Course Title	PHYSICS FOR CIVIL ENGINEERING		
Course Code	PHY5C12/22	(L-T-P) C	(3-1-0)3
Exam	3 hours	Hours/Week	04
SEE	100 marks	Total Hours (L+T+P+TW+SL)	90

Course Objective:

The objective of the course is to make students learn principles and theories of physics in civil engineering field and to develop effective solutions for civil engineering problems.

Course Outcomes:Upon completion of the course, students shall be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Interpret fundamental concepts of physics to analyze vibrations, rigid body dynamics, crystallography, photonics, Acoustics and shock waves.	1	-
2	Apply theoretical principles to understand and solve problems related to rigid body dynamics, crystal structures, photonic systems, lasers, and Acoustics.	1	-
3	Solve problems related to the applications of material science, crystallography, photonics, and Acoustics.	1	-
4	Discuss collaboratively in groups to conduct experiments, analyze results, and effectively communicate findings through presentations	1, 8, 9	-

MODULE-1	10Hrs.

Vibrations and Rigid Body Dynamics.

Pre-requisites:Fundamentals of Newtonian Mechanics.

Free vibrations. Damped vibrations-derivation of expressions for displacement of damped harmonic motion. Discussion of types of damped vibrations. Forced vibrations-derivation of expression for amplitude and phase-

variation with frequency, Resonance. Condition for amplitude resonance. Consequences of resonance. Spring mass and its applications

Rigid body. Moment of inertia. Torsional pendulum-derivation of expression for time period of oscillation. Mention its uses. Bending of beams- derivation of expression for bending moment of a beam. Cantilever-derivation for depression of loaded end of a single cantilever. Applications of cantilevers.

Self-learning component: Simple Harmonic Vibrations.

Numerical problems *on amplitude and phase of forced vibrations, time-period of oscillation, bending moment and Young's Modulus/depression of a cantilever.*

MODULE-2	**10Hrs.**

Acoustics and Ultrasonics.

Pre-requisites:Fundamentals of Sound.

Acoustics; Introduction to acoustics, Types of Acoustics, reverberation and reverberation time, absorption power and absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (No derivation), Eyring's formula (No derivation). Comparison of Eyring's and Sabine's formula, measurement of absorption coefficient, factors affecting the acoustics and remedial measures, Noise and its Insulation,

Ultrasonics. Non-destructive testing of materials using ultrasonics. Measurement of velocity of ultrasonic waves and elastic constants in solids and liquids. List of application of ultrasonics, detection of cracks in metal blocks, kill bacteria in liquid, medical field, Determining the depth of the sea.

Self-learning; Production of Ultrasonic waves.

Numerical Problems *on reverberation time, absorption power and absorption coefficient, Sabine's formula, Eyring's formula*.

MODULE-3	**10Hrs.**

Photonics.

Pre-requisites: Geometrical optics, physical science of light waves

Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources. Ruby laser, CO2 laser, Semiconductor laser. Advantages and disadvantages of above laser sources. Holography. Qualitative discussion of measurement of pollutants (LIDAR),LASER Range Finder, Speed Checker, laser cutting, laserdrilling, laser welding,List of other applications: laser-guided missiles, Bridge Deflection ,Road Profiling.

Self-learning: Characteristics of Laser

Numerical problems *on Boltzmann factor, Energy density, number of photons.*

MODULE-4	**10Hrs**

Crystallography.

Pre-requisites: States of matter, Classifications of solids

Introduction to crystalline solids. Space lattice, Bravais lattice–unit cell, primitive cell. Lattice parameters. Directions and planes, Miller indices. Expression for interplanar spacing. Coordination number. Atomic packing factors (SC, FCC, BCC). Density of a unit cell. Production of X-ray, Bragg's law and Bragg's spectrometer. XRD-application in material characterization.

Shock waves: Mach number and Mach Angle, Definition and Characteristics of Shock waves, Construction and working of Reddy Shock tube, List of applications of Shock Waves,

Self-learning: 7 basic crystal systems.

Numerical problems *on Miller indices, Interplanar space. Bragg's law, Mach number*

Prescribed Textbooks:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Engineering physics	R K Gaur and S L Gupta,ISBN:	Eleventh Edition,	Dhan pat Rai Publishing Company (P) Ltd.	2011

		9788189928223			
2	Solid state physics.	S.O.Pillai, ISBN-10: 9386070928,	Eighth edition,	New Age International Pvt. Ltd,	2018

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Shock waves made simple.	Chin too S Kumar, K Takayama and K P J Reddy:	New	Willey India Pvt. Ltd, Delhi	2014
2	A Textbook of Engineering Physics	M.N. Avadhanulu and P.G. Kshirsagar,	10th revised Ed,	S. Chand. & Company Ltd, New Delhi	2018
3	Lasers and Non Linear Optics	B.B Laud	3rd Ed	New Age International Pvt. Ltd,	2011

Online Courses and Video Lectures:

1. **https://onlinecourses.nptel.ac.in/noc23_ee84/preview**
2. **https://onlinecourses.nptel.ac.in/noc23_cy37/preview**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted. Details of activity 1: - Hands on model and report	10+10 =20

	submission Details of activity 2: - Presentation and viva-voce	
Total		**50**

Course Articulation Matrix

Course Outcomes	**Program Outcomes [POs]**										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**
CO1	3										
CO2	3										
CO3	3										
CO4	3							1	1		

CourseTitle	**PHYSICS LAB FOR CIVIL ENGINEERING**		
CourseCode	PHY5CL17/27	**(L-T-P)C**	**(0**-0-2)1
Exam	3hours	**Hours/Week**	02
SEE	**100 marks**	**Total Hours (L+T+P+TW+SL)**	**30**

CourseObjective:

To impart hands-on experience in fundamental experiments related to modern physics, material properties, mechanical systems, and optical techniques and develop skills essential for civil engineering practice.

CourseOutcomes:

Uponcompletionofthecourse,students shallbeableto

Sl. No.	Courseoutcomes	PO	PSO
1.	Apply appropriate experimental techniques to determine material, electrical, mechanical, and optical properties.	1,8,9	-
2.	Interpret experimental data to evaluate physical parameters relevant to engineering applications in a professional laboratory setting	1,8,9	-

CourseContents

List of experiments

Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique.

Determination of dielectric constant by charging and discharging of a capacitor.

Determination of wavelength of LASER by diffraction technique.

Verification of Stefan's law of radiation.

Determination of Planck's constant using Light Emitting Diodes.

Estimation of frequencies of vibrating string and AC using Sonometer.

Determination of resonance frequency and inductance using LCR circuits.

Determination of Young's modulus using single cantilever.

Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.

Determination of numerical aperture and modes of transmission of optical fiber.

Determination of Fermi energy of given material.

Determination of Mach number by using Reddy shock tube.

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Engineering physics Lab Manual	Faculty of Department of Physics	1	Department of Physics, Malnad College of Engineering, Hassan	2025

Online Courses and Video Lectures:

https://youtu.be/ASOcMmPCLhU

https://youtu.be/pJm1B-||_OE

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
Continuous Assessment	Conduction of any 10 of 12 experiments -20 marks (conduction + calculation with results) Record-10 marks	30
Test (CIE)	Write up, experimental set up, conduction and calculation-80% of maximum marks Viva-Voce-20% of maximum marks (test will be conducted for 50 marks and reduced to 20)	20
Total		**50**

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1
CO1	3							1	1		
CO2	3							1	1		

Course Title	PHYSICS FOR MECHANICAL ENGINEERING STREAM		
Course Code	PHY5M12/22	**(L-T-P) C**	**(**3-1-0)3
EXAM	**3 Hours**	**Hours/Week**	**4**
SEE	**100 marks**	**Total Hours (L+T+P+TW+SL)**	**90**

Course Objective:

The objectiveofthecourseistomakestudentslearnprinciplesandtheoriesofphysicsinthe Mechanical engineering field and to develop effectivesolutionsforengineering problems.

CourseOutcomes:

Uponcompletionofthecourse,students shallbeableto

#	Course Outcomes	Mapping to PO's	Mapping toPSO's
1	Interpret fundamental concepts of physics to analyze vibrations, rigid body dynamics, crystallography, photonics, and thermoelectric phenomena.	1	-
2	Apply theoretical principles to understand and solve problems related to rigid body dynamics, crystal structures, photonic systems, lasers, and thermoelectric materials.	1	-
3	Solve problems related to the applications of material science, crystallography, photonics, and thermoelectric devices in engineering	1	-
4	Work collaboratively in groups to conduct experiments, analyze results, and effectively communicate findings through presentations	1, 8, 9	-

MODULE-1	10 hours

Vibrations and Rigid Body Dynamics

Prerequisites: Basics of Mechanics, Oscillations, and Differential equations.

Simple harmonic vibrations. Free vibrations. Damped vibrations-derivation of expressions for displacement of damped harmonic motion. Discussion of types of damped vibrations. Forced vibrations-derivation of expression for amplitude and phase-variation with frequency. Resonance. Condition for amplitude resonance. Applications of resonance,spring mass and its applications.

Rigid body. Moment of inertia. Torsional pendulum-derivation of expression for time of oscillation. Applications in automotive engineering and robotics (moment of inertia of rotating parts like wheels, axles and design of rotating machinery and structural elements). Bending of beams- derivation of expression for bending moment of a beam. Cantilever-derivation for depression of loaded end of a single cantilever. Application: Cantilever beams in cranes and wings of airplanes.

Self-learning topics: Fundamentals of Elasticity.

Numerical problems *on Amplitude and phase of forced vibrations, time-period of oscillation, bending moment and Young's Modulus/depression of a cantilever.*

MODULE-2	**10 hours**

Crystallography

Pre-requisites: Basic understanding of Atomic structure, Wave-particle duality, and Geometry

Space lattice, Bravais lattice–unit cell, primitive cell. Lattice parameters. Directions and planes, Miller indices. Expression for interplanar spacing. Coordination number. Atomic packing factors (SC, FCC, BCC). Density of a unit cell. X-rays and their types. Bragg's law. Bragg's X-ray spectrometer for identification of crystal structure. Importance of X-ray diffraction in material characterisation. de Broglie's concept of matter waves. Diffraction of matter waves-Davisson-Germer experiment, application of diffraction of X-rays and electrons inadvent of nanotechnology andmaterial characterization-Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM).

Self-learning topics: 7 basic crystal systems

Numerical problems on de Broglie's equation Miller indices, Interplanar space, Bragg's law.

MODULE-3	**10 hours**

Photonics

Pre-requisites: Fundamentals of electromagnetic waves and geometrical optics.

Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources (to list out Solid, Gas and Semiconductor lasers and to list the contrast between them). CO_2 laser –construction and working. Industrial applications of laser: laser cutting, laser drilling, laser welding and laser assisted ultrasonics of finding defects in materials

Optical fibres. Construction and principle. Ray propagation mechanism. Angle of acceptance and numerical aperture - their relationship with refractive indices of core and clad and condition for ray propagation. Modes of transmission: V-number and number of modes, Types of optical fibres, Merits and demerits of optical fibres. Applications: Optical fiber sensors and industrial endoscopy.

Self-learning topics: Identification of other applications: Bar Code scanner, Laser Printer, Laser Cooling, laser fencing, laser-guided missiles, LASER Range Finder, Road Profiling, Bridge Deflection, Speed Checker.

Numerical problems *on Boltzmann factor, Numerical aperture, V-number and number of modes.*

MODULE-4	**10 hours**

Thermoelectric materials and devices

Pre-requisites: Fundamentals of thermodynamics.

Thermoelectric phenomena. Thermo emf and thermo current, Seebeck effect. Variation of thermo emf with temperature, Peltier effect, Seebeck, Peltier and Thomson coefficients (Mention Expression), laws of thermoelectricity. Experimental demonstration of Peltier effect. Explanation of thermo emf based on Peltier effect. Thermo-electric power. Construction and Working of Thermoelectric generators (General). Construction and working of Thermoelectric coolers (Refrigerators), Construction and working of Exhaust (Automobiles). Applications: Temperature sensors: Resistance Temperature Detector (RTD), Thermistor, Thermocouple, waste heat recovery.

Self-learning topics: Renewable energy sources from heat

Numerical Problems *on thermoelectric coefficients.*

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering physics	R K Gaur and S L Gupta, ISBN: 9788189928223, Dhanpat Rai	second	(P) Ltd. Edition	2011
2	Solid state physics	S O Pillai, physicsISBN-10: 9386070928	Eighth edition	New Age International Pvt. Ltd,	9 January 2018.

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Fiber Optics	: A K Ghatak and K Thyagarajan ISBN-13: 978-0521577854	2	Cambridge University Press India Pvt. Limited	1998
2	NPTEL courses on Engineering physics	E-resources			
3	Heat, Thermodynamics and Statistical Physics	Singal, Agarwal and Prakash ISBN-13- 9789350065235	New	Pragati Prakashan, India	2017
4	Heat and thermodynamics	Brijlal N Subramanyam ISBN: 81-219-2813-3 S.	new	Chand and Co. Ltd. New Delhi,	2007

E Books and online course materials:

https://onlinecourses.nptel.ac.in/noc23_ee84/preview

https://onlinecourses.nptel.ac.in/noc23_cy37/preview

Online Courses and Video Lectures:

https://youtu.be/ASOcMmPCLhU

https://youtu.be/pJm1B-||_OE

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
CIE	Three CIEs Conductedfor20markseach and reduced to 10 marks	30
Activity Details	Details of activities to be conducted Group Activity - Execution and Report: 10 marks Presentation and Viva-Voce: 10 marks	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**
CO1	3										
CO2	3										
CO3	3										
CO4	3							1	1		

CourseTitle	**PHYSICS LAB FOR MECHANICAL ENGINEERING STREAM**		
CourseCode	PHY5ML17/27	**(L-T-P) C**	**(0**-0-2)1
Exam	3hour	**Hours/Week**	02
SEE	**100 marks**	**Total Hours (L+T+P+TW+SL)**	**90**

CourseObjective:

To provide hands-on experience in experiments that strengthen concepts in modern physics, materials, mechanics, and optics, enhancing practical engineering skills.

Course Outcomes:

Uponcompletionofthecourse,students shallbeableto

Sl. No.	Courseoutcomes	PO	PSO
1.	Conduct experiments to determine various physical properties such as resistivity, energy gap, dielectric constant, Young's modulus, and Fermi energy using standard techniques.	1,8,9	-
2.	Analyze experimental data and effectively present results relevant to engineering applications.	1,8,9	-

CourseContents

List of experiments

1. .Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique.
2. Determination of dielectric constant by charging and discharging of a capacitor.
3. Determination of wavelength of LASER by diffraction technique.
4. Verification of Stefan's law of radiation.
5. Determination of Planck's constant using Light Emitting Diodes.

6. Estimation of frequencies of vibrating string and AC using Sonometer.
7. Determination of resonance frequency and inductance using LCR circuits.
8. Determination of Young's modulus using single cantilever.
9. Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.
10. Determination of numerical aperture and modes of transmission of optical fiber.
11. Spring constant
12. Fermi energy of copper
13. Measurement of Mach number using Reddy Shock tube

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering physics Lab Manual	Faculty of Department of Physics	1	Department of Physics, MCE, Hassan	2025

Online Courses and Video Lectures:

https://youtu.be/ASOcMmPCLhU

https://youtu.be/pJm1B-||_OE

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Assessment	Conduction of any 10 of 13 experiments -20 marks (conduction + calculation with results) Record-10 marks	30
Test (CIE)	Write up, experimental set up, conduction and calculation-80% of	20

	maximum marks Viva-Voce-20% of maximum marks (test will be conducted for 50 marks and reduced to 20)	
Total		**50**

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1
CO1	3							1	1		
CO2	3							1	1		

Course Title	PHYSICS FOR ELECTRONICS AND ELECTRICAL ENGINEERING STREAM		
Course Code	PHY5E12/22	**(L-T-P) C**	(3-1-0)4
Exam	3hour	**Hours/Week**	04
SEE	**100 marks**	**Total Hours (L+T+P+TW+SL)**	**90**

Course Objective:

Objective of the course is to make students learn principles and theories of physics in electronics and electrical engineering fields and to develop effective solutions for engineering problems.

Course Outcomes: Uponcompletionofthecoursestudents shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping toPSO's
1	Interpret theories of materials science, photonics and quantum mechanics	1	-
2	Identify applications of materials science, photonics and quantum mechanics.	1	-
3	Solve problems on materials science, lasers, optical fibers and quantum mechanics.	1	-
4	Realise the concepts, laws and properties of materials, photonics and quantum behaviour of matter through activities.	1,8,9	

MODULE-1	10Hrs.

Electrical Properties of Solids

Pre-requisites: States of Matter and their properties

Free electron theories: Free electrons in metals. Drift velocity, Mean free path, Mean collision time, Relaxation time. Classical free electron theory-assumptions. Expression for electrical conductivity in metals. Failures of classical free electron theory. Quantum free electron theory–assumptions. Fermi energy. Fermi-Dirac distribution function (Fermi factor). Merits of quantum free electron theory. Effects of impurity and temperature on electrical resistivity of metals. Applications(Qualitative discussion); Designing electrical interconnects, PCBs, conductor materials, optoelectronic components-photodetectors, thermal solutions for electronics-heat sinks.

Semiconductors:Effects of impurity and temperature on electrical resistivity of semiconductors. Electrical conductivity of a semiconductor (derivation). List of Applications: Diodes, Transistors, Integrated Circuits (ICs), Sensors, and in Electric Motor Control, Smart Grids and Power Monitoring, Electric Vehicles (EVs).

Self-learning topics: Band theory of solids and classification of semiconductors.

Numerical problems *on electron concentration, electrical conductivity, resistivity, Fermi factor, Fermi energy.*

MODULE-2	**10Hrs.**

Dielectrics and Superconductors

Pre-requisites: Distinction between different types of materials.

Dielectric materials:Classification: polar and nonpolar dielectrics. Relative permittivity (dielectric constant), Polarization and its types. Frequency dependence of polarizability and permittivity. Expression for internal field. Clausius-Mossotti equation. Dielectric loss and loss tangent, Dielectric strength and breakdown. Ferroelectric and Piezoelectric Materials. Applications(Qualitative); Energy storage devices, transformers, PCBs, RF and Microwave Components.

Superconductors: Temperature dependence of electrical resistivity in superconductors. Meissner effect. Critical magnetic field.Critical current. Type I and Type II superconductors. BCS Theory. High temperature superconductors. Applications; Discussion of superconducting magnets, MRI and SQUID, Identification of other applications; LosslessPower Transmission and Distribution, Superconducting Filters and Amplifiers, Quantum Technology, Generators and Maglev Vehicle.

Self-learning topics: Types of Dielectric Materials-Solid, Liquid, and Gaseous Dielectrics.

Numerical problems *on dielectric constant, internal field, Clausius-Mossotti equation, critical currentand critical magnetic field*.

MODULE-3	**10Hrs.**

Photonics

Pre-requisites: Fundamentals of Geometrical optics

LASER: Interaction of radiation with matter. Expression for energy density in terms of Einstein's coefficients. Requisites of a Laser system. Conditions for laser action. Types of laser sources (to list out Solid, Gas and Semiconductor lasers and to list the contrast between them). CO_2 laser –construction and working, Applications:LIDAR-Measurement of pollutants (qualitative), Identification of otherapplications: laser cutting, laser drilling, laser welding, Mention of Communication Systems,Measurements and Instrumentation, Testing and Inspection, Power Systems, Consumer Electronics Devices, Remote Sensing.

Optical fibers: Construction and principle. Ray propagation mechanism. Angle of acceptance and numerical aperture - their relationship with refractive indices of core and clad and condition for ray propagation. Modes of transmission: V-number and number of modes, Types of optical fibres, Attenuation. Applications: Discussion of Fiber Optic Communication, identification of other applications-Electrical Power Systems, Measurement and Instrumentation. Lighting and Displays, Embedded Sensing in Smart Systems, Electromagnetic Isolation. Merits and demerits of optical fibers.

Self-learning topics:Analog vs Digital Transmission.

Numerical problem*s on energy, Boltzmann factor, V-number, Numerical aperture, and attenuation.*

MODULE-4	**10Hrs**

Quantum Communication

Pre-requisites: Modes of transfer of thermal energy

Black body. Black body radiation spectrum, Wien's law and Rayleigh Jeans law. Planck's law. Dual nature of

matter-Louis de Broglie hypothesis of matter waves. Group velocity, phase velocity, particle velocityand their relation with velocity of light (no derivations). Expression for de Broglie wavelength of electron. Characteristics of matter waves.Schrodinger wave equation. Max Born's interpretation of wave function. Application of Schrodinger wave equation to find eigen values and eigen functions for a trapped particle. Discussion of probability density for different quantum states and advent to quantum computing and communication.

Classical bits and Qubits; Definitions of their types; SQUID, Photonic, NMR, Ion trap. Heisenberg's uncertainty principle. Quantum tunneling, Quantum superposition, Quantum entanglement. Quantum Communication- Quantum Teleportation. Features, Challenges, and Future Prospects of quantum communication: Quantum key distribution. Quantum repeater. Quantum internet. Quantum Satellite Communication (Qualitative).

Self-learning Topics:Application of Schrodinger wave equation to find eigen values and eigen functions for a free particle.

Numerical problems *on Louis de Broglie equations, group velocity, phase velocity and Eigenvalue equation.*

Prescribed Textbooks:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Engineering physics	R K Gaur and S L Gupta ISBN: 9788189928223	2022	Dhanpat Rai Publishing Company	2022
2	Solid state physics	S O Pillai ISBN-10: 9386070928	Eighth edition	New Age International Pvt. Ltd	2018

3	Quantum Computation and Quantum Information	Michael A. Nielsen & Isaac L. Chuang	10th Anniversary Edition	Cambridge University Press	2012

Reference Books:

Sl. No	BookTitle	Authors	Edition	Publisher	Year
1	Modern Physics	Kenneth S. Krane, ISBN-13: 9781118061145,	3	John Wiley & Sons	2012
2	Lasers and non-linear optics	B.B. Laud, ISBN: 9788122430561	3	New Age International Private Limited	2015
3	Fiber Optics	A K Ghatak and K Thyagarajan, *ISBN-13: 978-1-4039-3011-8, ISBN: 1-4039-3011-2*	2	Macmillan/Laxmi Publications (P) Ltd., New Delhi	2006

E Books and online course materials:

1. https://onlinecourses.nptel.ac.in/noc23_ee84/preview
2. https://onlinecourses.nptel.ac.in/noc23_ph36/preview

Online Courses and Video Lectures:

https://www.coursera.org/search?query=engineering%20physics&topic=Physical%20Science%

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	ThreeCIEsconductedfor20markseach and reduced to 10 marks	30
Activity Details	Details of activities to be conducted Group activity-execution and report-10 marks Presentation, Viva-Voce – 10 marks	20
Total		**50**

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1
CO1	3										
CO2	3										
CO3	3										
CO4	3							1	1		

Course Title	PHYSICS LAB FOR ELECTRONICS AND ELECTRICAL ENGINEERING STREAM		
Course Code	PHY5EL17/27	**(L-T-P) C**	(0-0-2)1
Exam	3hour	**Hours/Week**	02
SEE	**100 marks**	**Total Hours (L+T+P+TW+SL)**	**30**

Course Objective:

Objective of the course is to make students realize principles of physics by conducting experiments towards developing effective solutions for engineering problems.

Course Outcomes: Upon completion of the course, students shall be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Identify the physical properties of materials, lasers, optical fibers and black body through practical experience.	1,8,9	-
2	Interpret physical parametersof materials properties, lasers, optical fibers and quantum mechanics.	1,8,9	-

SN	Experiments
1	Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique
2	To determine the **resistivity (ρ)** and **conductivity (σ)** of a given metallic wire using its resistance, length, and cross-sectional area.
3	Determination of dielectric constant by charging and discharging of a capacitor.
4	Determination of wavelength of LASER by diffraction technique

5	Verification of Stefan's law of radiation
6	Determination of Planck's constant using Light Emitting Diodes
7	Estimation of frequencies of vibrating string and AC using Sonometer
8	Determination of resonance frequency and inductance using LCR circuits.
9	Determination of Young's modulus using single cantilever
10	Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.
11	Determination of numerical aperture and modes of transmission of optical fiber
12	Determination of quantum circuit under black box using the output (only 5 circuits).
13	I-V Characteristics of zener diode

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering physics Lab Manual	Faculty of Department of Physics	1	Department of Physics, Malnad College of Engineering, Hassan	2025

Online Courses and Video Lectures:

https://onlinecourses.nptel.ac.in/noc24_ph06/preview

https://archive.nptel.ac.in/courses/115/105/115105110/

https://www.youtube.com/watch?v=pJm1B-lI_0E

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Assessment	Conduction of any 10 of 13 experiments, computation -20 marks Reports -10 marks	30
Test (CIE)	Write up, experimental set up, conduction and calculation-80% of max. Marks. Viva-Voce – 20% of max. Marks (test will be conducted for 50 marks and reduced to 20 marks)	20
Total		**50**

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1
CO1	3							1	1		
CO2	3							1	1		

Course Title	PHYSICS FOR COMPUTER ENGINEERING STREAM		
Course Code	**PHY5S12/22**	**(L-T-P) C**	(3-1-0) 3
Exam	3hour	**Hours/Week**	04
SEE	**100 marks**	**Total Hours (L+T+P+TW+SL)**	**90**

Course Objective: The objective of the course is to enable students to learn the principles and theories of physics relevant to computer science and allied engineering fields, forming a foundation towards developing effective engineering solutions.

Course Outcomes: Upon completion of the course the students will be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Discuss the working principles of quantum and classical physics, LASERs, optical fibers, and their applications in photonic systems.	1	-
2	Apply principles of photonics, classical and quantum mechanics in deriving relations between physical quantities and properties.	1	-
3	Solve the problems pertaining to photonics, classical and quantum properties of materials.	1	-
4	Analyze principles of classical and quantum physics through activities.	1,8,9	-

MODULE-1	10 Hrs.

Photonics

Pre-requisites: Fundamentals of geometrical optics.

LASER: Characteristic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's A and B Coefficients and Expression for Energy Density (Derivation), Laser Action, Population Inversion, Metastable State, Requisites of a laser system, Semiconductor Diode Laser, Applications: LIDAR, Bar code scanner, Laser Printer (Qualitative).

Optical Fiber: Principle and Structure, Propagation of Light, Acceptance angle and Numerical Aperture (NA), Derivation of Expression for NA, V-number, Modes of Propagation, fractional refractive index, Classification of Optical Fibers, Attenuation and their types, Applications: Fiber Optic Communication and networking, broadband communication and speed of internet.

Self-learning: Acceptance angle and Total Internal Reflection.

Numerical problems *on Boltzmann factor, V-number, Numerical aperture, and attenuation.*

MODULE-2	10 Hrs.

Free Electron Theory and Superconductivity

Pre-requisites: Basics of current electricity.

Free Electron Theory

Free electron concept in metals. Classical free electron theory-assumptions. Drift velocity, mean free path, Mean collision time, Relaxation time. Expression for electrical conductivity in metals, Failures of Classical Free Electron Theory, Assumptions of Quantum Free Electron Theory, Fermi Energy, Fermi Factor, Variation of Fermi Factor with Temperature and Energy. Merits of Quantum Free Electron Theory. Matthiessen's rule and temperature dependent electrical conductivity.

Superconductivity

Introduction to Superconductors, Temperature dependence of resistivity, Meissner's Effect and its experimental demonstration, Critical Field, Temperature dependence of Critical field, Critical Current, Types of Superconductors.

BCS theory, High Temperature superconductivity, Josephson Junctions, superconducting magnets, SQUID(Qualitative), Applications in Quantum Computing and magnetic sensors for brain computer interface.

Self-learning: Resistivity and Mobility

Numerical problems *on electrical conductivity, Fermi energy, and critical magnetic field.*

MODULE-3	10 Hrs.

Quantum mechanics for computation

Pre-requisites: Wave–Particle dualism

Black body radiation spectrum, Wien's law and Rayleigh Jeans law, assumptions of quantum theory of radiation, Planck's law. Explanation of dual nature of matter. de Broglie Hypothesis of Matter Waves, de Broglie wavelength and derivation of its expression for electrons, Phase Velocity and Group Velocity, and their relationship with speed of light (no derivation). Wave Function, Time independent Schrödinger wave equation, Physical Significance of a wave function and Born Interpretation, Expectation value, Eigen functions and Eigen Values, Particle inside one dimensional infinite potential well, Quantization of Energy States, Waveforms and Probabilities. The application of quantum mechanics in quantum technology - quantum computation, quantum communication, quantum sensors, quantum materials and devices.

Self-learning: Photoelectric Effect and Compton Effect (qualitative)

Numerical problems *on de Broglie equations, group velocity, phase velocity and Eigenvalue equation***.**

MODULE-4	10 Hrs.

Elements of Quantum Computing

Pre-requisites: Fundamentals of binary systems, thermodynamics and statistics.

Introduction to quantum computers, difference between classical and quantum computers, features of quantum computers; exponential speedup, parallel computation, reversible computation. Principles of quantum computation; Heisenberg's uncertainty principle, Quantum tunnelling, Quantum entanglement, quantum superposition. Qubits and

working principle of their different types; SQUID, Photonic, NMR, Ion trap. Notations of representing states and operations of quantum computation; Dirac bracket notation, Bloch sphere and matrix. Basics of quantum logic gates; single qubit logic gates (X, Y, Z and Hadamard) and multi-qubit logic gates (Controlled X).

Physics-Inspired Machine Learning Systems

Energy minimization principle in physical systems and its application to neural networks; Hopfield network structure, energy function, attractor states, and Hebbian learning rule. Boltzmann distribution and its role in determining state probabilities in neural systems; influence of temperature on energy-based learning. Simulated annealing technique for global optimization, temperature scheduling and acceptance probability. Ising model analogy for binary neurons; local interactions and global stability.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Engineering physics	R K Gaur and S L Gupta	1	*Dhanpat Rai Publishing* Company (P) Ltd.	2011
2	Solid state physics	S O Pillai	1	New Age International Pvt. Ltd	2018

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Modern Physics: Kenneth S. Krane	Kenneth S. Krane	3	John Wiley & Sons, Inc.,	2012
2	Fiber Optics	A K Ghatak and K Thyagarajan	1	Cambridge University Press India Pvt. Limited	1998

3	Quantum Computation and Quantum Information	Michael A. Nielsen & Isaac L. Chuang	10thAnniversary Edition	Cambridge University Press	2012	

E Books and online course materials:

https://onlinecourses.nptel.ac.in/noc23_ph29/preview

Online Courses and Video Lectures:

https://youtu.be/lZ3bPUKo5zc?si=xH1W4tBalCExwzEw

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Group activity-execution and report-10 marks 2) Presentation, Viva-Voce – 10 marks	20
Total		**50**

Course Articulation Matrix

Course Outcomes	**ProgramOutcomes [POs]**										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO1 1**

CO1	3										
CO2	3										
CO3	3										
CO4	3							1	1		

Course Title	**PHYSICS LAB FOR COMPUTER ENGINEERING STREAM**		
Course Code	PHY5SL17/27	**(L-T-P) C**	(0-0-2)1
Exam	3 hr	**Hours/Week**	02
SEE	**100 marks**	**Total Hours (L+T+P+TW+SL)**	**30**

Course Objective:

To enable students to explore and apply fundamental concepts of physics through hands-on experiments, fostering analytical thinking and practical skills essential for solving real-world engineering challenges.

Course Outcomes: Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply practical knowledge of fundamental physics principles through experimental techniques involving semiconductors, lasers, optics, thermal radiation, and mechanical systems.	1,8,9	-
2	Develop students' ability to perform and analyze experiments for evaluating Physical parameters of materials relevant to engineering applications.	1,8,9	-

SN	Experiments
1	Measurement of electrical resistivity and energy gap of a semiconductor using four probe technique
2	Determination of quantum circuit under black box using the output (only 5 circuits).
3	Determination of dielectric constant by charging and discharging of a capacitor.
4	Determination of wavelength of LASER by diffraction technique

5	Verification of Stefan's law of radiation
6	Determination of Planck's constant using Light Emitting Diodes
7	Estimation of frequencies of vibrating string and AC using Sonometer
8	Determination of resonance frequency and inductance using LCR circuits.
9	Determination of Young's modulus using single cantilever
10	Determination of moment of inertia of rigid bodies and rigidity modulus of a string using torsion pendulum.
11	Determination of numerical aperture and modes of transmission of optical fiber
12	I-V Characteristics of zener diode

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering physics Lab Manual	Faculty of Department of Physics	1	Department of Physics, Malnad College of Engineering, Hassan	2025

Online Courses and Video Lectures:

https://onlinecourses.nptel.ac.in/noc24_ph06/preview

https://www.youtube.com/watch?v=pJm1B-lI_0E

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous	Conduction of any 10 of 12experiments, computation -20 marks	30

Assessment	Reports -10 marks	
Test (CIE)	Write up, experimental set up, conduction and calculation-80% of max. Marks Presentation Viva-Voce – 20% of max. Marks (CIE will be conducted for 50 marks and reduced to 20 marks)	20
Total		**50**

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1
CO1	3							1	1		
CO2	3							1	1		

Course Title	QUANTUM COMPUTATION AND QUANTUM COMMUNICATION		
Course Code	**23OEPH61/71**	**(L-T-P) C**	(3-0-0)3
Exam	3hour	**Hours/Week**	03
SEE	**100 marks**	**Total Hours (L+T+P+TW+SL)**	**90**

Course Objective:

The course introduces foundational quantum mechanics concepts applied in computation and communication, focusing on differences from classical systems, basic circuits, and simple algorithms and protocols.

Course Outcomes: Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's
1	Understand the differences between classical and quantum computation models.	1
2	Apply quantum gate operations and circuit models to simulate quantum systems.	1,5
3	Analyze the behavior of multi-qubit systems and quantum algorithm structures using IBM-Qiskit.	1,5,9
4	Evaluate quantum key distribution protocols and interpret entangled states.	1

MODULE-1	8 Hrs.

Foundations of Quantum Theory

Pre-requisites: Complex Numbers, Linear Algebra, Probability, Classical Bits

Quantum computing v/s classical computing. Concept of a qubit: representation on Bloch sphere, computational basis states $|0\rangle$ and $|1\rangle$, and superposition principle. Quantum postulates: state vectors, observables, unitary evolution, and measurement. Concept of quantum measurement and collapse of state. Differences between

probabilistic classical bit and quantum state. Linear algebra tools used in quantum computing: vector spaces, inner and outer products, orthonormality. Introduction to Dirac notation. Introduction to quantum states of multi-qubit systems using tensor products. Applications (Qualitative discussion): Role of qubits in other applications - quantum sensors, quantum-enhanced memory, and quantum biology.

Self-learning topics: Bra-ket notation and inner product interpretations.

Numerical problems on: *Representing a qubit on Bloch sphere Calculating measurement probabilities*

Using vector algebra to define multi-qubit states

MODULE-2	**8 Hrs.**

Quantum Gates and Circuits

Pre-requisites: Matrix operations, Boolean logic gates

Basic quantum gates and their matrix representations: Pauli-X, Y, Z; Hadamard (H); Phase (S, T) gates. Identity and Unitary property of gates. Two-qubit gates: CNOT, SWAP, and their circuit symbols. Construction of quantum circuits using gate sequences. Evolution of quantum states through unitary transformations. Quantum entanglement: definition, Bell states, and importance in quantum information. Basics ofquantum teleportation and superdense coding (qualitative). Quantum parallelism and quantum interference. Experiments who proved quantum principles are correct; Davisson and Germer (1927), Bell Inequality Violations experiments (Nobel prize 2022 winning experiments by Anton Zeilinger, Alain Aspect, and John F. Clauser)

Applications (Qualitative discussion): Quantum processors, superconducting qubits, trapped ions, photonic systems, IBM-Q and Rigetti simulators.

Self-learning topics: Representation of gates in matrix and circuit form, multi-qubit state transformations.

Numerical problems on: *Applying gate matrices to qubit states, Constructing Bell states using gates, Evolution of entangled states*

MODULE-3	**8 Hrs.**

Elements of Quantum algorithm

Pre-requisites: Basics of quantum gates and circuits

Introduction to the Deutsch–Jozsa Algorithm: constant vs balanced functions. Bernstein–Vazirani Algorithm: finding hidden strings. Simon's algorithm and periodicity. Grover's search algorithm: unstructured database search (qualitative explanation). Basics of Quantum Fourier Transform (QFT) and its importance in period finding (no derivation). Shor's Algorithm: factorization function. Simulation of simple algorithms using quantum circuits. Introduction to quantum speedup and complexity classes.

Applications (Qualitative discussion): Search problems, cryptanalysis, AI, and optimization using quantum algorithms. Mention Quantum Safety and post quantum cryptography.

Self-learning topics: Quantum circuit construction using Qiskit, difference between classical and quantum search techniques.

Numerical problems on: *Deutsch algorithm execution, QFT output state calculation for given 2-qubit input, Periodicity detection through simplified circuits*

MODULE-4	**8 Hrs**

Quantum Communication and Cryptography

Pre-requisites: Basics of classical communication and logic operations

Quantum entanglement and EPR paradox (conceptual). Quantum Teleportation Protocol (1993, Bennett et al.), BB84 Protocol (1984, Charles Bennett and Gilles Brassard), E91 Protocol (1991, Artur Ekert), Superdense Coding (1992, Bennett and Wiesner) for Quantum Key Distribution (QKD): state preparation, transmission, measurement, and key sifting and Quantum Secret Sharing (QSS) (1999, Hillery, Bužek, Berthiaume). Role of measurement bases and error checking. Quantum vs classical communication channels. Quantum cryptographic security and its resistance to classical attacks. Role of QKD in secure communication for critical infrastructure. Optical fibre and free space (Satellite) communication. Quantum repeaters and Quantum internet (qualitative). Applications (Qualitative discussion): Banking, defence communication, secure cloud services, quantum internet prototypes.

Self-learning topics: Classical symmetric/asymmetric cryptography, RSA overview.

Numerical problems *on: Simulating BB84 key exchange, Entanglement correlations, Calculation of quantum bit error rate (QBER)*

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Quantum Computation and Quantum Information	Michael A. Nielsen & Isaac L. Chuang	10th Anniverdsary Edition	Cambridge University Press	2012
2	Quantum Computing: A Gentle Introduction	Eleanor G. Rieffel, Wolfgang H. Polak	1st Edition	MIT Press	2011
3	Quantum Mechanics for Engineers	S. Das, A. Chakrabarti	1st Edition	Springer	2012

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Quantum Computing for Computer Scientists	Noson S. Yanofsky, Mirco A. Mannucci	1st Edition	Cambridge University Press	2008
2	Quantum Mechanics: The Theoretical Minimum	Leonard Susskind, Art Friedman	1st Edition	Basic Books	2014
3	An Introduction to Quantum Computing	Phillip Kaye, Raymond Laflamme, Michele Mosca	1st Edition	Oxford University Press	2007

E Books and online course materials:

https://s3.amazonaws.com/arena-attachments/1000401/c8d3f8742d163b7ffd6ae3e4e4e07bf3.pdf

Online Courses and Video Lectures:

https://onlinecourses.nptel.ac.in/noc21_cs103/preview

https://youtu.be/R0SOqLwLOR0?si=8DRsS2nUM1NJbZtf

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted Activity-execution and report-10 marks Presentation, Viva-Voce – 10 marks	20
Total		**50**

Course Articulation Matrix

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**
CO1	3										
CO2	3				1						
CO3	3				1				1		
CO4	3										

Teaching -Learning– Evaluation Scheme:

Sl.No	TeachingandLearningMethod	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	ClassRoomTeaching&Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
3	Activity Based Learning(ABL1&ABL2)	-	-	14
4	Evaluation of Learning Process	-	-	10
Total Learning Hours/Semester				**90**

Proposed Assessment Plan(for50marksofCIE):

Tool	Remarks	Marks
CIE	ThreeCIEsconductedfor20 marks each and reduced to 10 marks	30
Activity Details	Detailsof activities to be conducted Detailsofactivity1 Detailsofactivity2	20
Total		**50**

Activity Based Learning(27Hours)

ABL1(6Hours) :Activity1details	
	1) Group activity-execution and report- 10 marks

ABL2(7Hours):Activity2 details	
	Presentation , Viva-Voce – 10 marks

EvaluationofLearningProcess(7Hours)

Type of Evaluation	**Hours**
Test CIE 1, CIE2and CIE3	3
Quiz(1and2)(optional)	1
Semester End Exam	3
Total	**7**

1) **SampleActivity BasedLearning(ABL)Details**

Sl. No	Teaching and Learning Methods	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	ClassRoomTeaching&Learning	3	14	42
2	IntegratedLabComponent	-	-	-
3	StudentStudyHours–SelfLearning	1	14	14
4	EvaluationofLearningProcess	-	-	07
5	ActivityBasedLearning(ABL)	-	-	18+9=27

ABL1:CasestudywithSRSdocumentpreparation:

Prepare the document/softwareproject report software engineering methodology for the following scenarios or the applications.

1. ProblemAnalysisandProjectPlanning –Thoroughstudyoftheproblem– Identify Project scope, Objectives and Infrastructure.
2. SoftwareRequirementAnalysis–Describe the individual Phases/modules of the project and Identify deliverables.
3. Identificationofthefunctionalandnon-functionalrequirementsfromthe detailed problem statement.
4. SoftwareModelling:AnalysisandDesigning –DevelopthefollowingUML diagram for the SRS document prepared for the applications.

Usecasediagrams

ActivityDiagrams

DFD-0diagrams

DFD-1diagrams

Sequencediagrams

5. Thereportincludingthedetailedproblemstatement,SRSreport,and requirements analysis and modeling report needs to be submitted for evaluation. VariousrealtimeApplicationcanbeallottedtoateamof twomembers. **EvaluationofABL1(18Hours)** 1. IdentifyingareasforwhichyouwanttopreparetheSRSdocumentby literature review - 3 Hours. 2. Meetinganddiscussing(onlineoroffline)withthefacultyandfixingthe problem statement - 2 Hours. DesignandcreationofvariousUML diagrams-12Hours Presentationandsubmittingthefinalreport-1 Hours. **ABL2: Writing AssignmentwithProblemsonSoftwareengineeringandcost estimation concepts. (9 Hours)** Submissionofthefinalassignmentreportandevaluation.(Questionsof BloomslevelL3andHigher)	
TotalLearningHours/Semester	**90**

2) Sample Activity Based Learning(ABL)Details

Sl. No	TeachingandLearningMethod	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	ClassRoomTeaching&Learning	3	14	42
2	StudentStudyHours–SelfLearning	1	14	14
3	EvaluationofLearningProcess	-	-	07
4	ActivityBasedLearning(ABL)	-	-	14+13=27
ABL1:SimulationbasedAssignment(14Hrs)				
SimulationbasedAssignment		Toolselection		1
		Designof solution		4
		Implementingthesolution		4
		Testingtheresult		2
		Reportwriting		2
		Demonstration		1
ABL2:ProblemSolving Assignment(13 Hrs)				
ProblemSolvingAssignment		Understandtheinputdata requirements		1
		Formulatethe methodology		4
		Designthesolution		4
		Solvingtheproblemand submission		4
Total Learning Hours/Semester				**90**

3) SampleActivityBasedLearning(ABL)Details

Sl. No	TeachingandLearningMethod	No. of Hours/W eek	No.ofWeeks	Hours/ Semester
1	ClassRoomTeaching&Learning	3	14	42
2	StudentStudyHours–SelfLearning	-	-	-
3	EvaluationofLearningProcess	-	-	07
4	ActivityBasedLearning(ABL)	-	-	26+15=41
ABL1:Labbasedlearning(26 Hrs)				
ImplementationonMATLAB		1.Verificationwhethera given polynomial is primitive or not		2
		2.GeneratingGallois Field		2
		3.GeneratingLinearblock codes		2
		4.Decodingoflinear block codes		2
		5.Determiningthe syndrome		2
		6.Computingtheminimum distance of a linear block code		2
		7. Generation of a parity checkmatrixandgenerator matrixfor		4
		8.Hammingcodes		4
		9.Determiningthe		4

	generatorpolynomialsof (n,k) code.generator polynomialsof(n,k)code.	
	10.Generationofcyclic codes	2
ABL2: Seminar(15 Hrs)		
Subjectseminaron latest trends	Literaturereview	7
	Preparationofareport	4
	Preparationofslidesand presentation	4
TotalLearningHours/Semester		**90**

4) SampleActivityBasedLearning(ABL)Details

Sl. No	TeachingandLearningMethod	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	ClassRoomTeaching&Learning	3	14	42
2	IntegratedLabcomponent	2	14	28
2	StudentStudyHours–SelfLearning	1	14	14
3	EvaluationofLearningProcess	-	-	07
4	ActivityBasedLearning(ABL)	-	-	20+9=29
ABL1:ImplementingReal timeProjectsusingAIandML (20Hrs)				
1.Identifyingareasinwhichstudentswanttocarry outtheprojectbyliterature survey				3
2.Meetinganddiscussing(onlineoroffline)withthefacultyandfixingthe				2

Problemstatement		
3.Designingandimplementingthe project		14
4.Presentationandsubmittingthefinalreport		1
ABL2:SolvingAssignmentProblemsbasedondifferentMLalgorithms(9Hours)		
Submissionofthefinalassignmentreport.		9
TotalLearningHours/Semester		**120**

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

Hassan – 573202, Karnataka, India

Autonomous Programmes

BACHELOR OF ENGINEERING

DEPARTMENT OF CHEMISTRY

SYLLABUS
I AND II SEMESTERS
FIRST YEAR

Academic year 2025-26

Course Title	CHEMISTRY FOR CIVIL ENGINEERING STREAM		
Course Code	CHE5C12/22	**(L-T-P)C**	(3-1-0)3
SEE duration	3 hour	**Hours / Week**	04
SEE marks	100	**Total contact hours**	90

Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.

Course Outcomes:

After the completion of the course, students shall be able to:-

Sl. No.	Course outcomes	Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.	PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.	PO1, PO2
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2

Course Contents:

MODULE –1	10 Hrs.

Water and its Treatment

Introduction, sources of water, impurities in water, standards of water for industrial supply. Hardness of water, types of hardness determination of total hardness by EDTA method.

Boiler feed water and boiler problems, Boiler scales and sludge's- meaning, formation, disadvantages and prevention, priming and foaming.

External treatment of boiler feed water- Hot Lime -Soda process and Ion exchange method.

Internal treatment of water- phosphate conditioning &calgon treatment.

Desalination- Meaning,purification of water by reverse osmosis.

Potable water- Meaning, Standards of potable water, treatment of water for town supply**.** BOD and COD- definition, experimental determination of COD of the industrial waste water sample.

MODULE –2	10 Hrs.

Chemical Energy Sources and Engineering Materials

Fuels- Definition with examples. Characteristics of an ideal fuel. Calorific value- definition, types - Gross and Net calorific values, units in S.I system. Experimental determination of calorific value of a solid fuel using Bomb Calorimeter. Numerical problems on GCV and NCV.

Chemical processing of Petroleum: Cracking- Definition. Types of cracking- thermal and catalytic cracking. Fluidized catalytic cracking. Reforming of petrol with reactions (Isomerization, cyclisation, aromatization and dehydrogenation). Octane number &Cetane number. Knocking in IC engine. **Prevention of knocking** - Anti knocking agents (TEL & MTBE).

Green fuels:Power alcohol- introduction, advantages and disadvantages.B**iodiesel**- introduction, synthesis, advantages, and disadvantages.

Cement: Introduction, composition, properties, classification, manufacturing process of cement, process of setting and hardening of cement, additives for cement and testing of cement.

MODULE –3	10 Hrs.

Electrochemistry and Battery Technology

Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst's equation.

Concentration cell- Definition with example, derivation of EMF of concentration cells.

Electrodes - Types of electrodes-Metal-metal ion electrode, Metal- metal salt ion electrode, gas-electrode and ion selective electrode.

Secondary reference electrodes – Calomel electrode-construction, working and applications.

Ion selective electrode- construction and working of glass electrode. Determination of pH of a solution using glass electrode. Numerical problems on E, E^0, E_{cell}, E^0_{cell} and concentration cells.

Potentiometric estimation of FAS using $K_2Cr_2O_7$ solution.

Battery technology

Batteries- Definition, classification of batteries- primary & secondary batteries.

Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.

MODULE – 4	10 hrs.

Macromolecules for Engineering Applications

Introduction, definition with examples. **Glass transition temperature (Tg)** - definition, factors affecting Tg and significances of Tg.

Plastics – Compounding of resins in to plastics.

Synthesis, properties and Industrialapplications of PMMA and Polyurethane.

Polymer composites- introduction, **fibers**- meaning, synthesis, properties and industrial applications of Kevlar and Polyester.

Adhesives –Meaning, preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Bio-degradable polymers- Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration (water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering Chemistry	M.M. Uppal	11th Edition	Khanna Publishers	2011
2	A text Book of Engineering Chemistry	P C Jain and Monica Jain	16th Edition	Dhanapatrai Publications	2015
3	A Text Book of Engineering Chemistry	R.V. Gadag and Nitthyananda Shetty	2nd Edition	I.K. International Publishing house	2016
4	Chemistry for Engineering Students	S. Jai Prakash, R. Venugopal, Sivakumaraiah& Pushpa Iyengar	5th Edition	Subash Publications	2014

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Industrial Chemistry	B.K.Sharma	34th Edition	GOEL Publishing House	2014
2	Industrial Electrochemistry	Derek Pletcher & Frank C	2nd Edition	Walsh publisher	1993
3	Corrosion Engineering	M.G. Fontana, N.D. Greene	3rd Edition	McGraw Hill Publications	1996
4	Instrumental Methods of Analysis	Dr. K. R. Mahadik and Dr. L. Sathiyanarayanan	1st Edition	Nirali Prakashan	2003
5	Text Book of Polymer Science	F.W. Billmeyer, John Wiley & Sons	4th Edition	John Wiley & Sons	1999
6	Vogels text book of quantitative inorganic analysis	J. Bassett, R.C. Denny, G.H. Jeffery	4th Edition	ELBS/Longman	1980

E Books and online course materials:

1. https://nptel.ac.in/courses/105105110 *(Water and Waste Water Engineering - NPTEL)*
2. https://onlinecourses.nptel.ac.in/noc23_ce42/preview *(Water Chemistry - NPTEL)*
3. https://www.kopykitab.com/Engineering-Chemistry *(Kopykitab - Various authors, eBook access)*
4. https://ndl.iitkgp.ac.in/result?q=engineering%20chemistry *(National Digital Library of India - Free access to Engineering Chemistry books)*
5. https://www.pdfdrive.com/engineering-chemistry-books.html *(PDFDrive - Free Engineering Chemistry PDFs)*

Online Courses and Video Lectures:

1. https://www.edx.org/course/chemistry *(Introductory Chemistry - edX platform)*
2. https://www.youtube.com/playlist?list=PLLy_2iUCG87CQhELCytYLzKfBkzU8ovN9

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	ThreeCIEsconductedfor20markseach and reduced to 10 marks	30
Activity Details	Activities to be conducted.	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes[POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**	**2**												
CO2	**3**	**2**												
CO3	**3**	**2**												
CO4	**2**	**3**												

Course Title	CHEMISTRY LAB FOR CIVIL ENGINEERING STREAM		
Course Code	CHE5CL17	**(L-T-P) C**	(0-0-2)1
Exam	3 hr	**Hours/Week**	02
SEE	50	**Total Hours**	**24**

Course Objective:

To provide students with practical knowledge of quantitative analysis of materials by volumetric and instrumental methods for the determination of constituents present in a sample.

Course Outcomes: Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Conducting theexperiments with suitable volumetric and instrumental procedures.	PO1	-
2	Analysis and estimation of materials using volumetric and instrumental methods.	PO2	-

SL. NO	Experiments
1	Estimation of total hardness of water by EDTA method.
2	Estimation of CaO in Portland cement.
3	Estimation of iron in TMT bar by biphenyl amine/external indicator method.
4	Estimation of Copper present in electroplating effluent by optical sensor.
5	Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.
6	Determination of p^{Ka} of vinegar using p^{H} sensor.
7	Potentiometric estimation of FAS using $K_2Cr_2O_7$
8	Estimation of Copper present in electroplating effluent by optical sensor
9	Conductometric estimation of acid mixture
10	Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
	Demonstration (any two) offline/virtual:
11	Synthesis of polymer
12	Synthesis of iron oxide nanoparticles

13	Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch
14	Determination of chloride content in the given water sample by Argentometric method
	Open Ended Experiments:
15	Evaluation of acid content in beverages by using p^H sensors and simulation
16	Searching suitable PDB file and target for molecular docking

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Vogel's Textbook of Quantitative Inorganic Analysis	J. Bassett, R.C. Denny, G.H. Jeffery (Revised)	4th Edition	ELBS / Longman Group	1985
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https://youtu.be/gDsGHYUHeBE?si=JcAAlt_Am4-LVIIQ

https://youtu.be/gDsGHYUHeBE?si=wxl7CP-q-28kzuyk

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Assessment	Conduction of experiments(continuous evaluation) -20 marks Reports -10 marks	30
Test (CIE)	Lab CIE	20
Total		**50**

Course Articulation Matrix

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

Course Title	CHEMISTRY FOR COMPUTER SCIENCE AND ENGINEERING STREAM		
Course Code	CHE5S12/22	**(L-T-P)C**	(3-1-0)3
SEE duration	3 hour	**Hours / Week**	04
SEE marks	100	**Total contact hours**	90

Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.

Course Outcomes:

After the completion of the course, students shall be able to:-

Sl. No.	Course outcomes	Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.	PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.	PO1, PO2
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2

Course Contents:

MODULE –1	10 Hrs.

Macromolecules for Engineering Applications

Introduction, definition with examples. **Glass transition temperature (Tg)** - definition, factors affecting Tg and significances of Tg.

Plastics – Compounding of resins into plastics. Synthesis, properties and industrial applications of PMMA, Polyurethane & PTFE.

Polymer composites - introduction. **Fibers**- meaning, synthesis, properties and industrial applications of Kevlar and Polyester.

Adhesives –Meaning, preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Bio-degradable polymers- Introduction, types ofbio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).

Elastomers- Definition, types-natural and synthetic rubber. Preparation of natural rubber from latex, deficiencies of natural rubber, vulcanization of natural rubber.

Synthetic rubbers- Preparation, properties and industrial applications of SBR rubber, Thiokol, and Silicon rubber**.**

MODULE –2	**10 Hrs.**

Electrochemistry and Sensors

Electrochemistry

Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst's equation.

Concentration cell- Definition with example, derivation of E.M.F of concentration cells.

Electrodes -Types of electrodes-Metal-metal ion electrode, Metal- metal salt ion electrode, gas electrode and ion selective electrode.

Secondary reference electrodes – Calomel electrode- construction, working and applications.

Ion selective electrode- construction and working of the glass electrode. Determination of p^H of a solution using glass electrode. Numerical problems on E, E^0, E_{cell}, E^0_{cell} and concentration cells. Potentiometric estimation of FAS using $K_2Cr_2O_7$ solution.

Sensors: Introduction, working principle and applications of electrochemical sensors - Potentiometric sensors, Amperometric sensors, and Conductometric sensors. Optical sensors.

MODULE –3	**10 Hrs.**

Energy, Storage and Conversion

Batteries- Definition, difference between battery and cell. Classification of batteries- primary & secondary batteries. Battery characteristics.

Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.

Modern batteries: Construction, working and industrial applications of Li-ion battery.

Fuel Cells- Introduction, definition, construction, working and industrial applications of H_2-O_2 fuel cell & methanol-oxygen fuel cell. Differences between battery and fuel cell.

Green fuels:Power alcohol-introduction, advantages and disadvantages.

Biodiesel- Introduction, synthesis, advantages, and disadvantages.

E-waste management: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling, extraction of copper and gold from e-waste.

MODULE – 4	**10 hrs.**

Surface Finishing (PCB preparation)

Introduction, technological importance of metal finishing. Factors affecting the nature of electro deposit - metal ion concentration, current density, complexing agents, organic additives, p^H, temperature & throwing power.

Electroplating – Definition, electroplating process. Methods of cleaning the metal surfaces to be coated. Electroplating of Copper by cyanide bath method and electroplating of gold.

Electroless plating - Definition, distinction between electroplating and electroless plating, advantages of electroless plating. Electroless plating of Nickel and electroless plating of Copper in the manufacture of double-sided PCB.

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration (water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
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2	A text Book of Engineering Chemistry	P C Jain and Monica Jain	16th Edition	Dhanapatrai Publications	2015
3	A Text Book of Engineering Chemistry	R.V. Gadag and Nitthyananda Shetty	2nd Edition	I.K. International Publishing house	2016
4	Chemistry for Engineering Students	S. Jai Prakash, R. Venugopal, Sivakumaraiah& Pushpa Iyengar	5th Edition	Subash Publications	2014

Reference Books:

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3	Corrosion Engineering	M.G. Fontana, N.D. Greene	3rd Edition	McGraw Hill Publications	1996
4	Instrumental Methods of Analysis	Dr. K. R. Mahadik and Dr. L. Sathiyanarayanan	1st Edition	Nirali Prakashan	2003
5	Text Book of Polymer Science	F.W. Billmeyer, John Wiley & Sons	4th Edition	John Wiley & Sons	1999
6	Vogels text book of quantitative inorganic analysis	J. Bassett, R.C. Denny, G.H. Jeffery	4th Edition	ELBS/Longman	1980

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1. https://www.kopykitab.com/Engineering-Chemistry *(Kopykitab - Various authors, eBook access)*
2. https://ndl.iitkgp.ac.in/result?q=engineering%20chemistry *(National Digital Library of India - Free access to Engineering Chemistry books)*
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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Activities to be conducted.	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes[POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**	**2**												
CO2	**3**	**2**												
CO3	**3**	**2**												
CO4	**2**	**3**												

Course Title	CHEMISTRY LAB FOR COMPUTER SCIENCE ENGINEERING STREAM		
Course Code	CHE5SL17	**(L-T-P) C**	(0-0-2)1
Exam	3 hr	**Hours/Week**	02
SEE	50	**Total Hours**	**24**

Course Objective:

To provide students with practical knowledge of quantitative analysis of materials by volumetric and instrumental methods for the determination of constituents present in a sample.

Course Outcomes: Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Conducting the experiments with suitable volumetric and instrumental procedures.	PO1	-
2	Analysis and Estimation of materials using volumetric and instrumental methods.	PO2	-

SL. NO	Experiments
1	Estimation of total hardness of water by EDTA method.
2	Estimation of CaO in Portland cement.
3	Estimation of iron in TMT bar by biphenyl amine/external indicator method.
4	Estimation of Copper present in electroplating effluent by optical sensor.
5	Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.
6	Determination of p^{Ka} of vinegar using p^{H} sensor.
7	Potentiometric estimation of FAS using $K_2Cr_2O_7$
8	Estimation of Copper present in electroplating effluent by optical sensor
9	Conductometric estimation of acid mixture
10	Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
	Demonstration (any two) offline/virtual:
11	Synthesis of polymer

12	Synthesis of iron oxide nanoparticles
13	Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch
14	Determination of chloride content in the given water sample by Argentometric method
	Open Ended Experiments:
15	Evaluation of acid content in beverages by using p^H sensors and simulation
16	Searching suitable PDB file and target for molecular docking

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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Assessment	Conduction of experiments(continuous evaluation) -20 marks Reports -10 marks	30
Test (CIE)	Lab CIE	20
Total		**50**

Course Articulation Matrix

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

Course Title	CHEMISTRY FOR ELECTRICAL AND ELECTRONICS ENGINEERING STREAM		
Course Code	CHE5E12/22	**(L-T-P)C**	(3-1-0)4
SEE duration	3 hour	**Hours / Week**	06
SEE marks	100	**Total contact hours**	90

Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.

Course Outcomes:

After the completion of the course, students shall be able to:-

Sl. No.	Course outcomes	Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.	PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.	PO1, PO2
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2

Course Contents:

MODULE –1	10 Hrs.

Electrochemistry and Analytical Techniques

Electrochemistry- Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation of Nernst'sequation.

Concentration cell- Definition with example, derivation of EMF of concentration cells.

Electrodes - Types of electrodes-Metal-metal ion electrode, Metal-metal salt ion electrode, gas- electrode and ion selective electrode.

Secondary reference electrode – Calomel electrode - construction, working and applications.

Ion selective electrode- construction and working of the glass electrode. Determination of p^H of a solution using glass electrode. Numerical problems on E, E^0, E_{cell}, E^0_{cell} and concentration cells.

Analytical techniques: Introduction, principle and instrumentation: Colorimetric sensors – estimation of copper, Potentiometric sensors – estimation of iron and Conductometric sensors – estimation of weak acid.

MODULE –2	10 Hrs.

Energy, Storage and Conversion

Batteries- Definition, difference between battery and cell. Classification of batteries – primary & secondary batteries. Battery characteristics.

Secondary batteries - construction, working and industrial applications of Lead- acid battery and Nickel-metal hydride battery.

Modern batteries: Construction, working and industrial applications of Li-ion battery.

Fuel Cells- Introduction, definition, construction, working and industrial applications of H_2-O_2 fuel cell & methanol-oxygen fuel cell. Differences between battery and fuel cells.

Green fuels:Power alcohol-Introduction, advantages and disadvantages. **Biodiesel**- Introduction, synthesis, advantages, and disadvantages.

E-waste management: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling, extraction of copper and gold from e-waste.

MODULE –3	10 Hrs.

Macromolecules for Engineering Applications

Introduction, definition with examples. **Glass transition temperature (Tg)** - definition, factors affecting Tg and significances of Tg.

Plastics – Compounding of resins into plastics. Synthesis, properties and industrial applications of PMMA, Polyurethane & PTFE.

Polymer composites- introduction**, Fibers**- meaning, synthesis, properties and industrial applications of Kevlar and Polyester.

Adhesives –Meaning, Preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Bio-degradable polymers- Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).

Elastomers- Definition, types-natural and synthetic rubber. Preparation of natural rubber from latex, deficiencies of natural rubber, vulcanization of natural rubber.

Synthetic rubbers- Preparation, properties and industrial applications of SBR rubber, Thiokol,and Silicon rubber**.**

MODULE – 4	10 hrs.

Surface Finishing

Introduction, technological importance of metal finishing. Factors affecting the nature of electro deposit - metal ion concentration, current density, complexing agents, organic additives, p^H, temperature & throwing power.

Electroplating – Definition, electroplating process. Methods of cleaning the metal surfaces to be coated. Electroplating of Copper by cyanide bath method and electroplating of Gold.

Electroless plating - Definition, distinction between electroplating and electroless plating. Advantages of electroless plating. Electroless plating of Nickel.

Corrosion chemistry

Introduction, electrochemical theory of corrosion, types-differential metal, differential aeration (water line and pitting), factors affecting the nature of corrosion.

Corrosion control-galvanization, anodization and sacrificial anode method.

Prescribed Text Books:

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5	Text Book of Polymer Science	F.W. Billmeyer, John Wiley & Sons	4th Edition	John Wiley & Sons	1999
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Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Activities to be conducted.	20
Total		**50**

Course Articulation Matrix

Course Outcomes	**Program Outcomes[POs]**													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**	**2**												
CO2	**3**	**2**												
CO3	**3**	**2**												
CO4	**2**	**3**												

Course Title	CHEMISTRY LAB FOR ELECTRICAL AND ELECTRONICS ENGINEERING STREAM		
Course Code	CHE5EL17	**(L-T-P) C**	(0-0-2)1
Exam	3 hr	**Hours/Week**	02
SEE	50	**Total Hours**	**24**

Course Objective:

To provide students with practical knowledge of quantitative analysis of materials by volumetric and instrumental methods for the determination of constituents present in a sample.

Course Outcomes: Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Conducting the experiments with suitable volumetric and instrumental procedures.	PO1	-
2	Analysis and Estimation of materials using volumetric and instrumental methods.	PO2	-

SL. NO	Experiments
1	Estimation of total hardness of water by EDTA method.
2	Estimation of CaO in Portland cement.
3	Estimation of iron in TMT bar by biphenyl amine/external indicator method.
4	Estimation of Copper present in electroplating effluent by optical sensor.
5	Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.
6	Determination of p^{Ka} of vinegar using p^{H} sensor.
7	Potentiometric estimation of FAS using $K_2Cr_2O_7$
8	Estimation of Copper present in electroplating effluent by optical sensor
9	Conductometric estimation of acid mixture
10	Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
	Demonstration (any two) offline/virtual:
11	Synthesis of polymer

12	Synthesis of iron oxide nanoparticles
13	Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch
14	Determination of chloride content in the given water sample by Argentometric method
	Open Ended Experiments:
15	Evaluation of acid content in beverages by using p^H sensors and simulation
16	Searching suitable PDB file and target for molecular docking

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https://youtu.be/gDsGHYUHeBE?si=wxl7CP-q-28kzuyk

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Assessment	Conduction of experiments(continuous evaluation) -20 marks Reports -10 marks	30
Test (CIE)	Lab CIE	20
Total		**50**

Course Articulation Matrix

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

Course Title	CHEMISTRY FOR MECHANICAL ENGINEERING STREAM		
Course Code	CHE5M12/22	**(L-T-P)C**	(3-1-0)4
SEE duration	3 hour	**Hours / Week**	04
SEE marks	100	**Total contact hours**	90

Course Objective: The objective of this course is to build a strong foundation and basic skills in Engineering Chemistry for technological competence in industries.

Course Outcomes:

After the completion of the course, students shall be able to:-

Sl. No.	Course outcomes	Mapping to POs
1.	Describe the terms and chemical process involved in the scientific and engineering application.	PO1, PO2
2.	Illustrate the construction and working of the engineering process using basic concepts of chemistry.	PO1, PO2
3.	Outline the preparation, properties & applications associated with chemical substances in multidisciplinary fields.	PO1, PO2
4.	Apply the various principles and analytical techniques to solve the problems and quantitative analysis of materials in engineering applications.	PO1, PO2

Course Contents:

MODULE –1	10 Hrs.

Chemical Energy Sources and Engineering materials

Fuels- Definition with examples. Characteristics of an ideal fuel. Calorific value- definition, types - Gross and Net calorific values, units in S.I system. Experimental determination of calorific value of a solid fuel using Bomb Calorimeter. Numerical problems on GCV and NCV.

Chemical processing of Petroleum: Cracking- Definition. Types of cracking- thermal and catalytic cracking. Fluidized catalytic cracking. Reforming of petrol with reactions (Isomerisation, cyclisation, aromatisation and dehydrogenation). Octane number & Cetane number. Knocking in IC engine. **Prevention of knocking** - anti knocking agents (TEL & MTBE).

Green fuels: Power alcohol- introduction, advantages and disadvantages. **Biodiesel**- introduction, synthesis, advantages and disadvantages.

Alloys: Introduction, classification, composition, properties and applications of Stainless Steel, Solders, Brass and Alnico.

MODULE –2	**10 Hrs.**

Water and its Treatment

Introduction, sources of water, impurities in water, standards of water for industrial supply. Hardness of water, types of hardness determination of total hardness by EDTA method.

Boiler feed water and boiler problems, Boiler scales and sludges- meaning, formation, disadvantages and prevention, priming and foaming.

External treatment of boiler feed water- Hot Lime -Soda process and Ion exchange method.

Internal treatment of water- phosphate conditioning & Calgon treatment.

Desalination- Meaning, purification of water by reverse osmosis.

Potable water- Meaning, Standards of potable water, treatment of water for town supply**.**

BOD and COD- definition, experimental determination of COD of the industrial waste water sample.

MODULE –3	**10 Hrs.**

Electrochemistry and Battery Technology

Introduction, electrochemical cells – Definition, Types of electrochemical cells, Construction, working & representation of galvanic cell. Modern sign conventions, single electrode potential, standard electrode potential. E.M.F of a cell, standard E.M.F of a cell, derivation ofNernst equation.

Concentration cell- Definition with example, derivation of EMF of concentration cells.

Electrodes - Types of electrodes-Metal-metal ion electrode, Metal- metal salt ion electrode, gas-electrode and ion selective electrode.

Secondary reference electrodes – calomel electrode-construction, working and applications.

Ion-selective electrode- construction and working of glass electrode. Determination of pH of a solution using glass electrode. Numerical problems on E, E^0, E_{cell}, E^0_{cell} and concentration cells.

Potentiometric estimation of FAS using $K_2Cr_2O_7$ solution.

Battery technology

Batteries- Definition, Classification of batteries- primary & secondary batteries.

Secondary batteries - construction, working and industrial applications of Lead- acidbattery and Nickel -metal hydride battery.

Modern battery- construction, working and industrial applications of Li-ion batteries.

Fuel Cells- Introduction, definition, construction, working and industrial applications of H_2-O_2 fuel cell & Methanol-O_2 fuel cell.

MODULE –4	**10 Hrs**

Macromolecules for Engineering applications

Introduction, definition with examples. **Glass transition temperature (Tg)** - definition, factors affecting Tg and significances of Tg.

Plastics – Compounding of resins in to plastics.

Synthesis, properties and Industrial applications of PMMA and Polyurethane.

Polymer composites- introduction, **fibers**- meaning, synthesis, properties and industrial applications of Kevlar and polyester.

Adhesives –Meaning, Preparation, properties and applications of Epoxy resins & Phenol-formaldehyde resins.

Bio-degradable polymers- Introduction, types of bio-degradable polymers, preparation, properties and applications of polylactic acid (PLA).

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Tool	**Remarks**	**Marks**
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Course Outcomes	**Program Outcomes[POs]**													
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CO1	**3**	**2**												
CO2	**3**	**2**												
CO3	**3**	**2**												
CO4	**2**	**3**												

Course Title	CHEMISTRY LAB FOR MECHANICAL ENGINEERING STREAM		
Course Code	CHE5ML17	**(L-T-P) C**	(0-0-2)1
Exam	3 hr	**Hours/Week**	02
SEE	50	**Total Hours**	**24**

Course Objective:

To provide students with practical knowledge of quantitative analysis of materials by volumetric and instrumental methods for the determination of constituents present in a sample.

Course Outcomes: Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Conducting the experiments with suitable volumetric and instrumental procedures.	PO1	-
2	Analysis and Estimation of materials using volumetric and instrumental methods.	PO2	-

SL. NO	Experiments
1	Estimation of total hardness of water by EDTA method.
2	Estimation of CaO in Portland cement.
3	Estimation of iron in TMT bar by biphenyl amine/external indicator method.
4	Estimation of Copper present in electroplating effluent by optical sensor.
5	Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.
6	Determination of p^{Ka} of vinegar using p^{H} sensor.
7	Potentiometric estimation of FAS using $K_2Cr_2O_7$
8	Estimation of Copper present in electroplating effluent by optical sensor
9	Conductometric estimation of acid mixture
10	Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
	Demonstration (any two) offline/virtual:
11	Synthesis of polymer
12	Synthesis of iron oxide nanoparticles

13	Chemical Structure drawing using software: ChemDraw or ACD/ChemSketch
14	Determination of chloride content in the given water sample by Argentometric method
	Open Ended Experiments:
15	Evaluation of acid content in beverages by using p^H sensors and simulation
16	Searching suitable PDB file and target for molecular docking

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Vogel's Textbook of Quantitative Inorganic Analysis	J. Bassett, R.C. Denny, G.H. Jeffery (Revised)	4th Edition	ELBS / Longman Group	1985
2	Applied Chemistry: Theory and Practice	O. P. Vermani, A. K. Narula	2nd Edition	New Age International	1992

Online Courses and Video Lectures:

https://nptel.ac.in/courses/104101090

https://youtu.be/gDsGHYUHeBE?si=JcAAlt_Am4-LVIIQ

https://youtu.be/gDsGHYUHeBE?si=wxl7CP-q-28kzuyk

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Assessment	Conduction of experiments(continuous evaluation) -20 marks Reports -10 marks	30
Test (CIE)	Lab CIE	20
Total		**50**

Course Articulation Matrix

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

Course Title	Mathematics-I for Computer Science Engineering stream		
Course Code	MAT5S11	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120

Course Objective: To help students understand and apply numerical methods, calculus, and Laplace transforms to solve engineering problems and real-life applications.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	POs	PSOs
CO1	Compute solutions for Algebraic and transcendental equations and Interpolationusing Numerical methods	PO1	-
CO2	Apply the knowledge of calculus to solve problems related to polar curves and also its applications in Engineering problems	PO1, PO2	-
CO3	Approximate functions of one or two variables to polynomials using concepts of Taylor and Maclaurin series, partial differentiation and Jacobians.	PO1, PO2	
CO4	Evaluate engineering problems using concept of Laplace transform.And to solve the problems in transforming the continuous signals.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with differential calculus, numerical methods, and linear algebra, execute the same and provide correct output.	PO1, PO2,PO5	-

MODULE - 1	10 Hrs.

Numerical Methods: Numerical Solution of algebraic & transcendental equations by Gradient descent method , Newton Raphson method. Finite differences- Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae.

Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule. Illustrative examples from engineering field.

Applications- Estimating vehicles passing through a Toll Booth, Energy consumption in a smart home , Estimating Rain water Collected.

Self Study: Bisection method, Inverse Lagrange's interpolation formula. Approximate solutions of ODE related to Computer Science Engineering.

MODULE - 2	10 Hrs.

Polar coordinates : Polar curves, angle between the radius vector and the tangent, angle between two curves, Pedal equations,Curvature and Radius of curvature-cartesian,polar and pedal form.

Applications: Angle Between Curves – Collision Detection in Computer Vision, Curvature – Path Smoothing in AI/ML,Curvature and Radius of Curvature -Pedal Applications in Robotics.

Self Study: Brief introduction to evolutes and involutes, Radius of curvature-Parametric form. Derivative of arc-length.

MODULE - 3	**10 Hrs.**

Introduction to series expansion: Definition of differentiability, Statement of Taylor's theorem, Taylor's series and Maclaurin's series expansion for function of one variable.

Partial differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation and Illustrative examples.. Evaluation of Jacobians. Extreme values for a functions of two variables.

Applications -Minimizing the Canvas Area for a Fixed Volume.

Self Study: Differentiation of composite function, Propertis of Jacobians, Lagrange's method of undermined multipliers.

MODULE - 4	**12 Hrs.**

Laplace Transforms: Introduction, Definition and standard functions (statement only), Properties of Laplace transform. Laplace transform of e^{at}f (t),$t^n f(t)$, $\frac{f(t)}{t}$.Laplace transform of derivatives and integrals, Laplace transform of periodic functions, unit-step functions.

Applications: Network packet transmission with delayed start, Dual-phase CPU cooling system with delayed control response.

Self-Study: Unit-impulse function, Transform of derivatives and Integrals.

Lab Components:

1. Basic Python.
2. Computation of roots using - bisection method, Newton Raphson method.
3. Lagrange's interpolation formula.
4. Numerical integration- line integral (Trapezoidal rule) .
5. Numerical integration- line integral (Simpson's 1/3rd rule , Simpson's 3/8th rule).
6. Finding angle between polar curves & computing the curvature of a given curve.
7. Finding angle between radius vector and the tangent.
8. Finding partial derivatives, Jacobians.
9. Expressing the function of one variable using Taylor's & Maclaurin's series.
10. Standard Laplace Transforms e^{at}f (t),$\frac{f(t)}{t}$.

NOTE

1.Proofs are not required for any theorems and properties.

2.There should not be any questions from self study part in semester End Examination.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
01	Higher Engineering Mathematics	Dr. B. S. Grewal	44th	Khanna	2016
02	Advanced Engineering Mathematics	Erwin Kreyszig	8th	Wiley India Pvt. Ltd	2004
03	Calculus	Thomas Finney	9th	Thomas Finney	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Numerical methods,	R. K. Jain and S. R. K. Jain & S. R. K. Iyengar,	6th edition	New age International p.v.t. Publishers,	2014
2.	A textbook of Engineering Mathematics	N.P. Bali and Manish Goyal	Reprint	Laxmi Publications	2010

EBooks and online course materials:

- http://nptel.ac.in/courses.phd?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicerath.org/

Online Courses and Video Lectures:

- **https://www.courseera.org/_____**
- **https://nptel.ac.in/courses/____**

Teaching - Learning - Evaluation Scheme :

Sl.No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**120**

ABL 1 : Lab based learning (14 Hrs)		
Designing and implementation of Pyhton programming	Manual solving	4
	Writing program	5
	Execution	3
	Required output	1
	conclusion	1
ABL 2 : Problem Solving Assignment (15 Hrs)		
Problem Solving Assignment	Problem selection	1
	Formulate the methodology	3
	Solving the problem	4
	Report writing and submission	3
	Preparation of slide and presentation	4

Proposed Assessment Plan(for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Lab based learning 2) Problem Solving Assignment	20
Total		**50**

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-			-								
CO2	3	2			-								
CO3	3	2			-								
CO4	3	2			-								
CO5	3	2			1								

Course Title	Mathematics-I for Electrical and Electronics Engineering stream		
Course Code	MAT5E11	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120

Course Objective: To train the students to acquire knowledge in calculus and numerical methods so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	POs	PSOs
CO1	Use numerical methods to solve algebraic and transcendental equations, apply interpolation and finite difference techniques, and compute line integrals using different integration rules. Real-life and engineering application problems.	PO1	-
CO2	Understand and apply concepts related to the polar curves, including angles, and radius of curvature using different coordinate systems. Real-life and engineering application problems.	PO1, PO2	-
CO3	Evaluate derivatives, series expansions of single variable, extreme values for functions of two variables and apply these concepts to solve relevant mathematical problems. Real-life and engineering application problems.	PO1	
CO4	Analyze and apply suitable methods to compute probability in statistics.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with calculus, numerical methods and statistics. execute the same and provide correct output.	PO1, PO2,PO5	-

MODULE - 1	10 Hrs.

Numerical Methods: Numerical Solution of algebraic & transcendental equations by Gradient descent method,Newton Raphson method, Finite differences- Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae.

Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's 1/3rd and 3/8th rule, Weddle's rule. Illustrative examples from engineering field.

Applications-Application of root finding- ion concentration.

Self Study: Bisection method,Inverse Lagrange's interpolation formula. Approximate solutions of ODE related to Electrical Engineering.

MODULE - 2	10 Hrs.

Polar coordinates: Polar curves, angle between the radius vector and the tangent, angle between two curves, Pedal equations,Curvature and Radius of curvature (Cartesian, polar and pedal form).

Applications : Extreme values of a single variable- to find the peak current in an circuit.

Self Study:Brief introduction to evolutes and involutes. Radius of curvature-Parametric form. Derivative of arc-length. Extreme values of a single variable.

MODULE - 3	10 Hrs.

Introduction to series expansion: Definition of differentiability, Statement of Taylor's theorem, Taylor's series and Maclaurin's series expansion for function of one variable.

Partial differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation and Illustrative examples. Differentiation of composite function. Evaluation of Jacobians. Extreme values for a functions of two variables.

Applications: Application of total derivative- controlling sag in an uniformly loaded beam.

Self Study: Differentiation of composite function , Properties of Jacobians,Lagrange's method of undermined multifliers.

MODULE - 4	10 Hrs.

Statistics: Curve fitting- Linear, Quadratic.

Probability Theory: Mean, Standard deviation of the experimental data, Introduction to Random variables, Discrete random variables, binomial distribution , Poisson distribution.

Application - Experimental data for applications of probability in Electrical & Electronics Engineering.

Self Study: Contionous random variable. Computation of pdf,cdf,Mean and Standard Deviation.

Lab Components:

1. Basic Python.
2. Computation of roots using - bisection method, Newton Raphson method.
3. Lagrange's interpolation formula.
4. Numerical integration- line integral (Trapezoidal rule) .
5. Numerical integration- line integral (Simpson's 1/3rd rule , Simpson's 3/8th rule).
6. Finding angle between polar curves & computing the curvature of a given curve.
7. Finding angle between radius vector and the tangent.
8. Finding partial derivatives, Jacobians.
9. Expressing the function of one variable using Taylor's & Maclaurin's series.
10. To fit a curve for the data Linear/ Quadratic.

NOTE

1.Proofs are not required for any theorems and properties.

2.There should not be any questions from self study part in semester End Examination.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
01	Higher Engineering Mathematics	Dr. B. S. Grewal	44th	Khanna	2016
02	Advanced Engineering Mathematics	Erwin Kreyszig	8th	Wiley India Pvt. Ltd	2004
03	Calculus	Thomas Finney	9th	Thomas Finney	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
11.	Numerical methods,	R. K. Jain and S. R. K. Jain & S. R. K. Iyengar,	6th edition,	New age International p.v.t. Publishers,	2014
12.	A textbook of Engineering Mathematics, ,	N.P. Bali and Manish Goyal	Reprint,	Laxmi Publications	2010

EBooks and online course materials:

- http://nptel.ac.in/courses.phd?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicerath.org/

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- **https://www.courseera.org/**
- **https://nptel.ac.in/courses/**

Teaching - Learning - Evaluation Scheme :

Sl. No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**120**

ABL 1 : Lab based learning (14 Hrs)		
Designing and implementation of Pyhton programming	Manual solving	4
	Writing program	5
	Execution	3
	Required output	1
	conclusion	1
ABL 2 : Problem Solving Assignment (15 Hrs)		
Problem Solving Assignment	Problem selection	1
	Formulate the methodology	3
	Solving the problem	4
	Report writing and submission	3
	Preparation of slide and presentation	4

Proposed Assessment Plan(for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 3) Lab based learning 4) Problem Solving Assignment	20
Total		**50**

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3												
CO2	3	2											
CO3	3	-											
CO4	3	2											
CO5	3	2			1								

Course Title	Mathematics-I for Mechanical Engineering stream		
Course Code	MAT5M11	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120

Course Objective: Enable students to apply numerical methods to solve mathematical and engineering problems, analyze linear systems, and model real-life situations using appropriate mathematical techniques.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	POs	PSOs
CO1	Use numerical methods to solve algebraic and transcendental equations, apply interpolation and finite difference techniques, and compute line integrals using different integration rules. Real-life and engineering application problems.	PO1, PO2	-
CO2	Demonstrate the ability to analyze and solve systems of linear equations using direct and iterative methods, to compute Eigen value and Eigen vectors. Real-life and engineering application problems.	PO1, PO2	-
CO3	Understand and apply concepts related to the polar curves, including angles, and radius of curvature using different coordinate systems. Real-life and engineering application problems.	PO1, PO2	
CO4	Evaluate derivatives, series expansions of single variable, extreme values for functions of two variables and apply these concepts to solve relevant mathematical problems. Real-life and engineering application problems.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with differential calculus, numerical methods, and linear algebra, execute the same and provide correct output.	PO1, PO2,PO5	-

MODULE - 1	10 Hrs.

Numerical Methods: Numerical Solution of algebraic & transcendental equations by Newton Raphson method, Gradient in decant method, Finite differences- Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae.

Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule, Weddle's rule. Illustrative examples from engineering field.

Applications - discharge of the Stream, Pressure Distribution on a Curved Turbine Blade

Self Study: Bisection method, Inverse Lagrange's interpolation formula. Approximate solutions of ODE related to Mechnaical Engineering.

MODULE - 2	10 Hrs.

Linear Algebra: Elementary row transformation of a marix, Rank of the matrix, Consistency and solution of system of linear equations - Gauss elimination method, Gauss seidel method, Eigen values and Eigen vectors.

Application - Application of solution of system of equations to balance the chemical equations. Traffic flow problem.

Self Study: Solution of sytem of equations by Gauss-Jacobi iterative method. Stretching of an elastic membrane.

MODULE - 3	10 Hrs.

Polar coordinates: Polar curves, angle between the radius vector and the tangent, angle between two curves, Pedal equations, Curvature and Radius of curvature in cartesian, polar and pedal form.

Applicaions: Vehicle Dynamics on a Superelevated Curved Road, Stiffness of a beam

Self Study: Radius of curvature in parametric form, Derivative of arc length, Brief introduction to evolutes and involutes

MODULE - 4	10 Hrs.

Introduction to series expansion: Definition of differentiability, Statement of Taylor's theorem, Taylor's series and Maclaurin's series expansion for function of one variable.

Partial differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation and Illustrative examples. Evaluation of Jacobians. Extreme values for a functions of two variables.

Applications - Applications of Optimization (extreme values of a single variable)

Self Study: Lagrange's method of undermined multifliers, composite function, properties on Jacobians.

Lab Components: (Integrated course)

1. Basic Python Programs
2. Computation of roots using Newton Raphson method.
3. Lagrange's interpolation formula.
4. Numerical integration- line integral (Trapezoidal rule , Weddle's rule)
5. Numerical integration- line integral (Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule)
6. Compute Rank, Eigen value and Eigen vectors of the matrix.
7. Solve the system of equations by Guass seidal method.
8. Find angle between radius vector and tangent
9. Find angle of intersection of polar curves and the radius of curvature of a given curve.
10. Express the function of one variable using Taylor's & Maclaurin's series.
11. Find partial derivatives - Jacobians

Note:

1. Proofs are not required for any theorems and properties.
2. There should not be any questions from self study part in semester End Examination.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Higher Engineering Mathematics	Dr. B. S. Grewal	44	Khanna Publications	2016
2	Advanced Engineering Mathematics	Erwin Kreyszig	8 (Wiley student edition)	Wiley India P.v.t. Ltd	2004
3	Calculus	Thomas Finney	9	Pearson education	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Numerical methods	R. K. Jain and S. R. K. Jain & S. R. K. Iyengar	6	New age International p.v.t. Publishers	2014
2	A textbook of Engineering Mathematics	N.P. Bali and Manish Goyal	-	Laxmi Publications	2010

EBooks and online course materials:

1. https://www.geneseo.edu/~aguilar/public/assets/courses/233/main_notes.pdf
2. https://ocw.mit.edu/courses/res-18-001-calculus-fall-2023/pages/textbook/

Online Courses and Video Lectures:

1. https://www.coursera.org/learn/introduction-to-linear-algebra
2. https://www.coursera.org/learn/introduction-to-calculus
3. https://nptel.ac.in/courses/111104092

Teaching - Learning - Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours / Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
			Total Learning Hours/Semester	**120**

ABL 1 : Lab based learning (14 Hrs)		
Designing and implementation of Python programming	Manual solving	4
	Writing program	5
	Execution	3
	Required output	1
	conclusion	1
ABL 2 : Problem Solving Assignment (15 Hrs)		
Problem Solving Assignment	Problem selection	1
	Formulate the methodology	3
	Solving the problem	4
	Report writing and submission	3
	Preparation of slide and presentation	4

Proposed Assessment Plan(for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 5) Lab based learning 6) Problem Solving Assignment	20
Total		**50**

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3												
CO2	3	2											
CO3	3	-											
CO4	3	2											
CO5	3	2			1								

Course Title	Mathematics-I for Civil Engineering stream		
Course Code	MAT5C11	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120

Course Objective: Enable students to apply numerical methods to solve mathematical and engineering problems, analyze linear systems, and model real-life situations using appropriate mathematical techniques.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	POs	PSOs
CO1	Use numerical methods to solve algebraic and transcendental equations, apply interpolation and finite difference techniques, and compute line integrals using different integration rules. Real-life and engineering application problems.	PO1, PO2	-
CO2	Demonstrate the ability to analyze and solve systems of linear equations using direct and iterative methods, to compute Eigen value and Eigen vectors. Real-life and engineering application problems.	PO1, PO2	-
CO3	Understand and apply concepts related to the polar curves, including angles, and radius of curvature using different coordinate systems. Real-life and engineering application problems.	PO1, PO2	
CO4	Evaluate derivatives, series expansions of single variable, extreme values for functions of two variables and apply these concepts to solve relevant mathematical problems. Real-life and engineering application problems.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with differential calculus, numerical methods, and linear algebra, execute the same and provide correct output.	PO1, PO2,PO5	-

MODULE - 1	10 Hrs.

Numerical Methods: Numerical Solution of algebraic & transcendental equations by Newton Raphson method, Gradient in decant method, Finite differences- Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formulae.

Numerical Integration: Evaluation of a line integral by Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule, Weddle's rule. Illustrative examples from engineering field.

Applications - - discharge of the Stream, Rocket Launch Optimization

Self Study: Bisection method, Inverse Lagrange's interpolation formula. Approximate solutions of ODE related to Civil Engineering.

MODULE - 2	10 Hrs.

Linear Algebra: Elementary row transformation of a marix, Rank of the matrix, Consistency and solution of system of linear equations - Gauss elimination method, Gauss seidel method, Eigen values and Eigen vectors.

Application - Traffic flow problems, Stretching of an elastic membrane, to determine the growth of a population model.

Self Study: Solution of sytem of equations by Gauss-Jacobi iterative method. Stretching of an elastic membrane.

MODULE - 3	10 Hrs.

Polar coordinates: Polar curves, angle between the radius vector and the tangent, angle between two curves, Pedal equations, Curvature and Radius of curvature in cartesian, polar and pedal form.

Applicaions: Vehicle Dynamics on a Superelevated Curved Road, Stiffness of a beam

Self Study: Radius of curvature in parametric form, Derivative of arc length, Brief introduction to evolutes and involutes.

MODULE - 4	10 Hrs.

Introduction to series expansion: Definition of differentiability, Statement of Taylor's theorem, Taylor's series and Maclaurin's series expansion for function of one variable.

Partial differentiation: Definition of Partial derivative, Physical and geometrical interpretation of partial differentiation and Illustrative examples. Evaluation of Jacobians. Extreme values for a functions of two variables.

Applications: Soil Settlement Under a Foundation-Foundation Differential Settlement Analysis

Self Study: Lagrange's method of undermined multifliers, composite function, properties on Jacobians.

Lab Components: (Integrated course)

1. Basic Python Programs
2. Computation of roots using Newton Raphson method.
3. Lagrange's interpolation formula.
4. Numerical integration- line integral (Trapezoidal rule , Weddle's rule)
5. Numerical integration- line integral (Simpson's $1/3^{rd}$ rule , Simpson's $3/8^{th}$ rule)
6. Compute Rank, Eigen value and Eigen vectors of the matrix.
7. Solve the system of equations by Guass seidal method.
8. Find angle between radius vector and tangent
9. Find angle of intersection of polar curves and the radius of curvature of a given curve.
10. Express the function of one variable using Taylor's & Maclaurin's series.
11. Find partial derivatives - Jacobians

Note:

1. Proofs are not required for any theorems and properties.
2. There should not be any questions from self study part in semester End Examination.

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2. https://ocw.mit.edu/courses/res-18-001-calculus-fall-2023/pages/textbook/

Online Courses and Video Lectures:

1. https://www.coursera.org/learn/introduction-to-linear-algebra
2. https://www.coursera.org/learn/introduction-to-calculus
3. https://nptel.ac.in/courses/111104092

Teaching - Learning - Evaluation Scheme :

Sl.No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**120**

ABL 1 : Lab based learning (14 Hrs)		
Designing and implementation of Pyhton programming	Manual solving	4
	Writing program	5
	Execution	3
	Required output	1
	conclusion	1
ABL 2 : Problem Solving Assignment (15 Hrs)		
Problem Solving Assignment	Problem selection	1
	Formulate the methodology	3
	Solving the problem	4
	Report writing and submission	3
	Preparation of slide and presentation	4

Proposed Assessment Plan(for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 7) Lab based learning 8) Problem Solving Assignment	20
Total		**50**

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3												
CO2	3	2											
CO3	3	-											
CO4	3	2											
CO5	3	2			1								

PROGRAM SPECIFIC COURSES

1. ENGINEERING MECHANICS
2. BASIC ELECTRONICS ENGINEERING
3. PRINCIPLES OF PROGRAMMING USING C
4. ELEMENTS Of MECHANICAL ENGINEERING
5. ELEMENTS Of ELECTRICAL ENGINEERING

Course Title	ENGINEERING MECHANICS		
Course Code	26CIV5131	(L-T-P) C	(3-0-2) 4
CIE	30+20	Hours/Week	05
SEE	50	Total Hours	(42L+28P+43ABL+7EVL)=120

Course Objective:

- To develop students' ability to analyze the problems involving forces, moments with their applications.
- To make students to learn the effect of friction on different planes
- To develop the student's ability to find out the Centre of gravity and moment of inertia and their applications.

Course Outcomes:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Compute the resultant of coplanar concurrent and non-concurrent force system	1,2	-
2	Comprehend the action for forces, moments, and other types of loads on rigid bodies and compute the reactive forces	1,2	-
3	Analyze the frictional resistance offered by different planes and locate the centroid.	1,2	-
4	Compute the moment of inertia of sections and analyze the bodies in motion	1,2	-

MODULE-1 **11Hrs.**

Resultant of coplanar force system:

Basic dimensions and units, Idealizations, Classification of force system, principle of transmissibility of a force, composition of forces, resolution of a force, Free body diagrams, moment, Principle of moments, couple, Resultant of coplanar concurrent force system, Resultant of coplanar non-concurrent force system, Numerical examples.

MODULE-2 **10 Hrs.**

Equilibrium of coplanar force system:

Equilibrium of coplanar concurrent force system, Lami's theorem, Equilibrium of coplanar parallel force system, types of beams, types of loadings, types of supports, Equilibrium of coplanar non-concurrent force system, support reactions of statically determinate beams subjected to various types of loads, Numerical examples.

MODULE-3 **11 Hrs.**

Friction:

Introduction, laws of Coulomb friction, equilibrium of blocks on horizontal plane, equilibrium of blocks on inclined plane, ladder friction, wedge friction Numerical examples.

Centroid of Plane areas:

Introduction, Locating the centroid of rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration, centroid of composite areas and simple built-up sections, Numerical examples.

MODULE-4 **10 Hrs.**

Moment of inertia of plane areas:
Introduction, moment of inertia of plane lamina, polar moment of inertia, product of inertia, radius of gyration, parallel axes theorem, perpendicular axis theorem, moment of inertia of rectangular, triangular and circular areas from the method of integration, moment of inertia of composite areas and simple built-up sections, Numerical examples.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	A Textbook of Applied Mechanics Dynamics and Statics	I B Prasad	19th Edition,	Khanna Publishers. New Delhi. ISBN No. 978-81-7409-068-1	2016.
2	Basic Civil Engineering and Engineering Mechanics,	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan	-	Laxmi Publications	2015

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering Mechanics	Bhavikatti SS	7th Edition	New Age International	2019
2	Basic Civil Engineering and Engineering Mechanics	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan		Laxmi Publications	2017

E Books and online course materials:

1. Mechanics of Materials - Engineer4Free: The #1 Source for Free Engineering Tutorials
2. Engineering Mechanics: Download Subject Notes & Free PDF for AE/JE Exam

Online Courses and Video Lectures:

1. Introduction to Engineering Mechanics | Coursera
2. NPTEL :: Mechanical Engineering - NOC:Engineering Mechanics

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Activity Based Learning (ABL1&ABL2)	-	-	43
4	Evaluation of Learning Process	-	-	7
Total Learning Hours/Semester				**120**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Laboratory component	Details of activities to be conducted 1) Laboratory record 2) Laboratory CIE	20
Total		**50**

Laboratory Plan (integrated course 28 hours):

Lab Program	Program Details
1	Analysis of Lami's Theorem
2	Analysis of Equilibrium of concurrent forces.
3	Analysis of Parallel force system- Simply supported beam.
4	Specific Gravity of - Fine aggregates
5	Specific Gravity of Coarse aggregates.
6	Specific Gravity of Cement
7	Specific Gravity of Soil
8	Sieve analysis of Fine aggregate
9	Graphical representation of the gradation curve of Sieve analysis of Fine aggregate
10	Visual identification of building materials: Bricks, Stones, Tiles, M-Sand, Bitumen, Fly-Ash, GGBS, Steel Bars of Various Sizes

Activity Based Learning (43 Hours)

ABL1 : Activity1		Hours
1.	Assignment	
	Quiz- Each group has to prepare 5 questions and the quiz test will be held and discussed among students	
Total		**21**
ABL2 : Activity2		**Hours**
2.	Students shall visit different construction sites and record the data for	
	Different components of the buildings • Foundation • Plinth • Masonry structure • Column, Slab and beams • Other sub-works related to site The site should cover residential buildings, commercial buildings, roads, drains and any other special structures. Minimum of 2 sites has to be covered	22
Total		**43**

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Semester End Exam	3
Total	07

Course Articulation Matrix

Course Outcomes	ProgramOutcomes[POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO1	2	3												
CO2	2	3												
CO3	2	3												
CO4	2	3												

Course Title	BASIC ELECTRONICS		
Course Code	25BEE13/23	(L-T-P) C	(3-0-2)4
Exam	3hours	Hours/Week	3hours
SEE	100	Total Hours	42L+30P+48ABL=120

Course Objective: The objective of the course is to equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.

Course Outcomes::{with mapping shown against the Program Outcomes (POs)} Upon completion of the course, the student shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2	2,1
2	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices.	1,2, 5, 9	2,1
3	Develop competence knowledge to construct basic digital circuit by making use of basic gate and concepts of communication Systems	1, 2, 5, 9	2,1
4	Analyzing the basic analog device and its applications in electronics.	1, 2, 5, 9	2,1

MODULE-1 **10 Hours**

Semiconductor Diodes: Introduction, PN Junction diode, Characteristics, Diode Approximations, (Text1:2.1,2.2,2.3,2.4)

Diode Applications: Introduction, Half Wave Rectifier, Full Wave Center tapped and bridge Rectifier, Full wave Capacitor Filter Circuit,
(Text1:3.1,3.2,3.4,3.5)

Zener Diode: Junction Breakdown, Characteristics, Zener Diode as Voltage Regulator (Numerical). (Text1:2.9, 3.7)

MODULE-2 **10 Hours**

Bipolar Junction Transistors: Introduction, PNP and NPN Transistor, BJT Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, DC Loadline and Biaspoint: Self bias, fixed bias and voltage divider bias (Text1:4.2, 4.3, 4.5,4.6,4.7, 5.1, 5.2, 5.3, 5.4)

Field Effect Transistor: Junction Field Effect Transistor, JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion Enhancement MOSFETs(Text1: 9.1,9.2,9.5)

MODULE-3 **11 Hours**

Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters - Gain, input resistance, Output resistance, CMRR, slew rate, Bandwidth, input offset voltage, Input bias Current and Input offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting &Non-Inverting Amplifier.

Op-Amp Applications: Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator, Summer and subtractor (Text 2: 1.1,1.2,1.3,1.5,2.2,2.3,2.4,2.6,6.5.1,6.5.2,6.5.3, 6.12, 6.13).

MODULE-4 **11 Hours**

Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal &Hexa Decimal Numbers, Complements, Basic definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions.

Digital Logic Gates (Text3: 1.2,1.3,1.4,1.5,2.1,2.2,2.3,2.4, 2.5,2.6, 2.7)

Combinational logic: Introduction, Design procedure, Adders-Half adder, Full adder (Text3:4.1,4.2,4.3)

Communications: Introduction to Communication System, Modulation- AM and FM(Derivation and numerical)(Textbook5:1.1,1.2, 1.3, 3.1, 5.1)

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Electronic Devices and Circuits	**David. A. Bell**	5th	Oxford University Press.	2008
2.	Basic Electronics: Devices, Circuits and IT Fundamentals	**Santiram Kal**	1st	PHI	2009

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Op-amps and linear integrated circuits	**Ramakant A. Gayakwad**	4th	Prentice Hall	2000
2.	Electronic communication systems	**George Kennedy**	6th	McGraw Hill India.	2017
3.	Basic Electronics	DP Kothari, IJ Nagrath,	2nd	Mc Graw Hill Education (India), Private Limited	2018

Online Courses and Video Lectures:

- https://nptel.ac.in/courses/122106025
- https://nptel.ac.in/courses/108105132
- https://nptel.ac.in/courses/117104072

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Activity Based Learning (ABL1&ABL2)	-	-	38
3.	Evaluation of Learning Process	-	-	10
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted Activity1- Analog and digital Circuits design and simulation using open Source Simulator. Activity2- Assignment/Quiz	10 10
Total		**50**

Activity Based learning 1 (48 hours) :

Sl. No	List
1.	For a mobile charger design a zener voltage regulator that takes ripple DC voltage produced by bridge rectifier circuit and delivers a DC regulated supply of 5 V, 5 mA across load resistor.
2.	Construct an audio amplifier which takes 20 mV audio signal and delivers 2 V output signal to a loudspeaker inside a radio system.
3.	Design an inverting amplifier to have a voltage gain of 50 and the output voltage amplitude is to be2.5 V.
4.	A direct-coupled non inverting amplifier with a ± 25 mV input is to produce a ± 5 V

	output. Design the circuit with suitable resistance values.
5.	Design a bridge full wave rectifier circuit to produce 12 Vun regulated DC voltage using a capacitor filter used in an electric vehicle charger circuit.
6.	The difference of two input signals is to be amplified by a factor of 20. Design the circuit with suitable resistance values.
7.	Design a three-input inverting summing amplifier circuit and show how it can be converted into an averaging circuit.
8.	The basic concepts of communication System and various Modulation Techniques.
9.	Realization of Boolean expressions using basic gates.
10.	Realization of half/full adder circuit

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Lab Conduction	2	14	28
2	Evaluation	-	-	02
Total Learning Hours/Semester				30
ABL: Lab based learning 2 (28 Hrs)				

Sl. No	Experiment Title	hours
1.	Introduction to electronics components and instruments	4
2.	Half wave and Full wave rectifiers	5
3.	Voltage divider bias using BJT	4
4.	Single stage amplifier	5
5.	Inverting and Non inverting amplifiers using Op-amp	5
6.	Summer and subtractor circuits using Op-amp.	5
Total		**28**

Course Articulation Matrix:

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO1 1**	**PSO 1**	**PSO 2**
CO1	3	2										2	1
CO2	3	2			2				1			2	1
CO3	3	2			2				1			2	1
CO4	3	2			2				1			2	1

Course Title	PRINCIPLES OF PROGRAMMING USING C		
Course Code	PPC513/523	(L-T-P) C	(3-0-2)4
Exam	03 Hours	Hours/Week	03+02
SEE	50 Marks	Total Hours	120

Course Objective: To provide fundamental programming concepts essential to develop program for a given problem.

Course Outcomes: Upon Completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe the concepts of C programming language	1	-
2.	Analyze the given program to determine the output and its correctness	1, 2	-
3.	Develop and document programs to find a solution for the given problem	3, 10	-

MODULE-1	10 Hrs.

Introduction: Importance of C, Basic structure of C program, executing a C program, Characters set, C tokens, Variables, Data types, Operators, Expressions**,** Evaluation of expressions, Operator precedence and associativity, Type conversion, Managing Input and Output Operations.

MODULE-2	11 Hrs.

Decision making and Branching: Simple if, if..else, nested if and else if…ladder statements.Switch statement, The ?: operator.

Decision making and Looping: Loops in C, Jumps in Loops, programming examples, Nested loops.

MODULE-3	11 Hrs.

Arrays: One-dimensional Arrays, Two-dimensional Arrays, Character Arrays**,** Arithmetic operation on characters, String handling functions.

MODULE-4	10 Hrs.

User-defined Functions: Elements of User defined function, Category of functions, Parameters passing in functions: call by value and call by reference.

Structures: Defining a structure, Declaring a structure variable, Accessing structure members, Structure initialization, Operations on individual members, Arrays of structure

Pointers: Understanding pointers, Accessing the address of a variable, Declaring pointer variables, Initialization of pointer variables, Accessing a variable through its pointers, Pointer expressions, Pointers increments and scale factor, Pointers and arrays.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Programming in ANSI C	Balagurusamy E	8th Edition	Tata Mc Graw Hill	2013.

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	The C Programming Language	Brian W. Kernighan and Dennis M. Ritchie	2nd Edition	PHI	2012
2	Programming Techniques through C	M. G. Venkateshmurthy	-	Pearson Education	2014

E Books and online course materials:

1. C Tutorial (w3schools.com) (https://www.w3schools.com/c/
2. C Programming Language Tutorial | GeeksforGeeks (https://www.geeksforgeeks.org/c-programming-language/)

Online Courses and Video Lectures:

1. Best C Programming Courses & Certificates [2025] | Coursera Learn Online (**https://www.coursera.org/courses? query=c%20programming**)
2. Introduction To Programming In C - Course (nptel.ac.in) **(https://onlinecourses.nptel.ac.in/noc22_cs40 /preview)**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		**Remarks**	**Marks**
CIE	**CIE1**	Conducted for 20 marks & reduced to 10 marks	10
	CIE2	Conducted for 20 marks & reduced to 10 marks	10
	CIE3	Conducted for 20 marks & reduced to 10 marks	10
Activity Details		1. Lab CIE	10
		2. Mini project using scratch tool	10
Total			**50**
Teaching - Learning – Evaluation Scheme			

Sl. No	**Teaching - Learning Method**	**No. of Hours/ Week**	**No. of Weeks**	**Hours/ Semester**
1	Class Room Teaching	3	14	42
2	Integrated Lab component	2	14	28
3	Activity Based Learning	3	14	42
4	Evaluation of Learning Process			8
Total Learning Hours / Semester				**120**

Laboratory Plan (if integrated course) : 28 Hours

The necessary theory for each lab program will be taught during the lab session.

Program	Program Details
1.	Quadratic equation is given by $ax^2+bx+c=0$, where a, b and c are the coefficients provided where $a\neq0$.The formula to find roots of quadratic equation is $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$ Write a C program to find all the roots and test it for all three cases(based on discernment value)
2.	A shop keeper requires performing simple calculations like addition, subtraction, multiplication, division and modulo division for his daily business. Write a C program to design a simple calculator for shop keeper.
3.	An electric power distribution company charges its domestic consumers as follows:Consumption Units — Rate of Charge 0-200 — Rs. 0.50 per unit 201-400 — Rs.100 plus Rs.0.65 per unit excess of 200 401-600 — Rs.230 plus Rs.0.80 per unit excess of 400 601 and above — Rs.390 plus Rs.1.00 per unit excess of 600 Write a C program to read the customer number, power consumed and display the amount to be paid by the customer.
4.	Sine series is given $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots$ up to n terms, where x is an angle in radian. Write a C program to find sine value for a given angle. Also verify calculated sinevalue using built in function.
5.	A person wants to register his newly purchased car. He is passionate to have a palindrome number for car registration. Write a C program to check whether the number allotted is palindrome or not.
6.	Given a list of n student's weight, write a C program to find a student with given weight. If found, display the position of the student in the list else display suitable message.
7.	Given two matrices, writea C program to check whether the matrices are multipliable, if so find the product matrix, otherwise display suitable message.
8.	Given a matrix, write a C program to find its transpose. Also find sum of upper triangle elements and sum of lower triangle elements of the transposed matrix.
9.	Write a C program to read a string, find number of vowels and consonants in it.
10.	Develop a function to find the factorial of a given number. Using the above function. Write a C program to find nCr and nPr where $nCr = n!/r!\,(n-r)!$ and $nPr = n!/(n-r)!$
11.	Develop a C function to swap two numbers using pointers. Write a C program usingthe above function to swap two numbers.
12.	Define a structure data type called student containing members: name, usn, marks ofCIE1, CIE2, CIE3, activity1 and activity2. Write a C program that would assign valuesto individual members and display them along with the total internal marks of all students where total internal marks is sum of best of two CIE marks, acitvity1 and activity2.

Activity Based Learning:	**Hours / Semester**
Students use the Scratch platform to create animations, games, and other interactive projects.	**42+8=50**

Course Articulation Matrix

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

Course Title	Elements of Mechanical Engineering		
CourseCode	EME5234	LTPC	3-0-2-4
Exam	03 Hours	Hours / Week	3+2
SEE	50 Marks	Totalhours	42L+28P+50ABL=120

Course objectives:

To introduce fresh entrants of mechanical engineering course to the principles and fundamentals of Mechanical Engineering.

CourseOutcomes(COs){withmappingshownagainstthe**ProgramOutcomes(POs)**}

Upon completion of the course, students shall be able to:

COs	Outcomes	POs	PSOs
1.	describe the basic concepts of thermodynamics,properties of steam,working principle of internal combustion engines and electric/hybrid vehicles.	1, 2,4,5,6,8,9	-
2.	identify various engineering materials and explain the concepts of belt and gear drives	1, 2,4,5,6,8, 9	-
3.	demonstrate the working and operations of machine tools, metal joining and angular measurement of a given specimen using appropriate device.	1, 2,4,5,6,8, 9	
4.	discuss the role of computer systems in manufacturing, their contribution to automation, and the applications of 3D printing and Outline the performance of robots in mechanical engineering.	1, 2,4,5,6,8, 9	-

COURSECONTENTS:

Module– I	10Hrs.
Concepts of Thermodynamics: Work, Energy, Heat, Modes of Heat transfer: Conduction, Convection and Radiation.**Steam:** Steam formation, Types of steam, Steam properties and applications of steam, Simple numerical problems.**Heat engines and Heat pumps**: Introduction to Heat engines and Heat pumps. **IC Engines**: Components and working principles, 4-stroke petrol and diesel engines, Applications of IC Engines, (No Numerical) **Electric vehicles and Hybrid vehicles**: Working principles, Advantages and disadvantages, Components - Batteries, Chargers, Power devices, Drives and Transmission, Classification, Electric and Hybrid vehicle components,	
Module– II	**10Hrs**
Engineering Materials: Definition,Classification of Engineering Materials.**Composite materials**: Introduction, Constituents of a composite, Classification, Types of Matrix and Reinforcement materials, Advantages, Disadvantages and Applications of composite materials in Aerospace and Automobile industries. **Power Transmission:Belt drives**: Introduction, Open and Cross belt drives,Flat belts and V belts, Velocity ratio, Simple numerical problems.**Gear Drives:** Types of Gears-spur gears, bevel gears, helical gears, worm gear sets, and rack and pinion, Velocity ratio, Gear Trains - Simple and Compound gear trains and Simple numerical problems.	
Module– III	**10Hrs.**
Machine Tools: Lathe: Working principle, Specifications, Operations performed – Turning, Facing, Taper turning by swiveling the compound rest, Thread cutting and Knurling. **Drilling Machine**: Working principle, Specifications, Operations performed – Drilling, Reaming, Boring, Counterboring, Countersinking, and Tapping. **Milling machine**: Working principle, Specifications, Operations performed – Plane milling, End milling, Slot milling, Angular milling. (Sketches of machine tools not required. Sketches to be used only for explaining the operations). **Joining Processes**: Introduction, Temporary and Permanent joining methods: Working principle of Soldering, Brazing and Electric Arc welding, Advantages, Limitations and Applications.	

Module– IV	10Hrs.
Introduction to Advanced Manufacturing Systems: Introduction, Components of CNC, advantages and applications of CNC. **Automation:** Types - Fixed, programmable, and flexible automation, merits and demerits of automation, and Applications. **Introduction to Robotics:** Nomenclature of an Industrial Robot - Polar Cylindrical, Cartesian coordinate, and Spherical robot, Advantages, disadvantages, and applications. **Additive manufacturing**: Introduction, Basic principles (Steps in additive manufacturing), Additive manufacturing processes –.Classification with example	

Lab components	Hours
1. Performing facing, plain turning and step turning operations by using a lathe. 2. Performing facing, plain turning and knurling operations by using a lathe. 3. Preparation of welded joints using the arc welding process. 4. Calibration of vernier caliper and micrometer using slip gauges. 5. Determination of the angle of a specimen using a sine bar. 6. Determination of the hardness of materials using hardness testing machine.	**28**

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Elements of Mechanical Engineering	K R Gopala Krishna	38	Subhash Publications	2018
2	Elements of Workshop Technology (Vol. 1 and 2)	HazraChoudhry and Nirzar Roy	17	Media Promoters and Publishers Pvt. Ltd.	2015

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	An Introduction to Mechanical Engineering	Jonathan Wickert	2nd	Cengage Learning	2006
2	Elements of Mechanical Engineering	K P Roy, S K H Choudhry, A K H Choudhry, Roy	7th	Media promoters and publishers	2014
3	Electric and Hybrid vehicles Khanna Publications	A. K. Babu	2nd	Khanna Publications	2022
4	Introduction to Mechatronics	AppuuKuttan K K	1st	Oxford University Press	2007

Web links and Video Lectures (e-Resources):

https://nptel.ac.in/courses/112104526

- https://nptel.ac.in/courses/112104616
- https://nptel.ac.in/courses/112104769
- https://venturebeat.com/ai/how-ai-is-impacting-the-automotive-world/
- https://www.vlcsolutions.com/blog/artificial-intelligence-in-manufacturing/
- https://skill-lync.com/blogs/technical-blogs/design-applications-of-machine-learning-and-ai-in mechanical-engineering
- https://caeassistant.com/blog/ai-in-mechanical-engineering-video/
- https://www.neuralconcept.com/post/how-is-ai-used-in-mechanical-engineering
- https://www.youtube.com/watch?v=MKiiXubKaGM
- https://www.youtube.com/watch?v=_canCYWZPsc
- https://www.youtube.com/watch?v=lQ-MYnyxh7M
- https://openoregon.pressbooks.pub/manufacturingprocesses45/chapter/chapter-unit-1-the engine-lathe/
- https://www.millerwelds.com/resources/article-library/the-fundamentals-of-welding process-equipment-and-applications
- https://www.youtube.com/watch?v=sbbwJ5p6irc
- https://www.youtube.com/watch?v=TlhGTSDfQxc

Teaching-Learning–Evaluation Scheme:

Sl. No	TeachingandLearning Method	No.ofHours/ Week	No. of Weeks	Hours/ Semester
1	ClassRoomTeaching& Learning	03	14	42
2	IntegratedLab Component	02	14	28
3	Evaluationof LearningProcess	-	-	06
4	ActivityBasedLearning(ABL)	-	-	44
			Total	**120**

ProposedAssessmentPlan (for50marksof CIE):

Tool	**Remarks**	**Marks**
CIE	ThreeCIEsconductedfor20markseachandreducedto10 marks	30
Lab	**LabComponent-**Simple Machining operations in Lathe,Manualmetalarcwelding, Measuring dimensions using vernier caliper and micrometer, Sine bar, ,Checking Hardness, Comparative study of properties of Fuels,Simple models using sheet metal operations,3D printing	10
ABL	Activities based on Metal Joining, Machining, Measurements and Properties of Fuels for different given Materials/Fuels	10
Total		**50**

Activity Based Learning (44Hours)

TYPICAL OPEN-ENDED EXPERIMENTS: Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.Students to prepare the report and present the same on the activities listed below.	Hours
1. Comparative study of flash point and fire point of various fuels / oils using the open cup method 2. Comparative study of flash point and fire point of various fuels / oils using the closed cup method 3. Comparative study on viscosity of different base fuels. 4. Investigation of the effect of additives on the viscosity of base fuels. 5. Selection and justification of appropriate joining techniques for given applications 6. Fabrication of a sheet metal part with simple geometry and soldering. 7. Maketheengineeringpartswithgivenspecificationsusing3Dprinting techniques. 8. Comparative study of facing, plain turning and step turning operations by using a lathe and CNC machine	44

Rubrics for Lab component and Activity Based Learning:
(Lab component and ABL -To be conducted for 50 marks and the marks obtained shall be reduced to 20)

Performance Indicators	**Excellent**	**Good**	**Satisfactory**	**Needs Improvement**	**Poor**
Technical Skills & Procedure (PO1 & PO5) (10)	Performs operations flawlessly, correct sequence, excellent tool use. (9-10)	Minor errors, generally correct sequence and tool use. (7-8)	Performs task with some errors; needs occasional help. (5-6)	Many errors, requires frequent guidance. (3-4)	Cannot perform task without continuous supervision. (0-2)
Safety Compliance (PO6) (5)	Strictly follows all safety protocols, proper PPE usage at all times. (5)	Follows safety rules, occasional minor lapses. (4)	Mostly safe, some reminders needed. (3)	Frequent safety violations. (2)	Unsafe behavior ignores safety rules. (0-1)
Interaction with the Group (PO8) (5)	Naturally leads, encourages, and includes all group members. Facilitates communication and ensures tasks are distributed fairly. Respects all opinions. (5)	Cooperates well with group members. Communicates clearly, shares the workload, and is a reliable and positive team member. (4)	Works alongside others but with limited communication or collaboration. Tends to work in isolation or contributes unevenly to the group effort. (3)	Fails to cooperate with the group. Is dismissive of others' ideas or causes friction and disagreement within the team. (2)	Refuses to work with the group or actively disrupts the group's ability to complete the experiment. (1)
Lab Report (PO9) (10)	Report is exceptionally well organized, detailed, and insightful. All data and analysis are accurate. Submitted on time. (9-10)	Report is complete, well organized, and accurate. All required sections are present and data is correctly reported. Submitted on time. (7-8)	Report has minor errors in data or analysis, or is missing some minor components. Organization could be clearer. (5-6)	Report is incomplete, contains significant errors, is poorly organized, or is submitted late without a valid reason. (3-4)	Fails to submit a report or the submitted work is of completely unacceptable quality and lacks critical information. (0-2)
Execution (PO3 & PO5) (10)	Executes operations accurately with correct parameters; smooth, safe handling of equipment. (9-10)	Minor execution errors; mostly correct handling of tools/ machines. (7-8)	Acceptable performance with some parameter or handling errors. (5-6)	Multiple execution errors; needs frequent correction. (3-4)	Unable to perform operation independently. (0-2)
Result and Discussion (PO4) (5)	Presents accurate results; clearly compares with standards; insightful discussion of deviations and causes. (5)	Accurate results; some useful discussion. (4)	Results mostly correct; discussion basic. (3)	Results incomplete or partially wrong; weak discussion. (2)	Presents accurate results; clearly compares with standards; insightful discussion of deviations and causes. (1)
Viva Voce (PO9) (5)	Answers all questions confidently, showing deep conceptual and practical understanding. (5) / (17-20)	Answers most correctly; minor conceptual gaps. (4)	Answers some but lacks depth. (3)	Gives vague or incomplete answers. (2)	Unable to answer. (1)

CourseArticulationMatrix

Course Outcomes	ProgramOutcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PSO 1	PSO 2
CO1	3	2		1	1	1		1	2				
CO2	3	2		1	1	1		1	2				
CO3	3	1		1	1	1		1	2				
CO4	3	1		1	1	1		1	2				

Course Title	ELEMENTS OF ELECTRICAL ENGINEERING		
Course Code	EEE5235	L-T-P	(3-0-1) 4
CIE	50	Hours/Week	4
SEE	50	Total Hours	40

Course Objective: The students acquire knowledge on electrical engineering.

Course Outcomes: At the end of course, students will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Discuss the fundamental laws of electrical engineering	1, 2	1
2	Apply the concepts to find solutions of electrical circuits	1, 2	1
3	Illustrate the skills and wiring adhering to safety measures	1, 2	1
4	Describe operation of electrical machines and electrical tariff.	1, 2	1

MODULE - 1 — 10 Hrs.

Electrical Energy: Importance of electrical engineering**,** Significance of electrical energy, sources of energy, Conventional and renewable energy sources, General structure of electrical power systems using single line diagram approach.

Electromagnetism: Faraday's Laws of Electromagnetic Induction, Lenz's Law, Fleming's rules, statically and dynamically induced EMF; concepts of self and mutual inductance. Coefficient of Coupling, Energy stored in magnetic field.

DC circuits: Definitions –Passive and active electrical elements, circuit, network, node, branches, mesh, loop. Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits, analysis of electrical circuits with two loops using Maxwell's loop equation.

Self-learning topics: Simple applications of electromagnetic induction, self and mutual inductances.

MODULE - 2 — 10 Hrs.

Single-phase AC circuits: Generation of sinusoidal voltage, frequency of generated voltage, average value, RMS value, form factor and peak factor of sinusoidal voltage and currents. Phase or representation of alternating quantities. Analysis of R, L, C, R-L, R-C and R-L-C circuits with phasor diagrams, Real power, reactive power, apparent power, and Power factor. Series, Parallel and Series-Parallel circuits.

Self-learning topics: Measurement of Voltage, current, power and power factor in single phase AC system.

MODULE - 3 — 10 Hrs.

Three-phase AC circuits: Necessity and advantage of 3-phase system. Generation of 3-phase AC voltage. Definition of phase sequence. Balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced 3-phase circuits.

Transformer: Types of transformer, Emf equation, working principle of ideal transformer on no load and load.

DC Machines: Types of DC Machines, Emf equation, construction of DC machines, working principle of DC motor, applications.

Self-learning topics: Measurement of Voltage, current, power and power factor in three phase AC Systems.

MODULE - 4 — 10 Hrs

Domestic Wiring: Requirements, Types of wiring, Two way and three-way control of Lamps. General types of wires and cables. Specifications of wires used for domestic wiring and their selection.

Electrical Safety measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits, Electric Shock, General concept of earthing, Types of earthing, Safety Precautions to avoid shock, Residual Current Circuit Breaker (RCCB) and Earth Leakage Circuit Breaker (ELCB). General types of wires and cables and selection.

Electricity bill: Power rating of household appliances like lights, fans, Air Conditioners, Personal Computers etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Laboratory component

1	Verification of Ohm's law and Kirchhoff's laws.

2	Measurement of low range resistance using voltmeter-ammeter method. Verification of resistance value using multimeter/LCR meter.
3	Measurement of resistance, inductance, impedance and power factor using voltmeter, ammeter and wattmeter in single-phase AC circuits.
4	Measurement of three-phase power of an inductive load by 2-wattmeter method, when the load is (a) star connected and (b) delta connected. Calculation of resistance, reactance, impedance and power factor.
5	Wiring an appropriate electric circuit, understanding the basic principle used for 2-way and 3-way control of load.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Electrical Engineering	Rajendra Prasad	1st	Prentice-Hall of India Pvt. Ltd	2005

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Basic Electrical Engineering	D. C. Kulshreshtha	2nd	McGraw Hill	2019
2	Electrical and Electronics Technology	E. Hughes	2nd	Pearson	2010
3	Basic Electrical Engineering	D.P. Kothari, I.J. Nagrath	4th	McGraw Hill Education	2019

E Books and online course materials:

1. https://www.mheducation.co.in/basic-electrical-and-electronics-engineering-9789364441070-india
2. https://www.pcefet.com/common/library/books/39/173_BasicElectricalEngineeringbyV.K.MehtaandRohitMehta.pdf

Online Courses and Video Lectures:

1. https://www.youtube.com/watch?v=rLUyP6g1VNI&list=PL425060D3C78350E1
2. https://www.youtube.com/watch?v=VXo0p_1z3Uw&list=PLp6ek2hDcoNCc3IgSGVjIsiMhM_Ll9FEn

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity details	Writing Record – 10 marks Laboratory CIE -10 marks	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2											3	
CO2	3	2											3	
CO3	3	3											3	
CO4	3	2											2	

EMERGING SCIENCE COURSES

1. INTRODUCTION TO CIVIL ENGINEERING
2. INTRODUCTION TO ELECTRICAL ENGINEERING
3. INTRODUCTION TO ELECTRONICS ENGINEERING
4. INTRODUCTION TO MECHANICAL ENGINEERING
5. ESSENTIALS OF INFORMATION TECHNOLOGY

Course Title	INTRODUCTION TO CIVIL ENGINEERING		
Course Code	ESC514A	**(L-T-P) C**	(3-0-0) 3
CIE	30+20	**Hours/Week**	03
SEE	50	**Total Hours**	42L+41ABL+7ELP=90

Course Objective:

To equip students with foundational knowledge of civil engineering by introducing key disciplines, essential construction materials, structural systems, sustainable development principles, and basic analytical methods—fostering an understanding of how civil engineering shapes resilient, efficient, and environmentally responsible infrastructure for society.

Course Outcomes:

#	Course Outcomes	Mapping to PO's	Mapping toPSO's
1	Distinguish between different civil engineering disciplines based on their scope and application.	1	-
2	Evaluate **c**onstruction materials, structural components, and transportation infrastructure based on their properties and applications in building systems and road design.	1	-
3	Apply concepts of sustainability, smart infrastructure, and environmental systems in the context of green and energy-efficient construction.	1	-
4	Analyze force systems and calculate centroids for the built up lamina	1,2	-

MODULE-1	**10 Hrs.**

Civil Engineering Disciplines and Building Science:

Introduction to Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Environmental Engineering, Construction planning & Project management.

Basic Materials and Construction: Bricks-types, properties and tests, Cement-types, properties and basic tests & mortar, Plain, Reinforced & Pre-stressed Concrete, Structural steel, Construction Chemicals, Precast construction.

Structural elements of a building: foundation, plinth, lintel, chejja, Masonry wall, column, beam, slab and staircase.

MODULE-2	**10 Hrs.**

Sustainable Development and Smart Infrastructure in Civil Engineering

Sustainable materials and green construction: Green Building rating systems (LEED, IGBC, GRIHA), Energy-efficient designs and materials, rainwater harvesting, green roofs. Use of sensors and smart systems in green buildings.

Built-environment: Embodied energy, temperature and sound control in buildings, Security systems. Recycling.

Environment: Water Supply and Sanitary systems, urban air pollution management, Solid waste management, identification of Land fill sites, urban flood control.

MODULE-3	**11 Hrs.**

Analysis of force systems:
Concept of idealization, system of forces, principles of super position and transmissibility, Resolution and composition of forces, Law of Parallelogram of forces, Resultant of concurrent coplanar force systems- (equilibrium of concurrent). Resultant of non-concurrent coplanar force systems, Varignon's theorem, moment of forces, couple, free body diagram, and non-concurrent coplanar force systems (beams) Numerical examples.

MODULE-4	**11 Hrs.**

Centroid:
Importance of centroid and centre of gravity, determination of centroid by method of moments, axis of reference, methods of determining the centroid, Numerical examples for locating the centroid of built-up sections (Simple sections).

Transportation Engineering:
Introduction to Transportation Engineering: Definition and scope, Role in civil engineering and national development, Importance of transportation in economic growth and mobility.
Highway Engineering Basics: Types of roads (NH, SH, MDR, rural roads) Pavement types: Flexible vs. rigid Basic road components: carriageway, shoulders, medians, footpaths, Surface Characteristics, Cross Sectional elements, Camber, Road hierarchy and layout, Common traffic signs and road markings.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	A Textbook of Applied Mechanics Dynamics and Statics	I B Prasad	19th Edition,	Khanna Publishers. New Delhi. ISBN No. 978-81-7409-068-1	2016.
2	Basic Civil Engineering and Engineering Mechanics,	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan	-	Laxmi Publications	2015

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Engineering Mechanics	Bhavikatti SS	7th Edition	New Age International	2019
2	Basic Civil Engineering and Engineering Mechanics	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan		Laxmi Publications	2017

E Books and online course materials:

1. Understanding Civil Engineering Materials: An Introduction and Overview - Smart Civil Engineers
2. Engineering Mechanics: Download Subject Notes & Free PDF for AE/JE Exam

Online Courses and Video Lectures:

1. Introduction to Engineering Mechanics | Coursera
2. NPTEL :: Civil Engineering - NOC:Introduction to Civil Engineering Profession

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Activity Based Learning (ABL1&ABL2)	-	-	41
4	Evaluation of Learning Process	-	-	7
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Flipped class for module 2 2) Pragmatic theory application- module 3	20
Total		**50**

Activity Based Learning (41 Hours)

ABL1 : Activity1- Flipped class		**Hours**
Sustainable Development and Smart Infrastructure in Civil Engineering.		**20**
1.	Prepare the presentation for the given topic from the module and present the same	
	Report preparation for the given topic	
Total		
ABL2 : Activity2		**Hours**
2.	Students shall visit different construction sites and record the data for	
	Different components of the buildings • Foundation • Plinth • Masonry structure • Column, Slab and beams • Other sub-works related to site The site should cover residential buildings, commercial buildings, roads, drains and any other special structures. Minimum of 2 sites has to be covered	**21**
Total		**41**

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Semester End Exam	3
Total	07

Course Articulation Matrix

Course Outcomes	ProgramOutcomes[POs]													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO1 1**	**PO1 2**	**PS O1**	**PS O2**
CO1	3	2												
CO2	3	2												
CO3	3	2												
CO4	2	3												

Course Title	INTRODUCTION TO ELECTRICAL ENGINEERING		
Course Code	ESC514B/ESC524B	(L-T-P) C	(3-0-0)3
CIE	50	Hours/Week	3
SEE	50	Total Hours	40

Course Objective: To acquire basic knowledge of electrical engineering.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Explain the basic concepts of power system and AC and DC circuit analysis and basic electrical protection devices.	1, 2	1
2	Describe the operating principle of analog and digital measuring instruments.	1, 2	1
3	Apply the basic concepts of AC circuits and DC circuits.	1, 2	1
4	Analyze the working principle of electrical machines and transformers.	1, 2	1

MODULE – 1 — 10 Hrs.

Introduction: Conventional and Non-conventional energy resources with examples, advantages of renewable Energy Systems; General structure of electrical power systems using single line diagram approach.

Domestic Wiring: Requirements, Types of wiring: casing, capping. Two way and three way control of lamps.

Electricity bill: Power rating of household appliances like lights, fans, Air Conditioners, Personal Computers etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Measuring instruments: Dynamometer type Wattmeter, Energy meter, comparisons between digital and analog meters, digital multimeter.

MODULE – 2 — 10 Hrs.

Basics of Electromagnetic Induction: Faraday's law of Electromagnetic Induction, Significance of Lenz's law. Statically induced EMF and Dynamically induced EMF.

DC Circuits: Ohm's Law and its limitations**,** KCL & KVL, Series, and Parallel. Simple Numerical on KCL and KVL.

MODULE – 3 — 10 Hrs.

A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, Form factor, Peak factor. Simple problems on AC fundamentals.

Single phase AC circuit Analysis: Voltage and current relationship with phasor diagrams in R, L, and C circuits. Simple numerical on R, L & C circuits.

Three-phase AC circuits: Necessity and advantage of 3-phase system. Generation of 3-phase AC voltage. Definition of phase sequence. Balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections.

MODULE - 4 — 10 Hrs

DC machines: Construction and working principle. Classification of DC machine, EMF equation, problems on EMF.Applications.

Transformers: Necessity of transformer, principle of operation, Types of Transformers: Shell and Core type, EMF equation of a Transformer. Simple Numerical on EMF equations.Applications.

Three-phase induction Motors: Definition of rotating magnetic field (without derivation), Principle of operation. Constructional features of squirrel cage type and wound rotor type induction motor. Slip and its significance, problems. Applications.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Electrical Engineering	Rajendra Prasad	1st	Prentice-Hall of India Pvt. Ltd	2005

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year

1	Basic Electrical Engineering	D. C. Kulshreshtha	2nd	McGraw Hill	2019
2	Electrical and Electronics Technology	E. Hughes	2nd	Pearson	2010
3	Basic Electrical Engineering	D.P. Kothari, I.J. Nagrath	4th	McGraw Hill Education	2019

E Books and online course materials:

1. https://www.mheducation.co.in/basic-electrical-and-electronics-engineering-9789364441070-india
2. https://www.pcefet.com/common/library/books/39/173_BasicElectricalEngineeringbyV.K.MehtaandRohitMehta.pdf

Online Courses and Video Lectures:

1. https://www.youtube.com/watch?v=rLUyP6g1VNI&list=PL425060D3C78350E1
2. https://www.youtube.com/watch?v=VXo0p_1z3Uw&list=PLp6ek2hDcoNCc3IgSGVjIsiMhM_Ll9FEn

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1(Modelling of two and Three way control of lamps) 2) Details of activity 2 (Demonstration of different types of wires used)	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2											3	
CO2	3	2											3	
CO3	3	3											3	
CO4	3	2											2	

Course Title	INTRODUCTION TO ELECTRONICS ENGINEERING		
Course Code	ESC5143/ ESC5243	(L-T-P) C	(3-0-0) 3
Exam	3 Hours	Hours/Week	3
SEE	50 Marks	Total Hours	42L+48ABL=90

Course Objective: The objective of the course is to equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.

Course outcomes: Upon completion of the course, students shall be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Develop the basic knowledge on construction, operation and characteristics of semiconductor devices.	1,2	1,2
2	Apply the acquired knowledge to construct small scale circuits consisting of semiconductor devices.	1,2, 5, 8	1,2
3	Develop competence knowledge to construct basic digital circuit by make	1, 5, 8	1,2
4	Apply the knowledge of embedded system and basic communication system.	1,2	1,2

MODULE-1 **10Hrs.**

Power Supplies –Block diagram, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, voltage Multiplier.

Amplifiers – CE amplifier input and output characteristics, multi-stage amplifier; BJT as a switch: Cut-off and saturation modes, BJT Biasing: Introduction, self bias and fixed bias.

MODULE-2 **11 Hrs.**

Operational amplifiers - Ideal op-amp; characteristics of ideal and practical op-amp; Practical op- amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor, integrator, differentiator. (Text 1)

Oscillators – Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, **RC Phase Shift Oscillator**, Colpitt's and Hartley oscillator, Crystal oscillator, Multivibrators, Single-stage astable multivibrator (using transistor only). (Only Concepts, working, and waveforms. No mathematical derivations).

MODULE-3 **10 Hrs.**

Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates (Text 2: 1.2, 1.3, 1.4, 1.5,2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7)**.**

Combinational logic: Introduction, Design procedure, Adders -Half adder, Full adder.

MODULE-4 **11Hrs**

Embedded Systems–Definition, Embedded systems vs general computing systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller**.** (Text 4).

Analog Communication Schemes – Modern communication system scheme, Information source,and input transducer, Transmitter, Channel – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM,FM. (Problems on AM only).

Digital Modulation Schemes: Advantages of digital communication over analog communication, ASK, FSK, PSK.(Only concepts, no mathematical derivations) (Text 3).

Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	'Electronic Circuits, Fundamentals & Applications'	Mike Tooley	4th	Elsevier	2015
2.	Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008	M. Morris Mano	1st	Pearson education	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	'Basic Electronics'	D P Kothari, I J Nagrath,	2nd	McGraw Hill Education (India), PrivateLimited,	2018
2.	"Introduction to Embedded systems"	Shibu K V	4th	McGraw Hill Education (India), PrivateLimited	2011

Online course and video lecture:

1. https://www.youtube.com/watch?v=AUNQnmuIoJI&list=PLgdFAtuRW5n7LgdFwLaGfK3cWlbNxl7pA
2. https://www.youtube.com/watch?v=r9DU7yuWEao&list=PLu7-Sp50sShdDx6EVpK2yOYSWmqBJrfVH
3. https://www.youtube.com/watch?v=IoDoW5kykkw&list=PLzJaFd3A7DZsA8xZg3tgoshboIIBY98c

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
4.	Class Room Teaching & Learning	3	14	42
5.	Activity Based Learning (ABL1&ABL2)	-	-	38
6.	Evaluation of Learning Process	-	-	10
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted Activity1- Analog Circuit design and implementationon using open source Simulator (10 Marks). Activity2-Digital Circuit design and implementation using open- source Simulator (10 Marks).	20
Total		**50**

Activity Based Learning (38 Hours)

Activity 1 Details: **Following are the experiments list of analog circuit design and implementation using open-source simulator.** 1. For a mobile charger design a zener voltage regulator that takes ripple DC voltage producedby bridge rectifier circuit and delivers a DC regulated supply of 5 V, 5 mA across load resistor. 2. Construct an audio amplifier which takes 20 mV audio signal and delivers 2 V output signalto a loudspeaker inside a radio system. 3. Construct a sinusoidal wave generator circuit using crystal oscillator to generate an audiosignal frequency of 2 kHz. 4. Design an inverting amplifier to have a voltage gain of 50 and the output voltage amplitudeis to be 2.5 V. 5. A direct-coupled noninverting amplifier with a ± 25 mV input is to produce a ± 5 V output.Design the circuit with suitable resistance values. 6. Design a bridge full wave rectifier circuit to produce 12 V unregulated DC voltage using acapacitor filter used in an electric vehicle charger circuit. 7. The difference of two input signals is to be amplified by a factor of 20. Design the circuitwith suitable resistance values. 8. Design a three-input inverting summing amplifier circuit and show how it can be convertedinto an averaging circuit.	**Hours**
Total	**25**
Activity 2 Details: **Following are the experiments list of circuit design and implementation using open source simulator.** 1. Realization of Boolean expressions using basic gates. 2. Realization of half adder circuit. 3. Realization of full adder circuit. 4. Realization of 4-bit parallel adder. 5. Realization of Integrator. 6. Realization of Differentiator.	**Hours** 13
Total Learning Hours/Semester	**38**

Evaluation of Learning Process (10 Hours)

Type of Evaluation	**Hours**
Test (1,2 and 3)	3
Demonstration of activity	4
Semester End Exam	3
Total	**10**

Course Articulation Matrix

Course Outcomes	Program Outcomes											Program Specific Outcomes
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PS01**	**PSO2**
CO1	3	2										2	1
CO2	3	2			2			1				2	1
CO3	3				2			1				2	1
CO4	3	2						1				2	1

Course Title	INTRODUCTION TO MECHANICAL ENGINEERING		
Course Code	ESC514C/ 524C	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/ Week	3
SEE	50 Marks	Total Hours	48 L + 42 ABL = 90

Course Objective:To provide students with the fundamental knowledge of mechanical engineering principles and their practical applications.

Course Outcomes (COs):

COs	Outcomes	POs	PSOs
1.	explain the basic principles of energy systems,flying Machines and refrigeration	1, 2	-
2.	compare engines, power transmission systems, and modern mobility solutions	1, 2, 5	-
3.	classify and identify properties and applications of engineering, composite, and lightweight materials	1, 6, 11	-
4.	describe manufacturing processes, machine tools, modern methods, and recent advances in automation and mechatronics	1, 5, 11	-

MODULE - 1	10 Hrs.

Fundamentals of Mechanical Engineering: Streams of Mechanical Engineering and their relevance to society; Role of mechanical engineers in solving real-world problems.**Energy Conversion Systems:**Pelton turbine and Francis turbine – basic principles, schematic representation, and applications in power generation.**Flying Machines:**basic drone components, and working principle with simple examples.**Refrigeration & Air Conditioning:**working principle of vapour compression refrigeration system,working principle ofAir Conditioning and applications in domestic and industrial systems.

MODULE - 2	10 Hrs.

Engines: Introduction to petrol and diesel engines, 4-stroke working principle (No Numerical). Comparison of petrol and diesel engines.**Future Mobility:**Electric & Hybrid Vehicles – major components, advantages, limitations, and role in sustainable transport.**Power Transmission Systems:** Classification of gears, Spur gear, Helical gear, worm wheel and rack and pinion. Gear trains- simple and compound gear trains (No Numerical).

MODULE - 3	10 Hrs.

Engineering Materials: Classification, Ferrous metals (cast iron, mild steel) and Non-ferrous metals (aluminium, copper) – basic properties and common engineering applications.Materials behaviour-stress strain curve for ductile material.

Composite Materials: Constituents, classification, matrix & reinforcement,applications.**Lightweight Materials for Automotive & Aerospace:**Metal matrix composites, Polymer matrix composites, Ceramic matrix composites-Advantages and applications.

MODULE - 4	10 Hrs.

Manufacturing Processes: Welding (arc and gas welding), soldering, brazing – principles & applications.**Machine Tools:** Lathe (Facing& Taper turning) drilling (counter boring & reaming), milling (Up milling & down milling) – basic operations.**Modern Processes:** CNC – components, advantages, applications; Steps involved in Additive Manufacturing (3D printing).**Advances in Manufacturing Processes:** Automation –types, Mechatronics – open loop and closed loop; – working principles and applications.

Prescribed Textbooks:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Elements of Mechanical Engineering	K R Gopalakrishna, SudhirGopalakrishna, S C Sharma	36th	Subhas Stores	2016
2.	An Introduction to Mechanical Engineering	Jonathan Wickertand Kemper Lewis	3rd	Cengage Learning	2012

Reference Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Manufacturing Technology-Foundry, Forming and Welding	PNRao	3rd	Tata McGraw Hill	2003
2.	Materials Science & Engineering, An Introduction	William D Callister		John Wiley & Sons Inc	2010
3.	Internal Combustion Engines	V Ganesan	4th	Tata McGraw Hill Education	2017
4.	Introduction to Robotics	S K Saha	3rd	McGraw Hill	2024
5.	Introduction to Mechatronics	K KAppukuttan	1st	Oxford University Press	2007
6.	Automation, production systems, and computer integrated manufacturing	Groover M P	3rd	Prentice Hall	2008

E-Books and online course materials:

1. https://books.google.com.et/books?id=CtT0fzwkMvUC&printsec=frontcover#v=onepage&q&f=false
2. https://ftp.idu.ac.id/wp-content/uploads/ebook/tdg/DESIGN%20SISTEM%20DAYA%20GERAK/An%20Introduction%20to%20Mechanical%20Engineering.pdf

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc25_me09/preview
2. https://onlinecourses.swayam2.ac.in/nou24_ec10/preview
3. https://nptel.ac.in/courses/112105212
4. https://nptel.ac.in/courses/107106090
5. https://nptel.ac.in/courses/112104526
6. https://nptel.ac.in/courses/112104616
7. https://nptel.ac.in/courses/112104769

Teaching -Learning- Evaluation Scheme:

Sl. No.	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching &Learning	3	14	42
2.	Activity-Based Learning (ABL1 & ABL2)	-	-	41
3.	Evaluation of Learning Process	-	-	07
			Total Learning Hours/Semester	**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1. ABL1 - Industrial/ Laboratory Visit with Reflective Report & Presentation 2. ABL2 - Poster/ Model/ Infographic Presentation with Demonstration & Peer Review	20
	Total	**50**

Activity-Based Learning (41 Hours)

ABL1 (20 Hours): Industrial/ Laboratory Visit	Hours
Consent and preparation for visit (briefing and instruction)	1
Visit to industry/ lab	6
Interaction and observations at the industry/ lab	3
Preparation of report (formatting, content writing, editing)	6
Report presentation and discussion	4
Total	**20**

ABL2 (21 Hours): Poster/ Model/ Infographic Presentation	Hours
Topic selection, literature review, and material collection	4
Design and development of a poster or a working model	8
Practice and preparation for the presentation	4
Final presentation or demonstration with Q&A	3
Feedback, peer discussion, and reflection	2
Total	**21**

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Description	Hours
Continuous Internal Evaluation (CIE-1, CIE-2, CIE-3)	Descriptive tests (Syllabus to be decided by the course coordinators, such that all the COs shall be covered)	3 hrs
Activity Evaluation	Assessment of ABL components through demonstration, mini-reports, and participation	1 hr
Semester End Examination (SEE)	Final exam (descriptive, 3 hours)	3 hrs
	Total	**7 hrs**

COURSE ARTICULATION MATRIX

Course Outcomes	`Program Outcomes (POs)												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	2	-	-	-	-	2	-	-
CO4	3	-	-	-	3	-	-	-	-	-	2	-	-

CourseTitle	ESSENTIALS OF INFORMATION TECHNOLOGY		
CourseCode	ESC514E	(L-T-P)C	(3-0-0)3
Exam Hrs.	3	Hours/Week	3
SEE	50Marks	Total Hours	40

CourseObjective: To introduce the concepts of IT to all undergraduate students

CourseOutcomes(COs):Uponcompletionofthecourse,studentsshallbe able to:

#	CourseOutcomes	Mapping to POs
1.	Describe various information representation and manipulation schemes	1
2.	Make use of Information Technology (IT) infrastructure for information exchange and web pages	3
3.	Apply basic software engineering concepts for application development.	3,5
4.	Identify the role of cybersecurity and ethical issues in Information Technology (IT).	1

CourseContents:

MODULE–1	12Hrs

Data Storage: Bits and Their Storage, Main Memory, Mass Storage, Representing Information as Bit Patterns, The Binary System, Storing Integers, Storing Fractions.

Data Manipulation: Computer Architecture, Machine Language, Program Execution, Arithmetic/Logic Instructions, Communicating with Other Devices

Database Systems: Database Fundamentals, The Relational Model

MODULE–2	10Hrs

Operating Systems: The History of Operating Systems, Operating System Architecture, Coordinating the Machine's Activities, Handling Competition Among Processes, Security.

Algorithms: The Concept of an Algorithm, Algorithm Representation, Algorithm Discovery.

Networking and the Internet: Network Fundamentals, The Internet, The World Wide Web, Internet Protocols, Security

MODULE–3	10Hrs

Cybersecurity: Overview—What is Cybersecurity? Brief History of Cybersecurity Events, The Basic Information Security Model, Cyber Hygiene, Teams in Cybersecurity.

Ethical Issues in Information Technology: Overview, Ownership Rules, Ethics and Online Content

Software Engineering: The Software Engineering Discipline, The Software Life Cycle, Software Engineering Methodologies, Modularity, Tools of the Trade.

MODULE–4	10Hrs

Introduction to HTML and Website Development: What is HTML?, Cascading Style Sheets (CSS), WebsiteDesign and Storyboarding, Structure of a Website.

Computer Graphics: The Scope of Computer Graphics, Overview of 3D Graphics, Modeling, Rendering.

PrescribedText Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Computer Science: An Overview	J. Glenn Brookshear and Dennis Brylow	Second Edition	Pearson Education	2017
2	Fundamentals of Information Technology	Roy, Shambhavi; Daniel, Clinton; and Agrawal, Manish	-	Digital Commons at The University of South Florida	2023

Textbook 1: Chapter-1 (1.1-1.7), Chapter-2 (2.1-2.5) ,Chapter-3, Chapter-4,Chapter-5 (5.1-5.3) Chapter-9 (9.1-9.2), Chapter-10 (10.1-10.4)
Textbook 2: Chapter-12, Chapter-16, Chapter-17

ReferenceBooks:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	"Introduction to Information Technology"	V. Rajaraman,	Third Edition,	PHI Learning,	2018
2	Information Technology in Theory,	Pelin Aksoy,	First Edition,	Cengage	-

EBooksandonlinecourse materials:

1.Fundamentals of Information Technology

OnlineCoursesandVideoLectures:

1.Information Technology: https://onlinecourses.swayam2.ac.in/cec20_cs05/preview

2.Computer Organization and Architecture: https://nptel.ac.in/courses/106103068

3.Introduction To Internet: https://nptel.ac.in/courses/106105084

ProposedAssessmentPlan(for50marksof CIE):

Tool		Remarks	Marks
CIE	CIE1	Conductedfor20marks&reducedto10 marks	10
	CIE2	Conductedfor20marks&reducedto10 marks	10
	CIE3	Conductedfor20marks&reducedto10 marks	10
ActivityDetails		Practical Assessment	20
Total			50

Teaching-Learning–Evaluation Scheme				
Sl. No	Teaching-LearningMethod	No.of Hours/ Week	No.ofWeeks	Hours/ Semester
1	ClassRoom Teaching	3	14	42
3	ActivityBased Learning	3	12	36
4	Evaluation of LearningProcess			12
TotalLearningHours/Semester				90

Activity Based Learning:	**Hours / Semester 36**

Activity/Assessment

1. Create files of specific types, changing file properties & permissions, search files based on criteria. Creating hierarchy of folders, folder paths, changing folder properties and related operations on folders. File compressions, file backup and cloud-based file management.
2. Create word file with suitable content and performs various operations related to document Revision, Proofreading and references (As listed in the Textbook).
3. Locate the templates available for a word processing application that you have access to. Search the templates for a "Resume." Review the "Resume" template of your choice. Identify all the word processing features used in the "Resume" template. Use the "Resume" template to create your own resume. As you fill out the template, be sure to use the application to check your spelling and grammar. Verify the print layout of your resume. Save the resume and print a copy.
4. Consider the following data: Student First Name, Student Last Name, Student Age, Student Grade, Student School, Telephone Number, Sport (Volleyball, Basketball, Softball, Baseball, Soccer, or Football). Considering the data required in the list above, create a spreadsheet in a spreadsheet application you have access to. Add at least 10 rows of data to your spreadsheet. Once you add all the data to the spreadsheet, what is the average age for all the students? What formula did you use to calculate the average age?
5. Add a chart to the above spreadsheet that illustrates the total number of students for each sport. Which sport has the highest number of students? What formula did you use to count the total number of students for each sport?
6. Use the above spreadsheet to Analyzing and Organizing Data with suitable filters, sorting, conditional formatting and pivot tables.
7. Create a presentation (power point) using a presentation application you have access to that meets the requirements of marketing of brand-new product. Apply a theme, background, and professional layout for chosen product.
8. Create a Web page with basic HTML elements (tags). Insert lists, images, drop down lists and tables.
9. Create a Personal Website and host it on a free cloud-based Web hosting. Personal Web site should cover your complete biodata and your social activities.
10. Create a relational database model (MS Access or any other) for storing information about courses taken by students. Develop suitable queries to insert data onto tables, update fields, delete rows and query relevant information from the database model

CourseArticulationmatrix:

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

Course Title	Introduction to AI and its use cases for Civil Engineering		
Course Code	ETC515K/525K	**(L-T-P) C**	(3-0-0)3
Exam	3 Hrs	**Hours/Week**	3
SEE	100 Marks	**Total Hours**	42L+48ABL=90

Course Objective:

1. Explain AI concepts, machine learning models, and prompt engineering basics.

2. Apply AI methods (regression, classification, and clustering, neural networks) to civil engineering datasets.

3. Identify and analyze real-world AI applications in construction, transportation, water resources, and environmental engineering.

4. Discuss recent AI trends, ethical concerns, and emerging opportunities in civil infrastructure development.

Course Outcomes:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the fundamental concepts of AI, types of intelligence, search methods and knowledge representation with relevance to civil engineering systems.	PO1, PO2	
2	Demonstrate prompt engineering techniques and generative AI tools for solving and documenting civil engineering tasks such as DPRs and sustainable design brainstorming.	PO1, PO6	
3	Apply regression, classification, clustering, and advanced ML models to transportation, structural and water resource datasets in civil engineering.	PO1, PO6	
4	Apply AI-driven applications, robotics, and IoT in smart infrastructure, sustainable development, and civil project management.	PO7, PO8	

MODULE-1	11 Hrs.
Introduction on Foundations of AI for Civil Engineering: Artificial Intelligence Overview: History, advantages/disadvantages, types (Weak AI, Strong AI, Reactive, Limited Memory, Selfaware). **Human vs Machine Intelligence:** Defining intelligence, components, agents, and environments with traffic signal systems, water networks. **Search & Knowledge Representation:** Uninformed and informed search (best-first, greedy), knowledge-based systems (applications in building codes and design standards). **Self-study component**: Mini-report: "How AI can improve flood evacuation planning in cities."	
MODULE-2	**11 Hrs.**
Introduction on Prompt Engineering and Generative AI in Civil Engineering: Prompt Engineering Basics: Evolution, types of prompts, advantages in engineering communication. **Prompting Techniques:** Zero-shot, one-shot, few-shot, chain-of-thought, role-based prompting. **Applications**: Writing technical reports, environmental impact assessments, DPRs, sustainable design brainstorming. **Self-study component:** Prompts for concrete mix optimization, water cycle explanation, and structural design alternatives.	
MODULE-3	**10 Hrs.**
Introduction on Machine Learning for Civil Data Analysis: Regression: Predicting concrete strength, traffic growth, water demand, **Classification:** Soil type classification, flood risk prediction, Clustering: Rainfall pattern grouping, accident hotspot identification, **Advanced ML Techniques (Introduction):** Naive Bayes, Neural Networks, SVM — applied to structural health monitoring, pavement distress detection. **Self-study component:** Collect rainfall/temperature data for your city and apply regression in Excel/Python.	
MODULE-4	**12 Hrs.**
Introduction on Trends, Robotics, and Applications in Civil Infrastructure: Trends in AI: Ethical concerns, AI as a Service (AIaaS), Expert systems, IoT & AIoT for smart cities, **Robotics & Automation**: Drones in surveying, AI robotics in construction, **Applications in Civil Infrastructure: Transportation**: traffic flow prediction, signal optimization, **Water Resources**: leakage detection, water quality forecasting, **Environment**: pollution monitoring, STP optimization. **Self-study component:** Prepare a porton "Drone-based AI applications in highway construction."	

Prescribed Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence Applications in Civil Engineering	Satish Chander	–	Springer	2020
2	Neural Networks, Fuzzy Logic and Genetic Algorithms	S. Rajasekaran & G.A. Vijayalakshmi Pai	–	PHI Learning	2017
3	Artificial Intelligence: Beyond Classical AI	Reema Thareja	–	Pearson Education	2021
4	Prompt Engineering: Empowering Communication	Ajantha Devi Vairamani & Anand Nayyar	–	CRC Press, Taylor & Francis Group	2024

Reference Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence: A Modern Approach	Stuart Russell & Peter Norvig	4th Edition	Pearson	2021
2	Artificial Intelligence	Elaine Rich, Kevin Knight & Shivashankar B. Nair	3rd Edition	McGraw-Hill	2019
3	Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond	Tom Taulli	–	Apress, Springer	2023
4	Engineering Optimization: Theory and Practice	S.S. Rao	5th Edition	Wiley	2019

5	Recent Research Papers on AI in Civil Engineering Domains (Transportation, Construction, Water Resources, Environmental Engineering)	Various (IEEE/Elsevier)	–	IEEE / Elsevier	2019–2025

E-Books and online course materials:

1. NPTEL / SWAYAM: Artificial Intelligence for Engineers, Machine Learning Foundations.

2. MOOCs:

- AI for Everyone (AndrewNg).
- Machine Learning (Stanford University–Andrew Ng).
- Generative AI for Everyone.

3. Data & Case Study Platforms:

- Kaggle–Civil Engineering datasets (Concrete strength, traffic, water quality).
- ASCE Journal of Computing in Civil Engineering (Case studies on AI in infrastructure)

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1. Assignment 2. Regular short quizzes conducted for each module for understanding of the most recent concepts.	20
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (14 Hours): Activity 1 Details		**Hours**
1.	Field Visit	8
2	Report	6
Total		**14**
ABL2 (13 Hours): Activity 2 Details		**Hours**
1	1. Presentation	3
	2.Assignment	10
Total		**13**

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Quiz	1
Semester End Exam	3
Total	**7**

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

CourseTitle	INTRODUCTION TO AI AND ITS USE CASES		
CourseCode	ETC525L	(L-T-P)C	(3-0-0)3
Exam	03 Hours	Hours/Week	03
SEE	50 Marks	TotalHours	90

Course Objective: To explore the applications of AI in real world

Course Outcomes: UponCompletionofthecourse,students shallbe ableto:

#	Course Outcomes	Mapping to PO's
1.	Explain the concepts and types of artificial intelligence.	1
2.	Illustratebasicmachinelearningmethodsforregression,classificationandclustering.	3
3.	InteractwithgenerativeAItools usingpromptengineeringtechniques	5
4.	Describe recent trends in artificial intelligence and machine learning	1

MODULE-1 **10Hrs.**

Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Is Artificial Intelligence Same as Augmented Intelligence and Cognitive Computing, Machine Learning and Deep Learning.

Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms (only fundamentals)

MODULE-2 **10Hrs.**

Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.

Introduction to Prompt Engineering: Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work, Comprehending Prompt Engineering's Function in Communication, The Advantages of Prompt Engineering, The Future of LLM Communication.

Prompt Engineering Techniques for ChatGPT: Introduction to Prompt Engineering Techniques, Instructions Prompt Technique, Zero, One, and Few Shot Prompting, Self-Consistency Prompt.

MODULE-3 **10Hrs.**

Machine Learning: Introduction, Evolution, Need, Applications in Industry and Real World, Types of ML (Supervised, Unsupervised and Reinforcement), Case Studies.

MODULE-4 **10Hrs.**

Trends and Applications of AI: AI and Ethical Concerns, AI as a Service (AIaaS), Internet of Things, Artificial Intelligence of Things (AIoT), Robotics using AI, Drones using AI, AI in Healthcare, AI in Finance, AI in Agriculture, AI in Transportation.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	ArtificialIntelligence:BeyondClassicalAI	ReemaThareja		PearsonEducation,	2023
2	PromptEngineering:EmpoweringCommunication	AjanthaDeviVairamaniandAnandNayyar	1st	CRC Press, Taylor & Francis Group	2024

3	AI for Everyone – A Beginner's Handbook for Artificial Intelligence"	SaptarsiGoswami, Amit Kumar Das and Amlan Chakrabarti		Pearson	2024

Reference Books:

SN	BookTitle	Authors	Edition	Publisher	Year
1	ArtificialIntelligence:AModernApproach,	Stuart Russell and Peter Norvig	4th	Pearson Education	2023
2	ArtificialIntelligence	Elaine Rich, Kevin Knight, and Shivashankar B. Nair		McGraw Hill Education	
3	PromptEngineeringforGenerativeAI:ChatGPT,LLMs,andBeyond,Apress,	Tom Taulli		Springer Nature	
4	Artificial Intelligence: Making A System Intelligent,	Nilakshi Jain	1st	Wiley	

Online Courses and Video Lectures:

1. ElementsofAI–*https://www.elementsofai.com*
2. CS50'sIntroductiontoArtificialIntelligencewithPython–Harvard *https://cs50.harvard.edu/ai/*
3. GoogleMachineLearningCrashCourse–*https://developers.google.com/machine-learning/crash-course*
4. LearnPrompting(Open-SourceGuide)–*https://learnprompting.org*
5. GoogleAI–LearnwithGoogleAI*https://ai.google/education/*
6. Coursera–MachineLearningbyAndrewNg(StanfordUniversity) *https://www.coursera.org/learn/machine-learning*
7. OpenAIPromptEngineeringGuide(forChatGPT) *https://platform.openai.com/docs/guides/gpt-best-practices*
8. PromptEngineeringforDevelopers–DeepLearning.AI+OpenAI *https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/*
9. EthicsinAI–GoogleResponsibleAIPractices *https://ai.google/responsibilities/responsible-ai-practices/*
10. GoogleTeachableMachine(TrainAImodelsvisuallywithoutcode) https://teachablemachine.withgoogle.com

ProposedAssessmentPlan(for50marksof CIE):

Tool		Remarks	Marks
CIE	CIE1	Conductedfor20marks&reducedto10 marks	10
	CIE2	Conductedfor20marks&reducedto10 marks	10
	CIE3	Conductedfor20marks&reducedto10 marks	10
ActivityDetails		Practical Assessment	20
Total			50
Teaching-Learning–Evaluation Scheme			

Sl. No	Teaching-LearningMethod	No.of Hours/ Week	No.ofWeeks	Hours/ Semester
1	ClassRoom Teaching	3	14	42
3	ActivityBased Learning	3	12	36
4	Evaluation of LearningProcess			12
TotalLearningHours/Semester				**90**

Activity Based Learning:	**Hours / Semester 36**

1. **Spam Email Detector:** The Spam Email Detector is one of the earliest and most practical AI applications. This project involves training a machine learning model to classify emails as spam or legitimate.
2. **Sentiment Analysis of Product Reviews:** This project focuses on analyzing text data from platforms like Twitter, Facebook, or Instagram to determine the sentiment behind posts. By classifying content as positive, negative, or neutral, organizations can better understand public opinion, monitor brand health, and respond quickly to trends.
3. **Chatbot for Customer Service:**Chatbots are everywhere today, from e-commerce websites to banking apps. This project involves creating an AI-powered conversational agent that can answer FAQs, resolve simple queries, or even process transactions.
4. **Stock Price Prediction:**Financial forecasting is one of the most widely recognized applications of AI. In this project, you'll explore Stock Price Prediction by analyzing historical market data to anticipate future price movements.
5. **Language Translation Model:**A Language Translation Model project aims to build an AI system capable of translating text from one language to another. To tackle this challenge, beginners can explore sequence-to-sequence models and attention mechanisms, gaining exposure to natural language processing and machine translation techniques

Course Articulation Matrix

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

Course Title	INTRODUCTION TO AI AND ITS USE CASES (EEE)		
Course Code	ETC515M	(L-T-P) C	(3-0-0)3
CIE	50	Hours/Week	3
SEE	50	Total Hours	40

Course Objective: To understand the basics, techniques, and applications of Artificial Intelligence and its impact in electrical engineering.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Explain the concepts and types of artificial intelligence.	1, 2	1
2	Make use of prompt engineering techniques to interact with generative AI tools.	1, 2	1
3	Illustrate basic machine learning methods for regression, classification and clustering	1, 2	1
4	Identify real-world AI applications in electrical engineering.	1, 2	1

MODULE – 1 — 10 Hrs.

Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work?, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Is Artificial Intelligence Same as Augmented Intelligence and Cognitive Computing, Machine Learning and Deep Learning.

Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search).

Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.

Textbook 1: Chapter 1 (1.1-1.5), Chapter 3 (3.1-3.7.2), Chapter 4 (4.1-4.4)

MODULE – 2 — 10 Hrs.

Introduction to Prompt Engineering, Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work?, Comprehending Prompt Engineering's Function in Communication, The Advantages of Prompt Engineering, The Future of LLM Communication.

Textbook 2: Chapters 1, 3, 4 & 5

Machine Learning: Techniques in AI, Machine Learning Model, Regression Analysis in Machine Learning, Classification Techniques, Clustering Techniques, Naïve Bayes Classification, Neural Network, Support Vector Machine (SVM).

Textbook 1: Chapter 2 (2.1-2.8)

MODULE – 3 — 10 Hrs.

Trends in AI: AI and Ethical Concerns, AI as a Service (AIaaS), Recent trends in AI, Expert System, Internet of Things, Artificial Intelligence of Things (AIoT).

Textbook 1: Chapter 8 (8.1, 8.2, 8.4), Chapter 9 (9.1- 9.3)

MODULE - 4 — 10 Hrs

Applications of AI Techniques: Load flow studies, Economic load dispatch, Load frequency control – Single area system and two area system, Small Signal Stability, speed control of DC and AC Motors.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence: Beyond Classical AI	Reema Thareja	-	Pearson Education	2023
2	Prompt Engineering: Empowering Communication	Ajantha Devi Vairamani and Anand Nayyar,	1st	CRC Press, Taylor & Francis Group	2024
3	AI for Everyone – A Beginner's Handbook for Artificial Intelligence	Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti	-	Pearson	2024

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year

1	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig	4th	Pearson Education	2023
2	Artificial Intelligence	Elaine Rich, Kevin Knight, and Shivashankar B. Nair	-	McGraw Hill Education	-
3	Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond	Tom Taulli	-	Apress, Springer Nature	-
4	Artificial Intelligence: Making A System Intelligent	Nilakshi Jain	1st	Wiley	-

E Books and online course materials:

1. https://people.engr.tamu.edu/guni/csce642/files/AI_Russell_Norvig.pdf

Online Courses and Video Lectures:

1. Elements of AI – *https://www.elementsofai.com*
2. CS50's Introduction to Artificial Intelligence with Python – Harvard *https://cs50.harvard.edu/ai/*
3. Google Machine Learning Crash Course – *https://developers.google.com/machine-learning/crash-course*
4. Learn Prompting (Open-Source Guide) – *https://learnprompting.org*
5. Google AI – Learn with Google AI *https://ai.google/education/*
6. Coursera – Machine Learning by Andrew Ng (Stanford University) *https://www.coursera.org/learn/machine-learning*
7. OpenAI Prompt Engineering Guide (for ChatGPT) *https://platform.openai.com/docs/guides/gpt-best-practices*
8. Prompt Engineering for Developers – DeepLearning.AI + OpenAI *https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/*
9. Ethics in AI – Google Responsible AI Practices *https://ai.google/responsibilities/responsible-ai-practices/*
10. Google Teachable Machine (Train AI models visually without code) https://teachablemachine.withgoogle.com

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1(Modelling of two and Three way control of lamps) 2) Details of activity 2 (Demonstration of different types of wires used)	20
Total		**50**

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2											3	
CO2	3	2											3	
CO3	3	3											3	
CO4	3	2											2	

Introduction to AI and Applications			Semester	I/II
Course Code	**ETC515N/ ETC525N**	**(L-T-P) C**	**(3-0-0)3**	
Exam	**3hrs**	**Hours/Week**	**3**	
SEE	**50**	**Total Hours**	**42L+38ABL=90**	

Course outcome (Course Skill Set)

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Explain the concepts and types of artificial intelligence.	1,2, 8, 9, 11	-
2	Illustrate basic machine learning methods for regression, classification and clustering	1,8, 11	-
3	Identify real-world applications across different disciplines.	1,3, 11	-
4	Outline recent trends in artificial intelligence and machine learning.	1,3, 7, 11	-

MODULE-1 **11Hrs.**

Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work?, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Machine Learning and Deep Learning.

Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.

Textbook 1: Chapter 1 (1.1-1.5), Chapter 4 (4.1-4.4)

MODULE-2 **11Hrs.**

Machine Learning: Techniques in AI, Machine Learning Model – Types of ML: Supervised, Unsupervised, Semi-Supervised and Reinforcement Learning with example, Comparison b/w ML & DL, Neural Network, Support Vector Machine (SVM)- Example.

Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Depth-First Search Algorithm (Greedy Search).

Textbook 1: Chapter 2 (2.1-2.8), Chapter 3 (3.1-3.7.2)

MODULE-3 **10Hrs.**

Trends in AI: AI and Ethical Concerns, AI as a Service (AIaaS), Recent trends in AI – Collaborative Systems, Expert System – Working of an Expert System with Examples, Characteristics & Components of an Expert Systems, Internet of Things – Examples, Sensors, Artificial Intelligence of Things (AIoT) – Applications & Examples of AIoT.

Textbook 1: Chapter 8 (8.1, 8.2, 8.4.1, 8.4.2), Chapter 9 (9.1- 9.3)

MODULE-4 **10Hrs**

Robotics – Artificially Intelligent Robots, Characteristics of Robots, Types of Robots, Components of Robot, Drones Using AI, No Code AI, Low Code AI.

Textbook 1: Chapter 8 (8.3), Chapter 1 (1.8, 1.10, 1.11)

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence: Beyond Classical AI	ReemaThareja	-	Pearson Education	2023
2	AI for Everyone – A Beginner's Handbook for Artificial	SaptarsiGoswami, Amit Kumar Das and AmlanChakrabarti	-	Pearson	2024

	Intelligence				

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig	4th	Pearson Education	2023
2.	Artificial Intelligence	Elaine Rich, Kevin Knight, and Shivashankar B. Nair	-	McGraw Hill Education.	-
3.	Artificial Intelligence: Making A System Intelligent	Nilakshi Jain	1st	Wiley	-

Web Links and Video Lectures (e-Resources):

1. Elements of AI – https://www.elementsofai.com
2. CS50's Introduction to Artificial Intelligence with Python – Harvard https://cs50.harvard.edu/ai/
3. Google Machine Learning Crash Course – https://developers.google.com/machine-learning/crash-course
4. Google AI – Learn with Google AI https://ai.google/education/
5. Coursera – Machine Learning by Andrew Ng (Stanford University) https://www.coursera.org/learn/machine-learning
6. Ethics in AI – Google Responsible AI Practices https://ai.google/responsibilities/responsible-ai-practices/
7. Google Teachable Machine (Train AI models visually without code)https://teachablemachine.withgoogle.com

Teaching-Learning–Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Activity Based Learning (ABL1&ABL2)	-	-	38
3.	Evaluation of Learning Process	-	-	10
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks	Hours
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30	2
Activity Details	Details of activities to be conducted 1) Conduction of in class Essay/Debate with topics related to AI in the fields of Ethics and Society, jobs and the economy, education and learning, creativity and Identity, rights and personhood. Proper rubrics to be set by faculty for evaluation. 2) Group activity: a)Build a simple chatbot to serve specific application using any AI tools like Dialogflow or Scratch Extension b) Development and demonstration of image classifier using google's teachable machine. c)Creating a emoji translator using any AI tool which converts text to emoji's using natural language processing.	20	38
Total		**50**	

Course Articulation Matrix

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

Course Title	Introduction to AI and Applications		
Course Code	ETC515N	(L-T-P) C	(3-0-0)3
Exam	03 Hours	Hours/Week	03
SEE	50 Marks	Total Hours	90

Course Objective: To explore the applications of AI in real world

Course Outcomes: Upon Completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's
1.	Describe the concepts of artificial intelligence.	1
2.	Elucidate recent trends in artificial intelligence and machine learning	1
3.	Illustrate basic machine learning methods for regression, classification and clustering	3
4.	Interact with generative AI tools using prompt engineering techniques	5

MODULE-1 **12 Hrs.**

Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work?, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Is Artificial Intelligence Same as Augmented Intelligence and Cognitive Computing, Machine Learning and Deep Learning.

Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search).

Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.

MODULE-2 **10 Hrs.**

Machine Learning: Techniques in AI, Machine Learning Model, Regression Analysis in Machine Learning, Classification Techniques, Clustering Techniques, Naïve Bayes Classification, Neural Network, Support Vector Machine (SVM).

Trends in AI: AI and Ethical Concerns, AI as a Service (AIaaS), Recent trends in AI, Expert System, Internet of Things, Artificial Intelligence of Things (AIoT), Robotics, Robotics-an Application of AI, Drones Using AI, No Code AI, Low Code AI.

MODULE-3 **10 Hrs.**

Introduction to Prompt Engineering, Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work?, Comprehending Prompt Engineering's Function in Communication, The Advantages of Prompt Engineering, The Future of LLM Communication

Prompt Engineering Techniques for ChatGPT, Introduction to Prompt Engineering Techniques, Instructions Prompt Technique, Zero, One, and Few Shot Prompting, Self-Consistency Prompt.

Prompts for Creative Thinking: Introduction, Unlocking Imagination and Innovation.

Prompts for Effective Writing: Introduction, Igniting the Writing Process with Prompts.

MODULE-4 **10 Hrs.**

Industrial Applications of AI: Application of AI in Healthcare, Application of AI in Finance, Application of AI in Retail, Application of AI in Agriculture, Application of AI in Education, Application of AI in Transportation, AI in Experimentation and Multi-disciplinary research.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Artificial Intelligence: Beyond Classical AI	Reema Thareja		Pearson Education,	2023
2	Prompt Engineering: Empowering Communication	Ajantha Devi Vairamani and Anand Nayyar	1st	CRC Press, Taylor & Francis Group	2024
3	AI for Everyone – A Beginner's Handbook for Artificial Intelligence"	Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti		Pearson	2024

Textbook 1: Chapter 1 (1.1-1.5, 1.7, 1.8, 1.10, 1.11), Chapter 2 (2.1-2.8), Chapter 3 (3.1-3.7.2), Chapter 4 (4.1-4.4), Chapter 8 (8.1, 8.2, 8.3,8.4), Chapter 9 (9.1- 9.3)

Textbook 2: Chapters 1 , 3, 4 & 5

Textbook 3: Chapter 3, Chapter 5 (5.1)

Reference Books:

SN	BookTitle	Authors	Edition	Publisher	Year
1	Artificial Intelligence: A Modern Approach,	Stuart Russell and Peter Norvig	4th	Pearson Education	2023
2	Artificial Intelligence	Elaine Rich, Kevin Knight, and Shivashankar B. Nair		McGraw Hill Education	
3	Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond, Apress,	Tom Taulli		Springer Nature	
4	Artificial Intelligence: Making A System Intelligent,	Nilakshi Jain	1st	Wiley	

Online Courses and Video Lectures:

1. Elements of AI – *https://www.elementsofai.com*
2. CS50's Introduction to Artificial Intelligence with Python – Harvard *https://cs50.harvard.edu/ai/*
3. Google Machine Learning Crash Course – *https://developers.google.com/machine-learning/crash-course*
4. Learn Prompting (Open-Source Guide) – *https://learnprompting.org*
5. Google AI – Learn with Google AI *https://ai.google/education/*
6. Coursera – Machine Learning by Andrew Ng (Stanford University) *https://www.coursera.org/learn/machine-learning*
7. OpenAI Prompt Engineering Guide (for ChatGPT) *https://platform.openai.com/docs/guides/gpt-best-practices*
8. Prompt Engineering for Developers – DeepLearning.AI + OpenAI *https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/*
9. Ethics in AI – Google Responsible AI Practices *https://ai.google/responsibilities/responsible-ai-practices/*
10. Google Teachable Machine (Train AI models visually without code)

https://teachablemachine.withgoogle.com

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks & scaled to 10 marks	10
	CIE2	Conducted for 20 marks & scaled to 10 marks	10
	CIE3	Conducted for 20 marks & scaled to 10 marks	10
Activity Details		Practical Assessment	20
Total			**50**

Teaching - Learning – Evaluation Scheme				
Sl. No	**Teaching - Learning Method**	**No. of Hours/ Week**	**No. of Weeks**	**Hours/ Semester**
1	Class Room Teaching	3	14	42
3	Activity Based Learning	3	12	36
4	Evaluation of Learning Process			12
Total Learning Hours / Semester				**90**

Activity Based Learning:	**Hours / Semester 36**

1 Basic Prompt writing: Create two different prompts to ask an AI about the topic "Electricity." The first prompt should be vague, and the second prompt should be clear and specific. Compare the responses you get and describe which prompt gave a better answer and why.

2 Zero-Shot Prompting: Create a prompt that asks an AI to explain Ohm's Law without giving any example or background. Evaluate how well the AI explains the concept based on your prompt alone.

3 One-Shot and Few-Shot Prompting: Provide the AI with a single example of how to calculate the resistance in a simple circuit. Then write your own prompt asking the AI to solve a similar resistance calculation. After that, add two more examples to your prompt and observe any changes in the AI's response quality.

4 Chain-of-Thought Prompting: Develop a prompt that guides the AI step-by-step through calculating current flow in a circuit using Ohm's Law with resistors in series. Then, ask a final question for the AI to solve. Analyze how breaking down the reasoning steps impacts the accuracy of the answer.

5 Prompt Refinement: Start with an ambiguous prompt related to the "Water Cycle." Test the AI's response, note the confusion or errors, and then refine your prompt to make it clearer and more specific. Repeat this process twice and record how the AI's responses improve with each refinement. Role-Based Prompting: Create three prompts asking the AI to explain "Newton's Laws of Motion," each with a different role instruction: (a) as an expert engineer, (b) as a high school teacher, (c) as a beginner. Compare the tone, detail, and style of the responses.

6 Creative Engineering Problem Prompts: Craft a prompt that asks the AI to brainstorm ideas for designing a low-cost water purification system suitable for rural areas. Encourage creativity by adding phrases like "limited resources" and "sustainability"

7 Ethical Prompt Design Discussion: Identify a biased prompt related to job descriptions (e.g. language with respect to a gender). Rewrite the prompt to remove bias and create a neutral, inclusive version. Explain why this revision is more ethical.

8 Simulated Customer Support Chatbot: Develop a prompt that instructs the AI to play the role of a technical support agent helping a customer troubleshoot a failure in an electronic circuit. Include instructions to keep the tone friendly and professional and to ask diagnostic questions.

9 Multi-Language Prompting: Develop a prompt that asks the AI to translate a simple engineering glossary (5 technical terms) from English to your native language. Then modify the prompt to request additional explanations of these terms in the translated language.

10 Review a curated set of different prompt types (e.g., for summarization, information extraction, paraphrasing, question answering) from a "Prompt Gallery." For each prompt type, match it with a realworld task (e.g., summarizing a lecture note, extracting names from a project report). Test at least three prompt templates on an AI tool or by role-play (students simulate being the AI), with varied wording. Record the outcomes and discuss which prompt (or template) was most effective for each task, and explain why you think it worked best. Reflect on how changing small parts of a prompt can alter model response quality, completeness, or accuracy.

11 Choose a real engineering challenge or societal problem relevant to your field (e.g., "Reducing plastic waste in campus cafeterias" or "Optimizing solar panel placement on campus rooftops"). Draft an initial prompt that asks an AI to propose practical solutions. Share the AI's (or peer's) answer in small groups and identify aspects that are missing, vague, or not actionable. Refine your prompt based on feedback (e.g., specify constraints, ask for step-by-step solutions, or require a list of pros and cons). Repeat the process one more time, refining again for further clarity or specificity. Document the entire prompt-refinement process and share the best solution generated, along with a brief analysis of how prompt improvements led to better responses

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-

MALNAD COLLEGE OF ENGINEERING, HASSAN

DEPARTEMENT OF MECHANICAL ENGINEERING

Course Title	**INNOVATION & DESIGN THINKING**		
Course Code	**IDT518**	**(L-T-P) C**	(1-0-0)1
SEE duration	2 hours	**Hours / Week**	02
CIE marks	50	**Total Marks**	100
SEE marks	50	**Total hours**	**14L+14ABL+2ELP=30**

Course Objective:

The objective of this course is to make students choose real life problems and generate innovative ideas to solve them through design thinking approach.

Course Outcomes (COs) {with mapping shown against the **Program Outcomes (POs)}Upon completion of the course, students shall be able to:**

Sl. No.	Course outcomes	Mapping to POs
1.	explain the different stages in design thinking	1, 6, 7
2.	generate solutions to real life problems by applying the design thinking approach	1, 2, 10, 12

Course Contents:

MODULE –1	**5 Hrs.**

Introduction: Innovation, Design, Early man as a designer, Design thinking levels: Component or product level, System or community level. **Morphology of Design:** Divergence or Explorative phase, Transformation or Creative phase, Convergence phase. Sustainable Development Goals.

MODULE –2	**5 Hrs.**

Fundamentals of Design Thinking: Design Thinking Process: Different Phases. Empathize: Observation,Interview, Literature Survey. Define/Analyze:5 Why's technique, Conflict Analysis.

MODULE –3	**5 Hrs.**

Ideate: Eskimo nine dot problem,Theory of Inventive Problem Solving (TRIZ method), Brain storming. **Prototype:** Methods of Prototyping. **Testing:** Self-reflection, Interviewing real customer.

Activities:

1. Identifying real life problems through observation & interaction with real world
2. Literature Review
3. Brain Storming Session to generate ideas for the chosen problem
4. Skill building to prepare a prototype

TEXTBOOKS:

1. Dr.BalaRamadurai***,"KarminDesignThinking",***MudranikTechnologyPrivateLtd.ISBN978-93-5419-0I0-0.
2. V. Gupta and P. Murthy, An Introduction to engineering design method, Tata McGraw Hill, 2000. ISBN-0070964416.

REFERENCES:

1. John.R.Karsnitz,StephenO'BrienandJohnP.Hutchinson,***"EngineeringDesign"***,Cengagelearning(Internationaledition)SecondEdition,2013.
2. RogerMartin,***"TheDesignofBusiness:WhyDesignThinkingistheNextCompetitiveAdvantage"***,HarvardBusinessPress ,2009.
3. HassoPlattner,ChristophMeinelandLarryLeifer(eds),***"DesignThinking:Understand–Improve–Apply"***, Springer,2011
4. IdrisMootee,***"DesignThinkingforStrategicInnovation:WhatTheyCan'tTeachYouatBusinessorDesignSchool"***, JohnWiley &Sons2013.

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching	1	14	14
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning(ABL1&ABL2)	1	14	14
6	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				**30**

List of Activities:

1. Writing observations using 4W1H method
2. Interviewing people who are experiencing the chosen problem
3. Literature Review
4. Applying Multi Why's Technique to find root cause of the problem
5. Drawing Cause and Effect Diagram
6. Brain storming to generate innovative ideas
7. Preparing a prototype (can be a poster, model, website, app etc.)
8. Writing self-evaluation report
9. Collecting feedback from people through an interview

Scheme of Evaluation (Laboratory Courses)

Level	Evaluation Type	Evaluation modules	Marks
1	Continuous internal Evaluation	Record Writing (individual project)	30
		Presentation based on individual project	20
2	Semester End Examination	Group project report	20
		Presentation based on group project	20
		Viva voce	10
		Total	**100**

Note: The marks distribution to be made based on the rubrics.

Examination	Maximum marks	Minimum marks to qualify
CIE	**50**	**20**
SEE	**50**	**20**

INDIAN CONSTITUTION

Course Title:	**Indian Constitution**		
Course Code:	ICO519/529	CIE Marks	50
		SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	3 hours
Total Hours of Pedagogy	15 hours	Credits	01

Course objectives:

The course **INDIAN CONSTITUTION (22ICO17 / 27)** will enable the students,

1. To know about the basic structure of Indian Constitution.
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Course outcome (Course Skill Set)

At the end of the course 22ICO17/27 the student will be able to:

CO1	Analyze the basic structure of Indian Constitution.
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3	Know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system of India.
CO5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching – Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.

(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.

(ii) 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.

Module-1	**(04 hours)**

Indian Constitution: Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the Constituent Assembly.

Module-2	**(04 hours)**

Salient features of India Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations in different Complex Situations. building.

Module-3	**(04 hours)**

Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation, Union Executive : Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet.

Module-4	**(04 hours)**

Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism.

State Executive and Governor, CM, State Cabinet, Legislature - VS & VP, Election Commission, Elections & Electoral

Process. Amendment to Constitution, and Important Constitutional Amendments till today. Emergency Provisions.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and

earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Two Unit Tests each of 30 Marks (duration 01 hour)

- First test after the completion of 30-40 % of the syllabus.
- Second test after completion of 80-90% of the syllabus.

One Improvement test before the closing of the academic term may be conducted if necessary. However best two tests out of three shall be taken into consideration.

Two assignments each of 20 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and POs. (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks

Semester End Examinations (SEE)

SEE paper shall be set for **50 questions, each of the 01 mark**. The pattern of the **question paper is MCQ** (multiple choice questions). The time allotted for SEE is **01 hour.** The student must secure a minimum of 35% of the maximum marks for SEE.

Suggested Learning Resources:

Textbook:

1. **"Constitution of India" (for Competitive Exams)** - Published by Naidhruva Edutech Learning Solutions, Bengaluru. –2022.

2. "**Introduction to the Constitution of India**", (Students Edition.) by Durga Das Basu (**DD Basu**): Prentice –Hall, 2008.

Reference Books:

1. **"Constitution of India, Professional Ethics and Human Rights"** by Shubham Singles, Charles E.Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
2. **"The Constitution of India"** by Merunandan K B: published by Merugu Publication, SecondEdition, Bengaluru.
3. **"SamvidhanaOdu" - for Students & Youths by Justice HN NagamohanDhas, Sahayana, kerekon.**
4. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "**Engineering Ethics**", Prentice – Hall,2004.

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

1. Contents related activities (Activity-based discussions)
2. For active participation of students instruct the students to prepare Flowcharts and Handouts
3. Organizing Group wise discussions Connecting to placement activities
4. Quizzes and Discussions, Seminars and assignments.

Course Title	SAMSKRUTHIKA KANNADA		
Course Code	KSK519/529	(L-T-P)C	(1-0-0)1
CIE (Theory) marks	50	Class Hours/Week	01
SEE marks	50	Total class hours	30

Course Outcomes (COs):

At the end of course, student will be able to

#	Course outcomes	Mapping to PO's	Mapping to PSO's
CO1	Kannada bashe , Sahithya mathu kannadadha samskruthiya kurithu arivu mudiruthadhe.	P10	-
CO2	Kannada sahithyadha pradhana bhaghavadha adhunika poorva mathu Adunika kavyagalannu sankethikavagi Kalithu hechina odhige mathu jnanakke spoorthi moodiruthadhe.	P10	-
CO3	Vidhyarthigalalli sahithya mathu samskruthiya bhagge arivu agu asakthiyannu hechaguthade.		
CO4	Thantrika vyaktigala parichaya agu avarugala sadhisidha vishayagalannu thilidhukondu nadina ennithara vyakthigala bhagge thilidhukollalu Kauthukathe hechaguthadhe.		
CO5	Samskruthika,janapadha agu oravasa kathanagala parichaya madikoduvudu.		

Course Contents:

Ghataka -1: Kannada Samkruthi mathu bhashe Kurithadha Lekhanagalu

1. Karnataka Samkruthi – Hampa Nagarajayya

2. Karnatakada yekikarana : Ondhu Apoorva Charithre – G.Venkatasubbayya

3. Adalitha Bhasheyaagi kannada – Dr. L.Thimmesha mathu, Prof.V.Keshavamurthy

Ghataka -2: Adhunika poorvadha kavya bhaga

4 .Vachanagalu : Basavanna , Akkamahadevi , Allamaprabhu , Aydhakki Maaraiyya , Jedaradasimaiyya , Aydhakki Lakkamma.

5. Kirthanegalu : Adharindenu pala edharindhenu pala? Purandharadhasaru Thalanisadhiru kandya thalu manave – Kanakadasaru

6. Thatvapadagalu : Saavira kodagala suttu – Shishunaala sharipha

Ghataka -3: Adhunika kavyabhaga

7. DVG ravara Mankuthimmana kaggadhindha aydhu bandha kelavu bhagagalu

8. Kurudu kachana : Da.Ra.Bhendre

9.Hosabalina geethe : Kuvempu

Ghataka -4: Thantrika Vyakthigala Parichaya

10. Dr.Sir.M.Visveshwaraih : Vyakthi mathu Aithihasika – A.N.Murthyrao

11. Karakushala kalegalu mathu parampareya vignana – Karigowda Bichanahalli

Ghataka -5: Samkruthika , janapadha kathe mathu pravasa kathegalu

12. Ugadi – Vasudhendra

13. Meghane yembha girijana parvatha – Hi.Chi.Bhoralingaiyya

Course Title	BALAKE KANNADA (KANNADA FOR CONVERSATION)		
Course Code	**KBK519/529**	**(L-T-P)C**	**(1-0-0)1**
CIE (Theory) marks	100	**Class Hours/Week**	02
SEE marks	50	**Total class hours**	30

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Non kannadiga students to undrestan, speak, read and write kannada language	P10	-
2	Communicate (converse) in Kannada language in their daily life with kannada speakers	P10	-

Course Contents:

Part-I: Lessons to teach and learn Kannada Language

Lesson-1: Vayaktika swaamyasuuchaka/ sambandhitha saarwanaamagalu mattu prashnarthaka padagalu- personal pronouns, possessive forms, interrogative words

Lesson-2: Namapadagala sambandharthaka roopagalu, sandehaspada prashnegalu mattu sambhanda vachaka namapadagalu – Possessive forms of nouns, dubitive question and relative nouns

Lesson-3: Guna parimaana mattu varnabanna visheshanagalu sankhyavachakagalu- Qualitative, Quantitative and Color Adjectives, Numerals

Lesson-4: Kaaraka roopagalu mattu vibhakti prathyayagalu- sapthami vibhakti prathyaya- (aa, adu, avu, alli) Predictive forms, locative case

Lesson-5: Chathurthi vibhakthi prathyayada balake mattu sankhyavachakagalu- Dative cases and Numerals

Lesson-6: Sankhyaagunavaachakagalu mattu bahuvachana naamaroopagalu- Ordinal numerals and Plural markers

Lesson-7: Nyuuna / nishedhaarthaka kriyapadagalu mattu Varna gunavachakagalu- Defective / negative verbs and Color Adjectives

Lesson-8: Appane/oppige, nirdeshana, proothsaaha mattu otthaaya artharoopa padagalu mattu vaakyagalu- Permission, Commands, encouraging and Urging words (Imperative words and

sentences)

Lesson-9 : Saamanya sambhaashanegalalli dvithiya vibhakthi prathyayagalu mattu sambhavaniya prakaaragalu- Accusative Cases and Potential Forms used in General Communication

Lessson-10 : “Iru mattu Iralla” sahayaka kriyaapadagalu, sambhavyasuchaka mattu nishedhaarthaka kriyaa padagalu – Helping Verbs “Iru and Iralla” , Corresponding future and Negation Verbs

Lesson-11:Hoolike (tharathama), sambhanda suchaka mattu vastu suchaka prathyayagalu mattu nishedhaarthaka padagala balake- Comparative, Relationship, Identification and Negation Words

Lesson-12: Kaala mattu samayada haagu kriyapadagala vividha prakaragalu- Different types of forms of Tense Sentences with Verb forms

Lesson-13: Dh, -Th, -Thu, -ithu, -aagi, -alla,-gh, -kh, -ide, kriyaa prathyayagalondige bhootha, bhavishyath mattu varthamana kaala vaakya rachane- Formation of Past, Future and Present Tense Sentences with Verb forms

Lesson-14: Karnataka raajya mattu raajyada bagge kurithaada ithare maahithigalu- Karnataka State and General information about the State

Lesson-15: Kannada bhaashe mattu saahithya- Kannada Language and Literature

Lesson-16: Bhaashe kaliyalu eenannu maadabeeku mattu maadabaaradu- Do’s and Don’ts in Learning a Language

Lesson-17: Part-II

Kannada Language Script Part-1

Lesson-18 : Part-III

Kannada Vocabulary List: Sambhashaneyalli dinoopayoogi Kannada padagalu- Kannada words in Conversation.

University Guidelines for CIE Procedure:

i) CIE Marks in Vyavaharika Kannada and Aadalita Kannada shall be the sum of marks prescribed for tests and assignments. Marks prescribed for tests shall be 75 and that for the assessments be 25.

ii) The CIE marks awarded for the tests shall be based on three tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 25 marks and the final CIE marks shall be the sum of the marks of all the

three tests.

iii) The remaining 25 marks shall be awarded based on the evaluation of assignments/unit tests/written quizzes that supports to communication skills as per Bloom's Revised Taxonomy and Course/programme outcomes.

iv) Final marks awarded shall be the sum of (ii) and (iii) for a maximum of 100 marks.

The candidates shall write the test in Blue Books and also assignments/unit-tests/written quizzes in Blue Books/Notes which shall be preserved by the Principal/Head of the Department for at least six months after the announcement of University results and shall be made available for verification at the direction of the Registrar (Evaluation).

Course Title	Computer Aided Engineering Drawing (CAED) for CV stream		
Code	CED513	LTPC	2-0-2-3
SEE Duration	3 Hours	Hours/ Week	04
CIE (Theory Marks)	20	CIE (Practical/ Activity Marks)	30
SEE Marks	50	Total Hours	28L+28P+34ABL=90

Course Objective: To introduce the students to "universal language of Engineers" for effective communication and perform drafting exercises of geometrical shapes, solids and machine elements in different systems of Projection using BIS/ISO standards and conventions with the aid of manual drafting and CAD package to effectively take-up the basic industrial/societal drawing needs.

Course Outcomes:

Upon completion of the course, students shall be able to;

COs	Statement	POs
1	Apply the principles of orthographic projection and create projections of planes and basic geometric solids.	1,2, 5, 9
2	develop the lateral surfaces of geometrical solids	
3	interpret isometric views and draw orthographic views of machine components	

Course contents:

MODULE 1	14 Hours
Principles of orthographic Projections: Different planes of projection and views taking point as an example with explanation about distance of a point from planes of projections. Concept of true length and true inclination of a line (emphasis on practical problems).	
Orthographic Projection of Planes: Projection of Planes by change of position method only (no combination of planes).	

MODULE 2	18 Hours
Orthographic Projection of Solids: Front, top and profile views of geometric solids resting with their base completely on HP (no other positions).	
Development of lateral surfaces: Introduction to section planes and section of regular solids, Parallel and Radial line methods.	

MODULE 3	12 Hours
Isometric Projections: Isometric projections of geometric solids and simple machine components. Conversion of Isometric views into Orthographic views: Simple machine components.	

MODULE 4	08 Hours
Multidisciplinary Applications & Practice (Self Study Component)	
Modeling Basic Building Components: foundations, columns, beams, slabs, walls, doors windows, staircase, assigning materials and rendering building components. Drafting a 2D floor plan for a simple single-storey residential/commercial building, Converting the floor plan into 3D model with walls, openings, and roof structure. Concept of building drawing	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing	N.D.Bhatt & M.Panchal	55th	Charotar Publishing House	2024
2.	Engineering Drawing	K.R. Gopal Krishna	30th	Subhash Publications, Bangalore	2017

Reference Books:

	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing & Design	Cencil Jensen, Jay D. Helsel, Dennis R. Short	7th	Tata McGraw-Hill	2007
2.	Printed Circuit Board Design using AutoCAD	Chris Schroder	-	Newness	1997
3.	Design of foundation systems	Nainan P Kurian	3rd	Alpha Science International Ltd	2005

Teaching -Learning– Evaluation Scheme:

Sl.No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching &Learning	4	14	56
2	Integrated Lab Component	-	-	-
3	Student Study Hours - Self Learning	-	-	-
3	Activity Based Learning (ABL1)	-	-	27
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 10 marks	20
Activity Details	Submission of printouts of computer-solved problems	30

Total	**50**

Activity Based Learning (27Hours)

ABL1(XX Hours) : Activity 1 details		**Hours**
1.	Computer-solved problems printout of **Projection of Planes**	5
2.	Computer-solved problems printout of **Projection of Solids**	5
3.	Computer-solved problems printout of **Development of lateral surfaces**	6
4.	Computer-solved problems printout of **Isometric Projections**	6
5.	Computer-solved problems printout of **Basic Applications**	5
Total		27

Evaluation of Learning Process(7Hours)

Type of Evaluation	**Hours**
Test(1 and 2)	3
Submission of printouts	1
Semester End Exam	3
Total	**7**

COURSE ATRICULATION MATRIX

Course Out comes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1			3				2				
CO2	1	1			3				2				
CO3	1	1			3				2				

Course Title	Computer Aided Engineering Drawing (CAED) for ECE stream		
Code	CED513	LTPC	2-0-2-3
SEE Duration	3 Hours	Hours/ Week	04
CIE (Theory Marks)	20	CIE (Practical/ Activity Marks)	30
SEE Marks	50	Total Hours	28L+28P+34ABL=90

Course Objective: To introduce the students to "universal language of Engineers" for effective communication and perform drafting exercises of geometrical shapes, solids and machine elements in different systems of Projection using BIS/ISO standards and conventions with the aid of manual drafting and CAD package to effectively take-up the basic industrial/societal drawing needs.

Course Outcomes:

Upon completion of the course, students shall be able to;

COs	Statement	POs
1	Apply the principles of orthographic projection and create projections of planes and basic geometric solids.	1,2, 5, 9
2	develop the lateral surfaces of geometrical solids	
3	interpret isometric views and draw orthographic views of machine components	

Course contents:

MODULE 1	14 Hours
Principles of orthographic Projections: Different planes of projection and views taking point as an example with explanation about distance of a point from planes of projections. Concept of true length and true inclination of a line (emphasis on practical problems).	
Orthographic Projection of Planes: Projection of Planes by change of position method only (no combination of planes).	

MODULE 2	18 Hours
Orthographic Projection of Solids: Front, top and profile views of geometric solids resting with their base completely on HP (no other positions).	
Development of lateral surfaces: Introduction to section planes and section of regular solids, Parallel and Radial line methods.	

MODULE 3	12 Hours
Isometric Projections: Isometric projections of geometric solids and simple machine components. Conversion of Isometric views into Orthographic views: Simple machine components.	

MODULE 4	08 Hours

Multidisciplinary Applications & Practice (Self Study Component)

3D Modelling: Optical fibre cable with core and cladding, photonic crystal fibers, Antenna: Single elem patch antenna, antenna array.

Sheet Metal & Surface Design: PCB Enclosures: Creation of different geometry with slots as Standards: NMEA-0183, applying material properties for heat sink and water/dust proofing and rende for realistic visualization.

Concept of Industrial drawing

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing	N.D.Bhatt & M.Panchal	55th	Charotar Publishing House	2024
2.	Engineering Drawing	K.R. Gopal Krishna	30th	Subhash Publications, Bangalore	2017

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Teaching -Learning– Evaluation Scheme:

Sl.No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching &Learning	4	14	56
2	Integrated Lab Component	-	-	-
3	Student Study Hours - Self Learning	-	-	-
3	Activity Based Learning (ABL1)	-	-	27
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 10 marks	20

Activity Details	Submission of printouts of computer-solved problems	30
Total		**50**

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3.	Computer-solved problems printout of **Development of lateral surfaces**	6
4.	Computer-solved problems printout of **Isometric Projections**	6
5.	Computer-solved problems printout of **Basic Applications**	5
Total		27

Evaluation of Learning Process(7Hours)

Type of Evaluation	**Hours**
Test(1 and 2)	3
Submission of printouts	1
Semester End Exam	3
Total	**7**

COURSE ATRICULATION MATRIX

Course Out comes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1			3				2				
CO2	1	1			3				2				
CO3	1	1			3				2				

Course Title	Computer Aided Engineering Drawing (CAED) for EEE stream		
Code	CED513	LTPC	2-0-2-3
SEE Duration	3 Hours	Hours/ Week	04
CIE (Theory Marks)	20	CIE (Practical/ Activity Marks)	30
SEE Marks	50	Total Hours	28L+28P+34ABL=90

Course Objective: To introduce the students to "universal language of Engineers" for effective communication and perform drafting exercises of geometrical shapes, solids and machine elements in different systems of Projection using BIS/ISO standards and conventions with the aid of manual drafting and CAD package to effectively take-up the basic industrial/societal drawing needs.

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MODULE 2	18 Hours
Orthographic Projection of Solids: Front, top and profile views of geometric solids resting with their base completely on HP (no other positions).	
Development of lateral surfaces: Introduction to section planes and section of regular solids, Parallel and Radial line methods.	

MODULE 3	12 Hours
Isometric Projections: Isometric projections of geometric solids and simple machine components. Conversion of Isometric views into Orthographic views: Simple machine components.	

MODULE 4	08 Hours

Multidisciplinary Applications & Practice (Self Study Component)

2D drawing of switches, sockets, panels, junction boxes, antenna, electric circuits. Schematic diagram Automatic fire alarm, Call bell system, UPS system, Basic power system diagram.

Concept of Industrial drawing

Prescribed Text Books:

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1.	Engineering Drawing	N.D.Bhatt & M.Panchal	55th	Charotar Publishing House	2024
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Teaching -Learning– Evaluation Scheme:

Sl.No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching &Learning	4	14	56
2	Integrated Lab Component	-	-	-
3	Student Study Hours - Self Learning	-	-	-
3	Activity Based Learning (ABL1)	-	-	27
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 10 marks	20
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Total		**50**

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ABL1(XX Hours) : Activity 1 details		**Hours**
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3.	Computer-solved problems printout of **Development of lateral surfaces**	6
4.	Computer-solved problems printout of **Isometric Projections**	6
5.	Computer-solved problems printout of **Basic Applications**	5
Total		27

Evaluation of Learning Process(7Hours)

Type of Evaluation	**Hours**
Test(1 and 2)	3
Submission of printouts	1
Semester End Exam	3
Total	**7**

COURSE ATRICULATION MATRIX

Course Out comes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1			3				2				
CO2	1	1			3				2				
CO3	1	1			3				2				

Course Title	Computer Aided Engineering Drawing (CAED) for ME stream		
Code	CED513	LTPC	2-0-2-3
SEE Duration	3 Hours	Hours/ Week	04
CIE (Theory Marks)	20	CIE (Practical/ Activity Marks)	30
SEE Marks	50	Total Hours	28L+28P+34ABL=90

Course Objective: To introduce the students to "universal language of Engineers" for effective communication and perform drafting exercises of geometrical shapes, solids and machine elements in different systems of Projection using BIS/ISO standards and conventions with the aid of manual drafting and CAD package to effectively take-up the basic industrial/societal drawing needs.

Course Outcomes:

Upon completion of the course, students shall be able to;

COs	Statement	POs
1	Apply the principles of orthographic projection and create projections of planes and basic geometric solids.	1,2, 5, 9
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Development of lateral surfaces: Introduction to section planes and section of regular solids, Parallel and Radial line methods.	

MODULE 3	12 Hours
Isometric Projections: Isometric projections of geometric solids and simple machine components. Conversion of Isometric views into Orthographic views: Simple machine components.	

MODULE 4	08 Hours
Multidisciplinary Applications & Practice (Self Study Component)	
3D Modeling: Simple machine parts / engineering components. (Applying material properties rendering for realistic visualization)	
Sheet Metal & Surface Design: Automotive panels, HVAC ducting Concept of Industrial drawing	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing	N.D.Bhatt & M.Panchal	55th	Charotar Publishing House	2024
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Total Learning Hours/Semester				**90**

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4.	Computer-solved problems printout of **Isometric Projections**	6
5.	Computer-solved problems printout of **Basic Applications**	5
Total		27

Evaluation of Learning Process(7Hours)

Type of Evaluation	**Hours**
Test(1 and 2)	3
Submission of printouts	1
Semester End Exam	3
Total	**7**

COURSE ATRICULATION MATRIX

Course Out comes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1			3				2				
CO2	1	1			3				2				
CO3	1	1			3				2				

Course Title	Computer Aided Engineering Drawing (CAED) for CSE stream		
Code	CED513	LTPC	2-0-2-3
SEE Duration	3 Hours	Hours/ Week	04
CIE (Theory Marks)	20	CIE (Practical/ Activity Marks)	30
SEE Marks	50	Total Hours	28L+28P+34ABL=90

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MODULE 3	**12 Hours**
Isometric Projections: Isometric projections of geometric solids and simple machine components. Conversion of Isometric views into Orthographic views: Simple machine components.	

MODULE 4	08 Hours

Multidisciplinary Applications & Practice (Self Study Component)

2D Network drawing with wired and wireless, Network topology - wired and wireless.

3D Modeling: Raspberry Pi / Arduino boards, Router & switches, IoT devices - Concept of convertin 3D printing format (stl)

Concept of Industrial drawing

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Engineering Drawing	N.D.Bhatt & M.Panchal	55th	Charotar Publishing House	2024
2.	Engineering Drawing	K.R. Gopal Krishna	30th	Subhash Publications, Bangalore	2017

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2	Integrated Lab Component	-	-	-
3	Student Study Hours - Self Learning	-	-	-
3	Activity Based Learning (ABL1)	-	-	27
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Tool	Remarks	Marks
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2.	Computer-solved problems printout of **Projection of Solids**	5
3.	Computer-solved problems printout of **Development of lateral surfaces**	6
4.	Computer-solved problems printout of **Isometric Projections**	6
5.	Computer-solved problems printout of **Basic Applications**	5
Total		27

Evaluation of Learning Process(7Hours)

Type of Evaluation	**Hours**
Test(1 and 2)	3
Submission of printouts	1
Semester End Exam	3
Total	**7**

COURSE ATRICULATION MATRIX

Course Out comes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1			3				2				
CO2	1	1			3				2				
CO3	1	1			3				2				

Course Title	Introduction to Python Programming		
Course Code	**PLC515**B	**L-T-P-C**	**(2-0-2) 4**
SEE duration	**3 hours**	**Hours / Week**	**4**
CIE(Theory) Marks	**30**	**CIE (Practicals) / Activity Marks**	**20**
SEE marks	**50**	**Total contact hours**	**28L+28P+64ABL=120**

Course Objective: Student's will be able to write a python program to solve the given problem.
Course Outcomes (COs): Upon completion of the course, students shall be able to:

SL. No.	Course Outcomes	Mapping to Pos	Mapping to PSOs
1.	Describe and apply python language construct for writing a program	1,3,5	-
2.	Analyze the codes snippet for its correctness	2,5	-
3.	Design a GUI/python program for the given problem	3,5	-

Course Contents:

Module 1	10 Hours

Python Basics: The way of Programming. Variables, Expression and Entering Expressions into the Interactive Shell. The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program,
Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow ControlStatements, Importing Modules, Ending a Program Early with sys.exit(). Loops for iteration.
Manipulating Strings: Working with Strings, Useful String Methods.

Module 2	10 Hours

Lists: The List DataType, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List. List-like Types: Strings and Tuples.
Dictionaries: The Dictionary DataType, Pretty Printing.
Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Argument sandprint(). Local and Global Scope, The global Statement. Exception Handling, A Short Program: Guess the Number.

Module 3	10 Hours

Reading and Writing Files: Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module,Saving Variables with the print.format() Function.
GUI Programming: Tkinter Introduction, Tkinter and Python programming, Widgets Label, Button, Entry, Scaling, Menu, Check Box, Radio button. Tkinter examples

Module 4	10 Hours

Classes and objects: Programmer-defined types, Attributes, Rectangles, Instancesas returnvalues, Objects are mutable, Copying.
Classes and functions: Time, Pure functions, Modifiers, Prototyping versus planning
Classes and methods: Object oriented features, Printing objects, Another example, A more

complicated example, Theinit method. Thestr method. Operator overloading. Type-baseddispatch, Polymorphism.

Programming Exercises:

1. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages.
2. Develop a program to generate Fibonacci sequence of length(N).Read N from the console.
3. Write a function to calculate factorial of a number. Develop a program to compute binomialcoefficient (Given N and R),
4. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.
5. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.
6. Write a python program to Guess the number using randint() Functions (ask player to guess 6times).
7. Write a magic 8-ball game program in python using list.
8. Write a program to search an element using linear search.
9. Write a program to search an element using binary search.
10. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
11. Write an Object-oriented Python program to create two Time objects: current Time, which contains the current time; and bread Time, which contains the amount of time it takes for abread maker to make bread. Then we'll use add Time to figure out when the bread will bedone. Write the print Time function to display the time when the bread will bed one by thebread maker.
12. Define a function that takes two objects representing complex numbers and returns newcomplex number with an addition of two complex numbers. Define a suitable class 'Complex to represent the complex number. Develop a program to read N (N>2) complex numbers and to compute the addition of N complex numbers.
13. Develop a program that uses class Student which prompts the user to enter marks in threesubjects and calculates total marks, percentage and displays the score card details [Hint: Use list to store the marks in three subjects and total marks. Use init() method to initialize name, USN and the lists to store marks and total, Use the getMarks() method to read marks into the list, and display() method to display the scorecard details.]
14. Design GUI a python program to store the information about the student like first name, lastname, department (text box), gender(radio button) with login and cancel button.
15. Design a simple GUI image viewer.

Text Books :

1. Al Sweigart, "Automate the Boring Stuff with Python", 1st Edition. No Starch Press, 2015.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition,Green Tea Press, 2015.
3. Wesley J Chun, “Core Python Application Programming”, 3rd Edition, Pearson Publication, 2016.

Reference Books:

1. R. Nageswara Rao, "Core Python Programming", 3rd Edition, Dreamtech Press

Teaching-Learning Process

These are sample strategies, which teacher can use to accelerate the attainment of the various Course outcomes and make Teaching-Learning more effective

1. Chalk and talk, use modern tools and projector.

2. Demonstrate and visualize basic data types(list, tuple, and dictionary).
3. Use https://pythontutor.com/visualize.html/mode edit in order to visualize the python code
4. Online Videos

Web links and Video Lectures(e-Resources):

- https://www.learnbyexample.org/python/
- https://www.learnpython.org/
- https://pathontutor.com/visualize.html#mode=edi

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

- Quizzes for list, tuple, string dictionary slicing operations using below link: https://github.com/sushantkhara/Data-Structures-And-Algorithms-with-python/raw/main/Python%203%20%20400%20exercises%20and%20solutions%20for%20beginners.pdf

MOOCs:

1. https://onlinecourses.nptel.ac.in/noc21_cs32/

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2		3									
CO2		2			3									
CO3			2		3									

Course Title:	**Physical Education**		
Course Code:	**PE5110/5210**	CIE Marks	50
Course Type(Practical)	Practical	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	0:0:1:0	Exam Hours	02 hours Practical
Total Hours of Pedagogy/physical activity	30 hours	Credits	01

Course objectives:

To improve the student's physical and mental health

Course Outcome:

At the end of the course students will be able to

#	Course Outcomes	Mapping to PO's
1	Describe Health, wellness & its balance for positive mindset.	PO1
2	Adopt healthy lifestyles or good health and better future.	PO1
3	Demonstrate physical activity	PO1, PO9

Course Contents:

Module-1

(3hours of Pedagogy) :

Good Health & It's balance or positive mind set: Health-Importance of Health, Influencing factors of Health, Health beliefs, Advantages of good health, Health & Behavior, Health & Society, Health & family, Health & Personality, Psychological disorders-Method to improve good psychological health, Changing health habits for good health.

Module-2

(3hours of Pedagogy)

Building of healthy life styles for better future: Developing healthy diet for good health, Food & health, Nutritional guidelines for good health, Obesity & overweight disorders and its management, Eating disorders, Fitness components for health, Wellness and physical function, How to avoid exercise injuries.

Physical Education Practical classes(24hours of Practical)		
Sl. No	Name of the Game	Name of the Skills
1.	Shuttle badminton	Service
		Smash
		Receive
		Drop Shot
		Foot work
2.	Basket ball	Dribbling
		Shooting
		Ten ley shoot
		Defensive slide
		Passing
3.	Foot Ball	Dribbling
		Chest drop
		Ball control
		Thigh drop
		Shooting
4.	Table tennis	Service
		Fore hand receive
		Back hand receive
		Smash
		Rally
5.	Volley ball	Attack
		Block
		Service
		Upper hand pass
		Under hand pass
6.	Ball badminton	Service
		Fore hand receive
		Back hand receive
		Spin Smash
		Striate Smash
7.	Throw ball	Spin Pass
		Jump Throw
		Service
		Receive
		Simple pass
8.	Kho- Kho	Giving Kho
		Single chain
		Pole dive

		Pole turning
		3 – 6 Up
9.	Kabaddi	Hand Touch
		Chain Hold
		Ankle Hold
		Thigh Hold
		Bonus
10.	Hand ball	Step with ball
		Shoot
		Pass
		Block
		Dribbling

Assessment Details (both CIE and SEE):

CIE Theory -20 Marks (Multiply Choice Questions - 20 marks)

CIE Practical -30 Marks (Physical activity, Performance and Attendance)

SEE Practical -50 Marks (Skill test-20 marks, Game performance-20 marks, and Event viva -10 marks)

Evaluation method	Assessment Tool	Maximum Marks	Minimum marks to be obtained
CIE	Multiple Choice Questions	20	**8**
	Performance and Attendance Criteria	30	**12**
SEE	Skill Examination	20	**20**
	Game Performance Examination	20	
	Viva -Voce	10	
	Total Marks	**100**	**40**

Course Title	Mathematics-II for Computer Science Engineering stream		
Course Code	MAT5S21	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus, so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	POs	PSOs
CO1	Identify and apply numerical techniques to solve engineering problems related to mathematics.	PO1	-
CO2	Apply the analytical methods to solve first order and first degree differential equations and determine Orthogonal trajectories.	PO1, PO2	-
CO3	Identify second and higher order differential equations and apply to engineering problems.	PO1, PO2	
CO4	Examine and compute the vector calculus problems. Determine the probabilities of the events	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with numerical methods, differential equations, vector calculus and Laplace transforms. Execute the same and provide correct output.	PO1, PO2,PO5	-

MODULE - 1	10 Hrs.

Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta method of fourth order, Euler's modified method.

Partial Differential Equations: Brief introduction to classification of PDE, Solution of non-homogeneous PDE by direct integration. Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method using standard five point formula, diagonal formula and iterative formula.

Applications - To find all possible solutions of one-dimensional heat equation and one-dimensional wave equation. Application connected with Computer Science Engineering.

Self-Study- Milne's predictor corrector method, Solving PDE by variable separable method. To find all possible solutions of two-dimensional Laplace equation.

MODULE - 2	10 Hrs.

Ordinary Differential Equations: First order first degree: Linear differential equations ,Orthogonal trajectories in Cartesian form .Applications to find the orthogonal trajectories -streamlines of flow in the channel, curves of constant temperature in a body, Equi-potential lines in an electric field between two concentric cylinders**.**

Applicatons - Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. carbon dating half-life period, Application of first order differential equation- Logistic model- Natural growth of halibut population .

Self-Study: Exact differential equation, Reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right) and \frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$.

MODULE - 3	**10 Hrs.**

Ordinary Differential Equations: Higher order - Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non- homogenous differential equations by inverse differential operator method for the following standard forms: exponential, polynomial, trigonometric and their product. Method of variation of parameters to solve linear differential equation with constant coefficients.

Applications -Oscillatory Electrical circuit: LC Circuit, LCR Circuit, LC Circuit with E.M.F, LCR Circuit with E.M.F, Electro-Mechanical Analogy.

Self-Study- Method of undetermined coefficients, LDE with variable coefficients-Legendre's differential equations.

MODULE - 4	**12 Hrs.**

Vector Calculus: Scalar and vector fields, Gradient, directional derivative, divergence, curl-physical interpretation; solenoid and irrigational vector fields-illustrative problems.

Probability Theory: Definition of probability, Addition law of probability, conditional probability, multiplication law of probability, Baye's theorem.

Applications: Drone Navigation using Vector Calculus, Robotic Arm with Rotating Joint, Email Spam Detection – Baye's Theorem.

Self-Study- Curvilinear coordinates: Probability and set notations, independent events.

Lab Components:

1. Solution of first order ordinary differential equation using Taylor series method
2. Solution of first order ordinary differential equation using Runge-kutta method.
3. Solution of first order ordinary differential equation using Euler's modified method.

4. Orthogonal trajectories in Cartesian form.
5. Solution of First order first degree-Linear differential equations
6. Solution of Linear differential equation with constant coefficients - Solutions of homogeneous equations.
7. Particular solution of non- homogenous differential equations for the following standard forms, exponential, polynomial, trigonometric and their product.
8. Solution of 2^{nd} order differential equations (by variation of parameter method).
9. Finding gradient, divergence and curl.
10. Bayes' Theorem.

NOTE

1.Proofs are not required for any theorems and properties.

2.There should not be any questions from self study part in semester End Examination.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
01	Higher Engineering Mathematics	Dr. B. S. Grewal	44^{th}	Khanna	2016
02	Advanced Engineering Mathematics	Erwin Kreyszig	8^{th}	Wiley India Pvt. Ltd	2004
03	Calculus	Thomas Finney	9^{th}	Thomas Finney	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Numerical methods,	R. K. Jain and S. R. K. Jain & S. R. K. Iyengar,	6th edition,	New age International p.v.t. Publishers,	2014
2.	A textbook of Engineering Mathematics,	N.P. Bali and Manish Goyal	Reprint,	Laxmi Publications	2010

EBooks and online course materials:

- http://nptel.ac.in/courses.phd?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicerath.org/

Online Courses and Video Lectures:

- **https://www.courseera.org/_____**
- **https://nptel.ac.in/courses/____**

Teaching - Learning - Evaluation Scheme:

Sl.No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**120**
ABL 1 : Lab based learning (14 Hrs)				
Designing and implementation of Pyhton programming		Manual solving		4
		Writing program		5
		Execution		3
		Required output		1
		conclusion		1
ABL 2 : Problem Solving Assignment (15 Hrs)				
Problem Solving Assignment		Problem selection		1
		Formulate the methodology		3
		Solving the problem		4
		Report writing and submission		3
		Preparation of slide and presentation		4

Proposed Assessment Plan(for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Lab based learning 2) Problem Solving Assignment	20
Total		**50**

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-			-								
CO2	3	2			-								
CO3	3	2			-								
CO4	3	2			-								
CO5	3	2			1								

Course Title	Mathematics-II for Electrical and Electronics Engineering stream		
Course Code	MAT5E21	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120

Course Objective: To train the students to acquire knowledge in differential equations and vector calculus, so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	POs	PSOs
CO1	Compute the analytical solution of first-order and first degree differential equations and also to determine engineering phenomena using orthogonal trajectories. Real-life and engineering application problems.	PO1	-
CO2	Apply appropriate methods to find solutions for higher order linear differential equations including both homogeneous and non-homogeneous cases. Real-life and engineering application problems.	PO1, PO2	-
CO3	Develop the ability to analyze vector fields in engineering contexts, understand key concepts of vector operations compute the engineering problems.	PO1, PO2	
CO4	Evaluate the concept of Laplace transform and obtain Laplace transform of periodic functions and unit step functions to solve the problems in transforming the continuous signals.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with numerical methods, differential equations, vector calculus and Laplace transforms. Execute the same and provide correct output.	PO1, PO2,PO5	-

MODULE - 1	10 Hrs.

Ordinary Differential Equations: First order first degree-Linear differential equations, Exact equations. Applications to find the orthogonal trajectories -streamlines of flow in the channel, curves of constant temperature in a body, Equi-potential lines in an electric field between two concentric cylinders**.**

Applicatons - Mathematical modelling through differential equations of first order first degree and solution-modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. carbon dating half-life period. Application of first order differential equation Logistic model- Natural growth of halibut population.

Self-Study- Reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right) an \frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Orthogonal trajectories in Cartesian form, illustrative examples, Linear differential equations.

MODULE - 2	13 Hrs.

Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non- homogenous differential equations by inverse differential operator method for the following standard forms, exponential, polynomial, trigonometric and their product. Method of variation of parameters to solve linear differential equation with constant coefficients.

Applications of second order, first degree Differential equations -Oscillatory Electrical circuit, LC Circuit, LCR Circuit, LC Circuit with E.M.F, LCR Circuit with E.M.F, Electro-Mechanical Analogy.

Self-study-Method of undetermined coefficients, LDE with variable coefficients (Cauchy's and Legendre's differential equations).Applications of second order, first degree Differential equations - Transmission lines, Highway engineering.

MODULE - 3	10 Hrs.

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems.

Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta (RK) method of fourth order, Euler's modified method.

Applications - Conservation of laws, Electrostatics, Analysis of streamlines and electric potentials.

Self-Study- Vector Integration: Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem and Stoke's theorem. Problems. Volume integral and Gauss divergence theorem. Milne's predictor corrector method.

MODULE - 4	10 Hrs.

Laplace Transforms: Introduction, Definition, Importance of Laplace transform in engineering applications, properties, Laplace transform of standard functions, Laplace transform of derivatives, Laplace transform of periodic functions, unit-step functions.

Applications-Network packet transmission with delayed start, Dual-phase CPU cooling system with delayed control response.

Self-Study- Inverse Laplace Transforms, Unit impulse functions (Dirac – delta function). Application of Fourier series to Laplace equation.

Lab Components:

1. To Solve first order ODE using Taylor series method
2. To Solve first order ODE using Runge-kutta method.
3. To Solve first order ODE using Euler's modified method
4. To compute orthogonal trajectories
5. To Solve First order first degree-Linear differential equations
6. Solution of Linear differential equation with constant coefficients - Solutions of homogeneous equations.
7. Particular solution of non- homogenous differential equations for the following standard forms, exponential, polynomial, trigonometric and their product.
8. To solve second order differential equations by variation of parameter method.
9. Finding gradient, divergence and curl.
10. Standard Laplace Transforms e^{at}f (t), $\frac{f(t)}{t}$.

NOTE

1. Proofs are not required for any theorems and properties.

2.There should not be any questions from self study part in semester End Examination.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
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02	Advanced Engineering Mathematics	Erwin Kreyszig	8th	Wiley India Pvt. Ltd	2004
03	Calculus	Thomas Finney	9th	Thomas Finney	2002

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Numerical methods	R. K. Jain and S. R. K. Jain & S. R. K. Iyengar,	6th edition	New age International p.v.t. Publishers,	2014
2	A textbook of Engineering Mathematics	N.P. Bali and Manish Goyal	Reprint	Laxmi Publications	2010

EBooks and online course materials:

http://nptel.ac.in/courses.phd?disciplineID=111

- http://www.class-central.com/subject/math(MOOCs)
- http://academicerath.org/

Online Courses and Video Lectures:

- **https://www.courseera.org/**
- **https://nptel.ac.in/courses/**

Teaching - Learning - Evaluation Scheme :

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		Writing program		5
		Execution		3
		Required output		1
		conclusion		1
ABL 2 : Problem Solving Assignment (15 Hrs)				
Problem Solving Assignment		Problem selection		1
		Formulate the methodology		3
		Solving the problem		4
		Report writing and submission		3
		Preparation of slide and presentation		4

Proposed Assessment Plan(for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 3) Lab based learning 4) Problem Solving Assignment	20
Total		**50**

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	**3**												
CO2	**3**	**2**											
CO3	**3**	**2**											
CO4	**3**	**2**											
CO5	**3**	**2**			**1**								

Course Title	Mathematics-II for Civil Engineering		
Course Code	MAT5C21	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120

Course Objective To train the students to acquire knowledge in differential equations, vector calculus and curve fitting, so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	POs	PSOs
CO1	Apply suitable methods to solve the first order problems connected with ordinary differential equations/partial differential equations.	PO1, PO2	-
CO2	Examine the higher order problems that are connected with differential equations/partial differential equations and solve.	PO1, PO2	-
CO3	Examine and compute the vector calculus problems/applications connected with gradient, divergence and curl. Correlate the experimental data using rank correlation coefficient, fit a curve to the data-solve simple problems	PO1, PO2	
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with differential equations, vector calculus and curve fitting, execute the same and provide correct output.	PO1, PO2,PO5	-

MODULE - 1	10 Hrs.

Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector methods.

Partial Differential Equations. Brief introduction to classification of PDE, Solution of non-homogeneous PDE by direct integration, Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method using standard five point formula, diagonal formula and iterative formula.

Applications: To find all possible solutions of one-dimensional heat equation and two-dimensional wave equation.

Self-Study- Adam-Bash forth method, Solving PDE by variable separable method. Homogeneous PDEs involving derivatives with respect to one independent variable only. Solution of Lagrange's linear PDE. To find all possible solutions of two-dimensional Laplace equation. Application connected with civil Engineering.

MODULE - 2	10 Hrs.

Ordinary Differential Equations - first order first degree-Linear differential equations, Exact differential equations. Bernoulli's differential equations.

Applications: Mathematical modelling through differential equations of first order first degree and solution- modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. carbon dating half-life period, Application of first order differential equation- Autonomous equation and population dynamics- Logistic model- Natural growth of halibut population.

Self-study-Reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ $and\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$, Orthogonal trajectories in Cartesian form-illustrative examples, Applications to find the orthogonal trajectories -streamlines of flow in the channel, curves of constant temperature in a body. Equi-potential lines in an electric field between two concentric cylinders.

MODULE - 3	**10 Hrs.**

Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non- homogenous differential equations by inverse differential operator method for the following standard forms, exponential, polynomial, trigonometric and their product. Method of variation of parameters to solve linear differential equation with constant coefficients.

Applications of second order, first degree Differential equations: - Mechanical Vibrations-A Spring mass system $mu^{II}(t)+ku^{I}(t)+gu(t)=f(t)$, Undamped free vibrations, damped free vibrations, forced vibrations with damping, forced vibrations without damping.

Self-study- method of undetermined coefficients, LDE with variable coefficients (Cauchy's and Legendre's differential equations. Mechanical system and transmission lines.

MODULE - 4	**10 Hrs.**

Vector Calculus: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields.

Statistics: curve fitting – Linear and quadratic equation, Rank correlation

Applications: Finding projectile height from its acceleration, Forced Convection Cooling.

Self-study: lines of regression, Vector Integration: Line integrals.

Lab Components:

1. Solution of first order ordinary differential equation using Taylor series method
2. Solution of first order ordinary differential equation using Runge-kutta method.
3. Solution of first order ordinary differential equation using Euler's modified method.
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Note:

1. Proofs are not required for any theorems and properties.
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1. https://www.coursera.org/learn/introduction-to-linear-algebra
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3. https://nptel.ac.in/courses/111104092

Teaching - Learning - Evaluation Scheme:

Sl.No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours - Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	14+15
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**120**

ABL 1 : Lab based learning (14 Hrs)		
Designing and implementation of Pyhton programming	Manual solving	4
	Writing program	5
	Execution	3
	Required output	1
	conclusion	1
ABL 2 : Problem Solving Assignment (15 Hrs)		
Problem Solving Assignment	Problem selection	1
	Formulate the methodology	3
	Solving the problem	4
	Report writing and submission	3
	Preparation of slide and presentation	4

Proposed Assessment Plan (for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 5) Lab based learning 6) Problem Solving Assignment	20
Total		**50**

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-			-								
CO2	3	2			-								
CO3	3	2			-								
CO4	3	2			-								
CO5	3	2			1								

Course Title	Mathematics-II for Mechanical Engineering stream		
Course Code	MAT5M21	(L-T-P)	(3-1-2)4
Exam	3hours	Hours / Week	06
SEE	50 Marks	Total Hours	42L+14T+28P+36ABL=120

Course Objective To train the students to acquire knowledge in differential equations, vector calculus and curve fitting, so as to solve basic engineering application problems.

Course Outcomes (COs): At the end of course, student will be able to:

COs	Outcomes	POs	PSOs
CO1	Apply suitable methods to solve the first order problems connected with ordinary differential equations/partial differential equations.	PO1, PO2	-
CO2	Examine the higher order problems that are connected with differential equations/partial differential equations and solve.	PO1, PO2	-
CO3	Examine and compute the vector calculus problems/applications connected with gradient, divergence and curl. Correlate the experimental data using rank correlation coefficient, fit a curve to the data-solve simple problems	PO1, PO2	
CO4	Model the real-life problems/ Engineering application problems and hence solve the same.	PO1, PO2	-
CO5	Write the program in python for the mathematical procedures connected with differential equations, vector calculus and curve fitting, execute the same and provide correct output.	PO1, PO2,PO5	-

MODULE - 1 **10 Hrs.**

Numerical solution of first order, first degree ODE: Taylor's series method, Runge-Kutta (RK) method of fourth order, Milne's predictor corrector methods.

Partial Differential Equations. Brief introduction to classification of PDE, Solution of non-homogeneous PDE by direct integration, Numerical solution of a Laplace equation, Poisson equation by finite difference approximation method using standard five point formula, diagonal formula and iterative formula.

Applications: To find all possible solutions of one-dimensional heat equation and two-dimensional wave equation.

Self-Study- Adam-Bash forth method, Solving PDE by variable separable method. Homogeneous PDEs involving derivatives with respect to one independent variable only. Solution of Lagrange's linear PDE. To find

all possible solutions of two-dimensional Laplace equation. Application connected with civil Engineering.	
MODULE - 2	**10 Hrs.**
Ordinary Differential Equations - first order first degree-Linear differential equations, Exact differential equations. Bernoulli's differential equations. **Applications:** Mathematical modelling through differential equations of first order first degree and solution- modelling of population growth, finding initial velocity of the space vehicle so that it has to escape from earth. carbon dating half-life period, Application of first order differential equation- Autonomous equation and population dynamics- Logistic model- Natural growth of halibut population. **Self-study**-Reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ $and\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$, Orthogonal trajectories in Cartesian form-illustrative examples, Applications to find the orthogonal trajectories -streamlines of flow in the channel, curves of constant temperature in a body. Equi-potential lines in an electric field between two concentric cylinders.	
MODULE - 3	**10 Hrs.**
Linear differential equation with constant coefficients - Solutions of homogeneous equations. Particular solution of non- homogenous differential equations by inverse differential operator method for the following standard forms, exponential, polynomial, trigonometric and their product. Method of variation of parameters to solve linear differential equation with constant coefficients. **Applications of second order, first degree Differential equations: -** Mechanical Vibrations-A Spring mass system $mu^{II}(t)+ku^{I}(t)+gu(t)=f(t)$, Undamped free vibrations, damped free vibrations, forced vibrations with damping, forced vibrations without damping. **Self-study-** method of undetermined coefficients, LDE with variable coefficients (Cauchy's and Legendre's differential equations. Mechanical system and transmission lines.	
MODULE - 4	**10 Hrs.**
Vector Calculus: Velocity & acceleration of a vector point function, Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. **Statistics: curve fitting –** Linear and quadratic equation, Rank correlation **Applications:** Finding projectile height from its acceleration, Lubricant Performance in Bearings. **Self-study:** lines of regression, Vector Integration: Line integrals.	
Lab Components: 1. Solution of first order ordinary differential equation using Taylor series method 2. Solution of first order ordinary differential equation using Runge-kutta method.	

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