by Oxford University Press – 2018.
4. **Professional Writing Skills in English,** Infinite Learning Solutions – (Revised Edition) 2021.
5. **Technical Communication** – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
6. High School English Grammar & Composition by Wren and Martin, S Chandh & Company Ltd – 2015.
7. **Effective Technical Communication** – Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private Limited – 2018.
8. **Intermediate Grammar, Usage and Composition** by M.L.Tichoo, A.L.Subramanian, P.R.Subramanian, Orient Black Swan – 2016.

CO-PO Mapping												
Course Out comes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21EGH28.1									2	2	1	2
21EGH28.2									2	2	1	2
21EGH28.3									2	2	1	2
21EGH28.4									2	2	1	2
21EGH28.5									2	2	1	2

SCIENTIFIC FOUNDATIONS OF HEALTH			
Course Code	21SFH19/29	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:0:4	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	01	Exam Hours	02

Course Objectives:

The course will enable the students:

To know about Health and wellness (and its Beliefs)

- To acquire Good Health & It's balance for positive mind-set.
- To build the healthy lifestyles for good health for their better future.
- To Create of Healthy and caring relationships to meet the requirements of MNC and LPG world.
- To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future.
- To Prevent and fight against harmful diseases for good health through positive mindset.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

- ✓ Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and soft-ware's to meet the present requirements of the Global employment market.
  I. Direct instructional method (Low /Old Technology),
  II. Flipped classrooms (High/advanced Technological tools),
  III. Blended learning (combination of both),
  IV. Enquiry and evaluation based learning,
  V. Personalized learning,
  VI. Problems based learning through discussion,
  VII. Following the method of expeditionary learning Tools and techniques,
- ✓ Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students in theo-retical applied and practical skills in teaching of the concepts of Health and Wellness in general.

Module-1

Good Health and It's balance for positive mindset:	
What is Health, Why Health is very important Now? – What influences your Health?, Health and Be-haviour, Health beliefs and advertisements, Advantages of good health (Short term and long term benefits), Health and Society, Health and family, Health and Personality - Profession. Health and behaviour, Disparities of health in different vulnerable groups. Health and psychology, Methods to improve good psychological health. Psychological disorders (Stress and Health - Stress manage-ment), how to maintain good health, Mindfulness for Spiritual and Intellectual health, Changing health habits for good health. Health and personality.	**05 Hours**
Teaching -Learning Process	Chalk and talk method, Power Point presentation and YouTube videos, Anima-tion videos methods. Creating real time stations in classroom discussions. Giv-ing activities & assignments.

Module-2

Building of healthy lifestyles for better future:	
Developing a healthy diet for good health, Food and health, Nutritional guidelines for good health and well beingness, Obesity and overweight disorders and its management, Eating disorders - proper ex-ercises for its maintenance (Physical activities for health), Fitness components for health, Wellness and physical Function.	**05 Hours**

Teaching-Learning Process	Chalk and talk method, PowerPoint presentation and YouTube videos, Animation videos Methods. Creating real time stations in classroom discussions. Giving activities & assignments.

Module-3

Creation of Healthy and caring relationships : Building communication skills (Listening and speaking), Friends and friendship - education, the value of relationships and communication, Relationships for Better or worsening of life, understanding of basic instincts of life (more than a biology), Changing health behaviors through social engineering.	**05 Hours**
Teaching-Learning Process	Chalk and talk method, PowerPoint presentation and Animation videos methods. Creating real time stations in classroom discussions. Giving activities and assignments.

Module-4

Avoiding risks and harmful habits : Characteristics of health compromising behaviors, Recognizing and avoiding of addictions, How addiction develops and addictive behaviors, Types of addictions, influencing factors for addictions, Differences between addictive people and non addictive people and their behavior with society, Effects and health hazards from addictions Such as..., how to recovery from addictions.	**05 Hours**
Teaching-Learning Process	Chalk and talk method, PowerPoint presentation and Animation videos methods. Creating real time stations in classroom discussions. Giving activities and assignments.

Module-5

Preventing and fighting against diseases for good health : Process of infections and reasons for it, How to protect from different types of transmitted infections such as…., Current trends of socio economic impact of reducing your risk of disease, How to reduce risks for good health, Reducing risks and coping with chronic conditions, Management of chronic illness for Quality of life, Health and Wellness of youth: a challenge for the upcoming future Measuring of health and wealth status.	**05 Hours**
Teaching-Learning Process	Chalk and talk method, PowerPoint presentation and YouTube videos, Animation videos methods. Creating real time stations in classroom discussions. Giving activities & assignments.

Course Outcome :

At the end of the course the student will be able :

1. To understand Health and wellness (and its Beliefs)
2. To acquire Good Health & It's balance for positive mindset
3. To inculcate and develop the healthy lifestyle habits for good health.
4. To Create of Healthy and caring relationships to meet the requirements of MNC and LPG world.
5. To adopt the innovative & positive methods to avoid risks from harmful habits in their campus, outside the campus and also fight against harmful diseases for good health through positive mindset.

Assessment Details both (CIE and SEE):

Component	Weightage (%)
CIE [Multiple Choice Questions(MCQ)/Quizzes/ written test/Report Writing/ Seminar activities]	50
Semester End Examination **(**SEE) - [Multiple Choice Questions(MCQ)/Descriptive]	50

Suggested Learning Resources:

1. **Health Psychology** (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor Published by Rout ledge 711 Third Avenue, New York, NY 10017.
2. **Health Psychology - A Textbook,** FOURTH EDITION by Jane Ogden McGraw Hill Education (India) Private Limited - Open University Press
3. **HEALTH PSYCHOLOGY (Ninth Edition)** by SHELLEY E. TAYLOR - University of California, Los Angeles, McGraw Hill Education (India) Private Limited - Open University Press
4. **Scientific Foundations of Health (Health & Wellness) - General Books** published for university and colleges references by popular authors and published by the reputed publisher.
5. **SWAYAM / NPTL / MOOCS / Weblinks / Internet sources / YouTube videos** and other materials/ notes.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- ✓ Contents related activities (Activity-based discussions).
- ✓ For active participation of students, instruct the students to prepare Flowcharts and Handouts.
- ✓ Organizing Group wise discussions and Health issues based activities.
- ✓ Quizzes and Discussions.
- ✓ Seminars and assignments.

CO-PO Mapping

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
21SFH19/29.1	2	2	3					1	1	1	1	
21SFH19/29.2	1	2	3	2	3	1				1	2	
21SFH19/29.3	1	1	2	3	2		1		2			2
21SFH19/29.4	1	2	3	2	3				2		1	2
21SFH19/29.5	1	1	2								1	2

AICTE Activity Points to be earned by students admitted to BE/B.Tech., /B.Plan day college programme (For more details refer to Chapter 6,AICTE Activity Point Programme, Model Internship Guidelines):

Over and above the academic grades, every day college regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eighth semester Grade Card.

The activities can be spread over the years, any time during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression.

In case students fail to earn the prescribed activity Points, an Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

Summer Internship -I:

All the students admitted to engineering programmes shall have to undergo a mandatory summer internship of **03 weeks** during the intervening vacation of II and III semesters. Summer Internship shall include Inter / Intra Institutional activities, Viva-voce examination (Presentation followed by question-answer session) shall be conducted during III semester and the prescribed credit shall be included in III semester.

The internship shall be considered as ahead of passing and shall be considered for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent examination after satisfying the internship requirements. (The faculty coordinator or mentor has to monitor the students' internship progress and interact to guide them for the successful completion of the internship.)

PROGRAM OUTCOMES (PO):

S. No	PO
01	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
02	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
03	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
04	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
05	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
06	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
07	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
08	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
09	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and de-sign documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

CO Assessment with PO's:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)