B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

VISION

PROMOTING PROSPERITY OF MANKIND BY AUGMENTINGHUMAN RESOURCE CAPITAL THROUGH QUALITY TECHNICAL EDUCATION & TRAINING

MISSION

ACCOMPLISH EXCELLENCE IN THE FIELD OF TECHNICAL EDUCATION THROUGH EDUCATION, RESEARCH ANDSERVICE NEEDS OF SOCIETY

B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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FIRST YEAR SYLLABUS BOOK
With effect from the A.Y.2021-2022

CONTENTS

Scheme & Syllabus for UG Programme – I & II SemestersABBREVATIONS

AY	Academic Year
AAT	Alternative Assessment Tools
BOE	Board of Examiners
BOS	Board of Studies
CBCS	Choice Based Credit System
CGPA	Cumulative Grade Point Averages
CIE	Continuous Internal Evaluation
HS	Humanity and Social Science Courses
L-T-P-S	Lecture-Tutorial- Practical-Self study
NFTE	Not Fit for Technical Education
SEE	Semester End Examination
SGPA	Semester Grade Point Average
BS	Basic Science
ES	Engineering Science
NC	No Credit

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Scheme of Instruction for First Semester B.E.

2021-2022(PHYSICS CYCLE)

S No	Course Code	Course Title	Credits			
			L	**T**	**P**	**Total**
1	21MAB1SCDE	Calculus and Differential Equations	2	1	0	3
2	21PYB1SPHY	Engineering Physics	4	0	0	4
3	21PYB1SPHL	Engineering Physics Lab	0	0	1	1
4	21EE1EBEE	Basic Electrical Engineering	2	1	0	3
5	21EE1ELBEE	Basic Electrical Engineering Lab	0	0	1	1
6	21CV1ESECM	Elements of Civil Engineering and Mechanics	2	1	0	3
7	21ME1AEIDT	Innovation and Design Thinking	1	0	0	1
8	21ME1ESEVI	Engineering Visualization	1	0	2	3
9	21MA1HSCEN	Communicative English	1	0	0	1
	Total					20

Scheme of Instruction for First Semester B.E.
2021-2022(CHEMISTRY CYCLE)

S No	Course Code	Course Title	Credits			
			L	**T**	**P**	**Total**
1	21MAB1SCDE	Calculus and Differential Equations	2	1	0	3
2	21CYB1SECT	Engineering Chemistry	4	0	0	4
3	21CYB1SECL	Engineering Chemistry Lab	0	0	1	1
4	21EC1EBEC	Basic Electronics & Communication Engineering	2	1	0	3
5	21ME1EMEE	Elements of Mechanical Engineering	2	0	1	3
6	21IS1ESPPS	Problem Solving through Programing	2	1	0	3
7	21IS1ESCPL	Computer Programming Laboratory	0	0	1	1
8	21BT1AEFHT	Scientific Foundations of Health	1	0	0	1
9	21MA1HSCEN	Communicative English	1	0	0	1
	Total					20

L-Lecture (1 credit=1 contact hr.);

T-Tutorial (1 credit=2 contact hrs.);

P-Practical (1 credit=2 contact hrs.);

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Scheme of Instruction for Second Semester B.E.

2021-2022 (CHEMISTRY CYCLE)

S No	Course Code										Course Title	Credits			
												L	T	P	Total
1	2	1	M	A	2	B	S	A	C	N	Advanced Calculus and Numerical Methods	2	1	0	3
2	2	1	C	Y	2	B	S	E	C	T	Engineering Chemistry	4	0	0	4
3	2	1	C	Y	2	B	S	E	C	L	Engineering Chemistry Lab	0	0	1	1
4	2	1	E	C	2	E	S	B	E	C	Basic Electronics & Communication Engineering	2	1	0	3
5	2	1	M	E	2	E	S	E	M	E	Elements of Mechanical Engineering	2	0	1	3
6	2	1	I	S	2	E	S	P	S	P	Problem Solving through Programming	2	1	0	3
7	2	1	I	S	2	E	S	C	P	L	Computer Programming Laboratory	0	0	1	1
8	2	1	B	T	2	A	E	S	F	H	Scientific Foundations of Health	1	0	0	1
9	2	1	M	A	2	H	S	P	W	S	Professional Writing Skills in English	1	0	0	1
	Total														20

Scheme of Instruction for Second Semester B.E.
2021-2022(PHYSICS CYCLE)

S No	Course Code										Course Title	Credits			
												L	T	P	Total
1	2	1	M	A	2	B	S	A	C	N	Advanced Calculus and Numerical Methods	2	1	0	3
2	2	1	P	Y	2	B	S	P	H	Y	Engineering Physics	4	0	0	4
3	2	1	P	Y	2	B	S	P	H	L	Engineering Physics Lab	0	0	1	1
41	2	1	E	E	2	E	S	B	E	E	Basic Electrical Engineering	2	1	0	3
5	2	1	E	E	2	E	L	B	E	E	Basic Electrical Engineering Lab	0	0	1	1
6	2	1	C	V	2	E	S	E	C	M	Elements of Civil Engineering and Mechanics	2	1	0	3
7	2	1	M	E	2	A	E	I	D	T	Innovation and Design Thinking	1	0	0	1
8	2	1	M	E	2	E	S	E	V	I	Engineering Visualization	1	0	2	3
9	2	1	M	A	2	H	S	P	W	S	Professional Writing Skills in English	1	0	0	1
	Total														20

L-Lecture (1 credit=1 contact hr.);

T-Tutorial (1 credit=2 contact hrs.);

P-Practical (1 credit=2 contact hrs.);

Course Title	**Calculus and Differential Equations**	**Course Code**	**21MA1BSCDE**
Credits	**03**	**L – T – P**	**2 – 1 – 0**

Course Objectives: The goal of the course Calculus and Differential Equations is

- To facilitate the students with a concrete foundation of differential calculus & analyticalmethods for ordinary differential equations, required for solving engineering problems.
- To enable the students to apply linear algebra to solve engineering problems.

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.

UNIT-1

DIFFERENTIAL CALCULUS – 1 [08 hours]
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.
(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT-2

DIFFERENTIAL CALCULUS – 2 [08 hours]
Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems. 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.
(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

UNIT-3

LINEAR ALGEBRA [08 hours]

Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations; Gauss-elimination method and Approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector.
Self-Study: Solution of system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem. (RBT Levels: L1, L2 and L3).

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT-4

ORDINARY DIFFERENTIAL EQUATIONS (ODE's) OF FIRST ORDER [08 hours]

Bernoulli's differential equations. Exact and reducible to exact differential equations. Applications of ODE's - Orthogonal trajectories. Nonlinear differential equations: Introduction to general and singular solutions; Solvable
for ponly; Clairaut's equations, reducible to Clairaut's equations. Problems. Self-Study: Applications of ODE's: L-R circuits. Solvable for x and y. (RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

UNIT-5

ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER [08 hours]

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.
(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

Course outcomes (Course Skills Set)
After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO
21MA1BSCDE	CO 1	Understand and Apply the concepts of calculus and linear algebra.	1
	CO 2	Demonstrate the importance of calculus and linear algebra through solving mathematical problems.	9, 12
	CO 3	Engage in independent study as a member of a team to make presentations on an application of mathematical concepts for society.	6, 9, 10 &12

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	50 % Weightage	Total
CIE – Theory	Presentation	10	100	05	50
	Assignment	10		05	
	Test 1	40		20	
	Test 2	40		20	
	Test 3	40		20	
SEE	End Exam	100		50	

Two best scores out of the three tests will be considered for CIE.

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 1, 3, 5 and two questions each from Unit 2 and Unit 4.

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. B.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, Latest ed.
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 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

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ENGINEERING PHYSICS			
Course Code	21PY1BSPHY / 21PY2BSPHY	CIE Marks	50
Teaching Hours/Week (L:T:P)	4:0:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	04	Exam Hours	03 Hours
Total Hours per Week	04		

Course objectives:

To provide the first-year engineering students with

- Recognition of Quantum Mechanics as foundation to analyze properties of engineering materials.
- Ability to use any LASER tool and optical fiber, with a clear understanding of its principle, classification and limitations.
- Development of critical thinking to use the study of vibrations in inter-disciplinary fields.
- Quantitative and reasoning skills in solving engineering problems.

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve course outcomes:

1. Conventional lecture methods involving various types of innovative teaching techniques such as power point presentation, videos and animation films
2. Offering real-life examples of physics in engineering studies
3. Seminars and quizzes for students to develop skills
4. Group learning to improve students' creativity and analytical skills
5. Motivating the students for self-study
6. Promoting critical thinking and lifelong learning

MODULE – 1	**QUANTUM MECHANICS**	**[10 HOUR]**

Introduction, wave-particle duality, de-Broglie hypothesis. Definition and expressions of phase velocity and group velocity. Relation between group velocity and phase velocity, relation between group velocity and particle velocity, relation between group velocity, phase velocity and velocity of light. Derivation of de-Broglie wavelength using group velocity. Matter waves–characteristic properties. Problems.

Heisenberg's uncertainty principle–statement and physical significance. Application of uncertainty principle -Non-existence of electron in the nucleus. Wave function-properties and physical significance. Probability density and normalization of wave function. Setting up of one-dimensional time independent Schrödinger's wave equation. Eigen functions and eigen values. Application of Schrodinger's wave equation: Particle in a one dimensional potential well of infinite height and finite width (eigen functions, probability density and eigen values for the first three states). Problems.

Teaching-Learning Process	Chalk and talk, Power point presentation, Videos **Practical Topics:** 1. Wavelength of different transparent LEDs **Self-study:** Gamma ray microscope, Schrodinger's cat and tunneling

MODULE – 2	**LASERS AND OPTICAL FIBERS**	**[10 HOUR]**

LASERs: Introduction, characteristics of LASERs, interaction of radiation with matter, expression for energy density of a system under thermal equilibrium in terms of Einstein's coefficients, conditions for LASER action using Einstein's coefficients, basic requisites of a LASER system, construction and working of He-Ne LASER and semiconductor diode LASER. Applications of LASERs: Holography–recording of hologram and reconstruction of image. Problems.

Optical Fibers: Introduction, principle of propagation in optical fibers. Angle of acceptance, expression for numerical aperture and condition for propagation. Number of modes: V-number. Classification of optical fibers. Attenuation-causes of attenuation, expression for coefficient of attenuation. Applications of optical fibers: Block diagram and discussion of point-point optical communication, advantages and disadvantages. Problems.

Teaching-Learning Process	Chalk and talk, Power point presentation, Videos **Practical Topics**: 1. Wavelength of LASER source 2. Divergence of LASER beam 3. Numerical aperture of an optical fiber 4. Attenuation coefficient of an optical fiber **Self-study**: Other LASER systems and their applications in various fields of science and technology and finite spectral width of laser

MODULE – 3 ELECTRICAL AND THERMAL PROPERTIES OF SOLIDS [10 HOUR]	
Electrical Properties: Review of classical free electron theory, limitations of classical free electron theory. Postulates of quantum free electron theory, Fermi energy, Fermi velocity, Fermi temperature. Expression for density of states (qualitative), expression for Fermi energy. Fermi factor and its dependence on energy and temperature. Electrical conductivity (qualitative expression using effective mass and Fermi velocity). Merits of quantum free electron theory. Problems. **Thermal Properties:** Macroscopic and microscopic descriptions of thermal system, thermal equilibrium, concept of temperature. Review of laws of thermodynamics and its applications. Concept of free energy, entropy, enthalpy and their significance. Thermal conductivity, expression for thermal conductivity of a conductor using classical free electron theory. Wiedemann–Franz law, calculation of Lorentz number using classical and quantum assumptions. Theory and determination of thermal conductivity using Forbe's and Lee–Charlton's methods. Problems.	
Teaching-Learning Process	Chalk and talk, Power point presentation, Videos **Practical Topics:** 1. Fermi energy of Copper 2. Thermal conductivity of a poor conductor by Lee–Charlton's method 3. Thermal conductivity of a good conductor by Forbe's method **Self-study:** Particle statistics and Andrew's experiment on carbon dioxide
MODULE – 4 MATERIALS SCIENCE [10 HOUR]	
Dielectric Materials: Introduction, polarization, expression for polarization, types of polarization, expression for electronic polarizability. Expression for internal field in one dimensional liquids and solids, Lorentz field. Clausius–Mossotti relation. Applications of dielectric materials. Problems. **Semiconductors:** Introduction, expression for concentration of electrons in conduction band, expression for hole-concentration in valance band (qualitative). Expression for intrinsic carrier concentration, Expression for Fermi level in intrinsic semiconductors, Fermi level in semiconductors, conductivity of semiconductors. Hall effect, expressions for Hall voltage and Hall coefficient. Problems.	
Teaching-Learning Process	Chalk and talk, Power point presentation, Videos **Practical Topics:** 1. Determination of dielectric constant of a material 2. Energy band gap of a semiconductor by four probes method **Self-study:** Frequency dependence of polarization, dielectric loss, super-capacitors, semiconductor devices and applications of Hall effect

MODULE – 5	**OSCILLATIONS AND RESONANCE**	**[10 HOUR]**

Theory of free vibrations: Periodic motion, simple harmonic motion, equation of a simple harmonic oscillator, expressions for period and frequency, energy considerations-total energy, conversion of energy from kinetic to potential in SHM.

Theory of damped vibrations: Resistive forces, equation of motion-expression for decaying amplitude, three cases of damping. Logarithmic decrement, relaxation time and quality factor.

Theory of forced vibrations: Equation of motion-expression for amplitude, three cases of forcing, expression for maximum amplitude.

Resonance: Phenomenon of resonance, sharpness in resonance. Examples of resonance: LCR circuit. Problems.

Teaching-Learning Process	Chalk and talk, Power point presentation, Videos **Practical Topics:** 1. LCR circuits 2. Determination of spring constant **Self-study:** Importance of resonance and its application in NMR and ESR

Course outcomes:	On completion of the course, the student will have the Ability to:	POs Mapped	Strength of mapping
CO1	**Understand, define and explain** the fundamental principles of quantum mechanics, transport phenomena, dielectric and semiconductor material properties of solids, laser and optical fiber and concept of vibrations	--	--
CO2	**Apply** the concepts of quantum mechanics, metallic, dielectric and semiconductor properties of solids, laser and optical fiber and types of vibrations to obtain desired parameters	PO1	3
CO3	Perform as a **member of team,** report and make an oral presentation of the concept of physics	PO9, PO10, PO12	3

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain minimum of 40% marks individually both in CIE and SEE to pass.
- Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration).
- Based on this, grading will be awarded.

Continuous Internal Examination pattern :

- Three tests will be conducted for 40 marks and will be scaled down to 20 marks. Students best two performance will be considered out of three tests.
- Two quizzes will be conducted for 20 marks and later scaled down to 10 marks.
- The question paper pattern for test is as follows: PART A ---- 5 marks (no internal choice), PART B ---- 15 marks (no internal choice), PART C ---- 20 marks (with internal choice),
- Total CIE marks is equal to **20+20+10 = 50 marks**

Semester End Examination question paper pattern :

- The question paper pattern will be as per VTU/As decided in the college Academic council.

Text Books:

1. A Text book of Engineering Physics – M N Avadhanulu and P G Kshirsagar, S Chand & Company Ltd
2. Engineering Physics – R K Gaur and S L Gupta, Dhanpat Rai Publications
3. Concepts of Modern Physics - Arthur Beiser, Tata McGraw Hill Edu Pvt Ltd

Reference Books:

1. Introduction to Mechanics – M K Verma, University Press (India) Pvt Ltd
2. Lasers and Non Linear Optics – B B Laud, New Age International Publishers
3. Solid State Physics - S O Pillai, New Age International Publishers

E-Books/Resources:

http://nptel.ac.in
https://swayam.gov.in
https://www.britannica.com/technology/laser,k
http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
http://de.physnet.net/PhysNet/education.html

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Engineering Physics Laboratory			
Course Code	21PY1BSPHL / 21PY2BSPHL	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Credits	01	Exam Hours	3 Hours

Course objectives:

1. To give hands-on experience on various experiments
2. To demonstrate competency and understanding of the basic concepts in experimental Physics

List of Experiments:
Ten Experiments to be performed

No.	Name of the experiment	Mapping with Units	Skill
1	Wavelength of transparent LEDs	Unit-1	Determine
2	Wavelength of semiconductor LASER source using diffraction grating	Unit-2	Determine
3	Numerical aperture and attenuation coefficient of an optical fiber	Unit-2	Analyse
4	Divergence angle of semiconductor LASER beam	Unit-2	Determine
5	Fermi energy of copper	Unit-3	Determine
6	Thermal conductivity of a poor conductor by Lee Charlton's method	Unit-3	Determine
7	Thermal conductivity of a metal by Forbe's method	Unit-3	Determine
8	Dielectric constant of a material by charging and discharging of a capacitor	Unit-4	Determine
9	Energy gap of a semiconductor using four probe method	Unit-4	Determine
10	Series and parallel LCR circuits	Unit-5	Analyse
11	Spring constant of a given spring	Unit-5	Determine
12	X-ray film analysis	General	Analyse

Course outcomes:

	On completion of the course, the student will have the Ability to:	POs Mapped	Strength of mapping
CO1	**Conduct** experiments and **analyze** the data using theoretical knowledge, leading to valid conclusion of the physical system	PO4	3
CO2	**Function** as an individual, work in a group effectively during conduction of experiments	PO9	3

Assessment Details:

Scheme of Continuous Internal Evaluation (CIE):

Criteria	Conduction of experiment and reporting	Record writing	Viva-voce	Lab Test	Total Marks
Marks	10	10	5	25	50

Lab Test: One experiment will be allotted for each student

Details of marks for each experiment

1. Write-up : 05
2. Conduction of experiment : 10
3. Result : 05
4. Viva : 05

Total : 25

Eligibility for Semester End Examination

Submission and certification of lab manual and record is compulsory to attend SEE
Minimum marks required in CIE to attend semester end practical examination: 20 marks
Viva-voce will be conducted individually

Semester End Examination:

All 10 experiments are included for the practical examination.

Scheme of Semester End Examination (SEE):			
1.	Exam will be conducted for 50 marks in 3 hours duration Two experiments will be allotted for each student		
2	Minimum marks required in SEE to pass: 20 out of 50 marks		
3	Write-up	10 marks	50 marks
4	Conduction of experiments	20 marks	
5	Calculations, result with unit, accuracy	10 marks	
6	Viva- voce	10 marks	

Suggested Learning Resources:

https://bmsce.ac.in/home/contentView/Physics-Department/PHY/47
https://vlab.amrita.edu/?sub=1&brch=282&sim=1512&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

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BASIC ELECTRICAL ENGINEERING			
Course Code	21EE1ESBEE/21EE2ESBEE	CIE Marks	50
Teaching Hours/Week (L: T:P)	(2:2:0)	SEE Marks	50
Credits	03	Exam Hours	03

Course objectives:

1) To explain the laws used in the analysis of DC and AC circuits.
2) To explain the behavior of circuit elements in single-phase circuits.
3) To explain the generation of three-phase voltages and operation of three-phase circuits.
4) To explain the construction and operation of transformers, DC generators and motors, induction motors and synchronous generators.
5) To explain electric transmission and distribution, electricity billing and, equipment and personal safety measures and working of Electric Vehicles

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. (Numerical problems on KCL and KVL can be solved using Branch current method.)

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.

Teaching-Learning Process	Chalk and talk method.

MODULE- 2

Single-phase circuits: Analysis of R-L, R-C, R-L-C series circuits, Real power, reactive power, apparent power and Power factor. Measurement of power.

Three-phase circuits: Generation of three-phase voltages, 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.

Teaching-Learning Process	Single-phase circuits: Chalk and talk, Three-phase circuits: (i) For a generation of 3-phase voltages, 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 star and delta connections.

MODULE- 3	
DC Machines: (a) Constructional details, induced emf expression as dc generator. **(b)** Principle of operation of dc motor, back emf and torque equation, 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.	
Teaching-Learning Process	DC Machines: Cut -out demo/actual machine models, video for working of machine, Chalk and talk. Transformer topic: Cut-out demo/actual machine models 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 with the concept of winding factor (excluding the derivation of winding factors).	
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: Structure of electric supply systems through block diagrams only. **Electricity bill:** Power rating of household appliances including air conditioners, PCs, laptops, printers etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. **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 and Residual Current Circuit Breaker (RCCB). **Introduction to Electric Vehicles**: Overview and block diagram approach to Electric Vehicles.	
Teaching-Learning Process	Chalk and talk, Demonstration of functioning of MCB and Fuse. Visit: Visit nearest locality pole or pad-mounted transformer. Self-study topic: Safety precautions to avoid shock.

Course outcomes:

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

CO1	Understand the basic concepts of Electrical engineering
CO2	Apply the basic knowledge of mathematics and electrical engineering to obtain the desired parameters / performance characteristics of electric circuits and machines.
CO3	Analyse the behavior of electric circuits, transformers, electrical machines and electric vehicles.
CO4	Understand the electricity tariffs, safety devices and consumption of electrical installations.
CO5	Able to engage in self-study as individual/team work to make effective technical presentation on electrical concepts and communicate effectively to an audience.

B.CO-PO mapping

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

C. Proposed Assessment Plan (for 50 marks of CIE)

Assessment Tool	**Remarks**	**Marks**
Internals	Best of Two Tests	40
Assignment	One	05
Seminar	One	05
Total		**50**

Sl No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Electrical and Electronic Technology	Edward Hughes	Pearson	12th Edition, 2016
2	Basic Electrical Engineering	D. C. Kulshreshtha	McGraw-Hill Education	1st Edition, 2019
3	Basic Electrical Engineering	N Narasimhaswamy	EBPB Publishers	1st Edition 2015
4	Basic Electrical Engineering	Dr. B Venkatesh Dr.Madhura S Prof. Divya . S Prof. Chaitanya L	InSc Publishers	1st Edition 2021

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BASIC ELECTRICAL ENGINEERING LABORATORY			
Course Code	21EE1ELBEE/21EE2ELBEE	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Credits	01	Exam Hours	02

Course objectives:

After studying this course, students should be able to

1) Explain how to verify KCL and KVL for DC circuit and maximum power transfer theorem.
2) Explain power and power factor measurement of different types of lamps.
3) Explain the measurement of impedance for R-L circuits.
4) Explain method of controlling a lamp from two different places.
5) Explain the effect of open and short circuits in simple circuits and the suitability of earth resistance.

Sl. NO	**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 CFL 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 connected load.
6	Determination of Phase and Line quantities in three-phase delta connected load.
7	Determination of efficiency of a single-phase transformer by direct load test.
8	Two -Way Control of a Lamp and Formation of switching table.
9	Measurement of Earth Resistance
10	Study of the effect of Open and Short circuits in simple circuits.

Course outcomes

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

CO1	verify Kirchhoff's laws and maximum power transfer theorem for DC circuit.
CO2	Conduct an experiment to measure power, power factor and circuit parameters in single phase AC circuit and to verify voltage and current relationship in three phase AC circuits.
CO3	Conduct an experiment to study the performance of electrical machines.
CO4	Conduct a study on safety aspects and wiring

B. CO-PO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1												
CO2	**3**											
CO3				**3**								
CO4						**1**						

C. Proposed Assessment Plan (for 50 marks of CIE)

TOOL-Lab component	NUMBERS	MARKS
Lab Record	---	35
Lab Internals	1	10
Viva Voce	1	05
Total		**50**

Semester End Evaluation (SEE): The practical examinations are to be conducted as per the time table with a batch-wise strength of not more than 10-15 students per batch.

1) All laboratory experiments are to be included for practical examination.
2) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners.
3) Students can pick one experiment from the questions lot prepared by the examiners.
4) Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

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ELEMENTS OF CIVIL ENGINEERING AND ENGINEERING MECHANICS			
Course Code	**21CV1ESECM**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:1:0:0	SEE Marks	50
Total Contact Hours	40	Total Marks	100
Credits	3	Exam Hours	3 Hrs.

Course objectives:

- To develop students' ability to analyze the problems involving forces, moments with their applications.
- To develop the student's ability to determine the centroid and evaluate the moment of inertia for composite figures.
- To introduce students to the application of engineering mechanics in various fields of civil engineering.

Module-1- Analysis of force systems (10 hours)

Concept of idealization of bodies, concept of force, system of forces, principle of superposition and transmissibility of force, resolution and composition of forces, parallelogram law of forces, triangle and polygon law of forces, a moment of forces, couple, Varignon's theorem, resultant of coplanar concurrent and non-concurrent force systems, free body diagram, Lami's theorem, equations of equilibrium of concurrent and non-concurrent coplanar force system, related problems

Module-2 - Support reactions and plane trusses:(09 hours)

Types of loads and types of supports, statically determinate and indeterminate beams, support reactions in beams, Numerical problems on support reactions for statically determinate beams (point load, uniformly distributed load, uniformly varying loads and moments)

Trusses:

Types of trusses, analysis of statically determinate trusses by method of joints and method of sections.

Module-3 -Centroid and Moment of inertia:(09 hours)

Introduction, methods of determining the centroid, locating the centroid of simple figures – rectangle, triangle and sector of a circle from first principle, the centroid of composite and built-up sections.

Moment of inertia: Introduction, method of determining the second moment of area of plane sections from first principles, parallel axis theorem and perpendicular axis theorem, the radius of gyration, moment of inertia of composite area and built-up sections.

Concept of product of inertia(No numerical problems)

Module-4 –Friction(06 hours)

Types of friction, laws of friction, limiting friction, coefficient of friction, concept of static and dynamic friction, numerical problems on impending motion with respect to concurrent and non concurrent force systems

Module-5 – Overview of Civil Engineering Systems(06 hours)

Introduction to structural engineering, geotechnical engineering, construction technology, hydraulics, water

resources and irrigation engineering, transportation engineering, environmental and sanitary engineering, GIS, earthquake engineering. Role of civil engineers in the development of the nation.

Course outcome (Course Skill Set)

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

1. **Apply** the concepts of force, moment and area distribution for engineering problems.
2. **Analyze** Engineering problems pertaining to determinate beams, trusses and bodies under impending motion.
3. **Understand** the role of civil engineering systems for societal needs.

Assessment Details (both CIE and SEE)

Continuous Internal Evaluation:

The evaluation will be done for 50 marks comprising of two tests of twenty marks each and 2 quizzes/ AAT of 5 marks each.

Semester End Examination:

The SEE question paper will be set for 100 marks which includes all 5 modules.
An internal choice will be given in module 1 and module 3.

Suggested Learning Resources:

Books

1. R. C. Hibbbler, Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
2. Bansal R. K., A Text Book of Engineering Mechanics, Laxmi Publications.
3. Andy Ruina and Rudra Pratap, Introducing to Statics and Dynamics, Oxford University Press.
4. Reddy Vijaykumar K and K Suresh Kumar, Engineering Mechanics.
5. F.P. Beer and E. R. Johnston, Mechanics for Engineers, Statics and Dynamics, McGraw Hill.
   Irving H. Shames, Engineering Mechanics, Prentice-Hall.

Weblinks and Video Lectures (e-Resources):

https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8
https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8P
https://www.youtube.com/watch?v=ljDIIMvx-eg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5
https://www.youtube.com/watch?v=VQRcChR9IkU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=18
https://www.youtube.com/watch?v=3YBXteL-qY4
https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10
https://www.youtube.com/watch?v=lheoBL2QaqU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=7
https://www.youtube.com/watch?v=atoP5_DeTPE https://www.youtube.com/watch?v=ksmsp9OzAsI
https://www.youtube.com/watch?v=x1ef048b3CE https://www.youtube.com/watch?v=l_Nck-X49qc
https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force
https://www.youtube.com/watch?v=RIBeeW1DSZg
https://www.youtube.com/watch?v=R8wKV0UQtlo
https://www.youtube.com/watch?v=0RZHHgL8m_A

CO-PO Mapping

	At the end of the course, the student will be able to	POs mapped	Strength of Mapping
CO1	**Apply** the concepts of force, moment and area distribution for engineering problems.	PO1	3
CO2	**Analyze** engineering problems pertaining to determinate beams, trusses and bodies under impending motion.	PO2	3
CO3	**Understand** the role of civil engineering systems for societal needs	PO7	2

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INNOVATION AND DESIGN THINKING			
Course Code	**21ME1AEIDT / 21ME2AEIDT**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	01	Exam Hours	01

Course Category: Foundation

Preamble: This course provides an introduction to the basic concepts and techniques of engineering and reverse engineering, the process of design, analytical thinking and ideas, basics of drawing

Course objectives:

- To explain the concept of design thinking for product and service design and 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

INTRODUCTION TO CREATIVITY & PROCESS OF DESIGN

Understanding Design thinking

Shared model in team-based design – Introduction to Theory and practice in Design thinking – MVP and Prototyping and their role

Teaching-Learning Process	-Introduction about the design thinking: Chalk and Talk method -Introduction to creativity and innovation: Theory and practice through presentation and activities(group/individual) -Introduction to MVP and Prototyping scenario through live examples and videos

Module-2	
Tools for Design Thinking Introduction to various tools Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space– Empathy for design – Collaboration in distributed Design	
Teaching - Learning Process	-Case studies on design thinking for real-time interaction and analysis -Class room exercises for collaboration 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 –	
Teaching-Learning Process	Case studies on design thinking and business acceptance of the design
Module-4	
DT For strategic innovations Introduction to strategic innovation Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Strategy and Organization – Business Model design.	
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	
Teaching-Learning Process	8 hours design thinking workshop from the expert 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:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Identify situations which need application of design thinking concepts.	**PO 1**	**3**
CO2	Develop ideas through design thinking tools to solve the above identified problems.	**PO 2**	**3**
CO3	Demonstrate the qualities relating to design thinking through group activities	**PO 9, PO 10, PO 12**	**3**

Assessment Details (both CIE and SEE)

Continuous Internal Evaluation:

i) Internal Tests to include Quiz/MCQ/descriptive/case study/any other for 20 Marks (CIE-1 for 20 Marks and CIE-2 for 20 Marks taking best of two).

ii) Alternate Assessment Tool to include Seminar/Group activity/Poster Presentation/Concept Video/Mini Project/any other for 30 Marks.

Semester End Examination:

The SEE shall include Viva-voce/Seminar/Group activity/Poster Presentation/Concept Video/Mini Project/any other for 50 Marks.

Suggested Learning Resources:

Text Books :

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

References:

5. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", CengageLearning, Second Edition, 2011.
6. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (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 Developmen
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 t
9. https://designthinkingforeducators.com/design-thinking/
10. www.designthinkingformobility.org
11. Human-Centered Design Toolkit (IDEO);
12. https://www.ideo.com/post/design-kit
13. https://dschool.stanford.edu/resources/the-bootcamp-bootleg

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Course Title: Engineering Visualization	**Course Code**: 21ME1ESEVI / 21ME2ESEVI	**Credits**: 03
L:T:P: 1:0:2	**Contact Hours**: 65	**Hours/Week**: 05

Course Objectives:

1. To provide an understanding of the concept of systems of projection, standards and conventions.
2. To develop the views of basic geometrical entities i.e. points, lines, planes and solids.
3. To impart skills in manual sketching and usage of modern engineering tools necessary in engineering practice
4. To acquire the skill of expressing three -dimensional and two-dimensional objects into professional language and vice versa
5. To enable exposure to engineering communication

UNIT – 1

A: Introduction: Principles of Engineering Graphics and their significance, BIS Conventions, dimensioning, scales, line conventions, material conventions sketching, Introduction to CAD software, standard tool bar menu and description of most commonly used tool bars, and navigational tools. **[1L + 0T+2P Hrs.]**

B: Orthographic Projections

Introduction, quadrant system, Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants. Projections of straight lines (located in first quadrant and without reference to traces), True and apparent lengths, True and apparent inclinations to reference planes, simple application problems. **[2L + 0T+ 6P Hrs.] Projections of Plane Surfaces (First Angle Projection Only)**

Introduction, Projections of plane surfaces: triangle, square, rectangle, rhombus, circle, regular pentagon and regular hexagon in different positions by change of position method

[2L + 0T+ 4P Hrs.]

UNIT – 2

Projections of solids (First Angle Projection Only)

Introduction, Projections of regular upright solid: tetrahedron, cube, prism, pyramid, cylinder and cone in different positions by change of position method.

[3L + 0T+ 10 P Hrs.]

UNIT – 3

A: Isometric Projection (Using Isometric Scale only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron, right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (maximum of two solids) Use of solid-modeling software for creating cube, right regular prisms, pyramids, cylinders, cones, spheres, and combination of solids and extracting orthographic views and Isometric views.

[2L+ 0T+ 10P Hrs.]

UNIT – 4

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 viz. Funnels, Trays, Transition pieces connecting two ducts.

[2L+ 0T+ 08P Hrs.]

UNIT – 5

Using CAD software (for CIE only)

5A: Use of solid-modeling software for creating engineering components (Mechanical components, Electrical Components, Electronic components): creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids. Computer Aided Assembly and Detailed Drawing.

5B: Basic Building Drawing: Plan, Elevation and section of single storied residential (or) office building with flat RCC roof and brick masonry walls having not more than 2 rooms with electrical wiring and lighting diagrams

i. Electronic Drawing- PCB Drawings.

[0L+ 0T+ 12P Hrs.]

Text Books:

1. Engineering Drawing Vol 1 & 2 Combined, K. R. Gopalkrishna, ISBN 39789383214235, Subhas Stores, Bangalore, 2017
2. Textbook Of Computer Aided Engineering Drawing by K.R. Gopalkrishna,Sudhir Gopalakrishna, ISBN-13 5551234102489, 2017

Reference Books:

1. Engineering Drawing, N.D. Bhat& V.M. Panchal, 45 Edition, Charotar Publishing, Gujarat
2. Fundamental of Engineering Drawing & Graphics Technology, French,Thomas E., Vierck, C. J. and Foster, R. J., McGraw Hill Book Company (2005).
3. Fundamentals of Engineering Drawing with an Introduction to InteractiveComputer Graphics for Design and Production- Luzadder Warren J., Duff John M.,Eastern Economy Edition, 2005- Prentice-Hall of India Pvt. Ltd., New Delhi.
4. A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belagavi
5. Electrical Engineering Drawing, Bhattacharya S. K., New Age International publishers, second edition 1998, reprint 2005.
6. Printed Circuit Board Design using AutoCAD, Chris Schroder, Newnes,1997.
7. Introduction to Architectural and Technical Drawing: Roksaneh Rahbarianyazd – Hourakhsh A. Nia · 2020

E-books:

1. Siemens Solid Edge Exercises 200 Practice Drawings for Solid Edge and Other Feature-Based Modelling Software By Sachidanand Jha · 2019, ISBN:9781096479147, 1096479141, Amazon Digital Services LLC - KDP Print US.
2. Solid Edge 2020 for Designers, 17th Editionbooks.google.co.in › books Prof. Sham Tickoo, CADCIM Technologies · 2020

3. Publications of Bureau of Indian Standards
https://law.resource.org/pub/in/bis/S01/is.sp.46.2003.pdf

a) IS 10711 – 2001: Technical products documentation – Size and lay outof drawing sheets.
b) IS 9609 (Parts 0 & 1) – 2001: Technical products documentation – Lettering.
c) IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
d) IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
e) IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

NPTEL/SWAYAM/ MOOC:

1. NPTEL course on ENGINEERING DRAWING AND COMPUTER GRAPHICShttps://nptel.ac.in/courses/112/105/112105294/#

Scheme of Evaluation:

CIE:

- Weightage should be 60% for sketching & 40% for CIE using solid edgesoftware.
- The Laboratory session shall be held every week as per the time table andthe performance of the student shall be evaluated in every session the average of marks over number of units is considered for 20 marks.
- Three tests for CIE shall be conducted and average of best two considered for 20 marks.
- Project/Assignment/Experiential Learning covering Unit 5

Sl.No	Evaluation Method	Unit	Marks	Weightage
1.	CIE-Test 1	1B	40	20
2.	CIE-Test 2	2	40	
3.	CIE-Test 3	3,4	40	
4.	Sketching and lab assignments	1B -4	60	20
5.	Project/Assignment/Experie ntial Learning	5	10	10
				50

SEE:

- Manual sketching and drafting using CAD software as given in tablebelow.
- **UNIT** 1A & 5 shall not be considered for SEE.
- Candidate shall answer 4 full questions selecting one from each unit.

Sl.No	Unit	Number of questions	Weightage (To answer one full question from each unit)		
			Sketching	ON Software	Total
1.	1B	02	20		20
2.	2	02	0	30	30
3.	3	02	0	30	30
4.	4	02	20	0	20
	Total	**08**	**40**	**60**	**100**

Course Outcomes:

At the end of the Course the students will be able to:

CO1: Draw orthographic projections of basic geometrical entities in variouspositions.
CO2: Represent graphic primitives using free hand sketches
CO3: Create Isometric views and projections of solids and preparedevelopment of lateral surfaces.
CO4: Use modern engineering tool (CAD software) necessary for engineering visualisation

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Course Title: ENGINEERING CHEMISTRY	**Course Code**: 21CY1BSECT/21CY2BSECT	**Credits**: 04
L:T:P: 4:0:0	**Contact Hours**: 52	**Hours/Week**: 04

Course Objectives: To impart the knowledge of Chemistry involved in Electrochemical cells, Corrosion and its control; Conventional, electrochemical and renewable sources of energy; Polymers; Green Chemistry; Water treatment; Phase equilibria; Nanomaterials and Instrumental methods of analysis.

Course Content:

UNIT-I

Electrochemistry - Corrosion and Metal Finishing **11 hours**

Electrodes and cells - Introduction, Nernst equation, Classification of cells - primary, secondary and concentration cells; Reference electrodes - Calomel electrode; Ion-selective electrodes - Glass electrode. Determination of pH using glass electrode, numerical problems on concentration cells/galvanic cells.

Corrosion - Definition, Electrochemical theory of corrosion, Types of corrosion - differential metal, differential aeration (pitting and water line corrosion) and stress corrosion; Factors affecting the rate of corrosion; Corrosion control: inorganic coatings – anodizing and phosphating; Metal coatings - galvanization, tinning; Cathodic protection – Sacrificial anode, Impressed current method

Metal finishing - Introduction, technological importance; Electroplating of Chromium, Electroless plating: Introduction, Electroless plating of copper (PCB).

Self-study: Galvanic series and its importance in corrosion control

UNIT-II

Energy - Sources, Conversion and Storage **10 hours**

Chemical fuels - Introduction, Calorific value - definition, gross and net calorific values; Determination of calorific value of a solid / liquid fuel using Bomb calorimeter and numerical problems on calorific value; Petroleum cracking - fluidized bed catalytic cracking; Knocking in IC engine and Octane number; Reformation of petrol; Hydrogen as a fuel - advantages, production and storage.

Solar cells - Construction and working of Si based PV cell, advantages.

Batteries - Basic concepts, Classification of batteries - primary and secondary batteries; Battery characteristics; Modern batteries - construction, working and applications of zinc-air, nickel-metal hydride and Li-ion batteries ($LiCoO_2$ battery).

Fuel cells - Introduction, Construction and working of methanol-oxygen fuel cell with acid electrolyte.

Self-study: Power alcohol; Biodiesel

UNIT-III

Polymers for Engineering Applications **10 hours**

Polymers - Introduction, Molecular weight - number average and weight average molecular weight, Polydispersion index and its significance, numerical problems; Glass transition temperature (T_g); Structure and property relationship in polymers; **Plastics** - Definition of resins and plastics; Synthesis, properties and applications of PMMA and UF resin; **Elastomers** - Synthesis, properties and application of butyl rubber and nitrile rubber; **Polymer composites** - Composites as structural material; Synthesis and applications of Kevlar and Carbon fibers; **Conducting polymers** - Introduction, synthesis of polyaniline, mechanism of conduction and uses.

Biodegradable polymers - Introduction, Polyglycolic acid - synthesis, degradation and uses.

Self-study: Polycarbonates - Synthesis and applications

UNIT-IV

Green Chemistry and Water treatment **10 hours**

Green Chemistry - Introduction, 12 basic principles of green chemistry; Synthesis of i) adipic acid ii) paracetamol by conventional and green route. Industrial applications of green chemistry - Synthesis of ethylene oxide and methyl methacrylate; Numericals on atom economy.

Water treatment - Introduction, hardness of water, types, determination of hardness by EDTA method, disadvantages of hard water, removal of hardness by ion exchange method, Desalination of water - reverse osmosis, forward osmosis. Dissolved oxygen, BOD and COD - introduction and their significance in waste water treatment, experimental determination of COD of waste water, treatment of waste water - aerobic and anaerobic oxidation, primary, secondary (trickling filter method) and tertiary treatment methods, numerical problems on hardness & COD.

Self-study: Desalination by electrodialysis

UNIT-V

Phase equilibria, Nanomaterials and Instrumental methods of analysis **11 hours**

Phase equilibria – Gibbs phase rule; Concept of Phase component, degrees of freedom with examples; Numericals. Application of Phase rule to i) one component system - water system; ii) two component system - Pb-Ag system; Freezing mixtures - NaCl-water system

Nanomaterials - Introduction, size dependent properties (Surface area, Electrical, Optical, Catalytic and Thermal properties). Synthesis of nanomaterials: top down and bottom up approaches; Synthesis by sol-gel and chemical vapor deposition methods. Nanoscale materials: Graphene and Carbon nanotubes - properties and applications.

Instrumental methods of analysis - Principle, Instrumentation and applications of Colorimetry (Copper), Flame Photometry (Sodium), Potentiometry (Iron).

Self-study: Conductometry (mixture of strong acid and a weak acid with a strong base, strong acid with strong base, weak acid with strong base)

Text Books

1. Engineering Chemistry - by Chandra Shekara B M and Basavaraju B C (Banbayalu publishers), Bengaluru, revised edition, 294 pages, *also available in Kindle version*.
2. Engineering Chemistry: Fundamentals and Applications - by Shikha Agarwal, *Cambridge University Press*, New Delhi, 2016, 1179 pages.

Reference Books

1. Wiley's Engineering Chemistry (Wiley India), 2nd Edition, 2013, 1026 pages.
2. A Text book of Engineering Chemistry - by P. C. Jain and Monica Jain, Dhanapatrai Publications, New Delhi, 2011, 16th Edition, 1404 pages.

e-books

1. Electrochemistry basics by LibreTexts of UCDavis: https://chem.libretexts.org/LibreTexts/University_of_California_Davis/UCD_Chem_002C/UCD_Chem_2C%3A_Larsen/Chapters/Unit_1%3A_Electrochemistry
2. Introduction to Chemistry - Tracy Poulsen; 250 pages; ISBN-13: 9781478298601; ISBN-10: 147829860X.

NPTEL/SWAYAM/MOOCs

1. **http://nptel.ac.in/**
2. **https://swayam.gov.in/**

Course outcomes: On completion of the course, the student will have the ability to:		**POs Mapped**	**Strength of mapping**
CO1	Understand and explain the principles of chemistry involved in water treatment, corrosion, energy sources, polymers, nanomaterials and instrumental methods of analysis.	---	---
CO2	**Apply** the acquired knowledge to solve the Engineering Chemistry problems.	PO1	3
CO3	**Analyze** the Engineering Chemistry problems and draw meaningful inferences.	PO2	2
CO4	Implement **sustainable solutions** through concepts of Engineering Chemistry in the field of Energy and Environment.	PO7	2
CO5	**Engage in self-study** and make an **effective oral presentation** on contribution of Engineering Chemistry to society.	PO6, PO10 & PO12	1 each

Scheme of Evaluation

Component	**Type of assessment**	**Max. Marks**		**Weightage**	**Total**	**Total Marks**
CIE (Theory)	AAT-1#	20		10	50*	50 (CIE)
	AAT-2#	20				
	Test 1	40	Best of Two tests	40		
	Test 2	40				
	Test 3	40				
SEE	Sem End Exam	100		50		50 (SEE)
Grand Total Marks						**100**

#AAT includes assignment from self-study components and oral presentations
***minimum CIE marks ≥ 20 to gain eligibility to write the SEE**

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Course Title: ENGINEERING CHEMISTRY LABORATORY		**Course Code**: 21CY1BSECL/21CY2BSECL	**Credits**: 01
L: T:P: 0:0:1	**Hours/Week**: 02	**CIE Marks-50**	**SEE Marks-50** **SEE duration-3 Hours**

Course objectives: To impart the knowledge and experimental skills involved in volumetric and Instrumental methods (potentiometer, flame photometer, conductivity meter, colorimetry, bomb calorimeter, pH meter) of analysis.

Sl.No.	**Volumetric experiments**
1	Determination of total hardness of a sample of water using disodium salt of EDTA.
2	Determination of percentage of copper in brass using standard sodium thiosulfate solution.
3	Determination of chemical oxygen demand (COD) of the given industrial waste water sample.
4	Determination of percentage of iron in the given rust solution (using potassium dichromate) by external indicator method.
	Instrumentation Experiments
5	Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution.
6	Determination of pKa of a weak acid using pH meter.
7	Conductometric estimation of HCl + CH_3COOH using standard sodium hydroxide solution.
8	Estimation of copper by colorimetric method.
9	Estimation of sodium in water by flame photometric method.
	Demonstration Experiments
10	Determination of calorific value of a solid fuel using Bomb calorimeter.
11	Synthesis of polyaniline and its conductivity measurement.
	Virtual Experiment
12	Determination of viscosity average molecular weight of a polymer using Ostwald's viscometer.

Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE): The CIE marks awarded in case of Practical shall be based on the weekly evaluation of laboratory journals/ reports after the conduction of every experiment and one practical test.

Semester End Examination (SEE):

1. Submission and certification of lab manual and record is compulsory to attend SEE.
2. Minimum marks required in CIE to attend semester end practical examination is 20 marks.
3. Viva-voce will be conducted individually.
4. The practical examinations will be conducted as per the time table.
5. All experiments are included for practical examination.
6. Exam will be conducted for 50 marks in 3 hours duration. Two experiments (one from volumetric analysis and one from instrumental methods of analysis) will be allotted for each student.
7. Students can pick one experiment from the lot prepared by the examiners.
8. Change of experiment is allowed only once with 15% marks deduction.

Component	Type of assessment	Max. Marks	Weightage	Total	Total Marks
CIE	Class performance as per manual and record	10+10	20	50	50
	Lab Test	30	30		
SEE	Sem End Exam	50	50	50	50
Grand Total Marks					**100**

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.

Course Outcomes: On completion of the course, the student will have the ability to:		**POs Mapped**	**Strength of mapping**
CO1	**Apply** the knowledge of engineering chemistry to conduct experiments to quantitatively investigate materials by volumetric and instrumental methods	PO1	3
CO2	**Analyze** and interpret the data and results from Engineering Chemistry experiments	PO2 & PO5	2 & 1
CO3	Assess and address the issues of **Environmental** Pollution	PO6 & PO7	1 each

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Course Title		**Basic Electronics & Communication Engineering**			
Course Code		**21EC1ESBEC**	**Credits**	**3**	**L-T-P**	**2:1:0**
CIE	**50 Marks(100% weightage)**	**SEE**	**100 Marks (50% weightage)**		

UNIT -1 — 9 hours

Electronic Circuits: Power Supplies – Block diagram, Rectifiers, Reservoir and smoothing circuits, Full-wave rectifiers, Bi-phase rectifier circuits, Bridge rectifier circuits, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers.
Amplifiers – Types of amplifiers, Gain, Input and output resistance, Frequency response, Bandwidth, Phase shift, Negative feedback, Multi-stage amplifiers.
Operational amplifiers - Operational amplifier parameters, Operational amplifier characteristics, Operational amplifier configurations, Operational amplifier circuits.
Oscillators – Positive feedback, Conditions for oscillation, Ladder network oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator, Crystal controlled oscillators.
(Only Concepts, working, and waveforms. No mathematical derivations)
Text 1: Chapters 6, 7, 8 and 9

UNIT-2 — 7 hours

Logic Circuits – Logic gates, Bistables, R-S Bistables, D-type Bistables, J-K Bistables. Text 1: Chapter 10
Data representation, Data types, Data storage, A microcontroller system. Text 1: Chapter 11
Realization using basic gates and truth table the Half Adder (Text 4: Fig.11.11) and Full Adder (Text 4: Table 11.5 & Fig. 11.13), Multiplexer (Text 4: 10.5.3) and decoder (Text 4: 10.5.4).
Shift registers, Register type – operation and truth table (Text 4: 13.2, 13.3), Counters and asynchronous counters (Text 4: 13.5, 13.6) Text 4: Fig. 11.11, Fig. 11.13, 10.5.3, 10.5.4, 13.2, 13.3, 13.5, 13.6

UNIT-3 — 7 hours

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. Text 2: 1.1, 1.2, 1.4, 1.5, Fig. 2.1, 2.1, 2.1.1.4, 2.1.1.6, 2.1.1.7.
Sensors and Interfacing – Instrumentation and control systems, Transducers, Sensors. Text 1: Chapter 15
Actuators, LED, 7-Segment LED Display, Stepper Motor, Relay, Piezo Buzzer, Push Button Switch, Keyboard. Text 2: 2.3.2, 2.3.3.1 to 2.3.3.8 except 2.3.3.3
Communication Interface, UART, Parallel Interface, USB, Wi-Fi, GPRS. Text 2: 2.4, 2.4.1.3, 2.4.1.5, 2.4.2.2, 2.4.2.6, 2.4.2.8.

Unit-4 **9 hours**

Analog and Digital Communication– Modern communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Hardwired and Softwired, Noise, Receiver, Multiplexing, Types of communication systems. Text 3: 1.2, 1.2.1, 1.3, 1.4 – 1.4.1, 1.4.2, 1.5, 1.5.2, 1.6, 1.14, 1.15 From Summary portion of Chapter 1 of Text 3: Types of modulation (only concepts) – AM (only 2.2, no 2.2.1 and rest), FM.

Cellular Wireless Networks - Introduction, cellular telephone system, cellular concept and frequency reuse. Text 3: 8.1, 8.2, 8.3 Wireless Network Topologies - First Generation (1G) Technology, Second Generation (2G) Technology, GSM Communications, GSM System architecture, Third Generation (3G) Technology, CDMA Technology, High-level architecture of LTE, Fourth Generation (4G) Technology, Wireless LAN, Bluetooth, Bluetooth Architecture. Text 3: 8.4, 8.5, 8.6, 8.7, 8.7.2, 8.9, 8.10, 8.12, 8.15, 8.16, 8.17, 8.17.1

Unit-5 **7 hours**

Electronics and communication in sustainable development

Concept of sustainability and united nations sustainable development goals (SDGs) (https://sdgs.un.org/goals)

Application of sensor networks in smart agriculture: Introduction, Smart agriculture, objectives, role of wireless sensors in smart agriculture, classification of WSN, sensor market, application of WSN in smart agriculture, Challenges (chapter 1: section 1.1 and 1.2)

Energy sustainability in buildings (section 6.1 and 6.2 to 6.4), WSN-BASED PERSONAL LIGHTING MANAGEMEN (section 7.6)

Sensor networks in health care Chapter 10 (10.1 to 10.3)

E-waste Management (Reference 1)

CO-1	**Understand** the concepts of electronic circuits and systems.	**-**
CO-2	**Apply** the basic principles of electronics to solve analog and digital circuits.	**PO1(3)**
CO-3	**Analyze** and **Identify** a suitable electronics and communication system for a given application.	**PO2(2)**
CO-4	**Design** the basic electronic circuits for a given specification to address engineering applications.	**PO3(1)**
CO-5	**Implement** the electronic circuits using electronic circuit simulation tools.	**PO5(1)**
CO-6	**Understand** the impact of electronics & communication engineering for the sustainable development in the areas of agriculture, energy, healthcare and E-waste Management	**PO6(1)** **PO7(1)**

CO - PO mapping with strength for 160 credit scheme

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2	**3**											
CO3		**2**										
CO4			**1**									
CO5					**1**							
CO6						**1**	**1**					

Simulation of experiments using Proteus tool (BEC) MARKS: 10

1.Simulation exercises with well-defined set of experiments are carried with advanced tools and assessment weightage of 10 marks is allocated for group activity.

Tutorial /Experiment	Topic
1	Introduction to Proteus tool
2	Demo of a circuit using Proteus
3	Half / full-wave rectifier using diodes
4	Voltage multipliers
5	Op-amp circuits – inverting, non-inverting amplifiers, summers, differentiators, oscillators. Comparator
6	+5V power supply unit using Bridge rectifier, capacitor filter, and IC 7805.
7	To switch on/off an LED using a diode in forward / reverse bias
8	IC 741 Integrator circuit / comparator circuit
9	Flip-flops – all types
10	Realization using basic gates and truth table the Half Adder
11	Transistor switch circuit to operate a relay that switched off/on an LED.
12	AM modulation and demodulation

Rubrics for Evaluation of AAT

Team N0	USN	Name	Technical content (Report and PPT)	Demo/ Presentation	Total
			5 Marks	5 Marks	10 Marks

Syllabus-160 Credit scheme

Text Books

1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications', 4 th Edition, Elsevier, 2015. DOI https://doi.org/10.4324/9781315737980. eBook ISBN9781315737980
2. K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited, 2016.
3. S L Kakani and Priyanka Punglia, 'Communication Systems', New Age International Publisher, 2017. https://elib4u.ipublishcentral.com/pdfreader/communication-systems
4. D P Kothari, I J Nagrath, 'Basic Electronics', 2nd edition, McGraw Hill Education (India), Private Limited, 2018
5. Sensor Networks for Sustainable Development, Mohammad Ilyas, Sami S. Alwakeel, Mohammed M. Alwakeel, el-Hadi M. Aggoune, June 25, 2014 by CRC Press

Reference Materials

1. Monika, Jugal Kishore "E-Waste Management: As a Challenge to Public Health in India" Indian Journal of community medicine, Vol. 35, Issue 3, 2010.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2963874/

List of experiments for additional learning through Activity based learning

Tool Identified: Proteus 8.12

1. Half / full-wave rectifier using diodes
2. Voltage multipliers
3. Op-amp circuits – inverting, non-inverting amplifiers, summers, differentiators, oscillators. Comparator
4. Flip-flops – all types
5. AM modulation and demodulation
6. +5V power supply unit using Bridge rectifier, capacitor filter, and IC 7805.
7. To switch on/off an LED using a diode in forward / reverse bias
8. Transistor switch circuit to operate a relay that switched off/on an LED.
9. IC 741 Integrator circuit / comparator circuit
10. Realization using basic gates and truth table the Half Adder

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Course Title: ELEMENTS OF MECHANICAL ENGINEERING	**Course Code**: 21ME1ESEME / 21ME2ESEME	**Credits**: 03
L:T:P: 2:0:1 (credits)	**Contact Hours**: 52	**Hours/Week**: 04

Module 1 [6 hours]

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 contribution to GDP (Not for CIE/SEE).

Steam Formation and Application:
Formation of steam and thermodynamic properties of steam (No numerical problems), Applications of steam in industries.

Energy Sources and Power Plants:
Classification of energy sources; Construction and working of Hydel power plant, Solar power plant (Helio-thermal process, flat and parabolic collectors), Wind power plant.

Introduction to basics of Hydraulic turbines and pumps:
Classification of Hydraulic turbines, Principle and Operation of Pelton Wheel and Francis Turbine. Introduction to working of single stage Centrifugal Pump.

Module 2 [5 hours]

Materials and its Industrial Application: (Definitions, types and list of applications only)
Metals-Ferrous: Tool steels and stainless steels. Non-ferrous: Aluminum alloys.
Ceramics- Glass, optical fiber glass, cermets.
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: Classification, definitions and principles of operation. Procedure followed in soldering, brazing, and welding. Brief description of arc welding. Introduction to TIG welding and MIG welding.

Heat Transfer Applications:
Modes of Heat Transfer; Definition, Governing laws, Principle of heat transfer in Automobile Radiators, Cooling of Electrical and Electronic Devices (Active, Passive and Hybrid Cooling.)

Module 3 [5 hours]

Fundamentals of IC Engines:
Classification of Internal Combustion Engines, Working of 4-Stroke (petrol and diesel) engines, Applications of IC Engines, Numerical problems on Power and Mechanical efficiency calculations.

Insight into future mobility technology; Introduction to Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles (block diagram only). 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 (with block diagrams). Applications of Refrigerator. Working Principle of Air Conditioning (with block diagram), Applications of Air conditioning.

Module 4 [5 hours]

Mechanical Power Transmission:
Belt Drives: Principle, working and Application of flat and V-belt drives.;
Flat belt drives (Open and crossed), Simple numerical problems on flat belt drives involving velocity ratios (with effect of belt thickness and slip).

Gear Drives: Classification of gear drives, Gear Trains and their application: simple and compound Gear Trains, Simple numerical problems on Gear trains involving velocity ratios

Fundamentals of Mechanical Linkages: Definitions of Machines and Mechanisms.
Applications of linear motion, oscillatory motion, and rotary motion.

Introduction to Robotics: Robot anatomy, Joints & links, common Robot configurations. Applications of Robotics.

Module 5 [5 hours]

Fundamentals of Machine Tools and Operations: (Machine tool sketches are not included for CIE/SEE)
Working Principle of Lathe, Milling and Drilling machine tools 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.
Concepts of Smart Manufacturing and Industrial IoT.

Introduction to Mechatronics: Concept of open-loop and closed-loop control systems, Examples of Mechatronic systems.

Laboratory Components:

1. One exercise each involving welding and soldering.
2. One lathe model involving facing, turning and knurling.

Demonstration

1. Any one turbo-machine through Cut Sections.
2. Different gear trains.
3. Any one heat transfer application device
4. Engine components through cut sections
5. CNC/WJM lab
6. One model involving milling and drilling

Teaching- Learning Process:

1. PowerPoint 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

Suggested Learning Resources:

Books:

1. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008
2. Elements of Mechanical Engineering, V. K. Manglik, PHI Learning, 2014

Additional References:

1. Basic and Applied Thermodynamics, P. K. Nag, Tata McGraw Hill 2nd Ed., 2002
2. Standard Handbook of Machine Design, Joseph E Shigley; Charles R Mischke,
3. Thomas H Brown, Jr., McGraw-Hill, New York, 2004.
4. Thermal Management in Electronic Equipment, HCL Technologies, 2010
5. Thermal Management of Microelectronic Equipment, L. T. Yeh and R. C. Chu, ASMEPress, New York, 2002
6. Fundamentals of Robotics: Analysis and Control, Robert J. Schilling, PearsonEducation (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)

Scheme of Examination (SEE):

Answer FIVE FULL questions selecting one from each module. Two questions each to be set from all modules.

Course Outcomes:

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

CO 1. Understand the basic concepts of mechanical engineering in the fields of energy and its utilization, materials technology, manufacturing techniques, and transmission systems through demonstrations.

CO 2. Understand the application of energy sources in Power generation and utilization, Engineering materials, manufacturing, and machining techniques leading to the latest advancements and transmission systems in day-to-day activities.

CO 3. Apply the skills in developing simple mechanical elements and processes.

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Course Title	**PROBLEM-SOLVING THROUGH PROGRAMMING**				
Course Code	**211CC1ESPSP/ 211CC2ESPSP**	**Credits**	3	**L-T-P**	2:1:0
CIE	50	**SEE**	**100 Marks (50% Weightage)**		
Contact Hours / Week	3	**Total Lecture Hours**			40

UNIT – 1	**8 Hrs**
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. Problem solving, algorithms and flowchart. **Overview of C:** Basic structure of C program, executing a C program. Constant, variable and data types, Operators and expressions	
UNIT – 2	**8 Hrs**
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.	
UNIT – 3	**8 Hrs**
Arrays: Arrays (1-D, 2-D), Character arrays and Strings, Basic Algorithms: Searching and Sorting **Algorithms** (Linear search, Binary search, Bubble sort and Selection sort).	
UNIT – 4	**8 Hrs**
User Defined Functions and Recursion Example programs: Finding Factorial of a positive integer, GCD of two numbers and Fibonacci sequence.	
UNIT - 5	**8 Hrs**
Structures, Unions and Pointers, Preprocessor Directives and Example Programs like Addition of two complex numbers using structures , compute the sum, mean and standard deviation of all elements stored in an array of N real numbers using pointers.	
Text Books: 1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill 2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India	
Reference Books: Reema Thereja , Programming in C , Cengage publication.	
e-Books: elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html	
MOOCS https://nptel.ac.in/courses/106/105/106105171/	

COURSE OUTCOMES (COs)		
Student will be able to		
CO1	**Describe** all the hardware components of the computers and the basic concepts of C Programming.	
CO2	**Apply** various constructs of C Programming for solving a given problem.	PO1
CO3	**Analyze** the given code to debug, determine the output and find correctness of the given programs.	PO2
CO4	**Define the problem, implement and demonstrate** a concept identified in a co-course of the semester.	PO3,PO5,,PO10, PO12

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COMPUTER PROGRAMMING LABORATORY			
Course Code	**211CC1ESCPL / 211CC2ESCPL**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	--	Total Marks	100
Credits	01	Exam Hours	03

Course Objectives:

1. Explain problem statements and identify appropriate solutions.
2. Demonstrate the use of IDE, C Compiler, and identify and rectify the syntax and syntactic errors during programming.
3. Development of algorithms and programs using constructs of C programming language
4. Reporting the observations.

Sl. No.	**Sample Practice Programs**
1.	Calculation of Simple Interest.
2.	Check whether the given number is even or odd
3.	Convert string case.
4.	Check for the palindrome, prime number, perfect
5.	square. Development of linear search algorithm.

List of problems for which students should develop the program and execute in the Laboratory

1.	Develop a C program to solve simple arithmetic calculations, using arithmetic expressions and use of each operator leading to simulation of a commercial calculator. (No built-in math function).
2.	Compute the roots of a quadratic equation by accepting the coefficients and print the 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. Implement a C program to read the name of the user, number of units consumed, and print out the charges.
4.	Develop a program to compute the factorial of a given number using recursion.
5.	Develop a program to search an element by sorting a given array using appropriate searching technique.

6.	Develop a program that reads two matrices A (m x n) and B (p x q) and Compute the product of matrices A and B. Print both the input matrices and resultant matrix with suitable headings and output should be in the matrix format only.
7.	Develop a program to compute sin(x) using Taylor series approximation. Compare the results with the built-in functions. Print both the results with the appropriate inferences.
8.	Develop a program to sort the given set of N numbers using Bubble sort.
9.	Develop the functions to implement string operations such as comparison, concatenation and string length. Convince the parameter passing techniques.
10.	Implement the 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.	Implement a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.
12.	Implement the Recursive functions for Binary to Decimal Conversion.

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Scientific Foundations of Health			
Course Code	**21SFH29**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0	SEE Marks	50
Total Hours of Pedagogy	02 Hours/Week	Total Marks	100
Credits	01	Exam Hours	60 Minutes / 01 Hour

Course objectives:

The course 21**SFH29** 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 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,
- ✓ 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 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 Behaviour, 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 management), how to maintain good health, Mindfulness for Spiritual and Intellectual health, Changing health habits for good health. Health and personality.

Teaching -Learning Process	Chalk and talk method, Power Point presentation and YouTube videos, Animation videos methods. Creating real time stations in classroom discussions. Giving 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 exercises for its maintenance (Physical activities for health), Fitness components for health, Wellness and physical function,**	
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 behaviours through social engineering,	
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.	
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.	
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 (Course Skill Set)

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

CO 1: To understand Health and wellness (and its Beliefs)

CO 2: To acquire Good Health & It's balance for positive mindset

CO 3: To inculcate and develop the healthy lifestyle habits for good health.

CO 4: To Create of Healthy and caring relationships to meet the requirements of MNC and LPG world

CO 5: To adopt the innovative & positive methods to avoid risks from harmful habits in their campus & outside thecampus.

CO 6: To positively fight against harmful diseases for good health through positive mindset.

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Course Title	**Communicative English**	**CourseCode**	**21MA1HSCEN**
Credits	**01**	**L – T – P**	**1 – 0 – 0**

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 / VTU guidelines.

Teaching-Learning Process (General Instructions):

These are sample strategies, which teacher can use to accelerate the attainment of the variouscourse outcomes.

- Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suitmodern technological tools and softwares 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 LSRW skills.
(ix) 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 teachingof communicative skills in general.

UNIT-1

Introduction to Communicative English: [3 hours]

Introduction to Communication, Barriers to Effective Communicative English, Different styles and levels of Communication, Different Channels of Organizational Communication. How to improve and Develop Interpersonal and Intrapersonal Communication Skills.

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).

UNIT-2

Introduction to Phonetics: [3hours]

Introduction, Phonetic Transcription, English Pronunciation, Pronunciation Guidelines Related to consonants and vowels, Sounds Mispronounced, Syllables, Word Accent and Stress Shift, – Rules for Word Accent, Intonation – purposes of intonation, Words often Misspelt – Exercises on it. Common Errors in Pronunciation.

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).

UNIT-3

Basic English Communicative Grammar and Vocabulary PART - I:[3 hours]

Grammar: Parts of Speech in brief, Tense, Articles and Preposition. Introduction to Vocabulary,
Introduction to Vocabulary, All Types of Vocabulary –Exercises on it.
Homophones andHomonyms.

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).

UNIT-4

Basic English Communicative Grammar and Vocabulary PART - II:[3 hours]
Question Tags, One Word Substitutes and Exercises. Words formation - Prefixes and Suffixes (Vocabulary), Contractions and Abbreviations. Synonyms & Antonyms, Analogy of Comparison.

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).

UNIT-5

Communication Skills for Employment:[3 hours]

Information Transfer: Oral Presentation - Examples and Practice. Extempore / Public Speaking, Various techniques for neutralization of Mother Tongue Influence – Exercises. Reading and listening Comprehensions - Exercises. Letter of application. Résumé writing.

Teaching-Learning Process	Chalk and talk method, 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 Outcomes		**PO**
CO1	To understand, remember and apply the rules of accent, speech, and intonation patterns and enhance the pronunciation and communication skills.	1
CO2	Perform as a member of a team and engage in group discussion and oral presentation.	9, 10
CO3	To learn the basic English grammar and understand all types of English vocabulary and acquire professional communication skills.	1, 10

Assessment Details (both CIE and SEE)

Assessment	Assessment Pattern	Units Prescribed	Marks Allotted
I CIE	MCQ	Unit 1, Unit 2	20
II CIE	Descriptive Test	Letter Writing, Resume Short notes on communication skills	20
III CIE	MCQ	Unit 3, Unit4	20
AAT	Assignment	Individual assessment through writing	05
AAT	Group Presentation/ skit	Topics based on human values, social issues	05
SEE	Descriptive Written Exam	Entire syllabus	50

Semester End Examination (SEE):

SEE paper will be set for 50 marks. The pattern of the question paper is **Descriptive**. The time allotted for SEE is 120 minutes**.**

1. Communicative English has become a very important component in all engineering and non-engineering competitive examinations. In exams like GRE, TOEFL, IELTS and GATE exam, all state and Central Government recruitment examinations, placement tests and other Examinations, so the pattern of question paper, in general, will be in multiple-choice question (MCQ) Pattern. So, to meet the relevance of the recruitment requirement of our Engineering students "Communicative English" Semester end examination (SEE) will be conducted by giving equal weightage to MCQ and **Descriptive** writing patterns.
2. The Semester End Exam (SEE) is conducted for 50 marks (120 minutes' duration).

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 Press 2017.

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
- Organising Group wise discussions Connecting to placement activities
- Quizzes and Discussions, Seminars and assignments

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SECOND SEMESTER B.E. COURSE

Course Title	Advanced Calculus a nd Numerical Methods	Course Code	21MA2BSACN
Credits	03	L – T – P	2 – 1 – 0

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 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.

UNIT-1

INTEGRAL CALCULUS **[08 hours]**

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 of polar curves and Volume by a triple integrals. Problems.
Beta and Gamma functions: Definitions, properties, the relation between Beta and Gamma functions.
Self-Study: Mass and density.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

UNIT-2

VECTOR CALCULUS **[08 hours]**

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. Statement of Green's theorem and Stokes theorem. Problems.
Self-Study: Volume integral and Gauss divergence theorem.

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT-3

PARTIAL DIFFERENTIAL EQUATIONS (PDE's) [08 hours]

Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Solution of PDE by the method of separation of variables. 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.

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT-4

NUMERICAL METHODS -1 [08 hours]

Solution of algebraic 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.

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

UNIT-5

NUMERICAL METHODS -2 [08 hours]

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.

Teaching-Learning Process	Chalk and talk method/PowerPoint Presentation

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

COURSE CODE	CO	COURSE OUTCOME (CO)	PO
21MA2BSACN	CO 1	Understand and Apply the concepts of multivariable calculus and numerical methods	1
	CO 2	Demonstrate the importance of multivariable calculus and numerical methods through solving mathematical problems.	9, 12
	CO 3	Demonstrate the concepts of numerical methods using mathematical programing tools.	5, 9, 10 & 12

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	50 % Weightage	Total
CIE – Theory	AAT	10	100	05	50
	Assignment	10		05	
	Test 1	40		20	
	Test 2	40		20	
	Test 3	40		20	
SEE	End Exam	100		50	

Two best scores out of the three tests will be considered for CIE.

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from units 3, 4, 5 and two questions each from Unit 1 and Unit 2.

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. **B.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, Latest ed.
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 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

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Course Title	**Professional Writing Skills in English**	**Course Code**	**21MA2HSPWS**
Credits	**01**	**L – T – P**	**1 – 0 – 0**

Course Objectives: The course will enable the students,

- To identify the common errors in writing and speaking English.
- To achieve better technical writing and Presentation skills for employment.
- To read technical proposals and make them write good technical reports.
- Acquire employment and workplace 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 / VTU guidelines.

Teaching-Learning Process (General Instructions):

These are sample strategies, which teacher can use to accelerate the attainment of the variouscourse 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 softwares 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 LSRW skills.

UNIT-1

Identifying Common Errors in Writing and Speaking English: [3 hours] Advanced English grammar for professionals with exercises, Common errors identification in parts ofspeech, Use of phrasal verbs, 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.

Teaching-Learning Process	Chalk and talk method, 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).

UNIT-2

Nature and Style of sensible writing: [3 hours]

Organizing principles of writing technical papers, The Structure- introduction, body and conclusion, Importance of proper punctuation, The art of condensation (Precise writing). Creating coherence and cohesion, Misplaced modifiers, Contractions, Collocations, Word order, Errors due to the confusion ofwords, Common errors in the use of gender, singular & plural. Redundancies & clichés.

Teaching-Learning Process	Chalk and talk method, PowerPoint 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).

UNIT-3

Technical Reading and Writing Practices: [3 hours]

Reading process and reading strategies. Reading comprehension passages and answering the questions set on it- global, inferential and referential questions. Introduction to technical writing process, Understanding of writing process, Introduction to technical report writing, Significance of reports, Types of reports.

Technical proposals writing, Characteristics of technical proposals. Scientific writing process. Grammar – Voice (Active and Passive voices), Spotting error exercises, Cloze Test.

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).

UNIT-4

Professional Communication for Employment: **[3 hours]** Listening- Types of listening, Understanding and interpreting, Listening barriers, Improving listeningskills. Reading skills Writing effective resume for employment, Model letter of application (Coverletter) with Resume, Emails.

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).

UNIT-5

Professional Communication at Workplace:

Group Discussions- Importance, characteristics, strategies of a Group Discussions. Group Discussions as a tool for selection. Employment/ Job Interviews - Importance, types, characteristics, strategies of an employment/ job interviews. Presentation skills - Formal presentations by students - Importance, characteristics, strategies of presentation skills (non-verbal skills).

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:

Course Outcomes		**PO**
CO1	To understand and identify the common errors in writing and speaking.	1
CO2	Perform as a member of a team and engage in group presentation.	9, 10

CO3	Developing listening and speaking skills through classroom activities based on listening comprehension, recapitulation, interpretation and debate on the same.	1, 10
CO4	To read Technical proposals and write good technical reports, to acquire better analytical skills and methodology required for writing projects and research papers.	1, 10

Assessment Details (both CIE and SEE)

Assessment	Assessment Pattern	Units Prescribed	Marks Allotted
I CIE	MCQ	Unit 1 Unit 2	20
II CIE	Descriptive Test	Technical writing skills	20
III CIE	MCQ	Unit 3 Unit4	20
AAT	Assignment	Individual assessment through writing	05
AAT	Group Presentation/ skit	Topics based on human values, social issues	05
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Semester End Examination (SEE):

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2. **Functional English** (**As per AICTE 2018 Model Curriculum**) Cengage learning India PvtLimited [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.

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

- Contents related activities (Activity-based discussions)
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