Savitribai Phule Pune University
Faculty of Science & Technology

Curriculum

For

First Year
Bachelor of Engineering
(Choice Based Credit System)

(2019 Course)

(With Effect from Academic Year 2019-20)

TABLE -1 First Engineering _Structure for Semester-I														
Course Code	**Course Name**	**Teaching Scheme (Hours/Week)**			**Examination Scheme and Marks**						**Credits**			
		Theory	**Practical**	**Tutorial**	**ISE**	**ESE**	**TW**	**PR**	**OR**	**Total**	**TH**	**PR**	**TUT**	**Total**
107001	Engineering Mathematics-I	03	--	01	30	70	25	--	--	125	03	--	01	04
107002/ 107009	Engineering Physics / Engineering Chemistry	04	02	--	30	70	--	25	--	125	04	01	--	05
102003	Systems in Mechanical Engineering	03	02	--	30	70	--	25	--	125	03	01	--	04
103004 / 104010	Basic Electrical Engineering / Basic Electronics Engineering	03	02	--	30	70	--	25	--	125	03	01	--	04
110005/ 101011	Programming and Problem Solving / Engineering Mechanics	03	02	--	30	70	--	25	--	125	03	01	--	04
111006	Workshop[@]	--	02	--	--	--	--	25	--	25	--	01	--	01
	Total	16	10	01	150	350	25	125	--	650	16	05	01	22
101007	Audit Course 1[&]	02	Environmental Studies-I											
Induction Program : 2 weeks at the beginning of semester-I and 1 week at the beginning of semester-II														
TABLE -2 First Engineering_ Structure for Semester-II														
Course Code	**Course Name**	**Teaching Scheme (Hours/Week)**			**Examination Scheme and Marks**						**Credits**			
		Theory	**Practical**	**Tutorial**	**ISE**	**ESE**	**TW**	**PR**	**OR**	**Total**	**TH**	**PR**	**TUT**	**Total**
107008	Engineering Mathematics-II	04	--	01	30	70	25	--	--	125	04	--	01	05
107002/ 107009	Engineering Physics/ Engineering Chemistry	04	02	--	30	70	--	25	--	125	04	01	--	05
103004 / 104010	Basic Electrical Engineering / Basic Electronics Engineering	03	02	--	30	70	--	25	--	125	03	01	--	04
110005/ 101011	Programming and Problem Solving / Engineering Mechanics	03	02	--	30	70	--	25	--	125	03	01	--	04
102012	Engineering Graphics [Ω]	01	02	01	--	50	25		--	75	01	01		02
110013	Project Based Learning[§]	--	04	--	--	--	25	50	--	75	--	02	--	02
	Total	15	12	02	120	330	75	125	--	650	15	05	02	22
101014	Audit Course 2[&]	02	Environmental Studies-II											
107015		--	Physical Education-Exercise and Field Activities											

Instructions:

- PR/Tutorial must be conducted in three batches per division.
- Minimum number of required Experiments/Assignments in PR/ Tutorial shall be carried out as mentioned in the syllabi of respective subjects.
- Every Student should appear for Engineering Physics, Engineering Chemistry, Engineering Mechanics, Basic Electrical Engineering, Basic Electronics Engineering, Programming and Problem solving during the year.
- 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 internal continuous assessment only.**

Ω 1 Credit for Engineering Graphics theory has to be awarded on the basis of End semester examination of 50 marks while 1 credit of tutorial and practical **shall be awarded on internal continuous assessment only**.

@ Credit for the course of workshop practical is to be awarded on the basis of continuous assessment / submission of job work.

§ Project based learning (PBL) requires continuous mentoring by faculty throughout the semester for successful completion of the tasks selected by the students per batch. While assigning the teaching workload a load of 2 Hrs/week/batch needs to be considered for the faculty involved. The Batch needs to be divided into sub-groups of 5 to 6 students. Assignments / activities / models/ projects etc. under project based learning is carried throughout semester and Credit for PBL has to be awarded on the basis of internal continuous assessment and evaluation at the end of semester.

& Audit course for Environmental Studies and II (As per D.O.No.F.13-1/2000 (EA/ENV/COS-I) dated 14 May, 2019) is mandatory but non-credit course. Examination has to be conducted at the end of Sem I & II respectively for award of grade at college level. Grade awarded for audit course shall not be calculated for grade point &CGPA.

Audit course for Physical education is mandatory non-credit course. Examination has to be conducted at the end of Semester for award of grade at college level. Grade awarded for audit course shall not be calculated for grade point &CGPA.

Guidelines for Induction Program

Induction programme for first year students is introduced to familiarize them to the new environment and encourage them to look beyond classrooms. Objective is to help new students adjust and feel comfort-able in the new environment, inculcate in them the ethos and culture of the institution, help them build bonds with other students and faculty members, and expose them to a sense of larger purpose and self exploration. Induction Program should be preferably of 3 weeks (**2 weeks at the beginning of semester-I and 1 week at the beginning of semester-II)**.

In order to implement the (SIP) in the College the following activities can be taken at College.

- Physical Activity-This would involve a daily routine of physical activity with games and sports.
- Creative Arts: - Every students would chose one skill related to the arts whether visual arts or performing arts.
- Mentoring and Universal Human values:-Mentoring and connecting the students with faculty members and other students is the most important part of student induction. This can be effectively done by forming a group of 20-22 students with a faculty mentor each. This can be implemented through group discussion and real life activities rather than lecturing.
- Familiarization with College, Department, Branch :-The incoming student should be told about the credit, grading system and scheme of the examination. They should be explained how the study in College differs from the study in school. They should be taken on College tour and shown important points such as library, canteen, gymkhana etc. They should be shown their department.
- Literary Activity :-Literary Activity would compass reading book, writing a summery, debating, checking play etc.
- Proficiency modules :- The modules can be designed to overcome some critical lacunas that students might have like English Speaking, Computer familiarity etc.
- Lectures by Eminent People:- The lectures of Eminent people to be organized to expose the student to social activity public life.
- Visit to local Area:-A couple of visits to the landmark of the city or a hospital are orphanage could be organized.
- Extracurricular activities in College:-The new students should be introduced to the extracurricular activities at the College.
- Feedback and Report on the program:-Students should be asked to give their mid program Feedback and a each group of 20-22 students should be asked to prepare a single report on their experience of the program.

To Summarize the above activity the sequence of activities can be planned as given below :

- Address by Principal, HOD's and other functionaries and welcome the new students along with their parents.
- The branch wise allocation of students to be done and a group of 20-22 students is to farmed along with one faculty as mentor.
- A detail time table of various activities is to be prepared and displayed for all students. The timetable should give details of location and details of faculty in charge of the activity.
- The visit to local areas can be arranged on Saturdays.

The various activities to be carried out can be divided into three phases :-

1. Initial phase:- Which may induce Address by Principal, HOD's and other functionaries College and Dept Visit, interaction with parents Forming of students group and assigning of mentor mentee.
2. Regular Phase:- This phase may include the activities such as creative arts / universal

Human values Games & Sports in the morning session and in the afternoon session. Literary activities, Proficiency module, Lectures & workshop, Extra curricular Activities can be scheduled.

3. Closing Phase:- This phase may include taking feed back of students, preparation of Report by each group, Test of creative Arts, Human Values can be taken.

These are summarized guidelines given to the student inducing induction programme (SIP) Please refer SIP Manual published by AICTE for detail guidelines [2].

Savitribai Phule Pune University

First Year Engineering (2019 Course)

107001 – Engineering Mathematics – I

Teaching Scheme:	**Credits**	**Examination Scheme:**
TH : 3 Hrs./Week	**04**	**In-Semester Exam :30 Marks**
TUT : 1 Hr/Week		**End-Semester Exam :70 Marks**
		TW :25 Marks

Prerequisites:
Differentiation, Integration, Maxima and Minima, Determinants and Matrices.

Course Objectives:
To make the students familiarize with concepts and techniques in Calculus, Fourier series and Matrices. 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 (COs): The students will be able to learn

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

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

CO3: to deal withderivative of functions of several variables that are essential in various branches of Engineering.

CO4: to apply the concept of Jacobian to find partial derivative of implicit function and functional dependence. Use of partial derivatives in estimating error and approximation and finding extreme values of the function.

CO5: 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 and Eigen vectors applicable to engineering problems

Course Contents

Unit I: Differential Calculus: (08 Hrs.)

Rolle's Theorem, Mean Value Theorems, Taylor's Series and Maclaurin's Series, Expansion of functions using standard expansions, Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits and Applications.

Unit II: Fourier Series (08 Hrs.)

Definition, Dirichlet's conditions, Full range Fourier series, Half range Fourier series, Harmonic analysis, Parseval's identity and Applications to problems in Engineering.

Unit III: Partial Differentiation (08Hrs.)

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

Unit IV: Applications of Partial Differentiation (08 Hrs.)

Jacobian and its applications, Errors and Approximations, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Unit V: Linear Algebra-Matrices, System of Linear Equations (08 Hrs.)

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

Unit VI: Linear Algebra-Eigen Values and Eigen Vectors, Diagonaliztion (08 Hrs.)

Eigen Values and Eigen Vectors, Cayley Hamilton theorem, Diagonaliztion of a matrix, Reduction of Quadratic forms to Canonical form by Linear and Orthogonal transformations.

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 & Vol. II) by P.N.Wartikar and J.N.Wartikar Vidyarthi Griha Prakashan, Pune.
6. Linear Algebra –An Introduction, Ron Larson, David C. Falvo (Cenage Learning, Indian edition)

Tutorial and Term Work:

i) Tutorial for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division.

ii) Term work shall consist of six assignments on each unit-I to unit-VI and is based on performance and continuous internal assessment.

107002: Engineering Physics

Teaching Scheme:	Credits	Examination Scheme:
TH: 04 Hr/week	**05**	**In-Semester :30 Marks**
PR: 02 Hr/Week		**End-Semester :70 Marks**
		PR :25 Marks

Prerequisite Courses, if any:
Fundamentals of: optics, interference, diffraction polarization, wave-particle duality, semiconductors and magnetism

Companion Course, if any: Laboratory Practical

Course Objectives:
To teach students basic concepts and principles of physics, relate them to laboratory experiments and their applications

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

CO1: Develop understanding of interference, diffraction and polarization; connect it to few engineering applications.

CO2: Learn basics of lasers and optical fibers and their use in some applications.

CO3: Understand concepts and principles in quantum mechanics. Relate them to some applications.

CO4: Understand theory of semiconductors and their applications in some semiconductor devices.

CO5: Summarize basics of magnetism and superconductivity. Explore few of their technological applications.

CO6: Comprehend use of concepts of physics for Non Destructive Testing. Learn some properties of nanomaterials and their application.

Course Contents

Unit I **Wave Optics** **(08 Hrs)**

Interference

- Introduction to electromagnetic waves and electromagnetic spectrum
- Interference in thin film of uniform thickness (with derivation)
- Interference in thin film wedge shape (qualitative)
- Applications of interference: testing optical flatness, anti-reflection coating

Diffraction

- Diffraction of light
- Diffraction at a single slit, conditions for principal maxima and minima, diffraction pattern
- Diffraction grating, conditions for principal maxima and minima starting from resultant amplitude equations, diffraction pattern
- Rayleigh's criterion for resolution, resolving power of telescope and grating

Polarization

- Polarization of light, Malus law
- Double refraction, Huygen's theory of double refraction

Applications of polarization: LCD

Unit II **Laser and Optic Fibre** **(08 Hrs)**

Laser

- Basics of laser and its mechanism, characteristics of laser
- Semiconductor laser: Single Hetro-junction laser
- Gas laser: CO_2 laser
- Applications of lasers: Holography, IT, industrial, medical

Optic Fiber

- Introduction, parameters: Acceptance Angle, Acceptance Cone, Numerical Aperture
- Types of optical fiber- step index and graded index
- Attenuation and reasons for losses in optic fibers (qualitative)
- Communication system: basic building blocks

Advantages of optical fiber communication over conventional methods.

Unit III **Quantum Mechanics** **(08 Hrs)**

- De-Broglie hypothesis
- Concept of phase velocity and group velocity (qualitative)
- Heisenberg Uncertainty Principle
- Wave-function and its physical significance
- Schrodinger's equations: time independent and time dependent
- Application of Schrodinger's time independent wave equation - Particle enclosed in infinitely deep potential well (Particle in RigidBox)
- Particle in Finite potential well (Particle in Non Rigid box) (qualitative)
- Tunneling effect, Tunneling effect examples (principle only): Alpha Decay, Scanning Tunneling Microscope, Tunnel diode
- Introduction to quantum computing

Unit IV **Semiconductor Physics** **(08 Hrs)**

- Free electron theory (Qualitative)
- Opening of band gap due to internal electron diffraction due to lattice Band theory of solids
- Effective mass of electron Density of states
- Fermi Dirac distribution function
- Conductivity of conductors and semiconductors
- Position of Fermi level in intrinsic and extrinsic semiconductors (with derivations based on carrier concentration)
- Working of PN junction on the basis of band diagram
- Expression for barrier potential (derivation)
- Ideal diode equation
- Applications of PN junction diode: Solar cell (basic principle with band diagram) IV Characteristics and Parameters, ways of improving efficiency of solar cell
- Hall effect: Derivation for Hall voltage, Hall coefficient, applications of Hall effect

Unit V **Magnetism and Superconductivity** **(8Hrs.)**

Magnetism

- Origin of magnetism
- Classification of magnetism on the basis of permeability (qualitative)
- Applications of magnetic devices: transformer cores, magnetic storage, magneto-optical recording

Superconductivity

- Introduction to superconductivity; Properties of superconductors: zero electrical
- resistance, critical magnetic field, persistent current, Meissner effect
- Type I and Type II superconductors
- Low and high temperature superconductors (introduction and qualitative)
- AC/DC Josephson effect; SQUID: basic construction and principle of working; Applications of SQUID
- Applications of superconductors

Unit VI **Non Destructive Testing and Nanotechnology** **(8 Hrs.)**

Non Destructive Testing

- Classification of Non-destructive testing methods
- Principles of physics in Non-destructive Testing
- Advantages of Non-destructive testing methods
- Acoustic Emission Testing
- Ultrasonic (thickness measurement, flaw detection)
- Radiography testing

Nanotechnology

- Introduction to nanotechnology
- Quantum confinement and surface to volume ratio
- Properties of nanoparticles: optical, electrical, mechanical

Applications of nanoparticles: Medical (targeted drug delivery), electronics, space and defense, automobile

Books & Other Resources:

Text Books:

1. Engineering Physics, Avadhanulu, Kshirsagar, S. Chand Publications
2. A textbook of optics – N Subrahmanyam and BriLal , S. Chand Publications
3. Engineering Physics, Gaur, Gupta, Dhanpat Rai and Sons Publications

Reference Books:

1. Fundamentals of Physics, Resnick and Halliday (John Wiley and Sons)
2. Optics, Jenkins and White (Tata Mcgraw Hill)
3. Principles of Physics, Serway and Jewett (Saunders college publishing)
4. Introduction to Solid State Physics, C. Kittel (Wiley and Sons)
5. Principles of Solid State Physics, H. V. Keer, New Age International
6. Laser and Non-Linear Optics, B. B. Laud (Oscar publication)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni (Capital Publishing Company

Guidelines for Instructor's Manual

Lab manual is expected to cover following points:

1. Engineering Program Outcome (Graduate Attribute) and which attributes will be covered during practical
2. List of experiments to be performed with mention of objectives and outcome of the experiment

Guidelines for Student's Lab Journal

Student's lab journal is expected to cover:

1. List of experiments to be performed with mention of objectives and outcome of the experiment.
2. Instructions to students for performing the experiments
3. Precautions for each experiment
4. Write up of experiment (Preferably mentioning significance of experiment).

Guidelines for Lab /TW Assessment

1. The distribution of weightage of term work marks should be informed to students before start of the semester.
2. Term work assessment should be on continuous basis. At frequent intervals students are expected to inform about their progress/lagging.

Guidelines for Laboratory Conduction

1. DO's and DONT'S, along with precautions, are need to be displayed at prominent location in laboratory
2. Students should be informed about DO'S and DON'T and precautions before performing the experiment

Suggested List of Laboratory Experiments (<u>Any eight</u>)

Sr.	Experiment
1	Experiment based on Newton's rings (determination of wavelength of monochromatic light, determine radius of curvature of plano-convex lens)
2	To determine position of diffraction minima by studying diffraction at a single slit
3	To determine unknown wavelength by using plane diffraction grating
4	To find out Resolving power of Diffraction Grating/Telescope
5	To verify Malus Law
6	Any experiment based on Double Refraction (Determination of refractive indices, identification of types of crystal)
7	Any Experiment based on Laser (Thickness of wire, determination of number of lines on grating surface)
8	An experiment based on optic fibers
9	To study IV characteristics of Solar Cell and determine parameters (fill factor and efficiency)
10	To determine band gap of given semiconductor
11	To determine Hall coefficient and charge carrier density
12	Temperature dependence characteristics of semiconductor laser
13	To find out Magnetic susceptibility of given material
14	Ultrasonic Interferometer: Determination of velocity of ultrasonic waves in given liquid and find its compressibility
	Suggested Demonstration Experiments
1	Michelson interferometer
2	Half shade Polarimeter
3	Determination of absorption coefficient of sound of given material
4	Temperature dependence
5	Brewster's law
6	Measurement of sound pressure level

102003 - Systems in Mechanical Engineering		
Teaching Scheme: **TH : 3 Hrs./week** **PR : 2 Hrs./Week**	**Credits** **04**	**Examination Scheme:** **In-Semester :30 Marks** **End-Semester :70 Marks** **PR :25 Marks**

Course Objectives:

1. To identify the sources of energy and their conversions
2. To explain the basic concept of engineering thermodynamics and its application
3. To understanding the specifications of vehicles
4. To get acquainted with vehicle systems
5. To introduce manufacturing processes applying proper method to produce components
6. To be able to select and compare domestic appliances

Course Outcomes

On completion of the course, learner will be able to

CO1: Describe and compare the conversion of energy from renewable and non-renewable energy sources

CO2: Explain basic laws of thermodynamics, heat transfer and their applications

CO3: List down the types of road vehicles and their specifications

CO4: Illustrate various basic parts and transmission system of a road vehicle

CO5: Discuss several manufacturing processes and identify the suitable process

CO6: Explain various types of mechanism and its application

Course Contents

Unit I Introduction of energy sources & its conversion (06 Hrs)

Energy sources: Thermal energy, Hydropower energy, Nuclear energy, Solar energy, Geothermal energy, Wind energy, Hydrogen energy, Biomass energy and Tidal energy. Grades of Energy. (*Numerical on efficiency calculation of thermal power plant*)

Energy conversion devices: Introduction of pump, compressor, turbines, wind mills etc (*Simple numerical on power and efficiency calculations)*

Unit II Introduction to Thermal Engineering (06Hrs)

Laws of thermodynamics, heat engine, heat pump, refrigerator *(simple numerical)*

Modes of heat transfer: conduction, convection and radiation, Fourier's law, Newton's law of cooling, Stefan Boltzmann's law. *(Simple numerical)*

Two stroke and Four stroke engines (Petrol, Diesel and CNG engines). Steam generators.

Unit III Vehicles and their Specifications (04 Hrs)

Classification of automobile. Vehicle specifications of two/three wheeler, light motor vehicles, trucks, buses and multi-axle vehicles. Engine components (Introduction). Study of engine specifications, comparison of specifications of vehicles. Introduction of Electric and Hybrid Vehicles. Cost analysis of the Vehicle.

Unit IV Vehicle systems (08 Hrs)

Introduction of chassis layouts, steering system, suspension system, braking system, cooling system and fuel injection system and fuel supply system. Study of Electric and Hybrid Vehicle systems. Study of power transmission system, clutch, gear box (Simple Numerical), propeller shaft, universal joint, differential gearbox and axles. Vehicle active and passive safety arrangements: seat, seat belts, airbags and antilock brake system.

Unit V **Introduction to Manufacturing** **(06 Hrs)**

Conventional Manufacturing Processes: Casting, Forging, Metal forming (Drawing, Extrusion, etc.), Sheet metal working, Metal joining, etc. Metal cutting processes and machining operations- Turning, Milling and Drilling, etc.

Micromachining. Additive manufacturing and 3D Printing. Reconfigurable manufacturing system and IOT, Basic CNC programming**:** Concept of Computer Numerical Controlled machines.

Unit VI Engineering Mechanisms and their application in Domestic Appliances (6Hrs.)

Introduction to Basic mechanisms and equipment: Pumps, blowers, compressors, springs, gears, Belt-Pulley, Chain-Sprocket, valves, levers, etc. Introduction to terms: Specifications, Input, output, efficiency, etc.

Applications of: Compressors - Refrigerator, Water cooler, Split AC unit; Pumps - Water pump for overhead tanks, Water filter/Purifier units; Blower - Vacuum cleaner, Kitchen Chimney; Motor - Fans, Exhaust fans, Washing machines; Springs - Door closure, door locks, etc.; Gears - Wall clocks, watches, Printers, etc.; Application of Belt-Pulley/Chain-Sprocket - Photocopier, bicycle, etc.; Valves - Water tap, etc.; Application of levers - Door latch, Brake pedals, etc.; Electric/Solar energy - Geyser, Water heater, Electric iron, etc. (simple numerical on efficiency calculation)

Books & Other Resources

Text Books

1. Nag, P. K., "Engineering Thermodynamics," Tata McGraw-Hill Publisher Co. Ltd.
2. Chaudhari and Hajra, "Elements of Workshop Technology", Volume I and II, Media Promoters and Publishers, Mumbai
3. Agrawal,Basant and Agrawal, C. M., (2008), "Basics of Mechanical Engineering", John Wiley and Sons, USA
4. Rajput, R.K., (2007), "Basic Mechanical Engineering", Laxmi Publications Pvt. Ltd.
5. Pravin Kumar, (2018), " Basic Mechanical Engineering, 2nd Ed.", Pearson (India) Ltd.
6. Moran, M. J., Shapiro, H. N., Boettner, D. D., and Bailey, M. "Fundamentals of Engineering Thermodynamics", Wiley
7. Surinder Kumar, (2011), "Basic of Mechanical Engineering", Ane Books Pvt. Ltd. New Delhi

Reference Books

1. Khan, B. H., "Non Conventional Energy Sources, Tata McGraw-Hill Publisher Co. Ltd.
2. Boyle, Godfrey, "Renewable Energy",2nd Ed., Oxford University Press
3. Khurmi, R.S. ,and Gupta, J. K.,"A Textbook of Thermal Engineering", S. Chand & Sons
4. Incropera, F. P. and Dewitt, D.P., (2007), "Fundamentals of Heat and Mass Transfer, 6th Ed., John Wiley and Sons, USA
5. Groover,Mikell P., (1996), "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", Prentice Hall, USA
6. Norton, Robert L., (2009), "Kinematics and Dynamics of Machinery", Tata McGrawHill
7. Cleghorn, W. L., (2005), "Mechanisms of Machines", Oxford University Press
8. Juvinal, R. C., (1994), "Fundamentals of Machine Component Design", John Wiley and Sons, USA
9. Ganeshan, V., (2018), "Internal Combustion Engines", McGraw Hill
10. Anderson, Curtis Darrel and Anderson,Judy, (2010), "Electric and Hybrid Cars: A History", 2nd Ed., McFarland

Guidelines for Instructor's Manual

The Instructor's Manual should contain following related to every experiment:

- Brief theory related to the experiment.
- Apparatus with their detailed specifications.

- Schematic, Layout /diagram.
- Observation table/ simulation plots/graphs.
- Sample calculations for one/two reading.
- Result table.
- Graph and Conclusions.
- Few questions related to the experiment.
- Relevance of practical in real life /industry

Guidelines for Student's Lab Journal

The Student's Lab Journal should contain following related to every experiment:

- Theory related to the experiment.
- Apparatus with their detailed specifications.
- Schematic, Layout /diagram.
- Observation table/ simulation plots/graphs.
- Sample calculations for one/two reading.
- Result table.
- Graph and Conclusions.
- Few short questions related to the experiment.

Guidelines for Lab /TW Assessment

- There should be continuous assessment for the TW.
- Assessment must be based on understanding of theory, attentiveness during practical, and understanding.
- Session, how efficiently the student is able to do connections and get the results.
- Timely submission of journal.

The student shall complete the following activity as a term work.

Sr. No.	Activity
1.	**Group A: Industry / Workshop / Showroom Visit:** The visit of students is mandatory, to provide awareness and understanding of the course.
2.	**Group B: Assignments:** The student shall complete the following assignments on: i. Energy sources (Minimum one assignment on Conventional and one on Non-conventional sources) ii. Vehicle specifications and systems in passenger car iii. Electric vehicle specifications and its systems iv. Domestic appliances viz. refrigerator, air-conditioner, washing machine, cold storage
3.	**Group C: Experiments:** The student shall complete the following (**any four)** experiments: i. Demonstration of power train system in the vehicle ii. Demonstration of vehicle systems (automobile chassis, steering system, suspension system, braking system - Any Two) iii. Demonstration of energy conversion devices iv. Demonstration of additive manufacturing / rapid prototyping techniques v. Demonstration of CNC

103004: Basic Electrical Engineering		
Teaching Scheme: **TH : 03 Hr/week** **PR : 02 Hr/Week**	**Credits** **04**	**Examination Scheme:** **In-Semester : 30 Marks** **End-Semester : 70 Marks** **PR : 25 Marks**

Prerequisite Courses, if any: Engineering physics**,** electron theory, electricity, potential and kinetic energy

Course Overview: This course aims at enabling students of all Engineering Branches to understand the basic concepts of electrical engineering. This course is designed to provide knowledge of fundamentals and various laws in electromagnetic and magnetic circuits, electrostatics. The steady state analysis of AC and DC circuits, and its applications transformer, batteries and different energy conversion techniques are also included in this course.

Course Objectives:

1. To introduce fundamental concepts, various laws-principles and theorems associated with electrical systems.
2. To impart basic knowledge of all electrical quantities such as current, voltage, power, energy, frequency along with different types of fields.
3. To provide knowledge about fundamental parameters such as resistance, inductance and capacitance and magnetic circuits, AC and DC circuits.
4. To provide knowledge of the concepts of transformer, different energy conversions techniques.

Course Outcomes:

At the end of course students will be able to

CO1: Differentiate between electrical and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.

CO2: Calculate series, parallel and composite capacitor as well as characteristics parameters of alternating quantity and phasor arithmetic

CO3: Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram.

CO4: Relate phase and line electrical quantities in polyphase networks, demonstrate the operation of single phase transformer and calculate efficiency and regulation at different loading conditions

CO5: Apply and analyze the resistive circuits using star-delta conversion KVL, KCL and different network theorems under DC supply.

CO6: Evaluate work, power, energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge.

Course Contents

Unit I **Electromagnetism**: (**6Hrs**)

Review: resistance, emf, current, potential, potential difference and Ohm's law

Electromagnetism: Magnetic effect of an electric current, cross and dot conventions, right hand thumb rule, nature of magnetic field of long straight conductor, solenoid and toroid. Concept of mmf, flux, flux density, reluctance, permeability and field strength, their units and relationships. Simple series magnetic circuit, Introduction to parallel magnetic circuit(Only theoretical treatment), comparison of electric and magnetic circuit, force on current carrying conductor placed in magnetic field, Fleming's left hand rule. Faradays laws of electromagnetic induction, Fleming's right hand rule, statically and dynamically induced e.m.f., self and mutual inductance, coefficient of couplings. Energy stored in magnetic field.

Unit II **Electrostatics and AC Fundamentals** **(6 Hrs)**

A) Electrostatics: Electrostatic field, electric flux density, electric field strength, absolute permittivity, relative permittivity and capacitance. Capacitor, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors (no derivation) and time constant. **(2Hrs)**

B) AC Fundamentals: Sinusoidal voltages and currents, their mathematical and graphical representation, Concept of cycle, Period, frequency, instantaneous, peak(maximum), average and r.m.s. values, peak factor and form factor. Phase difference, lagging, leading and in phase quantities and phasor representation. Rectangular and polar representation of phasor. **(4Hrs)**

Unit III **Single Phase AC Circuits** **(06 Hrs)**

Study of AC circuits consisting of pure resistance, pure inductance, pure capacitance, series R-L, R-C and R-L-C circuits, phasor diagrams, voltage, current and power waveforms, resonance in series RLC circuits, concept of impedance, concept of active, reactive, apparent, complex power and power factor, Parallel AC circuits (No numericals), concept of admittance

Unit IV **Polyphase A.C. Circuits and Single phase Transformers** **(06 Hrs)**

A) Polyphase A.C. Circuits: Concept of three-phase supply and phase sequence. Balanced and unbalanced load, Voltages, currents and power relations in three phase balanced star-connected loads and delta-connected loads along with phasor diagrams. **(3Hrs)**

B) Single phase transformers: principle of working, construction and types, emf equation, voltage and current ratios. Losses, definition of regulation and efficiency, determination of these by direct loading method. Descriptive treatment of autotransformers. **(3Hrs)**

Unit V **DC Circuits:** **(06 Hrs)**

Classification of electrical networks, Energy sources – ideal and practical voltage and current sources, Simplifications of networks using series and parallel combinations and star-delta conversions, Kirchhoff's laws and their applications for network solutions using loop analysis, Superposition theorem, Thevenin's theorem.

Unit VI **Work, Power, Energy and Batteries** **(06 Hrs)**

A) Work, Power, Energy: Effect of temperature on resistance, resistance temperature coefficient, insulation resistance, conversion of energy from one form to another in electrical, mechanical and thermal systems. (**4Hrs**)

B) Batteries : Different types of batteries (Lead Acid and Lithium Ion), construction, working principle, applications, ratings, charging and discharging, concept of depth of charging, maintenance of batteries, series -parallel connection of batteries **(2Hrs)**

Books & Other Resources:

Text Books:

1. V.D. Toro, Principles of Electrical Engineering, Prentice Hall India, 1989
2. D. P. Kothari, I.J. Nagrath, Theory and Problems of Basic Electrical Engineering, PHI Publication
3. V.K. Mehta, RohitMehata Basic Electrical Engineering, S Chand Publications
4. B.L. Theraja, A text book on electrical technology Vol-I

Reference Books:

1. H Cotton, Electrical technology, CBS Publications
2. L. S. Bobrow, ―Fundamentals of Electrical Engineering‖, Oxford University Press, 2011.
3. E. Hughes, ―Electrical and Electronics Technology‖, Pearson, 2010.
4. D. C. Kulshreshtha, ―Basic Electrical Engineering‖, McGraw Hill, 2009.

Guidelines for Instructor's Manual

The Instructor's Manual should contain following related to every experiment –

- Brief theory related to the experiment.
- Apparatus with their detailed specifications.

- Connection diagram /circuit diagram.
- Observation table/ simulation waveforms.
- Sample calculations for one/two reading.
- Result table.
- Graph and Conclusions.
- Few questions related to the experiment.
- Relevance of practical in real life /industry

Guidelines for Student's Lab Journal

The Student's Lab Journal should contain following related to every experiment –

- Theory related to the experiment.
- Apparatus with their detailed specifications.
- Connection diagram /circuit diagram.
- Observation table/ simulation waveforms.
- Sample calculations for one/two reading.
- Result table.
- Graph and Conclusions.
- Few short questions related to the experiment.

Guidelines for Lab /TW Assessment

- There should be continuous assessment for the TW.
- Assessment must be based on understanding of theory, attentiveness during practical, understanding .
- Session, how efficiently the student is able to do connections and get the results.
- Timely submission of journal.

Suggested List of Laboratory Experiments/Assignments

Group A

Following **eight** practical are compulsory

1. To study safety precautions while working on electrical systems, handling of various equipment's such as multimeter, ammeters, voltmeters, wattmeter's, real life resistors, inductors and capacitors
2. To calculate and measure of charging and discharging of capacitor and observe the response on storage oscilloscope.
3. To measure steady state response of series RL and RC circuits on AC supply and observations of voltage and current waveforms on storage oscilloscope.
4. To derive resonance frequency and analyze resonance in series RLC circuit.
5. To verify the relation between phase and line quantities in three phase balanced star delta connections of load.
6. To determine efficiency and regulation of transformer by direct loading test of a single phase transformer.
7. To verify KVL and Superposition theorem.
8. To verify Thevenin's theorem in a DC network

Group B

From following **minimum two** practical are compulsory

1. To measure insulation resistance of electrical equipment's/cable using Megger
2. To demonstrate different types of electrical protection equipments such as fuses, MCB, MCCB, ELCB.
3. To measure of earth resistance at substation earthing using fall of potential method with IS 3043 standard.
4. To study of LT and HT electricity bills.

110005: Programming and Problem Solving		
Teaching Scheme: **TH: 03 Hrs/Week** **PR : 02 Hrs/Week**	**Credits** **04**	**Examination Scheme:** **In-Semester : 30 Marks** **End-Semester : 70 Marks** **PR : 25 Marks**

Prerequisite Courses, if any: students are expected to have a good understanding of basic computer principles.

Companion Course, if any: Programming and Problem Solving Laboratory (110005)

Course Objectives:

Prime objective is to give students a basic introduction to programming and problem solving with computer language Python. And to introduce students not merely to the coding of computer programs, but to computational thinking, the methodology of computer programming, and the principles of good program design including modularity and encapsulation.

1. To understand problem solving, problem solving aspects, programming and to know about various program design tools.
2. To learn problem solving with computers
3. To learn basics, features and future of Python programming.
4. To acquaint with data types, input output statements, decision making, looping and functions in Python
5. To learn features of Object Oriented Programming using Python
6. To acquaint with the use and benefits of files handling in Python

Following Fields are applicable for courses with companion Laboratory course

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

CO1: Inculcate and apply various skills in problem solving.

CO2: Choose most appropriate programming constructs and features to solve the problems in diversified domains.

CO3: Exhibit the programming skills for the problems those require the writing of well-documented programs including use of the logical constructs of language, Python.

CO4: Demonstrate significant experience with the Python program development environment.

Course Contents

Unit I Problem Solving, Programming and Python Programming (07 Hrs)

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,

Program Design Tools: Algorithms, Flowcharts and Pseudo-codes, implementation of algorithms.

Basics of Python Programming: Features of Python, History and Future of Python, Writing and executing Python program, Literal constants, variables and identifiers, Data Types, Input operation, Comments, Reserved words, Indentation, Operators and expressions, Expressions in Python.

Unit II Decision Control Statements (08 Hrs)

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. Other data types- Tuples, Lists and Dictionary.

Unit III **Functions and Modules** **(08 Hrs)**

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.

Unit IV **Strings** **(07 Hrs)**

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.

Unit V **Object Oriented Programming** **(08 Hrs)**

Programming Paradigms-monolithic, procedural, 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 object, class variables and object variables, public and private members, class methods.

Unit VI **File Handling and Dictionaries** **(07 Hrs)**

Files: Introduction, File path, Types of files, Opening and Closing files, Reading and Writing files. Dictionary method. **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).

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 ISBN-10: 938605230X, ISBN-13: 978-9386052308 ASIN: B07BFSR3LL

Reference Books:

1. R. G. Dromey, "How to Solve it by Computer", Pearson Education India; 1st edition, ISBN-10: 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

Programming and Problem Solving 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 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.

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.

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 need to 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 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 version is to be encouraged.

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

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

Sr. No.	Problem Statement Write Program in Python (with function/class/file, as applicable)
1.	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.
2.	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.
3.	To accept N numbers from user. Compute and display maximum in list, minimum in list, sum and average of numbers.
4.	To accept student's five courses marks and 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 distinction. If aggregate is 60>= and <75 then the grade if 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.
5.	To check whether input number is Armstrong number or not. An Armstrong number is an integer with three digits such that the sum of the cubes of its digits is equal to the number itself. Ex. 371.
6.	To simulate simple calculator that performs basic tasks such as addition, subtraction, multiplication and division with special operations like computing x^y and x!.

7.	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
8.	To accept two numbers from user and compute smallest divisor and Greatest Common Divisor of these two numbers.
9.	To accept a number from user and print digits of number in a reverse order.
10.	To input binary number from user and convert it into decimal number.
11.	To generate pseudo random numbers.
12.	To accept list of N integers and partition list into two sub lists even and odd numbers.
13.	To accept the number of terms a finds the sum of *sine* series.
14.	To accept from user the number of Fibonacci numbers to be generated and print the Fibonacci series.
15.	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
16.	To copy contents of one file to other. 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.
17.	To count total characters in file, total words in file, total lines in file and frequency of given word in file.
18.	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"
19.	Create class STORE to keep track of Products (Product Code, Name and price). Display menu of all products to user. Generate bill as per order.
Mini-Projects	
20.	Calculator with basic functions. Add more functionality such as graphic user interface and complex calculations.
21.	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.
22.	Use raspberry pi/or similar kit and python for- • Room Temperature Monitoring System • Motion Detection System • Soil Moisture Sensor • Home Automation System • A robot • Smart mirror or a smart clock. • Smile Detection using Raspberry Pi Camera
23.	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.

111006 -Workshop Practice

Teaching Scheme:	Credits	Examination Scheme:
PR : 2 Hrs/Week	01	PR : 25 Marks

Course Objectives:

1. To understand the construction and working of machine tools and functions of its parts.
2. To develop the skill through hands-on practices using hand tools, power tools, machine tools in manufacturing and assembly shop leading to understanding of a production processes.
3. To understand workshop layout and safety norms.

Course Outcomes:

CO1: Familiar with safety norms to prevent any mishap in workshop.
CO2: Able to handle appropriate hand tool, cutting tool and machine tools to manufacture a job.
CO3: Able to understand the construction, working and functions of machine tools and their parts.
CO4: Able to know simple operations (Turning and Facing) on a centre lathe.

Note

1. The demonstration of machine tools to be conducted by **teaching** faculty.
2. Minimum eight experiments to be conducted out of 10.

Guidelines for Instructor's Manual

Instructor manual shall contain:

- The production drawing of a job with all linear and geometric dimensions, Raw material, size and shape, allowances provided.
- List of tooling required.
- Process plan to complete the job.
- General safety instructions.

Guidelines for Student's Lab Journal

i. Student has to maintain a workshop diary consisting of drawing / sketches of the jobs and a brief description of tools, equipment, and procedure used for doing the job and time schedule.
ii. Student has to maintain one file for write ups based on demonstration of machine tools and safety norms

Guidelines for LAB/TW Assessment

Term work assessment shall be based on the timely completion of jobs, quality of job, skill acquired, and maintain of workshop diary and brief write-ups on illustrations/sketches of demonstrated parts/mechanisms/machine tools etc.

Guidelines for Laboratory Conduction

i. 1st on importance of workshop practical and shop floor safety norms
ii. 2nd to 6th Sessions are about demonstration of machine tools (Any 4)
iii. 7th to 9th on making utility job (Any 2)
iv. 10th& 11th session on preparation of workshop layout and safety norms.

Suggested List of Laboratory Experiments/Assignments

Sr. No.	List of Experiments
1.	Mandatory briefing on shop-floor safety
2.	**Demonstration and working of centre lathe** Demonstration on various functions of lathe parts: Headstock, Tailstock, Carriage, Lead screw, All geared Mechanism, Apron mechanism etc.
3.	**Demonstration of Lathe operations:** Step turning and facing, drilling operation on a Mild Steel cylindrical job on centre lathe. Understanding the concept of speed, feed and depth of cut.

4.	**Demonstration of Drilling machine** Demonstration on construction of Radial drilling machine, Tool holding devices, Concept of speed, feed and depth of cut.
5.	**Demonstration on Milling machine** Demonstration on construction, table movements, indexing and tooling of milling machine.
6.	**Demonstration of Shaper/Grinding machine (Any one)** Shaper: Crank and slotted link mechanism, Work feed mechanism Grinding: Surface grinder/Cylindrical grinding machine, Mounting of grinding wheel
7.	**Term work includes one job of Carpentry** Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns and its allowances.
8.	**Term work to include one job involving fitting** to size, male-female fitting with drilling and tapping operation on Mild Steel plate; Introduction to marking, cutting and sawing, sizing of metal, shearing, Concept of fits and interchangeability, selection of datum and measurements.
9.	**Term work to include one utility job preferably using sheet metal** (e.g. Tray, Funnel etc.) with riveting/welding/brazing/soldering (at least one temporary and one Permanent joint either using resistance welding/Arc welding); Introduction to sheet metal operations: punching, blanking, bending, drawing.
10.	**Prepare a Layout of Workshop** To prepare a work shop layout.
11.	**Collection of information about safety norms** in any one of the following type of industry:Metalworking/Chemical/Cement/Pharmaceuticals/Defense/Atomic energy/Aerospace /Marine/Construction/Railway etc.

Reference/Text Books

1. John, K. C., (2010),"Mechanical Workshop Practice, Prentice Hall Publication, New Delhi
2. Hazra and Chaudhary, Workshop Technology-I & II, Media promoters & Publisher Pvt. Ltd.

101007: Environmental Studies-I

TH:02 Hrs./week **(Mandatory Non-Credit Course)**

Course Objectives:

1. To explain the concepts and strategies related to sustainable development and various components of environment.
2. To examine biotic and abiotic factors within an ecosystem, to identify food chains, webs, as well as energy flow and relationships.
3. To identify and analyze various conservation methods and their effectiveness in relation to renewable and nonrenewable natural resources.
4. To gain an understanding of the value of biodiversity and current efforts to conserve biodiversity on national and local scale.

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

CO1:Demonstrate an integrative approach to environmental issues with a focus on sustainability.

CO2: Explain and identify the role of the organism in energy transfers in different ecosystems.

CO3: Distinguish between and provide examples of renewable and nonrenewable resources & analyze personal consumption of resources.

CO4: Identify key threats to biodiversity and develop appropriate policy options for conserving biodiversity in different settings.

Course Contents

Unit I **Introduction to environmental studies** **(02 Hrs)**

Multidisciplinary nature of environmental studies; components of environment – atmosphere, hydrosphere, lithosphere and biosphere. Scope and importance; Concept of sustainability and sustainable development.

Unit II **Ecosystems** **(06 Hrs)**

What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems:

a) Forest ecosystem
b) Grassland ecosystem
c) Desert ecosystem
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit III **Natural Resources: Renewable and Non-renewable Resources** **(08 Hrs)**

Land Resources and land use change; Land degradation, soil erosion and desertification.

Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.

Water: Use and over-exploitation of surface and ground water, floods droughts, conflicts over water (international & inter-state).

Heating of earth and circulation of air; air mass formation and precipitation.

Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit IV **Biodiversity and Conservation** **(08 Hrs)**

Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity; In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Suggested Readings:

1. Carson, R. 2002. Silent spring. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson,B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
4. Gleick, P.H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll. Principals of Conservation Biology.
   Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339:36-37.
7. McCully, P.1996. Rivers no more: the environmental effects of dams (pp.29-64). Zed Books.
8. McNeil, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.

107008 – Engineering Mathematics – II

Teaching Scheme:	**Credits**	**Examination Scheme:**
TH : 4 Hrs./Week	**05**	**In-Semester : 30 Marks**
TUT : 1 Hr./Week		**End-Semester : 70 Marks**
		TW : 25 Marks

Prerequisites:

Integration, Differential Equation, Three-dimensional coordinate systems

Course Objectives:

To make the students familiarize with Mathematical Modeling of physical systems using differential equations advanced techniques of integration, tracing of curve, multiple integrals and their applications. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance thinking power, useful in their disciplines.

Course Outcomes (COs): The students will be able to learn

CO1: the effective mathematical tools for solutions of first order differential equations that model physical processes such as Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc.

CO2: advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions needed in evaluating multiple integrals and their applications.

CO3: to trace the curve for a given equation and measure arc length of various curves.

CO4: the concepts of solid geometry using equations of sphere, cone and cylinder in a comprehensive manner.

CO5: evaluation of multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.

Course Contents

Unit I: First Order Ordinary differential Equations (09 Hrs.)

Exact differential equations, Equations reducible to exact form. Linear differential equations, Equations reducible to linear form, Bernoulli's equation.

Unit II: Applications of Differential Equations (09 Hrs.)

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.

Unit III: Integral Calculus (09 Hrs.)

Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign and Error functions.

Unit IV: Curve Tracing (09 Hrs.)

Tracing of Curves – Cartesian, Polar and Parametric curves, Rectification of curves.

Unit V: Solid Geometry (09 Hrs.)

Cartesian, Spherical polar and Cylindrical coordinate systems, Sphere, Cone and Cylinder.

Unit VI: Multiple Integrals and their Applications (09 Hrs.)

Double and Triple integrations, Change of order of integration, Applications to find Area, Volume, Mass, Centre of Gravity and Moment of Inertia.

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:

i) Tutorial for the subject shall be engaged in minimum three batches (batch size of 22 students) per division.

ii) Term work shall consist of six assignments on each unit-I to unit-VI and is based on

performance and continuous internal assessment.

107009: Engineering Chemistry

Teaching Scheme:	**Credits**	**Examination Scheme:**
TH : 04 Hrs/week	**05**	**In Semester : 30 Marks**
PR : 02 Hrs/Week		**End Semester: 70 Marks**
		PR : 25 Marks

Prerequisite Courses, if any:
Types of titrations, volumetric analysis, structure property relationship, types of crystals, periodic table, classification and properties of polymers, electromagnetic radiation, electrochemical series

Companion Course, if any: Laboratory Practical

Course Objectives:

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

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

CO1: Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity.

CO2: Select appropriate electro-technique and method of material analysis.

CO3: Demonstrate the knowledge of advanced engineering materials for various engineering applications.

CO4: Analyze fuel and suggest use of alternative fuels.

CO5: Identify chemical compounds based on their structure.

CO6: Explain causes of corrosion and methods for minimizing corrosion.

Course Contents

Unit I Water Technology (08Hrs)

Impurities in water, hardness of water: Types, Units and Numericals. Determination of hardness (by EDTA method using molarity concept) and alkalinity, numericals. Ill effects of hard water in boiler - priming and foaming, boiler corrosion, caustic embrittlement, scale and sludge.

Water treatment: i) Zeolite method and numericalsii) Demineralization method. Purification of water: Reverse osmosis and Electrodialysis.

Unit II Instrumental Methods of Analysis (08Hrs)

Introduction: Types of reference electrode (calomel electrode), indicator electrode (glass electrode), ion selective electrode: ion selective membranes such as solid membrane, enzyme based membrane and gas sensing membrane.

[A] Conductometry: Introduction, conductivity cell, conductometric titrations of acid versus base with titration curve.

[B] pHmetry: Introduction, standardization of pH meter, pH metric titration of strong acid versus strong base with titration curve.

Unit III **Engineering Materials** **(08Hrs)**

A] Speciality polymers: Introduction, preparation, properties and applications of the following polymers:

1. Engineering Thermoplastic: Polycarbonate,
2. Bio-degradable polymers: Poly (hydroxybutyrate-hydroxyvalanate),
3. Conducting Polymer: Polyacetylene,
4. Electroluminescent polymer: Polyphenylenevinylene,
5. Polymer composites: Fiber reinforced plastic (FRP)- Glass reinforced and Carbon reinforced polymer composite

[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).

Unit IV **Fuels** **(08Hrs)**

Introduction (definition, classification of fuel based on chemical reactions and characteristics of an ideal fuel),

Calorific value (CV): Higher calorific value (HCV) and Lower calorific value (LCV), Determination of Calorific value: Principle, construction and working of Bomb calorimeter and Boy's gas calorimeter and numericals,

Solid fuel: Coal: Analysis of Coal-Proximate and Ultimate analysis, numericals,

Liquid fuel: Petroleum: Refining of petroleum /crude oil and composition, boiling range and uses of various fractions,

Gaseous fuel: Composition, properties and applications of CNG. Hydrogen gas as a future fuel

Alternative fuels: Power alcohol and biodiesel.

Unit V **Spectroscopic Techniques** **(08Hrs)**

[A]UV-Visible Spectroscopy:

Introduction, interaction of electromagnetic radiation with matter, statement of Beer's law and Lambert's law, absorption of UV radiation by organic molecule leading to different electronic transitions, terms involved in UV-visible Spectroscopy- chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic shift and hypochromic shift, Instrumentation and basic principle of single beam spectrophotometer, applications of UV-visible spectroscopy.

[B] Infra red Spectroscopy:

Introduction, Principle of IR Spectroscopy, types of vibrations: Stretching (symmetric and asymmetric) and bending (scissoring, rocking, wagging and twisting), conditions of absorption of IR radiations, vibration of diatomic and polyatomic molecules. Instrumentation with block diagram. Parts of IR spectrum, fundamental group region, fingerprint region, applications of IR spectroscopy.

Unit VI **Corrosion Science** **(08Hrs)**

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, galvanic cell corrosion, concentration cell corrosion, Factors influencing rate of corrosion. Methods of corrosion control and prevention: cathodic and anodic protection, metallic coatings and its types, surface preparation, methods to apply metallic coatings-hot dipping, cladding, electroplating, cementation.

Books & Other Resources:

Text Books:

1. Engineering Chemistry by O .G. Palanna, Tata Magraw Hill Education Pvt. Ltd.
2. Textbook of Engineering Chemistry by Dr. S. S. Dara, Dr. S. S. Umare, S. Chand & Company Ltd.
3. Textbook of Engineering Chemistry by Dr. Sunita Rattan, S. K. Kataria& Sons Publisher

Reference Books:

1. Engineering Chemistry, Wiley India Pvt. Ltd.
2. Inorganic Chemistry, 5 ed by Shriver and Atkins, Oxford University Press
3. Basic Concept of Analytical Chemistry, 2ed , S. M. Khopkar, New Age-International Publisher
4. Instrumental Methods of Chemical Analysis, G. R. Chatwal& S. K. Anand, Himalaya Publishing House
5. Spectroscopy of organic compounds, 2 ed, P. S. Kalsi, New Age-International Ltd., Publisher
6. Polymer Science, V. R. Gowarikar, N. V. Viswanathan, jayadevSreedhar, Wiley Eastern Limited

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 iron plate using electroplating.
10. Preparation of biodiesel from oil.
11. Colloidal synthesis of 2-6 or 3-5 semiconductor quantum dots nanoparticles

104010:Basic Electronics Engineering

Teaching Scheme:	**Credits**	**Examination Scheme**
TH : 03 Hrs./week	**04**	**In - Semester : 30 Marks**
PR : 02 Hrs./week		**End - Semester : 70 Marks**
		PR : 25 Marks

Course Objectives:

1. The principle of electronics and working principle of PN junction diode and special purpose diodes.
2. The functioning of transistors like BJT, MOSFETs and OPAMP.
3. Basics of various logic gates, digital circuits and their applications.
4. Working and functions of various electronic instruments.
5. The operating principles and applications of various active and passive sensors.
6. Basic principles of communication systems.

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

CO1: Explain the working of P-N junction diode and its circuits.

CO2: Identify types of diodes and plot their characteristics and also can compare BJT with MOSFET.

CO3: Build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops.

CO4: Use different electronics measuring instruments to measure various electrical parameters.

CO5: Select sensors for specific applications.

CO6: Describe basic principles of communication systems.

Course Contents

Unit I **Introduction to Electronics** **(08Hrs)**

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

Introduction to active and passive components, P-type Semiconductor, N-type Semiconductor. Current in semiconductors(Diffusion and Drift Current)

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

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

Unit II **Transistor and OPAMP** **(07Hrs)**

Bipolar Junction Transistor : Construction, type, Operation, V-I Characteristics, region of operation, BJT as switch and CE amplifier

Metal Oxide Semiconductor Field Effect Transistors (MOSFET): Construction, Types, Operation, V-I characteristics, Regions of operation, MOSFET as switch & amplifier.

Operational amplifier: Functional block diagram of operational amplifier, ideal operational amplifier, Op-amp as Inverting and Non inverting amplifier

Unit III **Number System and Logic Gates** **(07Hrs)**

Number System:- Binary, BCD, Octal, Decimal, Hexadecimal their conversion and arithmetic, De-Morgan's theorem.

Basic Gates:- AND, OR, NOT, Universal Gate- XOR, XNOR, Half adder, Full adder

Flip Flop's SR, JK, T and D

Introduction to Microprocessor and Microcontroller (Only block diagram and explanation)

Unit IV **Electronic Instrumentation** **(06Hrs)**

Electronic Instruments: Principles and block diagram of digital multimeter, Function Generator, Digital Storage Oscilloscope (DSO) Power scope, AC/DC power supply, Auto transformer, Analog ammeter and voltmeter.

Unit V **Sensors** **(07Hrs)**

Classification of a sensors, Active /Passive Sensors, Analog/Digital Sensors, Motion Sensors (LVDT, Accelerometer), Temperature Sensors (Thermocouple, Thermistor, RTD), Semiconductor Sensors(Gas Sensors), Optical Sensors (LDR), Mechanical Sensors (Strain Guage, Load Cell, Pressure sensors), Biosensors. (Working Principle and one application).

Unit VI **Communication Systems** **(07Hrs)**

Basic Communication System: Block Diagram, Modes of Transmission, Communication Media: Wired and Wireless, Electromagnetic Spectrum, Allotment of frequency band for different applications, Block Diagram of AM and FM Transmitter and receiver,

Mobile Communication System: Cellular concept, Simple block diagram of GSM system.

Books & Other Resources:

Text Books:

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

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.

List of Laboratory Experiments/Assignments

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 Diode, BJT, MOSFETs, various IC packages e) Switches & Relays
2.	**Measurements using various measuring equipments:** a) Set up CRO and function generator for measurement of voltage, frequency b) Obtain the phase shift between to signals using CRO with the help of Lissagous pattern. c) Measure voltage, resistance using digital multimeter. Also use multimeter to check diode, BJT
3.	**V-I characteristics of:** a) P-N Junction Diode **(Study the datasheet of typical PN junction diode 1N 400X)** b) Zener Diode **(Study the datasheet of typical Zener diode 1N 4148)**
4.	**Rectifier circuits:** a) Implement half wave, full wave and bridge rectifier using diodes b) Observe the effect of capacitor filter on rectifier output
5.	**Frequency response of MOSFET:** a) To plot frequency response of BJT amplifier.**(Simulation)** b) To plot frequency response of MOSFET amplifier.**(Simulation)**
6.	**Linear applications of Op-amp:** Build inverting and non-inverting amplifier using op-amp **(Study the datasheet of typical Op-Amp 741)**
7.	**Test and verify the truth tables of:** a) Basic and Universal Gates **(Study the data sheet of respective IC's)** b) Half / Full Adder c) RS/JK/T/D flip flop
8.	**Study of transducers : (Any 3)**
9.	Build and test any circuit using BJT/MOSFET/Op-Amp/Logic Gates using any one sensor.
10.	Case Study of any one 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 guidelines, 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 handwritten 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 be encouraged.

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 is to be known to the students at the beginning of the course.

101011: Engineering Mechanics

Teaching Scheme:	**Credits**	**Examination Scheme:**
TH : 3 Hrs./week	**04**	**In-Semester : 30 Marks**
PR : 2 Hrs./Week		**End-Semester : 70 Marks**
		PR : 25 Marks

Prerequisite Courses, if any: 12th Physics, Maths

Course Objectives:

1. To impart knowledge about force systems and methods to determine resultant centroid and moment of inertia
2. To teach methods to calculate force of friction
3. To impart knowledge to determine reaction of beams, calculate member forces in trusses, cables and frames using principles of equilibrium
4. To teach space force systems
5. To train students to solve problems related to particle mechanics using principles of kinematics, kinetics and work power energy

Course Outcomes:

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

CO1: Determine resultant of various force systems

CO2: Determine centroid, moment of inertia and solve problems related to friction

CO3: Determine reactions of beams, calculate forces in cables using principles of equilibrium

CO4: Solve trusses, frames for finding member forces and apply principles of equilibrium to forces in space

CO5: Calculate position, velocity and acceleration of particle using principles of kinematics

CO6: Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy

Course Contents

Unit I Resolution and Composition of Forces (07Hrs)

Principle of statics, Force system, Resolution and composition of forces, Resultant of concurrent forces. Moment of a force, Varignon's theorem, resultant of parallel force system, Couple, Equivalent force couple system, Resultant of parallel general force system

Unit II Distributed Forces and Friction (06Hrs)

Moment of area, Centroid of plane lamina and wire bends, Moment of Inertia.

Friction- Laws of friction, application of friction on inclined planes Wedges and ladders friction Application to flat belt

Unit III **Equilibrium** **(06Hrs)**

Free body diagram Equilibrium of concurrent, parallel forces in a plane Equilibrium of general forces in a plane Equilibrium of three forces in a plane, Types of beams, simple and compound beams, Type of supports and reaction,

Forces in space, Resultant of concurrent and parallel forces in a space, Equilibrium of concurrent and parallel forces in a space.

Unit IV **Analysis of Structures** **(06 Hrs)**

Two force member, Analysis of plane trusses by Method of joints Analysis of plane trusses by method of section, Analysis of plane frames, Cables subjected to point load multi force member.

Unit V **Kinematics of Particle** **(06 Hrs)**

Kinematics of linear motion- Basic concepts Equation of motion for constant acceleration Motion under gravity, Variable acceleration motion curves.

Kinematics of curvilinear motion- Basic Concepts Equation of motion in Cartesian coordinates Equation of motion in path coordinates Equation of motion in polar coordinates Motion of projectile.

Unit VI **Kinetics of Particle** **(06Hrs)**

Kinetics- Newton's Second Law of motion Application of Newton's Second Law.

Work, power, energy, conservative and non-conservative forces Conservation of energy for motion of particle, Impulse, Momentum, Direct central impact. Coefficient of restitution, Impulse Momentum principle of particle.

Books & Other Resources:

Text Books:

1. Vector Mechanics for Engineers, by F. P. Beer and E. R. Johnson, McGraw-Hill Publication
2. Engineering Mechanics by R. C. Hibbeler, Pearson Education

Reference Books:

1. Engineering Mechanics by S. P. Timoshenko and D. H. Young, McGraw- Hill publication
2. Engineering Mechanics by J. L. Meriam and Craige, John Willey
3. Engineering Mechanics by F L Singer, Harper and Rowe publication
4. Engineering Mechanics by A. P. Boresi and R. J. Schmidt, Brooks/Cole Publication

Laboratory Course

Guidelines for Instructor's Manual

An instruction manual with aim, objective, apparatus, procedure and calculations to be performed for each experiment to be provided for students called as Lab Manual. Every year problems for assignment should be changed. It is advisable to give different data to different batches

Guidelines for Student's Lab Journal

Journal should be hand written

Guidelines for Lab /TW Assessment

Each and every experiment should be assessed and given mark out of 10. Finally the marks can be converted as per given in the structure.

Guidelines for Laboratory Conduction

Divide the students of a batch in groups of not more than 4 students and ask each group to take readings separately followed by calculations for each experiment. After every experiment faculty should sign the lab manual of readings of every student in the batch

Suggested List of Laboratory Experiments/Assignments

Sr. No.	Group A
	1. Verification of law of parallelogram of forces/polygon of forces. 2. To determine support reaction of simple/compound beams. 3. Determination of coefficient friction of belt/inclined plane. 4. To determine forces in the members of space force system. 5. To study the curvilinear motion. 6. Determination of coefficient of restitution.
	Group B
	Assignment of five problems on every unit to be solved during practical
	Group C
	Any two assignments of the following by graphical method using any drawing software. a) To determine the resultant of general force system. b) To determine unknown forces of concurrent force system c) To determine the forces in the member of the plane truss d) To determine velocity and acceleration of particle from given s-t diagram.

102012: Engineering Graphics		
Teaching Scheme: **TH : 01 Hr/week** **PR : 02 Hrs/Week** **TUT : 01 Hr/Week**	**Credits** **02**	**Examination Scheme:** **End-Semester : 50 Marks** **TW : 25 Marks**

Course Objectives

1. To acquire basic knowledge about engineering drawing language, line types, dimension methods, and simple geometrical construction.
2. To draw conic sections by various methods, involutes, cycloid and spiral.
3. To acquire basic knowledge about physical realization of engineering objects and shall be able to draw its different views.
4. To visualize three dimensional engineering objects and shall be able to draw their isometric views.
5. To imagine visualization of lateral development of solids.
6. To acquire basic knowledge about the various CAD drafting software's and its basic commands required to construct the simple engineering objects.

Course Outcomes

On completion of the course, learner will be able to

CO1: Draw the fundamental engineering objects using basic rules and able to construct the simple geometries.

CO2: Construct the various engineering curves using the drawing instruments.

CO3: Apply the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object.

CO4: Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.

CO5: Draw the development of lateral surfaces for cut section of geometrical solids.

CO6: Draw fully-dimensioned 2D, 3D drawings using computer aided drafting tools.

Course Contents

Unit I Fundamentals of Engineering Drawing (01 Hrs)

Need of Engineering Drawing and design, Sheet layout, Line types and dimensioning and simple geometrical constructions

Unit II Introduction to 2D and 3D computer aided drafting packages (02 Hrs)

Evolution of CAD, Importance of CAD, Basic Commands - Edit, View, Insert, Modify, Dimensioning Commands, setting and tools etc. and its applications to construct the 2D and 3D drawings

Unit III Engineering Curves (01 Hr)

Introduction to conic sections and its significance, various methods to construct the conic sections. Helix for cone and cylinder , rolling curves (Involutes , Cycloid) and Spiral

Unit IV Orthographic Projection (02 Hrs)

Principle of projections, Introduction to First and Third angle Projection methods, Orthographic projection of point, line, plane, solid and machine elements/parts

Unit V Isometric Projection (03 Hrs)

Introduction to isometric projection, oblique projection and perspective projection. Draw the isometric projection from the given orthographic views

Unit VI Development of Lateral Surfaces (03 Hrs)

Introduction to development of lateral surfaces and its industrial applications. Draw the development of lateral surfaces for cut section of cone, pyramid, prism etc.

Books & Other 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", Chartor 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

Guidelines for Laboratory Conduction

Tutorial Session

Can be utilized to teach the basic commands of any drafting package, by using this knowledge students shall be able to complete the five assignments on the CAD software. (Minimum 2 problems in each assignment)

Assignment 1: Construct any Engineering Curve using any method

Assignment 2: Orthographic view of any machine element along with sectional view.

Assignment 3: Draw Isometric view for given orthographic views.

Assignment4 :Draw the isometric or Orthographic view of a product/object (For example Workshop Job prepared during the workshop practice or any product developed during the first year session).

Assignment 5: Draw the development of lateral surface of a solid/ truncated solid.

Practical Session

Draw minimum two problems on each assignment on the A3 size drawing sheet.

Suggested List of Laboratory Experiments/Assignments

Assignment 1: Construct any Engineering Curve by any method

Assignment 2: Orthographic view of any machine element along with sectional view.

Assignment 3: Draw Isometric view for given orthographic views.

Assignment 4: Draw the development of lateral surface of a solid/ truncated solid

Assignment 5: Draw the isometric or Orthographic view of a product/object (For example Workshop Job prepared during the workshop practice or any product developed during the first year session.)

110013: Project Based Learning

Teaching Scheme:	**Credits**	**Examination Scheme:**
PR: 04 Hrs/Week	**02**	**PR : 50 Marks**

Preamble:

For better learning experience, along with traditional classroom teaching and laboratory learning; project based learning has been introduced with an objective to motivate students to learn by working in group cooperatively to solve a problem.

Project-based learning (PBL) is a student-centric pedagogy that involves a dynamic classroom approach in which it is believed that students acquire a deeper knowledge through active exploration of real-world challenges and problems. Students learn about a subject by working for an extended period of time to investigate and respond to a complex question, challenge, or problem. It is a style of active learning and inquiry-based learning. (Reference: Wikipedia). Problem based learning will also redefine the role of teacher as mentor in learning process. Along with communicating knowledge to students, often in a lecture setting, the teacher will also to act as an initiator and facilitator in the collaborative process of knowledge transfer and development.

Course Objectives:

1. To emphasizes learning activities that are long-term, interdisciplinary and student-centric.
2. To inculcate independent learning by problem solving with social context.
3. To engages students in rich and authentic learning experiences.
4. To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.

Course Outcomes:

CO1: Project based learning will increase their capacity and learning through shared cognition.
CO2: Students able to draw on lessons from several disciplines and apply them in practical way.
CO3: Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

Group Structure:

Working in supervisor/mentor –monitored groups. The students plan, manage and complete a task/project/activity which addresses the stated problem.

- There should be team/group of 5 -6 students
- A supervisor/mentor teacher assigned to individual groups

Selection of Project/Problem:

The problem-based project oriented model for learning is recommended. The model begins with the identifying of a problem, often growing out of a question or "wondering". This formulated problem then stands as the starting point for learning. Students design and analyze the problem within an articulated interdisciplinary or subject frame.

A problem can be theoretical, practical, social, technical, symbolic, cultural and/or scientific and grows out of students' wondering within different disciplines and professional environments. A chosen problem has to be **exemplary**. The problem may involve an interdisciplinary approach in both the analysis and solving phases.

By exemplarity, a problem needs to refer back to a particular practical, scientific, social and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry.

There are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content and structure of the activity.

- A few hands-on activities that may or may not be multidisciplinary
- Use of technology in meaningful ways to help them investigate, collaborate, analyze, synthesize and present their learning.
- Activities may include- Solving real life problem, investigation /study and Writing reports of in depth study, field work.

Assessment:

The institution/head/mentor is committed to assessing and evaluating both student performance and program effectiveness.

Progress of PBL is monitored regularly on weekly basis. Weekly review of the work is necessary. During process of monitoring and continuous assessment AND evaluation the individual and team performance is to be measured. PBL is monitored and continuous assessment is done by supervisor /mentor and authorities.

Students must maintain an institutional culture of authentic collaboration, self-motivation, peer-learning and personal responsibility. The institution/department should support students in this regard through guidance/orientation programs and the provision of appropriate resources and services. Supervisor/mentor and Students must actively participate in assessment and evaluation processes.

Group may demonstrate their knowledge and skills by developing a public product and/or report and/or presentation.

- Individual assessment for each student (Understanding individual capacity, role and involvement in the project)
- Group assessment (roles defined, distribution of work, intra-team communication and togetherness)
- Documentation and presentation

Evaluation and Continuous Assessment:

It is recommended that the all activities are to be record and regularly, regular assessment of work to be done and proper documents are to be maintained at college end by both students as well as mentor (you may call it PBL work book).

Continuous Assessment Sheet (CAS) is to be maintained by all mentors/department and institutes.

Recommended parameters for assessment, evaluation and weightage:

- Idea Inception **(5%)**
- Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product **(50%)** (Individual assessment and team assessment)
- Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents) **(25%)**
- Demonstration (Presentation, User Interface, Usability etc) **(10%)**
- Contest Participation/ publication **(5%)**
- Awareness /Consideration of -Environment/ Social /Ethics/ Safety measures/Legal aspects **(5%)**

PBL workbook will serve the purpose and facilitate the job of students, mentorand project coordinator. This workbook will reflect accountability, punctuality, technical writing ability and work flow of the work undertaken.

References:

- Project-Based Learning, Edutopia, March 14, 2016.
- What is PBL? Buck Institute for Education.
- www.schoology.com
- www.wikipedia.org
- www.howstuffworks.com

101014: Environmental Studies-II

TH: 02 Hr/week **Mandatory Non-Credit Course**

Course Objectives:

1. To provide a comprehensive overview of environmental pollution and the science and technology associated with the monitoring and control.
2. To understand the evolution of environmental policies and laws.
3. To explain the concepts behind the interrelations between environment and the development.
4. To examine a range of environmental issues in the field, and relate these to scientific theory.

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

CO1: Have an understanding of environmental pollution and the science behind those problems and potential solutions.

CO2: Have knowledge of various acts and laws and will be able to identify the industries that are violating these rules.

CO3: Assess the impact of ever increasing human population on the biosphere: social, economic issues and role of humans in conservation of natural resources.

CO4: Learn skills required to research and analyze environmental issues scientifically and learn how to use those skills in applied situations such as careers that may involve environmental problems and/or issues.

Course Contents

Unit V **Environmental Pollution** **(08 Hrs)**

Environmental pollution : types, causes, effects and controls; Air, water, soil, chemical and noise pollution

Nuclear hazards and human health risks

Solid waste management: Control measures of urban and industrial waste

Pollution case studies.

Unit VI **Environmental Pollution** **(07 Hrs)**

Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities& agriculture.Environment Laws : Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife protection Act; Forest Conservation Act; International agreements; Montreal and Kyoto Protocols and conservation on Biological Diversity (CBD). The Chemical Weapons Convention (CWC).Nature reserves, tribal population and rights, and human, wildlife conflicts in Indian context

Unit VII **Human Communities and the Environment** **(06 Hrs)**

Human population and growth; Impacts on environment, human health and welfares.

Carbon foot-print. Resettlement and rehabilitation of project affected persons; case studies. Disaster management: floods earthquakes, cyclones and landslides. Environmental movements: Chipko, Silent valley, Bishnios of Rajasthan. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.

Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Unit VIII **Field work** **(05 Hrs)**

- Visit to an area to document environmental assets; river/forest/flora/fauna, etc.
- Visit to a local polluted site – Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river Delhi Ridge, etc

Suggested Readings:

1. Carson, R. 2002. Silent spring. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson,B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
4. Gleick, P.H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll. Principals of Conservation Biology, Sunderland: Sinauer Associates, 2006
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339:36-37.
7. McCully, P.1996. Rivers no more: the environmental effects of dams (pp.29-64). Zed Books.
8. McNeil, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.