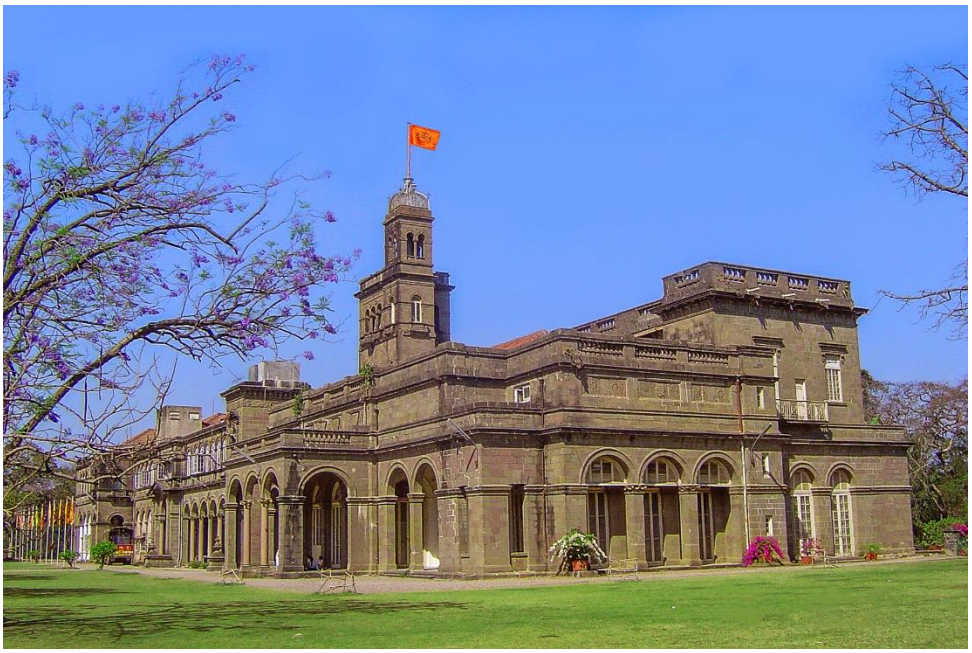
Savitribai Phule Pune University, Pune

Maharashtra, India

Faculty of Science and Technology



National Education Policy (NEP)-2020 Compliant Curriculum

For

First Year Engineering (2024 Pattern)

[Common to all UG Engineering Programms]

(With effect from Academic Year 2024-25)

First Year Engineering: Curriculum Structure (2024 Pattern) – Semester I

CourseCode	Course Type	Course Name	Teaching Scheme (Hours/week)			Examination Scheme and Marks					Credits			
			Lecture	Tutorial	Practical	CCE	End-Sem	Term work	Practical	Oral	Lecture	Tutorial	Practical	Total
Semester – I : Level 4.5														
ESC101	Basic Science Course	Engineering Mathematics- I	3	1	-	30	70	25	-	-	3	1	-	4
ESC102/ ESC103	Basic Science Course	Engineering Physics / Engineering Chemistry	3	-	2	30	70	25	-	-	3	-	1	4
ETC104/ ELE105	Engineering Science Course	Basic Electronics Engineering / Basic Electrical Engineering	2	-	2	30	70	25	-	-	2	-	1	3
MEC106/ CVL107	Engineering Science Course	Engineering Graphics / Engineering Mechanics	2	-	2	30	70	25	-	-	2	-	1	3
COM108	Engineering Science Course	Fundamentals of Programming Languages	2	-	2	30	70	25	-	-	2	-	1	3
VSE109/ VSE110	Vocational and Skill Enhancement Course	Manufacturing Practice Workshop/ Design Thinking & Idea Lab	-	-	2	-	-	25	-	-	-	-	1	1
AEC111	Ability Enhancement Course	Professional Communication Skills	-	2	2	-	-	25	-	-	-	2	-	2
CCC112	Co-Curricular Courses	Co-Curricular Courses - I	-	-	4	-	-	25	-	-	-	-	2	2
		Total	**12**	**03**	**14**	**150**	**350**	**200**	**-**	**-**	**12**	**3**	**7**	**22**

First Year Engineering: Curriculum Structure (2024 Pattern) – Semester II

Course Code	Course Type	Course Name	Teaching Scheme (Hours/week)			Examination Scheme and Marks					Credits			
			Lecture	Tutorial	Practical	CCE	End-Sem	Term work	Practical	Oral	Lecture	Tutorial	Practical	Total
Semester – II : Level 4.5														
ESC113	Basic Science Course	Engineering Mathematics- II	3	1	-	30	70	25	-	-	3	1	-	4
ESC103/ ESC102	Basic Science Course	Engineering Chemistry/ Engineering Physics	3	-	2	30	70	25	-	-	3	-	1	4
ELE105/ ETC104	Engineering Science Course	Basic Electrical Engineering / Basic Electronics Engineering	2	-	2	30	70	25	-	-	2	-	1	3
CVL107/ MEC106	Engineering Science Course	Engineering Mechanics/ Engineering Graphics	2	-	2	30	70	25	-	-	2	-	1	3
ITT114	Program Core Course	Programming and Problem Solving	2	-	2	30	70	25	-	-	2	-	1	3
VSE110/ VSE109	Vocational and Skill Enhancement Course	Design Thinking & Idea Lab/ Manufacturing Practice Workshop	-	-	2	-	-	25	-	-	-	-	1	1
IKS115	Indian Knowledge System	Indian Knowledge System	-	2	-	-	-	25	-	-	-	2	-	2
CCC116	Co-Curricular Courses	Co-Curricular Courses - ii	-	-	4	-	-	25	-	-	-	-	2	2
		Total	**12**	**03**	**14**	**150**	**350**	**200**	**-**	**-**	**12**	**3**	**7**	**22**

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Preface

The New Education Policy (NEP) 2020 has ushered a new era of change, in India's education system to better meet the needs of the 21st century. SPPU is committed to the effective and fruitful implementation of NEP in its true spirits emphasizing holistic and multidisciplinary education as per the directives of Maharashtra government. It emphasizes a multidisciplinary approach, aiming to develop critical thinking and creativity, thereby contributing to the holistic development of individuals.

We are delighted to present the first-year engineering syllabus -2024 pattern, which has been meticulously designed in alignment with the NEP 2020 with effect from academic year 2024-25. This curriculum aims to provide students with a holistic approach to engineering education ensuring a strong foundation in engineering principles through Program core courses along with Mathematics and Science courses. This curriculum also includes components of vocational and skill enhancement courses, Indian Knowledge System and Co-curricular courses to shape well-rounded engineers who can adapt to global demands. Also this documents provides information on the credit system, course contents, examination and evaluation scheme along with guidelines to make best use of the curriculum designed.

The syllabus encourages experiential learning, where theoretical concepts are supported by practical laboratory sessions. Also promotes research and innovation, encouraging students to engage in projects from the early stages of their academic journey. I wish to thank all the Board of Studies chairpersons and members who contributed in designing this curriculum.

We believe that this syllabus, crafted in the spirit of the NEP 2020, will equip our students with the necessary skills and knowledge to excel in their future endeavors. We look forward to embarking on this exciting academic journey with our students.

Dr. Pramod D. Patil
Dean – Science and Technology
Savitribai Phule Pune University, Pune

Program Outcomes (POs)

PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.
PO2	**Problem analysis**	Identify, formulate, review research literature and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
PO3	**Design / Development of Solutions**	Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
PO4	**Conduct Investigations of Complex Problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage**	Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
PO7	**Environment and Sustainability**	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
PO9	**Individual and Team Work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication Skills**	Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance**	Demonstrate knowledge and understanding of Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
PO12	**Life-long Learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological

General Guidelines

- Practical must be conducted in THREE batches per division. Batches size for load calculation should be 20 students.
- Tutorial must be conducted in TWO batches per division. Batches size for load calculation should be 30 students.
- Activities of Co-Curricular Courses (CCC112 and CCC116) should be conducted in TWO batches per division.
- Minimum number of required Experiments/Assignments in PR/ Tutorial shall be carried out as mentioned in the syllabi of respective subjects. However, a subject teacher may add few more assignments to cover content beyond syllabus.
- College is allowed to distribute Teaching workload of subjects Engineering Physics, Engineering Chemistry, Basic Electrical Engineering, Basic Electronics Engineering, Engineering Mechanics, Programming and Problem solving in semester I and II dividing number of FE divisions into two appropriate groups.
- Assessment of tutorial work has to be carried out as term-work examination.
- Term-work Examination and Practical Examination at first year of engineering course shall be conducted internally by the panel of examiners appointed by the principal.
- While assigning the teaching workload a load of 2 Hours/week/batch needs to be considered for the faculty involved.
- The entire evaluation process for Ability Enhancement Course (AEC), Skill Enhancement Course (SEC) & Value Addition Course (VAC) shall be done by the teacher responsible for the conducting these courses.
- There shall be no REVALUATION in respect of CCE as these are evaluated by the teachers who taught the said courses. However, CEO may allow rechecking in these papers as per prescribed procedure and payment of requisite fee.
- The instructor’s manual is to be developed as a hands-on resource and reference. The instructor's manual need to include prologue (about University/program/ institute/department/foreword/ preface etc.), copy of curriculum, conduction & Assessment guidelines, topics under consideration concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Abbreviations

AEC	Ability Enhancement Course
BSC	Basic Science Course
CCC	Co-Curricular Courses
CCE	Comprehensive Continuous Evaluation
CCE	Comprehensive Continuous Evaluation
CO	Course Outcome
ESC	Engineering Science Course
IKS	Indian Knowledge System
NEP	National Education Policy
PCC	Programme Core Course
PO	Program Outcomes
PR	Practical
PSO	Programme Specific Outcome
TH	Theory
TU	Tutorials
VSEC	Vocational and Skill Enhancement Course

Savitribai Phule Pune University

Faculty of Science and Technology

National Education Policy (NEP) Compliant Curriculum

Semester - I

First Year Engineering (2024 Pattern)

www.unipune.ac.in

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ESC101 : Engineering Mathematics I

Teaching Scheme		Credit	Examination Scheme:	
TH	3 Hours/Week	03	CCE	30 Marks
Tutorial	1 Hour/Week	01	End-Sem	70 Marks
			Term work	25 Marks

Prerequisite Courses, if any:

- Differentiation, Integration, Maxima and Minima, Matrices and Determinants.

Companion Course, if any:

Course Objectives:

To familiarize the students with concepts and techniques in Calculus, Fourier series and Linear Algebra. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.

Course Outcomes:

On completion of the course, learner will be able to:

CO1: Apply mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems.

CO2: Determine the Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.

CO3: Compute derivative of functions of several variables that are essential in various branches of Engineering.

CO4: Apply the concept of Jacobian to find partial derivatives of implicit function and functional dependence. Use of partial derivatives in estimating errors & approximations and finding extreme values of the function.

CO5: Apply the essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, finding linear and orthogonal transformations, Eigen values & Eigen vectors and Quadratic forms applicable to engineering problems.

Course Contents

Unit I	Single Variable Calculus	(08 Hours)

Rolle's Theorem, Mean Value Theorems, Taylor's and Maclaurin's Series, Indeterminate Forms. and L' Hospital's Rule.

Fourier series: Full range and Half rage Fourier series, Harmonic analysis, Applications to problems in Engineering

Unit II	Multivariable Calculus – Partial Differentiation	(08 Hours)

Introduction to functions of several variables, Limit, Continuity and Partial Derivatives. Euler's Theorem on Homogeneous functions, Partial derivative of Composite Function, Total Derivative and Change of Independent variables.

Unit III	Applications of Partial Differentiation	(08 Hours)

Jacobian and its applications, Errors and Approximations, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers and Applications to problems in Engineering

Unit IV	**Linear Algebra – Matrices and System of Linear Equations**	**(08 Hours)**

Rank of a Matrix, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations, Application to problems in Engineering.

Unit V	**Linear Algebra - Eigen Values, Eigen Vectors and Diagonalization**	**(08 Hours)**

Eigen Values and Eigen Vectors, Cayley Hamilton theorem, Diagonalization of a matrix, Reduction of Quadratic forms to Canonical form by Linear and Orthogonal transformations. Application to problems in Engineering.

Learning Resources

Text Books:

1.Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill)

2.Higher Engineering Mathematics by B. S. Grewal (Khanna Publication)

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.)
2. Advanced Engineering Mathematics by M. D. Greenberg (Pearson Education)
3. Advanced Engineering Mathematics by Peter V. O'Neil (Thomson Learning)
4. Thomas' Calculus by George B. Thomas, (Addison-Wesley, Pearson)
5. Applied Mathematics (Vol. I & Vol. II) by P.N.Wartikar and J.N.Wartikar Vidyarthi Griha Prakashan, Pune.
6. Elementary Linear Algebra. by Ron Larson and David C. Falvo (Houghton Mifflin Harcourt Publishing Company)

MOOC / NPTEL/YouTube Links: -
https://youtube.com/playlist?list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5&si=3xAONJdT2ph_jcvG

The CO-PO mapping table

The CO-PO mapping table												
PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										
CO2	3	2										
CO3	3	2										
CO4	3	2										
CO5	3	2										

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ESC102: Engineering Physics

Teaching Scheme	Credit	Examination Scheme:
TH: 03 Hours/Week PR: 02 Hours/Week	03 01	CCE (TH) : 30 Marks End - Semester(TH) : 70 Marks PR : 25 Marks

Prerequisite Courses, if any:
Bohr's atomic theory, properties of mechanical and electromagnetic waves, Huygens' principle and wavefront, interference and polarization of light, wave particle duality, intrinsic and extrinsic semiconductors, basics of magnetism, trigonometry and calculus.

Companion Course, if any: Laboratory Practical

Course Objectives:
The objective of the course is to impart the knowledge of fundamentals of physics through hands-on experiments and extend it to relevant engineering applications.

Course Outcomes:

On completion of the course, learner will be able to:

CO1: Develop the understanding of working principle of lasers, optical fibers and extend it to holography and fiber optic communication.

CO2: Deduce Schrödinger's wave equations and apply it to problems on the bound states by summarizing fundamentals of quantum physics.

CO3: Explain phenomena of interference in thin films, polarization, double refraction and connect to the Anti-Reflection Coating, LCD.

CO4: Develop understanding of Fermi level and Fermi energy in semiconductors on the basis of results of Fermi Dirac statistics and relate them with the working of semiconducting devices. Extend the **understanding** of Ultrasonics to thickness measurement, flaw detection.

CO5: Explain properties of nanoparticles and estimate engineering applications; Explain phenomenon of Superconductivity and estimate engineering applications.

Course Contents

Unit I	Fundamentals of Photonics	(08 Hours)

Lasers: Spontaneous and stimulated emission, population inversion, pumping, active medium & active center, resonant cavity, coherence length and coherence time; Characteristics of lasers, CO_2 laser: construction and working, engineering and industrial applications; Heterojunction laser diode: construction and principle, advantages, Holography: recording, reconstruction, technological applications.

Optical fibers: Critical angle, acceptance angle, acceptance cone, numerical aperture, total internal reflection and propagation of laser; Types of optical fibers: Single mode & multimode, step index & graded index, attenuation, attenuation coefficient, factors affecting attenuation; Advantages of optical fiber communication, numerical problems on parameters of optical fiber.

Mapping of Course Outcomes for Unit I	CO1

Unit II	Quantum Physics	(08 Hours)

de Broglie hypothesis of matter waves, de Broglie wavelength for a particle accelerated by KE "E" and a charged particle accelerated by PD "V", properties of matter waves; Wave function and probability density, mathematical conditions for wave function, problems on de Broglie wavelength; Need and significance of Schrödinger's equations, Schrödinger's time independent and time dependent equations; Energy of a particle enclosed in a rigid box and related numerical problems; Quantum mechanical tunneling, alpha particle decay, principle and applications of STM; Principles of quantum computing: concept of qbit, superposition and entanglement, comparison of classical & quantum computing, potential applications of quantum computing.		
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Wave optics**	**(08 Hours)**
Interference in thin film of uniform thickness, conditions of maxima and minima for reflected system; Conditions for maxima and minima for wedge shaped film (qualitative), engineering applications – ARC, determination of optical flatness; Numerical problems on thin film and wedge shaped film; Types of polarization: Unpolarized, Polarized, PPL, CPL and EPL, Malu's law and related numerical problems; Double refraction: geometry of calcite crystal, Huygens' theory; Engineering applications of polarization: LCD, communication & radar, 3D movies (recording, projection).		
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Semiconductor Physics & Ultrasonic**	**(08 Hours)**
Semiconductor Physics: Valence band, conduction band, band gap energy, classification of solids on the basis of band theory; Fermi level and Fermi energy for metal, FD distribution function and its temperature dependence, position of Fermi level in intrinsic semiconductors (derivation); Fermi level for extrinsic semiconductors, working of PN junction diode on the basis of Fermi energy; Solar cell: principle, working, IV-characteristics, efficiency and fill factor, measures to improve efficiency of solar cell, advantages and applications in environmental sustainability; Hall effect: derivation for Hall voltage and Hall coefficient and related numerical problems. **Ultrasonics:** Characteristics and properties of ultrasonic waves, Generation of ultrasonic waves by inverse piezoelectric effect (using transistor); Engineering applications - thickness measurement, flaw detection and related numerical problems		
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Physics of Nanoparticles and Superconductivity**	**(08 Hours)**
Nanoparticles: Quantum confinement and its effect on properties of nanoparticles, synthesis methods - ball milling and Physical Vapor Deposition; Properties of nanoparticles (optical, electrical, mechanical, magnetic); Applications of nanotechnology: Electronics (GMR effect and its application in read-write head of HDD), automobiles, environmental & energy, medical field (targeted drug delivery). **Superconductivity:** Temperature dependence of resistivity, critical magnetic field, critical current, Meissner effect and perfect diamagnetism; Type I and Type II Superconductors, Numerical problems on critical magnetic field; Formation of Cooper pairs, DC and AC Josephson effect, SQUID: working principle and applications; Engineering applications: electronics, principle of Maglev train.		

List of Laboratory Experiments/Assignments (Any 8)

1. An experiment based on Laser: To determine the divergence of a laser beam or to determine diameter of a thin wire or to perform beam profile analysis of a laser beam.
2. An experiment based on optical fiber: To determine the numerical aperture or attenuation coefficient or critical angle of incidence for given a glass slab or any experiment to calculate parameters of optical fiber.
3. Determination of Planck's constant using available experimental setup.
4. Newton's rings - to understand the interference and determine radius of curvature of a given plano-convex lens or determine wavelength of given monochromatic light.
5. An experiment based on diffraction: determination of number of lines per centimeter on grating surface using normal incidence method or determination of wavelength of laser using transmission grating or to determine wavelength of light using diffraction grating & spectrometer.
6. An experiment based on polarization: To verify cosine square law of Malus Law for plane polarized light or to determine the specific rotation of the given sample with the help of a polarimeter or to determine refractive indices of extraordinary and ordinary rays using double refractive prism.
7. To determine the band gap energy of a semiconductor sample using a PN junction diode.
8. To plot I-V characteristics and determine fill factor and efficiency of a given solar cell.
9. To determine Hall coefficient and charge carrier density of a given semiconductor sample.
10. Determination of velocity of ultrasonic waves and compressibility of given liquid by using Ultrasonic Interferometer
11. An experiment based on physical measurements developed using Arduino interface for Hall effect sensor or Ultrasonic sensor.
12. Study tour / visit to a research laboratory / facility and submit a report.

Note: Apart from the above list, any one experiment related to the curriculum available in the institute / developed in-house / performing experiment on Virtual Lab platform may also be considered to be performed out of eight experiments.

Learning Resources

Text Books:

- A Textbook of Engineering Physics, M. N. Avadhanulu, P. G. Kshirsagar & TVS Arun Murthy, S. Chand Publications.
- Engineering Physics, R. K. Gaur and S. L. Gupta, Dhanpat Rai Publications.

Reference Books:

- Optics, Ajoy Ghatak, Tata Mc Graw Hill
- Introduction to Solid State Physics, C. Kittel, Wiley and Sons.
- Quantum Mechanics, A. K. Ghatak, S. Lokanathan, Laxmi Publications
- Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing
- Principles of Physics, Serway and Jewett, Saunders college publishing

e-Books:

1. Feynman Lecture series: https://www.feynmanlectures.caltech.edu/
2. Concepts of Modern Physics, Arthur Beiser: https://nitsri.ac.in/Department/PHYSICS/Beiser_Modern_Physics.pdf

MOOC / NPTEL/YouTube Links:

1. Lectures by Walter Lewin: https://www.youtube.com/channel/UCiEHVhv0SBMpP75JbzJShqw
2. Quantum Mechanics Lecture Series by Prof. H. C. Verma: https://www.youtube.com/playlist?list=PLWweJWdB_GuISnGkAafMpzzDBvTHg02At

The CO-PO mapping table

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

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ESC103: Engineering Chemistry		
Teaching Scheme	**Credit**	**Examination Scheme**
TH: 03 Hours/Week **PR: 02 Hours/Week**	**03** **01**	**CCE : 30 Marks** **End – Semester (TH) : 70 Marks** **PR : 25 Marks**

Prerequisite Courses, if any: Types of titrations, structure property relationship, classification and properties of polymers, electromagnetic radiation, electrochemical series.

Companion Course, if any: Laboratory Practical

Course Objectives:

- To understand technology involved in analysis and improving the quality of water as a commodity.
- To study UV-Visible spectroscopic techniques for chemical analysis.
- To understand structure, properties and applications of specialty polymers and nano material.
- To study conventional and alternative fuels with respect to their properties and applications.
- To acquire the knowledge of electro-analytical techniques that facilitates rapid and precise understanding of materials.
- To understand corrosion mechanisms and preventive methods for corrosion control.

Course Outcomes:

On completion of the course, learner will be able to:

CO1: Understand the practical approaches and techniques required to effectively monitor water quality.

CO2: Select appropriate electro techniques and methods of material analysis.

CO3: Demonstrate the structure, properties of advanced engineering materials for various technological applications

CO4: Analyze different types of conventional and alternative fuels.

CO5: Explain causes of corrosion and methods for minimizing corrosion.

Course Contents

Unit I	Water Technology	(08 Hours)

Impurities in water, hardness of water: Types, Units and Numerical. Determination of hardness (by EDTA method using molarity concept) and alkalinity, numerical. Ill effects of hard water in boilers - priming and foaming, scale and sludge. Water treatment: i) Zeolite method and numerical ii) Demineralization method. Purification of water: Reverse osmosis and Electrodialysis. Modern technique for /of atmospheric water generation.

Mapping of Course Outcomes for Unit I	CO1

Unit II	Instrumental Methods of Analysis	(08 Hours)
Introduction: Types of reference electrode (calomel electrode), indicator electrode (glass electrode), ion selective electrode (solid membrane electrode). [A] Conductometry: Introduction, conductivity cell, conductometric titrations of acid versus base with titration curve. (Strong acid- Strong base). Applications of conductometry. [B] pHmetry: Introduction, standardization of pH meter, pH metric titration of strong acid versus strong base with titration curve and its applications. [C] UV-Visible Spectroscopy: Introduction, statement of Beer's law and Lambert's law, Electronic transitions in organic molecule, terms involved in UV-visible Spectroscopy. Instrumentation (double beam) and its applications. Numerical: Based on Absorption laws i.e. Molar absorptivity and concentration.		
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Advanced Engineering Materials**	**(08 Hours)**
A] Polymers: Introduction, Definition Polymer, Monomer, Functionality of monomers, Classification of polymer (Thermal Behavior-Thermoplastics and Thermosetting). Specialty polymers: Introduction, preparation, properties and applications of the following polymers: 1. Engineering Thermoplastic: Polycarbonate, 2. Bio-degradable polymers: Poly (hydroxybutyrate-hydroxyvalerate), 3. Conducting Polymer: Polyacetylene. [B] Nanomaterials: Introduction, classification of nanomaterials based on dimensions (zero dimensional, one-dimensional, two-dimensional and three-dimensional), structure, properties and applications of graphene and carbon nanotubes, quantum dots (semiconductor nanoparticles).		
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Energy Sources**	**(08 Hours)**
Introduction (definition, classification of fuel based on chemical reactions and characteristics of an ideal fuel), Calorific value, Higher calorific value and Lower calorific value, Determination of calorific value: Principle, construction and working of Bomb calorimeter and Boy's gas calorimeter and numerical, Solid fuel: Coal: Analysis of Coal-Proximate and Ultimate analysis, numerical, Alternative fuels: Power alcohol and biodiesel. Hydrogen gas as a future fuel. Lithium Ion Battery, construction, working, advantages, applications.		
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Corrosion and its Prevention**	**(08 Hours)**

Introduction, Types of corrosion – Dry and Wet corrosion, mechanism of dry corrosion, nature of oxide films and Pilling-Bedworth's rule, wet corrosion – mechanism: hydrogen evolution and oxygen absorption, Factors influencing rate of corrosion. Methods of corrosion control and prevention: Cathodic Protection (Sacrificial Anode and Impressed Current), metallic coatings and its types, surface preparation, methods to apply metallic coatings-hot dipping, electroplating. Corrosion Resistant / Anti corrosive paints.

Mapping of Course Outcomes for Unit V	CO5

List of Laboratory Experiments (Any 8 experiments from the given list).

1. To determine hardness of water by EDTA method.
2. To determine alkalinity of water.
3. To determine strength of strong acid using pH meter
4. To determine maximum wavelength of absorption of $CuSO_4$/$FeSO_4$/ $KMnO_4$, verify Beer's law and find unknown concentration of given sample.
5. Titration of a mixture of weak acid and strong acid with strong base using conductometer.
6. Preparation of polystyrene/phenol-formaldehyde/urea-formaldehyde resin.
7. To determine molecular weight/radius of macromolecule polystyrene/ polyvinyl alcohol by viscosity measurement.
8. Proximate analysis of coal.
9. To coat copper and zinc on an iron plate using electroplating.
10. Preparation of biodiesel from oil.
11. Colloidal synthesis of 2-6 or 3-5 semiconductor quantum dots nanoparticles.

Learning Resources

Text Books:

1.Textbook of Engineering Chemistry by Dr. S. S. Dara, Dr. S. S. Umare, S. Chand & Company Ltd.

2.Engineering Chemistry by O. G. Palanna, Tata Magraw Hill Education Pvt. Ltd.

3.Textbook of Engineering Chemistry by Dr. Sunita Rattan, S. K. Kataria& Sons Publisher.

Reference Books:

1.Basic Concept of Analytical Chemistry, 2ed, S. M. Khopkar, New Age-International Publisher.

2.Instrumental Methods of Chemical Analysis, G. R. Chatwal& S. K. Anand, Himalaya Publishing House.

3.Spectroscopy of organic compounds, 2ed, P. S. Kalsi, New Age-International Ltd., Publisher.

4.Polymer Science, V. R. Gowarikar, N. V. Viswanathan, jayadev Sreedhar, Wiley Eastern Limited.

5.Engineering Chemistry, B. Sivasankar, Tata Mcgraw-Hill Education Publishing company Limited.

6.Inorganic Chemistry, 5ed, Shriver and Atkins, Oxford University Press.

7.Fundamentals of Nanotechnology, G. L. Hornyak, J. J. Moone, H. F. Tihhale, J. Dutta, CRC press.

e-Books:

1. **https://chem.nju.edu.cn/_upload/article/files/b5/6f/01f0f2434d708df797208aea2613/83f2b441-65ee-44a6-ac47-ed21db462c5d.pdf.**
2. **https://edisciplinas.usp.br/pluginfile.php/5955761/mod_resource/content/1/CORROSION_AND_CORROSION_CONTROL_An_Intro%20%20Revie%20and%20Uhlig.pdf**

MOOC / NPTEL/YouTube Links:

1. **https://nptel.ac.in/courses/113104082**

The CO-PO Mapping table												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	1	-	-	-	-	1
CO2	3	3	1	-	-	-	-	-	-	-	-	1
CO3	3	2	1	-	-	-	1	-	-	-	-	1
CO4	3	3	1	-	-	-	1	-	-	-	-	1
CO5	3	2	1	-	-	-	1	-	-	-	-	1

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ETC104 : Basic Electronics Engineering		
Teaching Scheme	**Credit**	**Examination Scheme:**
TH: 02 Hours/Week **PR: 02 Hours/Week**	**02** **01**	**CCE : 30 Marks** **End - Semester(TH) : 70 Marks** **TW : 25 Marks**

Prerequisite Courses, if any:

- 12th Physics

Companion Course, if any: NIL

Course Objectives:

1. To understand the working principles of PN junction diode and Special purpose diodes.
2. To study the operating principle and applications of Bipolar Junction Transistors & MOSFET.
3. To learn the concepts of various logic gates, digital circuits, Microprocessor & Controller.
4. To understand the concepts of Opamp, its applications and electronic Instruments.
5. To know the methods of measurement of physical parameters using sensors and transmission with the help of communication systems.

Course Outcomes:

On completion of the course, learner will be able to:

CO1:Know about the working of P-N Junction diode and its application as rectifier & switch, basics of LED & Photodiode.

CO2: Understand the working of BJT & MOSFET, their characteristics & compare.

CO3: Learn logic gates & realization of the digital circuits.

CO4: Understand the functioning of Opamp and electronic instruments.

CO5: Select sensors based on their working principle for specific applications and its implementation with Communication system.

Course Contents

Unit I	Diodes and Applications	(06 Hours)

Evolution of Electronics, Current trends in Electronics, Impact of Electronics in industry and society.

Introduction to active and passive components, P-type Semiconductor, N-type Semiconductor.

P-N Junction Diode : P-N Junction diode construction and its working in forward and reverse bias conditions, V-I characteristics of P-N junction Diode, Diode as a switch, Half wave rectifier, Full wave and Bridge rectifier.

Special purpose diodes: Light Emitting Diode (LED) and photo diode along with V- I characteristics and their applications.

#Exemplar	LED TV, IR-Remote Controller, Rolling Displays, SMPS, Mobile & Laptop Chargers
Mapping of Course Outcomes for Unit I	CO1

Unit II	Transistors and Technology	(06 Hours)

Bipolar Junction Transistor: Construction, type, Operation, V-I Characteristics in CE mode, region of operation, BJT as switch and CE amplifier. Enhancement Metal Oxide Semiconductor Field Effect Transistors (EMOSFET): Construction, Types, Operation, V-I characteristics, Regions of operation, MOSFET as switch & amplifier. Introduction to VLSI Technology, Feature size/Channel Length, N Well method of VLSI CMOS manufacturing.		
#Exemplar	Audio Amplifier / PA System, CMOS ICs in Cell phone & Laptops, Pen Drives.	
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Logic Gates and Digital Circuits**	**(06 Hours)**
Number System: Introduction of Binary, Decimal, Octal, Hexadecimal, Conversion of Binary to Decimal, Decimal to Binary, Binary addition. Logic Gates - AND, OR, NOT, XOR, XNOR. Universal Gates – NAND, NOR. De-Morgan's theorem. Logic circuits - Half & Full adders. SR, JK, T & D Flip Flops. Introduction to Microprocessor and Microcontroller (Only block diagram and explanation). Digital IC design flow, IC Fabrication process flow.		
#Exemplar	Memories in Cell Phone, Laptop, Pen drive, ECU in Advanced car, Automation in manufacturing using PLC, Arduino Boards.	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Operational Amplifier and Electronic Instruments**	**(06 Hours)**
Operational amplifier: Functional block diagram of operational amplifier, Ideal & practical values of performance parameters, Op-amp applications: Inverting, Non-inverting amplifier. Electronic Instruments: Analog ammeter and voltmeter. Block diagram of Digital Multimeter, Function Generator, Digital Storage Oscilloscope (DSO), DC power supply.		
#Exemplar	Domestic Energy Meter, Battery Charging Station, ICU Monitor in Hospital.	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Sensors and Communication Systems Systems**	**(07 Hours)**
Classification of sensors: Active /Passive Sensors, Selection Criteria/Characteristics of sensor. Motion Sensors (LVDT), Temperature Sensors (Thermocouple, RTD), Mechanical Sensors (Strain Gauge), Biosensors. Block diagram of IoT based Data Acquisition and Automation System. Communication Systems: Block Diagram, Communication Media: Wired and Wireless, Electromagnetic Spectrum, Cellular concept, Block diagram of GSM system.		
#Exemplar	Digital Thermometer, Weighing Machine, Green House Automation in Agricultural, Home Automation. 4G & 5G Technology, Satellite Communication, Radar/Military Communication	

Mapping of Course Outcomes for Unit V	CO5

Learning Resources

Text Books:

1. Electronics Devices by Thomas.` L. Floyd, 9th Edition, Pearson
2. Modern Digital Electronics by R. P. Jain, 4th Edition, Tata McGraw Hill
3. Electronic Instrumentation by H. S. Kalsi, 3rd Edition, Tata McGraw Hill
4. Sensors and Transducers by D. Patrnabis, 2nd Edition, PHI
5. Electronic Communication Systems by Kennedy & Davis, 4th Edition, Tata McGraw Hill
6. Mobile Wireless communication by M. Schwartz, Cambridge University Press

Reference Books:

1. Digital Fundamentals by Thomas. L. Floyd, 11th Edition, Pearson
2. Mobile Communication by J. Schiller, 2nd Edition, Pearson
3. Sensors Handbook, by S. Soloman, 2nd Edition.
4. CMOS Circuit Design, Layout & Simulation, by Baker, 2nd Edition, Wiley IEEE Press

MOOC / NPTEL/YouTube Links:

1. Semiconductor materials : https://nptel.ac.in/courses/117103063
2. Digital and Analog Signals :https://nptel.ac.in/courses/117103064

The CO-PO mapping table

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

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ELE105 - Basic Electronics Engineering Lab			
Teaching Scheme		**Credit**	**Examination Scheme:**
PR	**: 02 Hours/Week**	**01**	**TW : 25 Marks**

Suggested List of Laboratory Experiments (Any Eight)

1.	Electronic Components: Study of Active and Passive components a) Resistors (Fixed &Variable), Calculation of resistor value using color code. b) Capacitors (Fixed &Variable) c) Inductors, Calculation of inductor value using color code. d) Devices such as Diode, BJT, MOSFET, various IC packages e) Switches & Relays
2.	Measurements using various measuring instruments: a) Setup CRO and function generator for measurement of voltage, frequency b) Measure Voltage, Resistance using digital Multimeter. Also use Multimeter to check diode, BJT.
3.	V-I characteristics of P-N Junction Diode (Study the datasheet of typical PN junction diode)
4.	Rectifier circuits: Implement DC Regulated Power Supply using bridge rectifier & diodes.
5.	Frequency response of MOSFET: a) To plot frequency response of BJT amplifier b) To plot frequency response of MOSFET amplifier
6.	Linear applications of Op-amp: Build invertingandnon-invertingamplifierusingop-amp(Studythedatasheetoftypical Op-Amp741)
7.	Test and verify the truth tables of: a) Basic and Universal Gates (Study the datasheet of respective ICs) b) Half & Full Adder
8.	Study of transducers (Any3)
9.	Build and test any circuit using BJT/MOSFET/Op-Amp/Logic Gates using any one sensor.
10.	Case Study of any on electronics appliances with block diagram, specification etc.

Guidelines for Instructor's Manual

- The instructor's manual is to be developed as a hands-on resource and reference.
- Copy of Curriculum, Conduction & Assessment guide lines, List of Experiments to be attached.

Guidelines for Student's Lab Journal

- The laboratory assignments/experiments are to be submitted by student in the form of journal.
- Journal consists of Certificate, table of contents, and write-up for each experiment.
- Each experiment should consist of:

- ✓ Title.
- ✓ Objectives.
- ✓ Problem Statement, Outcomes
- ✓ Hardware/Software (If any) requirements.
- ✓ Concept.
- ✓ Experimental procedure/Setup.
- ✓ Observation table
- ✓ Conclusion.

Guidelines for Laboratory Conduction

- All the experiments mentioned in the syllabus are compulsory.
- Use of open source software and recent version is to been courage.

Guidelines for Lab/TW Assessment

- Continuous assessment of laboratory work is done based on overall performance.
- Each lab assignment/experiment assessment will assign grade/marks based on parameters with appropriate weightage.
- Suggested parameters for overall assessment as well as each lab assignment/experiment assessment include:
  - ✓ Timely completion.
  - ✓ Performance.
  - ✓ Punctuality and neatness.
- The parameters for assessment are to be known to the students at the beginning of the course.

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ELE105 : Basic Electrical Engineering

Teaching Scheme	Credit	Examination Scheme:
TH: 02 Hours/Week	02	CCE : 30 Marks
PR: 02 Hours/Week	01	End - Semester (Th) : 70 Marks

Prerequisite Courses, if any: Intermediate physics, Intermediate Mathematics.

Companion Course, if any: **NIL**

Course Objectives:

1. To impart fundamental knowledge of electrical quantities, basic laws of magnetism along with applications.
2. To develop skills that can assist in the analysis of DC and AC electric circuits.
3. To inculcate skills that aid in determining the performance of transformer.
4. To familiarize different wiring schemes and electricity bill calculations.

Course Outcomes:

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

CO1: Apply Kirchhoff's Laws, Superposition theorem and network simplification techniques for DC circuit analysis.

CO2: Analyze the magnetic circuit parameters, self Inductance, mutual Inductance and Electromotive Forces (EMF's).

CO3: Calculate AC quantities using mathematical equations, waveforms, and phasor diagrams.

CO4: Compute the voltage, current, and powers of the given 1-phase and 3-phase AC circuits

CO5: Understand the working principle of 1-Phase Transformer, Motors (DC, Induction) and their practical applications.

Course Contents

Unit I	Elementary Concepts and DC Circuits	(06 Hours)

Elementary concepts: Resistance, EMF, current, potential difference, Ohm's law. Generalized block diagram of elementary power system showing stages such as Generation, Transmission, and Distribution of electrical energy. Classification of electrical networks, simplifications of networks using series-parallel combinations and star delta transformation technique, Kirchhoff's Laws and their applications for network solutions using loop analysis, Superposition theorem.

#Exemplar	Electric power system, Electricity Bill, Automobile & UPS Batteries
Mapping of Course Outcomes for Unit I	CO1

Unit II	Electromagnetism	(06 Hours)

Magnetic Circuit: Concept of flux density, field strength, permeability, MMF, reluctance, their units, and relationships. Simple series magnetic circuit, comparison of electric and magnetic circuit.

Electromagnetic Induction: Faradays Laws of electromagnetic induction, Fleming's right-hand rule, statically and dynamically induced emf, self and mutual inductance, coefficient of coupling. Energy stored in magnetic field

#Exemplar	Loudspeaker, Motor, Generator, Transformer

Mapping of Course Outcomes for Unit III	CO3	
Unit III	**AC Fundamentals**	**(06 Hours)**
Generation of single-phase sinusoidal voltages and currents, their mathematical and graphical representation, Concept of cycle, period, frequency, instantaneous, peak, average and RMS. values, peak factor and form factor. Phase, Phase difference, lagging, leading in phase quantities and their phasor representation. Rectangular and polar representation of phasor. Study of AC circuits consisting of pure resistance, pure inductance, pure capacitance		
#Exemplar	Generator, Electrical heater, radio circuits, capacitor	
Mapping of Course Outcomes for Unit IV	CO4	
Unit IV	**AC Circuits**	**(06 Hours)**
Single Phase AC Circuits: Series R-L, R-C and R-L-C circuits, concept of impedance, power factor, phasor diagrams, Voltage, current and power waveforms. Concept of active, reactive, apparent and complex power. Resonance in RLC series circuits. **Polyphase A.C. Circuits**: Concept of three-phase AC symmetrical system, phase sequence, balanced and unbalanced load. Voltage, current and power relations in three phase balanced star and delta connected loads along with phasor diagrams.		
#Exemplar	Machine windings, Electrical appliances response, Three phase AC Machines	
Unit V	**Introduction to Electric Machines**	**(06 Hours)**
Single Phase Transformer: Construction, working principle, EMF equation, transformation ratio, rating, types, losses, regulation and efficiency at different loading conditions. **Electrical Motors :** a) D.C. Motors: Construction, working principle, types, characteristics and EMF equation, b) Three Phase Induction Motor: Working principle using rotating magnetic field theory, types and applications. c) Single Phase Induction Motor: Construction, working principle of single phase Induction motor using double field revolving theory. Types and applications of split phase, capacitor start and capacitor run motors.		
#Exemplar	Machine windings, Electrical appliances response, Three phase AC Machines	
Mapping of Course Outcomes for Unit V	CO5	
Learning Resources		
Textbooks: 1. B.L. Theraja, “A textbook on Electrical Technology, Vol-I”, S Chand Publications 2. V. K. Mehta, Rohit Mehta, “Basic Electrical Engineering”, S Chand Publications 3. J. B. Gupta, “A textbook of Electrical Engineering”, S. K. Kataria & Sons 4. S. K. Bhattacharya, “Electrical Machines”, McGraw Hill Education		

Reference Books:

1. C. L. Wadhwa, “Basic Electrical Engineering”, New Age International (P) Limited
2. E. Hughes, “Electrical and Electronics Technology”, Pearson
3. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill Education
4. T. K. Nagsarkar, M. S. Sukhija, “Basic Electrical Engineering”, Oxford University Press

e-Books: https://newagepublishers.com/servlet/nagetbiblio?bno=001136&flag=

MOOC / NPTEL/YouTube Links: https://nptel.ac.in/courses/108105112

[#Exemplar: These are the practical applications based on the contents of the particular unit and for information only. *Comprehensive Continuous Evaluation]

The CO-PO mapping table

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

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ELE105 - Basic Electrical Engineering Laboratory		
Teaching Scheme	**Credit**	**Examination Scheme:**
PR: 02 Hours/Week	**01**	**PR: 25 Marks**

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a hands-on resource and reference. The instructor's manual needs to include prologue (about university / program/ institute / department / foreword / preface), University syllabus, conduction & Assessment guidelines, topics under consideration-concepts, objectives, and outcomes.

Guidelines for Student's Lab Journal

The students Lab Journal should contain following related to every experiment –

1. Title of the experiment
2. Objective
3. Apparatus with their detailed specifications.
4. Brief theory related to the experiment.
5. Connection diagram /circuit diagram.
6. Observation table
7. Sample calculations for one/two reading.
8. Result table
9. Graph and Conclusions.
10. Few questions related to the experiment.

Guidelines for Laboratory/ TW Assessment

1. Continuous assessment of laboratory work is to be done based on overall performance and Laboratory performance of student.
2. Each Laboratory assignment assessment should assign grade/marks based on parameters with appropriate weightage.
3. Suggested parameters for overall assessment as well as each Laboratory assignment assessment include- timely completion, performance, efficiency, punctuality, and neatness.

Suggested List of Laboratory Experiments (Any eight)

1. To study safety precautions while working on electrical systems, handling of various equipment's such as rheostat, multi-meter, ammeters, voltmeters, wattmeter's etc.
2. Study of wiring materials, switch board and different wiring schemes. (Simple wiring & staircase wiring).
3. To verify Kirchhoff's laws.
4. To verify Superposition theorem.
5. To determine efficiency and regulation of transformer by using direct loading test.
6. To measure steady state response of series RL and RC circuits.
7. To study RLC series resonance.
8. To verify the relation between phase and line quantities in three phase balanced star delta connections of load.
9. Study of cut view section of single phase/ three phase Induction motor.
10. To measure insulation resistance by using megger and study of Single-Phase LT electricity bill.

MEC106 : Engineering Graphics

Teaching Scheme	Credit	Examination Scheme:	
TH 02 Hours/Week PR 02 Hour/Week	02 01	CCE (TH) End-semester (TH) Term work (PR)	30 70 25

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Prerequisite Courses, if any:

- Basic Geometric Shapes
- Basic geometrical measurements (linear and angular), Construction
- Deviation of line, circle and polygon, Co-ordinate geometry.
- Computer literacy.

Companion Course, if any:

Course Objectives:

This course aims to cultivate students' ability to conceptualize physical objects and effectively translate them onto paper for communication in engineering contexts. It focuses on enhancing manual drawing skills, honing drawing interpretation abilities, and fostering a practical understanding of object dimensions. Additionally, the course seeks to introduce students to essential drawing and design software tools for a well-rounded skill set.

Course Outcomes:

On completion of the course, learner will be able to:

CO 1 – Explain the fundamentals of Engineering Graphics and basic principles of geometric construction and apply the knowledge of Projections, Methods to prepare the drawings for points and lines.

CO 2- Apply the types of Projections, Methods to prepare the drawings for planes.

CO 3 – Construct the various engineering curves and illustrate the application of various engineering curves and draw the development of the lateral surface of solid.

CO 4- Apply the concept of orthographic projection of an object to draw several 2D views for visualizing the physical state of the object.

CO 5 - Apply the visualization skill to draw an isometric projection from given orthographic views.

Course Contents

Unit I	Fundamentals of Engineering Drawing and Projection of Point and Line	(06 Hours)

Fundamentals of Engineering Drawing: Introduction to drawing instruments and their uses, Drawing sheets sizes and their layouts, Types of Lines, Dimensioning methods, General rules of dimensioning.

Projection of Point and Line

Theory of projection, Projection of points in all possible quadrants. Projection of line when parallel to both the reference planes, Projections of lines when it is perpendicular to one of the reference planes, when line is inclined to one and parallel to other reference plane, Line inclined to both reference planes (first angle projection).

Mapping of Course Outcomes for Unit I	CO1

Unit II	Projection of Plane	(06 Hours)
Introduction, Projection of plane when plane is Parallel to one and perpendicular to other, Projection of plane when plane is inclined to one plane and perpendicular to other Projections of planes when it is inclined to both reference planes.		
Mapping of Course Outcomes for Unit II	CO 2	
Unit III	**Engineering Curves and Development of Lateral Surfaces**	**(06 Hours)**
Engineering Curves: Conic Sections- Ellipse, Parabola and Hyperbola by directrix and focus and rectangle method, Helix (one convolution) on Cylinder and Cone, Cycloid, Involute of a circle, Archimedean spiral (one convolution) Development of Lateral Surfaces: Introduction, Method of development, development of lateral surfaces of right solids, cube, prisms, cylinder, pyramids, and cone.(No sectioned solids)		
Mapping of Course Outcomes for Unit III	CO 3	
Unit IV	**Orthographic Projection**	**(06 Hours)**
Introduction, Principle of projection, Plane of Projection, Method of Projection, Orthographic Projection, First and Third angle method of projection, Hidden features, curved features, circular features. etc. Typical problems by first angle projection method		
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Isometric Projection**	**(04 Hours)**
Introduction of isometric projection, Isometric lines, planes, non-isometric lines and planes, Isometric scale, Isometric projection and view, Construction of isometric view/ projection from given orthographic views.		
Mapping of Course Outcomes for Unit V	CO5	
Learning Resources		

Text Books:

1. Bhatt, N. D. and Panchal, V. M., (2016), “Engineering Drawing”, Charotar Publication, Anand, India
2. K. Venugopal, K, (2015), “Engineering and Graphics”, New Age International, New Delhi
3. Jolhe, D. A., (2015), “Engineering Drawing with introduction to AutoCAD”, Tata McGraw Hill, New Delhi
4. Rathnam, K., (2018), “A First Course in Engineering Drawing”, Springer Nature Singapore Pte. Ltd., Singapore

Reference Books:

1. Madsen, D. P. and Madsen, D. A., (2016), "Engineering Drawing and design", Delmar Publishers Inc., USA
2. Bhatt, N. D., (2018), "Machine Drawing", Charotor Publishing House, Anand, India
3. Dhawan, R. K., (2000), "A Textbook of Engineering Drawing", S. Chand, New Delhi
4. Luzadder, W. J. and Duff, J. M., (1992), "The Fundamentals of Engineering Drawing: With an Introduction to Interactive Computer Graphics for Design and Production", Peachpit Press, USA
5. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Loving, R. O., Dygon, J. T., (1990), "Principles of engineering graphics", McMillan Publishing, USA
6. Jensen, C., Helsel, J. D., Short, D. R., (2008), "Engineering Drawing and Design", McGraw-Hill International, Singapore

e-Books:

MOOC / NPTEL/YouTube Links:

NPTEL Course: Engineering Graphics and Design
https://onlinecourses.nptel.ac.in/noc21_me128/preview

NPTEL Course: Introduction and Geometric Construction
https://archive.nptel.ac.in/content/storage2/courses/112103019/module1/lec3/1.html

NPTEL Course: Computer Aided Design and Manufacturing".
https://archive.nptel.ac.in/courses/112/102/112102101/

The CO-PO mapping table

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

Note: Some units of theory can be taught during practical sessions and more emphasis can be given on hands on skills

Term Work 25 Marks, 2Hrs/week (1 Credit)

Guidelines for Practical Conduction

Practical Evaluation: At least 5 assignments based on drafting work must be given on all units and each assignment should have minimum 2 problems to be drawn on A2 size drawing sheet and two problems must be solved by using any CAD software.

CVL107 : Engineering Mechanics

Teaching Scheme	Credit	Examination Scheme:	
TH 2 Hours/Week PR 2 Hour/Week	02 01	CCE : End-semester (TH) : Term work :	30 Marks 70 Marks 25 Marks

Prerequisite Courses, if any:

- Engineering Mathematics and Physics

Companion Course, if any:

Course Objectives:

The objectives of this course is to make students to learn basics of engineering Mechanics concepts and its application to the real-world problems, solve problems involving Forces, loads and Moments and know their applications in allied subjects.

Course Outcomes:

On completion of the course, learner will be able to:

1. Understand basic concept of forces, moments and couples in two-dimension force system
2. Apply concept of free body diagram for static equilibrium in two-dimension force system
3. Analyze the practical example involving friction and application of two force members
4. Analyze rectilinear and curvilinear motion of particle
5. Apply Newton's second law, work energy and impulse momentum principles for particles

Course Contents

Unit I	**Force systems and its resultants**	(06 Hours)
Introduction, type of motion, fundamental concepts and principle, force system, resolution and composition of forces, resultant of concurrent force system, moment of a force, Varignon's theorem, resultant of parallel force system, couple and resultant of general force system. Introduction, centroid of basic figures, centroid of composite figure, moment of inertia of simple geometrical figure, parallel axis theorem, perpendicular axis theorem, moment of inertia of composite figure.		
#Exemplar/Case Studies		
Mapping of Course Outcomes	PO1, PO2	
Unit II	**Equilibrium**	**(06 Hours)**
Introduction, free body diagram, equilibrium of coplanar forces, equilibrium of two forces, three force principle, equilibrium of concurrent, parallel and general force system, type of load, type of support, type of beam and support reaction.		
#Exemplar/Case Studies		
Mapping of Course Outcomes	PO1, PO2	
UNIT III	**Friction and trusses**	
Introduction, sliding and rolling friction, laws of coulomb friction, coefficient of friction, angle of repose, angle		

of friction, cone of friction, friction on inclined plane, ladder friction and belt friction. Trusses: two force and multi force member, assumption of analysis, analysis of truss, identification of zero force members, method of joint and method of section.	
UNIT IV	**Kinematics of particle**
Introduction, basic concept, rectilinear motion: motion with uniform acceleration, gravitational acceleration and variable acceleration, curvilinear motion: rectangular components, motion of projectile, normal and tangential components.	
Mapping of Course Outcomes for Unit II	PO1, PO2, PO3
UNIT V	**Kinetics of particle**
Introduction, Newton's second law of motion, equation of motion, Newton's law of gravitation, application of Newton's second laws to rectilinear and curvilinear motion, conservative and nonconservative forces, work energy principle, conservation of energy, impulse momentum principle and impact	
Mapping of Course Outcomes for Unit II	PO1, PO2, PO3
Learning Resources	
Text Books: 1. Engineering Mechanics, Ferdinand Singer, 3rd edition, Harper and Row 2. Engineering Mechanics (Statics and Dynamics) by Hibbeler R. C., Pearson Education	
Reference Books: Engineering Mechanics, S Timoshanko and Young, Tata McGraw Hill Education Pvt. Ltd. New Delhi. Vector Mechanics for Engineers – Statics, Beer and Johnston, Tata McGraw Hill Vector Mechanics for Engineers – Dynamics, Beer and Johnston, Tata McGraw Hill. Engineering Mechanics - Statics and Dynamics, Meriam J. L. and Kraige L.G., John Wiley and Sons	

The CO-PO mapping table

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

CVL107 : Engineering Mechanics Practical			
Teaching Scheme	**Credit**	**Examination Scheme:**	
PR 2 Hour/Week	**01**	**Term work (PR):**	**25**
Journal consist of the following			
A. Compulsory experiments as per following list			
1. Verification of the Polygon law of forces			
2. To find support reaction of beam			
3. To determine coefficient of friction			
4. Determination of coefficient of restitution			
B. Graphical Solution of the following			
1. Equilibrium of concurrent force system			
2. Equilibrium of parallel force system			
3. Forces in the member of pin jointed truss			
4. Moment of Inertia			
C. Assignment on each unit: minimum four example on each unit			

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COM108 : Fundamentals of Programming Languages		
Teaching Scheme	**Credit**	**Examination Scheme:**
TH: 2 Hours/Week	**02**	**CCE : 30 Marks** **End – Semester : 70 Marks**
PR : 2 Hours/Week	**01**	**TW : 25 Marks**

Prerequisite Courses, if any:

- Basics of Computers
- Basic Mathematics

Companion Course, if any: Fundamentals of Programming Languages Lab

Course Objectives:

1. To understand the fundamental Concepts of C Programming
2. To acquire knowledge and Compare usage of Operators and Expressions in C Programming
3. To apply Control Flow structures in C Programming for Problem solving
4. To design a solution using Arrays, Character and String Arrays in C programming
5. To design a develop solution for simple computational problems using User Defined Functions in C Programming
6. Justify the use of structures in Problem solving using C programming language

Course Outcomes:

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

CO1: To **Design** algorithms for simple computational problems.

CO2: To **Use** mathematical, Logical Operators and Expressions.

CO3: To apply Control Flow structures for decision making.

CO4: To design a solution using Arrays, Character and String Arrays.

CO5: To **D**esign and apply user defined functions.

CO6: To **Apply** structures in Problem solving using C programming language.

Unit I	**Introduction to Program Planning & C Programming**	**(06 Hours)**

Program Design Tools: Art of Programming through Algorithms, Flowcharts.

Overview of C: History and importance C, Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Storage Class, Assigning Values to variables, Defining Symbolic Constants, declaring a Variable as Constant, Declaring a Variable as Volatile.

#Exemplar/Case Studies	Study of "C" Program compilation Process, testing and debugging.
Mapping of Course Outcomes for Unit I	CO1

Unit II	**Operators and Expressions**	**(06 Hours)**

Operators and Expressions: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators. Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators, Operator Precedence and Associativity, Mathematical Functions.		
#Exemplar/Case Studies	Study of Infix, Prefix and Postfix expressions.	
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Control Flow**	**(06 Hours)**
Decision Making and Branching: Simple If Statement, If-Else,Else-If,Switch Statement, Goto Statement **Decision Making and Looping:** While Statement, Do-While, For Statement, Break and Continue		
#Exemplar/Case Studies	Design simple calculator and Generating a Calendar	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Arrays**	**(06 Hours)**
Arrays: One Dimensional Arrays, Declaration of One-dimensional Arrays, Initialization of One-dimensional Arrays, Two –dimensional Arrays, Initialization of Two- dimensional Arrays. **Character Arrays and Strings:** Declaration and Initialization String Variables, Reading Strings from Terminal, Writing Strings to Screen, Putting Strings Together, Comparison of Two Strings, Introduction to String handling Functions		
#Exemplar/Case Studies	Matrix multiplication	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**User Defined Functions**	**(06 Hours)**
User Defined Functions: Need for User-defined Functions, A Multi-Function Program, Elements of User defined Functions, Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but No Return Values, Arguments with Return values, No Arguments but Returns a Value, Functions that Return Multiple Values, Nesting of Functions, Recursion **Structures :** What is a Structure? Structure Type Declarations, Structure Declarations, Referencing Structure Members, Referencing Whole Structures, Initialization of Structures.		
#Exemplar/Case Studies	Tower of Hanoi, Generation of Monthly balance sheet	
Mapping of Course Outcomes for Unit V	CO5	
Learning Resources		
Text Books: Programming in ANSIC, 8e –E. Balagurusamy		

Reference Books:

1. B. S. Gottfried, Programming with C (Schaum's Outline Series), 2nd ed. McGraw-Hill, 1996.
2. S. C. Kochan, Programming in C, Sams Publishing, 3rd ed. 2004.
3. B. W. Kernighan and D. M. Ritchie, The C Programming Language, 2 nd ed. UK: Prentice Hall, 1988.
4. W. Kernighan and B. Pike, The Practice of Programming, UK: Addison-Wesley, 1999
5. H. M. Deitel and P. J. Deitel, C: How to program, 8 th ed. Pearson Education, 2015.
6. P. Prinz and T. Crawford, C in a Nutshell: The Definitive Reference, 2nd ed., O'Reilly Media, 2016

e-Books:https://studylib.net/doc/25796931/programming-in-ansic--8e---balagurusamy

MOOC / NPTEL/YouTube Links:

The CO-PO mapping table

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	-	-	-	-	-	-	-	-
CO2	1	1	1	1	-	-	-	-	-	-	-	-
CO3	1	1	1	1	-	-	-	-	-	-	-	-
CO4	1	1	1	1	-	-	-	-	-	-	-	-
CO5	1	1	1	1	-	-	-	-	-	-	-	-
CO6	1	1	1	1	-	-	-	-	-	-	-	-

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COM108 - Fundamentals of Programming Languages Laboratory

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a hands-on resource and reference. The instructor's manual needs to include prologue (about University/program/ institute/ department/foreword/ preface etc), copy of curriculum, conduction & Assessment guidelines, topics under consideration- concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory-Concept in brief, features of tool/framework/language used, Design, test cases, conclusion. Program codes with sample output of all performed assignments are to be submitted as softcopy.

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journals may be avoided. Use of Drive containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Lab /TW Assessment

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of students. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Guidelines for Laboratory Conduction

List of laboratory assignments is provided below for reference. The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy should address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute them among batches of students. It is appreciated if the assignments are based on real world problems/applications. Encourage students for appropriate use of coding style, proper indentation and comments.

Use of open source software and recent versions is to be encouraged.

In addition to these, instructors may assign one real life application in the form of a mini-project based on the concepts learned. Instructors may also set one assignment or mini-project that is suitable to each branch beyond the scope of the syllabus.

Suggested List of Laboratory Experiments/Assignments (Any 6 to 8 laboratory assignments) based on Programming

1	To accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorial of number e) prime factors.
2	To accept from user the number of Fibonacci numbers to be generated and print the Fibonacci series.
3	To accept an object mass in kilograms and velocity in meters per second and display its Momentum. Momentum is calculated as $e=mc^2$ where m is the mass of the object and c is its velocity.

4	In array do the following: 1. Find given element in array 2. Find Max element 3. Find Min element 4. Find frequency of given element in array 5. Find Average of elements in Array.
5	Write a C program for employee salary calculation given, Basic, H.R.A. 20 % of Basic and D.A. 150 % of Basic.
6	To accept a student's marks for five subjects, compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinguished. If aggregate is 60>= and <75 then the Grade of first division. If aggregate is 50>= and <60, then the grade is second division. If aggregate is 40>= and <50, then the grade is third division.
7	To accept two numbers from user and compute smallest divisor and Greatest Common Divisor of these two numbers.
8	Write a C program that accepts a string from the user and performs the following string operations- i. Calculate length of string ii. String reversal iii. Equality check of two Strings iii. Check palindrome ii. Check substring
9	Create Structure EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary), and store the data and update the data in structure.
10	Create class STORE to keep track of Products (Product Code, Name and price). Display menu of all products to users. Generate bills as per order.
Mini-Projects	
1	Calculator with basic functions. Add more functionality such as graphic user interface and Complex calculations.
2	Program that simulates rolling dice. When the program runs, it will randomly choose a number between 1 and 6 (Or other integer you prefer). Print that number. Request user to roll again. Set the min and max number that dice can show. For the average die, that means a minimum of 1 and a maximum of 6.
3	Guess Number: Randomly generate a number unknown to the user. The user needs to guess what that number is. If the user's guess is wrong, the program should return some sort of indication as to how wrong (e.g. the number is too high or too low). If the user guesses correctly, a positive indication should appear. Write functions to check if the user input is an actual number, to see the difference between the inputted number and the randomly generated numbers, and to then compare the numbers.
4	To calculate the salary of an employee given his basic pay (take as input from user). Calculate gross salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employees pay professional tax as 2% of total salary. Calculate net salary payable after deductions.

Reference Books:

1. B. S. Gottfried, Programming with C (Schaum's Outline Series), 2nd ed. McGraw-Hill, 1996.
2. S. C. Kochan, Programming in C, Sams Publishing, 3rd ed. 2004.
3. B. W. Kernighan and D. M. Ritchie, The C Programming Language, 2 nd ed. UK: Prentice Hall, 1988.
4. W. Kernighan and B. Pike, The Practice of Programming, UK: Addison-Wesley, 1999
5. H. M. Deitel and P. J. Deitel, C: How to program, 8 th ed. Pearson Education, 2015.
6. P. Prinz and T. Crawford, C in a Nutshell: The Definitive Reference, 2nd ed., O'Reilly Media, 2016

e-Books:https://studylib.net/doc/25796931/programming-in-ansic--8e---balagurusamy

MOOC / NPTEL/YouTube Links: https://onlinecourses.nptel.ac.in/noc22_cs40/preview
: https://onlinecourses.nptel.ac.in/noc23_cs53/preview

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VSE109: Manufacturing Practice Workshop

Teaching Scheme	Credit	Examination Scheme:
PR: 02 Hours/Week	01	Term work (TW) : 25 Marks

Prerequisite Courses, if any:

- Basic Science
- Drawing

Companion Course, if any:

Course Objectives:

1. To acquire the basic knowledge of Machine Tools.
2. To inculcate the basics of various manufacturing processes.
3. To impart practical aspects of Machine Tools and Manufacturing processes used in industrial applications
4. To develop the skill through hands-on practices using hand tools, power tools, machine tools in manufacturing and assembly shop

Course Outcomes:

On completion of the course, learner will be able to:

CO1	Illustrate various sections of a typical workshop and different types of tools and machinery commonly found in a workshop	2-Understand
CO2	Explain the importance of workshop safety and apply general workshop safety rules and guidelines.	3-Apply
CO3	Demonstrate proficiency in various cutting techniques such as sawing, shearing, and laser cutting.	3-Apply
CO4	Plan and complete a simple sheet metal job from start to finish, incorporating shearing, bending, and joining operations.	3-Apply
CO5	Describe the applications, advantages and operation of advanced computerized machine tools in modern manufacturing.	2-Understand
CO6	Apply 3D Printing Technology including setup, operation, and post-processing to print simple mechanical component.	3-Apply

List of Laboratory Experiments/Assignments

01	**Introduction to Workshop Facilities** Introduction to various sections of a typical workshop and purposes / applications, different types of tools and machinery commonly found in a workshop, usage of basic hand tools.	
	Mapping of Course Outcomes	**CO1**
02	**Safety Rules and Guidelines** Importance of workshop safety and the potential hazards present, general workshop safety rules and guidelines, protective gears, emergency procedures including the location and use of emergency equipment (e.g., fire extinguishers, first aid kits).	
	Mapping of Course Outcomes	**CO2**

03	Preparation of simple Acrylic / wood / metal job by using suitable cutting / engraving operation such as LASER, router, sawing, shearing etc.	
	Mapping of Course Outcomes	**CO3**
04	Preparation of simple sheet metal job having shearing, bending and joining operations using different tools/equipments such as hammers, mallet, stake block, snip, etc.	
	Mapping of Course Outcomes	**CO4**
05	Introduction to advance machine tools such as CNC turn / mill, VMC, plasma arc machining, Laser cutting, CNC wood router etc. Detailed demonstration (construction and operation) of any one process with one programming assignment.	
	Mapping of Course Outcomes	**CO5**
06	Fundamental principles and concepts of 3D printing, types of 3D printing technologies, steps in 3D printing. Create simple 3D models using CAD software and print using 3D printer including pre and post processes.	
	Mapping of Course Outcomes	**CO6**

Learning Resources

Text Books:

1. H.S.Bawa, “Workshop Practice”, Tata McGraw Hill Education (Publisher)
2. S. K. Hajra Choudhary, Nirjhar Roy, “Element of Workshop Technology: Vol.1 and 2”, Media Promoters and Publishers Pvt. Ltd., 15th Edition, 2012

Reference Books:

1. MikellP.Groover,“IntroductiontoManufacturingProcesses”,WileyPublications
2. John,K.C., “Mechanical Workshop Practice”, Prentice Hall Publication, New Delhi
3. Chua Chee Kai, Leong Kah Fai, “3D Printing and Additive Manufacturing: Principles & Applications”, 4th Edition, World Scientific, 2015.
4. Automation, Production system & Computer Integrated manufacturing, M. P. Groover Person India, 2007 2nd edition.

e-Books:-

MOOC / NPTEL/YouTube Links: -

NPTEL Course on Fundamentals of Additive Manufacturing Technologies by Prof. Sajan Kapil, IIT Guwahati, https://onlinecourses.nptel.ac.in/noc21_me115/preview

NPTEL Course on Fundamentals of Industrial safety by Prof. Thomas, IIT Madras https://www.youtube.com/watch?v=3VReVbsmjKI

NPTEL Course on Computer Numeric Control Of Machine Tools And Processes by Prof. A. Roy Chaodhary, IIT Kharagpur https://www.youtube.com/watch?v=ImtSsDLgAaI&list=PLSGws_74K01-KX9YtVZACpOoFYy6oaJIC

The CO-PO mapping table

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

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VSE101 : Design Thinking Idea Lab				
Teaching Scheme		**Credit**	**Examination Scheme:**	
PR 2	**Hour/Week**	**02**	**Term work (PR)**	**25 Marks**

Course Objectives:

- Understand the core principles of design thinking and its role in engineering.
- Apply the six hats of design thinking to analyze and solve complex problems.
- Develop creative and user-centered solutions to real-world challenges.
- Demonstrate effective communication and collaboration in multidisciplinary teams.
- Evaluate and analysis design concepts and prototypes.
- Develop a mindset for continuous innovation and improvement.

Course Outcomes:

On completion of the course, learner will be able to:

CO1	Identify and define problems from a user's perspective and articulate design criteria.
CO2	Identify and define problems from a user's perspective and articulate design criteria.
CO3	Generate innovative ideas and solutions through brainstorming and ideation.
CO4	Generate innovative ideas and solutions through brainstorming and ideation.
CO5	Present and communicate design ideas effectively using visual aids and storytelling
CO6	Collaborate with peers and industry professionals to address real-world design challenges.

Note: -

1. The practical lab is designed to provide students with hands-on experience in applying the theoretical concepts they have learned in the course. The session aims to enhance their understanding, critical thinking, and problem-solving skills. (1 hour for explaining the concept and 1 hour for activity/ assignment / group discussion / brainstorming session)
2. Incorporating hands-on labs with access to various lab and workshop facilities in the Institute, can enhance the practical aspect of the course and provide students with opportunities to prototype and test their designs.

Laboratory Experiments/Assignments

Week	**1-2**	Introduction to Design Thinking • Understanding the design thinking process • Role of empathy and user-centric design • Practical Lab: Empathy mapping and user interviews • Assignment 1: Problem identification

	3-4	Ideation and Creativity • Techniques for idea generation and brainstorming • Practical Lab: Brainstorming sessions • Assignment 2: Idea generation and selection
	5-6	Prototyping and Testing • Creating prototypes to validate design concepts • Practical Lab: Rapid prototyping • Assignment 3: Prototyping and user testing
	6-7	Analysis and Evaluation • Applying the six hats of design thinking • Practical Lab: Six thinking hats analysis • Assignment 4: Six hats analysis of a case study
	7-8	Communication and Collaboration • Visual communication and storytelling • Group project and industry collaboration • Assignment 5: Design project presentation • Assignment 6: Reflection and lessons learned

Learning Resources

Reference Books:

1. Design Thinking: Understanding How Designers Think and Work by Nigel Cross
2. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation" by Tim Brown
3. Design Thinking for Visual Communication" by Ranjan Nayar and Jaidip Subedi
4. The Design of Everyday Things" by Don Norman• "Design Thinking: Creativity and Innovation" by S. Balaram
5. Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days" by Jake Knapp
6. Creative Confidence: Unleashing the Creative Potential Within Us All" by Tom Kelley and David Kelley (with a foreword by Ratan Tata)

Case Studies:

- **Design Thinking in Healthcare:** Redesigning a patient's waiting room experience.
- **Design Thinking in Product Development:** The evolution of the smartphone.
- **Design Thinking in Social Innovation:** Improving access to clean drinking water in rural areas.
- **Tata Nano:** The People's Car: Explore how Tata Motors aimed to revolutionize the automobile industry by creating an affordable and compact car for the masses, known as the Tata Nano.

- **Aravind Eye Care System:** Investigate how Aravind Eye Care System in India used innovative design thinking to provide high-quality, affordable eye care services to a large population, often in remote areas.
- **Project Shakti by Hindustan Unilever:** Analyze how Hindustan Unilever's Project Shakti empowered rural women in India by turning them into micro-entrepreneurs, distributing Unilever products in their communities.
- **Aadhaar: India's Unique Identification Program:** Explore how the Aadhaar program used biometric data and design thinking to provide millions of Indians with a unique identification system, enhancing access to government services and benefits.
- **Ola Cabs:** Transforming Transportation in India: Learn how Ola, an Indian ride-sharing platform, disrupted the traditional taxi industry by applying innovative design thinking to its services and business model.
- **Swiggy: Redefining Food Delivery:** Investigate how Swiggy, an Indian food delivery platform, leveraged design thinking to enhance the food delivery experience for customers and partner restaurants.
- **Lifebuoy: Promoting Hygiene in Rural India:** Explore how Lifebuoy, a brand under Unilever, used design thinking to develop innovative marketing campaigns and products to promote handwashing and hygiene in rural India.
- **Amul: The White Revolution in India:** Analyze how the Amul cooperative transformed the dairy industry in India through a unique business model, design thinking, and innovative marketing strategies
- **Flipkart: E-commerce Success Story:** Study how Flipkart, one of India's leading e-commerce platforms, employed design thinking to grow its business and offer a wide range of products and services.
- **ISRO's Mars Orbiter Mission**: Learn about how the Indian Space Research Organisation (ISRO) successfully launched the Mars Orbiter Mission (Mangalyaan) on a limited budget, showcasing innovation and design thinking in space exploration.
- **Designing Google's Self-Driving Car:** Explore how Google used design thinking to develop autonomous vehicles that redefine transportation.
- **Dyson**: Revolutionizing Vacuum Cleaners and Hand Dryers: Investigate how Dyson's innovative design thinking has transformed household appliances.
- **SpaceX**: Advancing Space Exploration Through Design Thinking: Analyze SpaceX's approach to space technology and how it has disrupted the aerospace industry.
- **Red Bull**: Creating an Energy Drink Empire: Learn how Red Bull's unique design thinking approach contributed to the success of their energy drink and brand.

- **McDonald's**: Evolution of Fast Food Service: Study the design thinking principles applied by McDonald's to enhance their customer experience and streamline operations.
- **Nest**: Reinventing Thermostats and Home Automation: Examine how Nest Labs, a subsidiary of Google, reimagined home automation with their smart thermostats and other products.
- **LEGO:** Building a Design-Centric Toy Empire: Investigate how LEGO has used design thinking to create a global brand that fosters creativity and learning through play.
- **IBM Design Thinking:** A Cultural Transformation: Explore IBM's adoption of design thinking to reshape its corporate culture and enhance its software and services.
- **Starbucks**: Brewing Design Innovation in the Coffee Industry: Analyze how Starbucks incorporates design thinking into its store layouts, product offerings, and customer experiences.
- **Amazon: Customer-Centric** Design in E-commerce: Discover how Amazon's design thinking philosophy has played a pivotal role in its e-commerce dominance

AEC111: Professional Communication Skills

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Teaching Scheme	Credit	Examination Scheme:	
Tut : 2 Hour/Week	02	Term work	25 Marks

Prerequisite Courses, if any:

- 12th English - Basic knowledge of Listening, Speaking, Reading, and Writing. (LSRW) skills.

Companion Course, if any:

Course Objectives:

To train the students in acquiring interpersonal communication skills by focusing on language skill acquisition techniques and error feedback.

Course Outcomes:

On completion of the course, learner will be able to:

CO1: Recognize, identify, and express advanced skills of Technical Communication in English through Language Laboratory.

CO2: Understand, categorize, differentiate, and infer listening, speaking, reading, and writing skills in societal and professional life.

CO3: Articulate and present the skills necessary to be a competent Interpersonal communicator.

CO4: Deconstruct, appraise, and critique communication behaviors.

CO5: Adapt, negotiate, and facilitate with multifarious socio-economical and professional arenas with effective communication and interpersonal skills.

Laboratory work should cover the following guideline topics for conduction of Laboratory activities:

Unit I	Introduction to the Language Lab
	a) The Need for a Language Laboratory b) Tasks in the Lab c) Writing a Laboratory Notebook
Unit II	Active Listening Skills Basic Listening Skills: Introduction, the process, importance and types of listening, Effective Listening: Principles and Barriers, Guidelines to increase listening,
	a) What is Active Listening? b) Listening Sub-Skills—Predicting, Clarifying, Inferencing, Evaluating, Note-taking c) Listening in Business Telephony
Unit III	Speaking

	a) Speaking—Accuracy and Fluency Parameters b) Pronunciation Guide—Basics of Sound Scripting, Stress, and Intonation c) Fluency-focussed activities—JAM (Just a Minute), Conversational Role Plays, Speaking using Picture/Audio Visual inputs. d) Group Discussion: Principles and Practice e) Giving a Presentation—Learning Presentation Basics and Giving Micro Presentations f) Activities to enhance listening Speaking Skills: Introducing yourself, describing a person, place, situation and event, giving instruction, Making inquiries – at a bank, post- office, air-port, hospital, reservation, counter
Unit IV	**Reading and Writing Skills**
	Effective Reading: Process, types and reading rate adjustment, Tips for improving reading skills, Reading Comprehension.
	Effective Written Communication: **Introduction**, Importance of written communication, Writing a Book/ small article/ Film Review, Scripting a Short Presentation
	Letter Writing: Types, Formats, Official Correspondence: Memo, Notice and Circulars, Agenda and Minutes, **Report Writing:** Purpose and Scope of a Report, Fundamental Principles of Report Writing, Project Report Writing, Summer Internship Reports. sentences Precise writing through meticulous editing, proofreading Writing abstracts and conclusions.
Unit V	**Workplace Communication**
	Greeting, Welcoming, Dealing with Complaints, Giving Instructions or Directions, Giving Information: About Various Facilities, Distance, Area, Local Specialties Consultation and Solution of Problems, Accepting Praises and Criticism, Apologizing. Fluency and Etiquette, Polite sentences and Words, Use of Persuading words, Intonation and Voice Modulation, Developing.

List of Laboratory Experiments/Assignments

Minimum eight practical/ assignments should be performed to cover entire curriculum of the course. The list of practical given below is just a guideline.

1. Speech/Seminar presentation
2. Observation of a recorded seminar and suggestions for improvement.
3. Technical Report Writing and presentation.
4. Role Plays
5. Interview Simulations
6. Reading and Listening Comprehension

7. Group Discussions
8. Resume Building
9. Business Correspondence
10. Cross-Cultural Communication
11. Situational Writing
12. SWOT analysis
13. Public Speaking Exercises
14. Greetings for different occasions.
15. Participation in institute/National level Elocution/Essay/G.D. Competitions

Guidelines for compressive continuous assessment (CCE)

- CCE should support for regular performance of practical by student and his/her regular assessment with proper understanding of practical carried out.
- It is a representative list of practical. The instructor may choose practical as per his requirements (so as to cover entire contents of the course) from the list.

Learning Resources

Text Books:

1) Communication Skills for Engineers by S. Mishra & C. Muralikrishna (Pearson)
2) Communication Skills for Technical Students by T.M. Farhatullah (Orient Longman)
3) Written Communication in English by Saran Freeman (Orient Longman)
4) Essential English Grammar (Elementary & Intermediate) Raymond Murphy (CUP)
5) Communication for Business: A Practical Approach by Shirley Tailor (Longman)

Reference Books:

1) Developing Communication Skills by Krishna Mohan & Meera Banerji (Macmillan)
2) Business Correspondence and Report Writing, R. C. Sharma & Krishna Mohan (Tata McGraw Hill)
3) Sasikumar et al. A Course in Listening and Speaking. New Delhi: Foundation Books, 2005.
4) Tony Lynch, Study Listening. Cambridge: Cambridge UP, 2004.

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

CCC112 : Co-Curricular Course - I			
Teaching Scheme	**Credit**	**Examination Scheme:**	
PR 2 Hour/Week	**02**	**Term work (PR)**	**25 Marks**

Prerequisite Courses, if any:

- Basic Science
- Drawing

Companion Course, if any:

Course Objectives:

1 To nurture the importance of health and wellness in their life.

2. To understand the importance of Sports in their life

3. To understand the importance of yoga to strengthen body and mind.

4. To motivate students for awareness of fitness.

Course Outcomes:

On completion of the course, learner will be able to:

Course Outcomes

1. To understand the importance of diet and lifestyle for health and wellness
2. To understand and apply various technical aspects of Sports of his/her choice.
3. To understand importance of yoga and meditation and apply various yoga activities for mental fitness
4. To learn and apply scientific way of using various physical fitness tools in gymnasium.

List of Laboratory Experiments/Assignments

Student have to perform following practical based activities

1	Activity for Health and wellness various activity to explore health issues, healthy diet, healthy lifestyle, harmony of the Self and Body, Mental and physical health to be conducted. 1. Demonstration and conduction of activity based on various health issues. 2. Conduction of Experts session on health diet for physical fitness.
2	**Activity for Sports** 3. To prepare presentation/ brief report of sports on various aspects such as rules, regulations and guidelines, etc. related to any sports of his/her choice. 4. Conduction of any sports activity on ground.
3	**Activity for Yoga** 5. Conduction of expert's session on literature of yoga and meditation to explore its importance for physical and mental fitness. 6. Conduction of yoga activities in group.

4	**Activity for Fitness** **7.** Conduction of expert's session by gymnasium trainer on various aspects related to physical fitness. **8.** To perform activities related to physical fitness such as running, weight lifting etc.
	Plan of Action (Execution of Activities) • Student should prepare the brief report of every activity performed and faculty should evaluate students performance based on his/ her participation in the activity. • Any certification earned related to above activity may be given credit to the student.

Learning Resources

Reference Books

1 Bucher, C. A. (n.d.) Foundation of physical education. St. Louis: The C.V. Mosby Co. Deshpande, S. H. (2014). Physical Education in Ancient India. Amravati: Degree college of Physical education.

2 Mohan, V. M. (1969). Principles of physical education. Delhi: Metropolitan Book Dep. Nixon, E. E. & Cozen, F.W. (1969). An introduction to physical education. Philadelphia: W.B. Saunders Co.

3 D.M Jyoti, Yoga and Physical Activities (2015) lulu.com3101, Hills borough, NC27609, United States

4 Shekar, K. C. (2003). Yoga for health. Delhi: Khel Sahitya Kendra.. 16. Amit Arjun Budhe, (2015) Career aspects and Management in Physical Education, Sports Publication, New Delhi.

5 Any book related to Indian classical music theory

Savitribai Phule Pune University
Faculty of Science and Technology

National Education Policy (NEP) Compliant Curriculum

Semester - II

First Year Engineering
(2024 Course)

www.unipune.ac.in

ESE113 : Engineering Mathematics – II

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Teaching Scheme	Credit	Examination Scheme:
TH: 03 Hours/Week TU: 01 Hours/Week	03 01	CCE : 30 Marks End - Semester(TH) : 70 Marks TW : 25 Marks

Prerequisites:

- Integration, Differential Equation, Three-dimensional coordinate systems

Course Objectives:

To familiarize the students with Advanced techniques of integration, Tracing of curve, Solid geometry, Multiple integrals and their applications, Mathematical modeling of physical systems using differential equations. The aim is to equip them with the concept and tools to understand advanced level mathematics and its applications, that would enhance thinking power, useful in their disciplines.

Course Outcomes:

On completion of the course, learner will be able to:

CO1: Apply advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions useful in evaluating multiple integrals and their applications.

CO2: Trace the curve for a given equation and measure arc length of various curves. **Apply** the concepts of solid geometry to solve problems on sphere, cone and cylinder in a comprehensive manner.

CO3: Evaluate multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.

CO4: Apply the effective mathematical tools for solving first order ordinary differential equations such as Exact and Reducible to exact Linear and reducible to Linear.

CO5: Model physical systems using ordinary differential equations, **solve and analyze** the solutions apply to Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc.

Course Contents

Unit I	Integral Calculus	(08 Hours)
Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign and Error functions.		
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Curve Tracing and Solid Geometry**	**(08 Hours)**
Tracing of Curves – Cartesian, Polar and Parametric curves, Rectification of curves. Cartesian, Spherical polar and Cylindrical coordinate systems, Sphere, Cone and Cylinder.		
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Multiple Integrals and Applications**	**(08 Hours)**
Double and Triple integrations, change of order of integration, Applications to find Area, Volume, Mass, Centre of Gravity and Moment of Inertia.		
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**First Order Ordinary differential Equation**	**(08 Hours)**

Exact differential equations, Equations reducible to exact form. Linear differential equations, Equations reducible to linear form and Bernoulli's equation.	
Mapping of Course Outcomes for Unit IV	CO4

Unit V	**Applications of Differential Equations**	**(08 Hours)**
Applications of Differential equations to Orthogonal Trajectories, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, Rectilinear Motion, Simple Harmonic Motion, One dimensional Conduction of Heat.		
Mapping of Course Outcomes for Unit V	CO5	

Learning Resources

Text Books:

1. Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill)
2. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi)

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.)
2. Advanced Engineering Mathematics by M. D. Greenberg (Pearson Education)
3. Advanced Engineering Mathematics by Peter V. O'Neil (Thomson Learning)
4. Thomas' Calculus by George B. Thomas, (Addison-Wesley, Pearson)
5. Applied Mathematics (Vol. I and II) by P.N. Wartikar and J.N.Wartikar Vidyarthi Griha Prakashan, Pune.
6. Differential Equations by S. L. Ross (John Wiley and Sons)

Tutorial and Term Work:

1. Tutorial for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division.
2. Term work shall consist of six assignments each on unit-I to unit-VI and is based on performance and continuous internal assessment.

MOOC / NPTEL/YouTube Links:

https://youtube.com/playlist?list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5&si=3xAONJdT2ph_jcvG

The CO-PO mapping table

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

ITT114: Programming and Problem Solving

Teaching Scheme	Credit	Examination Scheme:
TH: 02 Hours/Week **PR: 02 Hours/Week**	**02** **02**	**CCE : 30 Marks** **End - Semester(Th) : 70 Marks** **TW : 25 Marks**

Prerequisite Courses, if any:

- Basics of Computers and Basic Mathematics
- Fundamentals of Programming Languages (COM108)

Companion Course, if any: Fundamentals of Programming Languages Lab

Course Objectives:

1. To understand problem solving aspects and to know python programming.
2. To learn data types and decision control statements.
3. To learn functions and strings in Python.
4. To acquaint with the use and benefits of files handling in Python.
5. To learn features of Object Oriented Programming using Python.
6. To learn Inheritance and operator overloading in Python

Course Outcomes:

On completion of the course, learner will be able to:

CO1. Inculcate and apply various skills in problem solving.
CO2. Choose appropriate programming constructs and features to solve the problems in diversified domains.
CO3. Exhibit the programming skills for the problem solving using functions and string manipulations.
CO4. Demonstrate File handling and dictionaries in Python.
CO5. Apply Object Oriented Programming concepts using Python.
CO6. Apply Inheritance and operator overloading concepts in Python.

Unit I	Unit I : Problem Solving, Programming and Python Programming	(04 Hours)

General Problem Solving Concepts- Problem solving in everyday life, types of problems, problem solving with computers, difficulties with problem solving, problem solving aspects, top down design. Problem Solving Strategies,
Basics of Python Programming: Features of Python, History and Future of Python, Programming Paradigm, Features of Object Oriented Programming, Applications of Python Languages.

Mapping of Course Outcomes for Unit I	CO1, CO2

Unit II	Advance Data Types and Decision Control Statements	(04 Hours)

Advance data types- Tuples, Lists, Sets and Dictionary. Decision Control Statements: Decision control statements, Selection/conditional branching
Statements: if, if-else, nested if, if-elif-else statements. Basic loop Structures/Iterative
statements: while loop, for loop, selecting appropriate loop. Nested loops, The break, continue, pass, else statement used with loops.

Mapping of Course Outcomes for Unit II	CO2

Unit III	Functions and Strings	(03 Hours)

Need for functions, Function: definition, call, variable scope and lifetime, the return statement. Defining functions, Lambda or anonymous function, documentation string, good programming practices. Introduction to modules, Introduction to packages in Python, Introduction to standard library modules.
Strings and Operations- concatenation, appending, multiplication and slicing. Strings are immutable, strings formatting operator, built in string methods and functions. Slice operation, ord() and chr() functions, in and not in operators, comparing strings, Iterating strings, the string module.

Mapping of Course Outcomes for Unit III	CO2, CO3	
Unit IV	**File Handling and Dictionaries**	**(04 Hours)**
Files: Introduction, File path, Types of files, Opening and Closing files, Reading and Writing files. File Positions, Renaming and deleting files. Directory Methods, Dictionaries creating, assessing, adding and updating values. Case Study: Study design, features, and use of any recent, popular and efficient system developed using Python. (This topic is to be excluded for theory examination)		
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Object Oriented Programming**	**(04 Hours)**
Structured and object oriented, Features of Object oriented programming-classes, objects, methods and message passing, inheritance, polymorphism, containership, reusability, delegation, data abstraction and encapsulation. Classes and Objects: classes and objects, class method and self-argument, __init__() method, class variables and object variables, __del__() method, public and private members, Built in function to check, Get, Set and Delete class attribute, Garbage collection, class methods, Static Method.		
Mapping of Course Outcomes for Unit V	CO5	

Learning Resources

Text Books:

1. Reema Thareja, “Python Programming Using Problem Solving Approach”, Oxford University Press, ISBN 13: 978-0-19-948017-6
2. R. Nageswara Rao, “Core Python Programming”, Dreamtech Press; Second edition ISBN10:938605230X, ISBN-13: 978-9386052308 ASIN: B07BFSR3LL

Reference Books:

1. R. G. Dromey, “How to Solve it by Computer”, Pearson Education India; 1st edition, ISBN10: 8131705625, ISBN-13: 978-8131705629 Maureen Spankle, “Problem Solving and Programming Concepts”, Pearson; 9th edition, ISBN-10: 9780132492645, ISBN-13: 978-0132492645
2. Romano Fabrizio, “Learning Python”, Packt Publishing Limited, ISBN: 9781783551712, 1783551712
3. Paul Barry, “Head First Python- A Brain Friendly Guide”, SPD O’Reilly, 2nd Edition, ISBN:978-93-5213-482-3
4. Martin C. Brown, “Python: The Complete Reference”, McGraw Hill Education, ISBN-10:9789387572942, ISBN-13: 978-9387572942, ASIN: 9387572943
5. Jeeva Jose, P. Sojan Lal, “Introduction to Computing & Problem Solving with Python”, Khanna Computer Book Store; First edition, ISBN-10: 9789382609810, ISBN-13: 978-9382609810

The CO-PO mapping table

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	-	-	-	-	-	-	-	-	-
CO2	-	1	1	-	-	-	-	-	-	-	-	-
CO3	-	1	1	-	-	-	-	-	-	-	-	-
CO4	-	1	1	-	-	-	-	-	-	-	-	-
CO5	-	-	1	-	-	-	-	-	-	-	-	-
CO6	-	-	-	1	-	-	-	-	-	-	-	1

ITT114 : Programming and Problem Solving Laboratory			
Teaching Scheme	**Credit**	**Examination Scheme:**	
Tut : 2 Hour/Week	**02**	**Term work**	**25 Marks**

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory Concept in brief, features of tool/framework/language used, Design, test cases, conclusion.

Program codes with sample output of all performed assignments are to be submitted as softcopy. As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD containing students programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Lab /TW Assessment

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

All students should submit the term work consisting of 14 programming assignments. At least 2 assignments from each unit for Group A. Faculty can select any 4 assignments from Group B.

Laboratory Experiments/Assignments **Group A**
Practical on Unit I
Program Design Tools: Algorithms, Flowcharts and Pseudo-codes, implementation of algorithms. Writing and executing Python program, Literal constants, variables and identifiers, Data Types, Input operation, Comments, Reserved words, Indentation, Operators and expressions, Expressions in Python. Installation of Python 1. Program to display data of different types using variable and literal constants. 2. Program to read variables from the user. 3. Program to exhibit indentation errors. 4. Program to perform all operation (addition, multiplication, subtraction, division, modules) and expression. 5. Program to perform area of circle. 6. Program to calculate average of two numbers. 7. Program to convert degree Fahrenheit into degree Celsius. 8. To calculate salary of an employee given his basic pay (take as input from user). Calculate gross salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employee pay professional tax as 2% of total salary. Calculate net salary payable after deductions
Practical on Unit II

Type Conversion, Type casting, Comment 1. Program to demonstrate operation on lists 2. Program to determine whether a person is eligible to vote or not 3. Program to find whether the given number is even or odd 4. Program to find whether the given year is a leap year or not 5. Program to determine whether the character entered is a vowel or not. 6. Program to calculate the sum and average of first 10 numbers 7. Program to find whether the given number is an Amstrong number or not. 8. Program to enter a number and then calculate the sum of its digits. 9. Program to print the reverse of a number. 10. Program to print the multiplication table of n, where n value is entered by user. 11. Program to various patterns of *
Practical on Unit III
1. Program to concatenate two string using + operator. 2. Program to append a string using += operator. 3. Program to display power of a number without using formatting characters. 4. Program to display power of a number using formatting characters. 5. Program to demonstrate slice operation on string objects. 6. Program to understand how characters in a string are accessed using negative indexes. 7. Program to understand ord() and char() function. 8. Program that uses split() to split a multiline string. 9. Program that counts the occurrences of a character in a string. Do not use built in function. 10. Program to reverse of string by user defined function. 11.Write a python program that accepts a string from user and perform following string operations- i. Calculate length of string ii. String reversal iii. Equality check of two strings iii. Check palindrome ii. Check substring
Practical on Unit IV
1. Program to open a file and print its attribute values. 2. Program to access a file after it is closed 3. Program to write a file using the writelines() method. 4. Program to append data to an already existing file. 5. Program to display the contents of a file. 6. Program to split the line into a series of words and use space to perform the split operation. 7. Program that tells and sets the position of the file pointer. 8. Program that reads data from a file and calculates the percentage of vowels and consonants in the file. 9. Program that changes the current directory to our newly created directory. 10. Program to print the absolute path of a file using os.path.join 11. Program that counts the number of tabs, space and newline character in a file. 12. To copy contents of one file to another. While copying a) all full stops are to be replaced with commas b) lower case are to be replaced with upper case c) upper case are to be replaced with lower case.
Practical on Unit V

1. Program to access class variable using class object. 2. Program to access class members using class object. 3. Program to illustrating the use of __int__() method. 4. Program to differentiate between class and object variable. 5. Program to illustrating the use of __del__() method. 6. Program to illustrating the difference between public and private variable. 7. Program to call a class method from another method of the same class. 8. Program to add variables to a class at run-time 9. Program that has a class person storing name and date of birth (DOB) of a person. The program should subtract the DOB from todays date to find out whether a person is eligible to vote or not. 10. Create class EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary). Define function members to compute a)total number of employees in an organization b) count of male and female employee c) Employee with salary more than 10,000 d) Employee with designation “Asst Manager”

Laboratory Experiments/Assignments **Group B**
Teachers should frame assignments from Mechanical Engineering, Civil Engineering, Electrical Engineering application domains.
Faculty from these course branches to design and conduct the practical sessions.

Electrical Engineering:

1. Write a program for Modelling of an electrical circuit using Python program.
2. Apply Nodal analysis and Mesh analysis for a given electrical circuit using python
3. Write a program for Conversion between Star-Delta configurations and generate three phase voltage waveforms for Star and Delta configurations using Python commands.
4. Design a program for calculation of Force, Electric field and Potential at a given point using Python commands.
5. Calculation of ripple factor for a given rectifier: Half-wave/Full-wave/Bridge circuit using Python program.
6. Obtain the characteristics for the given circuit using Maximum power transfer theorem.

Civil Engineering:

1) A concentrated load of 1000KN is applied at the ground surface. Write a program to compute the vertical pressure (i) at a depth of 4m below the load , (ii) at a distance of 3m at the same depth. Use Boussinesq's equation.
2) A Filtered water discharge of 1MLD has a chlorine demand of 4.8 mg/l. It is required to maintain a chlorine residual of 0.2 mg/l. Write a program to determine the quantity of bleaching powder necessary of 6 months (Chlorine Available-25%).
3) A simply supported beam AB having spam of 4 meters loaded with following cases: Case 1) 100 KN at centre. Case 2) 50 KN at 1 meter from A support. Write a program to determine support reactions at A and B.
4) Two forces P and Q acting on a body 180 KN and 240 KN respectively. The angle between the two forces is 60 degrees. Determine the resultant of force P and Q and it's direction with respect to Q force.

Mechanical Engineering:

1) On a certain planet a correctly calibrated spring balance shows the weight of a body 12 N, the mass of which is 4.893 kg. Write a program to find the value of gravity on this planet.
2) Write a program to estimate the heat loss through a red brick wall of length 5m, height 4m and thickness 0.25m, if the temperatures of the wall surfaces are maintained at 110 degree centigrade and 40 degree centigrade respectively. K for red brick is 0.70 W/mk.
3) Assume five liters of Oil weigh 61.80 N. Write a program to calculate i) Specific Weight ii) Specific mass using python.

IKS115: Indian Knowledge System		
Teaching Scheme	**Credit**	**Examination Scheme:**
Tutorial : 02 Hr/Week	**02**	**Term Work: 25 Marks**

Index

Prerequisite Courses, if any: Intermediate physics, Intermediate Mathematics.

Companion Course, if any: **NIL**

Course Objectives:

1. To introduce students to the foundational concepts of Indian knowledge systems and their significance.
2. To familiarize students with key dates in Indian history and the historical timeline.
3. To provide an overview of Indian philosophical systems and their relevance.
4. To explore significant scientific achievements in ancient India and analyze scientific texts and inventions.
5. To examine the role of engineering in ancient India and its contributions to metallurgy, materials science, and architectural techniques.

Course Outcomes:

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

1. Understand the significance and historical context of Indian knowledge systems.
2. Comprehend Indian philosophical concepts, scientific achievements, and their interplay.
3. Recognize the role of engineering in ancient India and its impact on architecture and materials.
4. Apply ancient Indian engineering principles in modern practices while considering cultural and environmental aspects.

Course Contents

Unit I	Foundations of Indian Knowledge Systems	(02 Hours)

- Introduction to the course and its significance
- Understanding BC (Before Common Era) and BCE (Before Common Era)
- Historical timeline and key dates in Indian history
- Basics of Indian philosophy and its relevance

Mapping of Course Outcomes for Unit I	CO1

Unit II	Indian Philosophy and Science	(02 Hours)

- Overview of Indian philosophical systems
- Discussion on key philosophical concepts (e.g., Dharma)
- Significant scientific achievements in ancient India
- Analysis of scientific texts and inventions
- The interplay of philosophy and science in Indian culture

Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Engineering in Indian Knowledge Systems**	**(02 Hours)**
• Introduction to the role of engineering in ancient India • Examination of engineering marvels and innovations in ancient Indian civilization • Analysis of architectural and construction techniques in historical Indian structures • Exploration of ancient Indian contributions to metallurgy and materials science • Case study on the engineering excellence of ancient Indian structures and technologies		
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Modern Engineering Applications and Cultural Significance**	**(02 Hours)**
• The application of ancient Indian engineering knowledge in modern engineering practices • The significance of traditional Indian construction techniques in sustainable engineering • Examination of the impact of Indian engineering in contemporary infrastructure projects • Cultural and environmental considerations in modern engineering projects • Presentation and discussion of a case study on the integration of Indian engineering principles in modern construction		
Mapping of Course Outcomes for Unit IV	CO4	
Learning Resources		
Reference Books: **1.** "An Introduction to Indian Philosophy" by Satischandra Chatterjee and Dhirendramohan Datta **2.** "The Lost River: On the Trail of the Sarasvati" by Michel Danino” **3.** "Indian Philosophy: A Very Short Introduction" by Sue Hamilton” **4.** "Indian Science and Technology in the Eighteenth Century" by Dharampal” **5.** "Indian Architecture (Buddhist and Hindu Period)" by Percy Brown “ **6.** "Science and Civilization in India" by D. S. Kothari and Irfan Habib” **7.** "Traditional Indian Architecture" by Lethaby W.R.” **8.** "Sustainable Construction: Green Building Design and Delivery" by Charles J. Kibert”		

Web Materials:

1. Ancient Indian History and Culture - National Museum, New Delhi website "BCE and CE: Common Era" - History.com
2. "Indian Philosophy" - Stanford Encyclopedia of Philosophy
3. "Indian Science and Technology" - National Council of Science Museums
4. "Architectural Marvels of India" - Archaeological Survey of India
5. "History of Metallurgy in India" - National Institute of Technology, Tiruchirappalli
6. "Cultural and Environmental Aspects in Modern Engineering" - UNESCO World Heritage Sites "Sustainable Construction Practices in India" - Indian Green Building Council

Videos:

"Introduction to Indian Knowledge Systems" - NPTEL Online Course

Unit 2: Indian Philosophy and Science

"Indian Philosophy and Its Relevance Today" - YouTube Lecture Series

Unit 3: Engineering in Indian Knowledge Systems

"Ancient Indian Engineering" - National Geographic Documentary Unit

4:

"Sustainable Engineering in India" - TED Talk by Aromar Revi
Modern Engineering Applications and Cultural Significance

CO-PO Mapping

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						3	2					
CO2	2			3				2				
CO3	2		2			2	2					
CO4			3			3	3	2	3			

IKS115: Indian Knowledge System

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Assignments for Term Work

Note: Students have to complete 4 Assignments (1 on each Unit) and two activates from the following given list.

Unit 1: Foundations of Indian Knowledge Systems:

Research and Presentation (Individual or Group):

Assignment 1: Have students research and create a presentation on a specific key date or event in Indian history. They should explain its significance and how it contributed to Indian knowledge systems.

Learning Outcome: Enhances research skills and understanding of the historical context.

Comparative Analysis (Group):

Assignment 2: Assign groups to compare and contrast the BC/CE dating system with other historicaldating systems from different cultures.

Learning Outcome: Promotes critical thinking and cross-cultural understanding.

Unit 2: Indian Philosophy and Science:

Philosophical Debates (Class Discussion):

Activity: Organize in-class debates on key philosophical concepts like Dharma, Karma, and Moksha.Assign students to defend or critique these concepts.

Learning Outcome: Encourages critical thinking and active engagement with philosophy.

Scientific Inventions Showcase (Group Project):

Assignment 3: Have students research and create presentations or reports on significant scientificinventions or discoveries from ancient India.

Learning Outcome: Develops research and presentation skills while enhancing knowledge of Indianscientific achievements.

Unit 3: Engineering in Indian Knowledge Systems

Site Visit (Field Trip):

Activity: Organize a field trip to a historical site or monument known for its engineering excellence(e.g., Ajanta Caves or Qutub Minar) and have students analyze and document the engineering marvels.

Learning Outcome: Encourages practical observation and critical analysis of ancient Indian engineering.

Metallurgy and Materials Project (Group):

Assignment 4: Ask students to work in groups to research and present on ancient Indian contributionsto metallurgy and materials science. They can also create simple experiments to demonstrate metallurgical processes.

Learning Outcome: Enhances research and experimentation skills while deepening understanding of materials science

Unit 4: Modern Engineering Applications and Cultural Significance:

Sustainable Engineering Case Study (Individual):

Assignment 5: Assign students to choose a modern engineering project in India that incorporates sustainability principles. They should analyze the project's design, materials, and environmental impact.

Learning Outcome: Develops critical analysis skills and an understanding of sustainable engineering practices.

Engineering and Culture Presentation (Group):

Assignment 6: Have student groups present case studies on modern engineering projects that consider cultural and environmental aspects. Discuss how cultural sensitivity is integrated into theseprojects.

Learning Outcome: Promotes teamwork, presentation skills, and cultural awareness.

Integration of Indian Engineering Principles (Individual or Group):

Assignment 7: Encourage students to propose and discuss how ancient Indian engineering principlescould be integrated into a modern construction project. They should consider cultural, environmental,and sustainability aspects.

Learning Outcome: Encourages creative problem-solving and understanding of cultural relevance in engineering.

These assignments and activities engage students in practical and critical thinking, promote researchand presentation skills, and help them explore the rich heritage of Indian knowledge systems, philosophy, science, and engineering.

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CCC116 - Co-Curricular Courses - II			
Teaching Scheme		**Credit**	**Examination Scheme:**
PR	**: 04 Hours/Week**	**02**	**PR : 25 Marks**

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Suggested List of Laboratory Experiments (Any Eight)

Course objectives:

1. To explore the performance of various cultural activities.
2. To Explore and perform the importance of Fine/ Applied/ Visual Arts
3. To Explore and perform social activity by participating in NSS/ NCC/ NGO camps, etc.

Course Outcomes

The student will be able to –

1) To understand importance of various cultural activities and apply necessary skillsets to perform cultural activity.
2) To understand literature of performing arts such as Fine/ Applied/ Visual Arts and apply skillsets in related activities.
3) To understand importance of social activities and conduct various social activities necessary for human society.

Students have to perform following practical based activities.

Activity for Cultural

a) To collect data of various cultural activities such as various musical instruments, history of drama, poetry, etc.
b) To perform any cultural activity based on his/ her choice.

Activity for Performing Fine/ Applied/ Visual Arts

a) To collect literature of various Fine/ Applied/ Visual Arts to explore its importance in human life.
b) To conduct any group activity to explore performance in Fine/ Applied/ Visual Arts.

Activity for Social activities

a) Students shall perform the activates (any 2) like tree plantation, blood donation, Cleaning Awareness, Health Care Camps, etc.
b) Student will participate in NSS/NCC/NGO camps for performing different activates in rural areas.

Plan of Action (Execution of Activities)

a) Student should prepare the brief report of every activity performed and faculty should evaluate students performance based on his/ her participation in the activity.
b) Any certification earned related to above activity may be given credit to the student

Reference Books:

1. Charles J. Hall, (2002) Chronology of Western Classical Music by Call Number: Hol Ref ML161 .H227 2002 ISBN: 0415942160.
2. William Forde Thompson (2014). Music in the Social and Behavioral Sciences: An Encyclopedia. Sage Publications. pp. 1693–1694. ISBN 978-1-4833-6558-9.
3. Michael Patterson (Editor) The Oxford Dictionary of Plays by Call Number: REF PN1625 .P38 2005 ISBN: 0198604173
4. NSS activities guidelines https://nss.gov.in/sites/default/files/Guidelines%20.pdf

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