**APPLIED PHYSICS-I (THEORY)**

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|---|---|
| **Course code** | **BS103** |
| **Course title** | **Applied Physics-1 (THEORY)** |
| **Number of credits** | **3 (L:2, T:1, P:0)** |
| **Course requisites** | **High School level Physics** |
| **Course Category** | **BS** |

| Unit No. | Unit Title | Hours | Marks | | | |
|---|---|---|---|---|---|---|
| | | | K | C | A | Total Marks |
| 1 | Physical World, Units & Measurement | 5 | 3 | 2 | 2 | 07 |
| 2 | Force and Motion | 8 | 4 | 4 | 3 | 11 |
| 3 | Gravitation | 4 | 1 | 2 | 2 | 05 |
| 4 | Work, Energy & Power | 6 | 3 | 4 | 3 | 10 |
| 5 | Rotational Motion | 6 | 3 | 3 | 2 | 08 |
| 6 | Properties of Matter | 6 | 3 | 3 | 3 | 09 |
| 7 | Heat & Thermometry | 7 | 3 | 4 | 3 | 10 |
| | Total | 42 | 20 | 22 | 18 | 60 |

**TOTAL LECTURE HOURS PER WEEK: 02**
**TOTAL TUTORIAL HOURS PER WEEK: 01**
**TOTAL CREDITS: 03**

**Course Objectives:** Applied Physics includes the study of a large number of diverse topics all related to materials/things that exist in the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which such objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content. The course will help the diploma engineers to apply the basic concepts and principles to solve broadbased engineering problems and to understand different technology based applications.

**Teaching Approach:**

• Teachers should give examples from daily routine as well as, engineering/technology applications on various concepts and principles in each topic so that students are able to understand and grasp these concepts and principles. In all contents, SI units should be followed.

• Use of demonstration can make the subject interesting and develop scientific temper in the students. Student activities should be planned on all the topics.

• Activity- Theory - Demonstrate/practice approach may be followed throughout the course so that learning may be outcome and employability based.

**Rationale:**

Studying physics is foundational for engineering diploma students as it provides essential

principles and analytical skills crucial for understanding complex engineering concepts. Physics not only explains the fundamental laws governing matter, energy, and forces but also cultivates problem-solving abilities necessary for designing, analyzing, and optimizing engineering systems. It lays the groundwork for advanced engineering topics like fluid dynamics, heat transfer, and electromagnetism, which are vital across various engineering disciplines. By mastering physics, students develop a robust foundation and analytical mindset that are invaluable for their future roles as engineers.

**Course Content:**

**Unit 1: Physical world, Units and Measurements**

Physical quantities; fundamental and derived, Units and systems of units (FPS, CGS and SI units), Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other).

Measurements: Need, measuring instruments, least count, Errors in measurements (systematic and random), absolute error, relative error, error estimation and significant figures.

**Unit 2: Force and Motion.**

Scalar and Vector quantities – examples, representation of vector, types of vectors. Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only).

Force, Momentum, Statement and derivation of conservation of linear momentum, its applications such as recoil of gun, rockets, Impulse and its applications.

Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period, Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical), Centripetal and Centrifugal forces with examples. Expression and applications such as banking of roads and bending of cyclist.

**Unit 3: Gravitation**

Newton's law of gravitation, Universal gravitational constant, G. Acceleration due to gravity (g) and its relation with G. Variation of "g" with altitude and latitude (deduction not required). Difference between mass and weight. Simple problems

**Unit 4: Work, Power and Energy.**

Work: Concept and units, examples of zero work. Friction: concept, types, laws of limiting friction, coefficient of friction, reducing friction and its engineering applications.

Energy and its units, kinetic energy, gravitational potential energy, mechanical energy, conservation of mechanical energy for freely falling bodies, transformation of energy (examples).

Power and its units, power and work relationship, calculation of power (numerical problems).

**Unit 5: Rotational Motion**

Translational and rotational motions with examples, Definition of torque and angular momentum and their examples, Conservation of angular momentum (quantitative) and its applications.

Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only).

**Unit 6: Properties of Matter**

Elasticity: definition of stress and strain, moduli of elasticity, Hooke's law, stress-strain curve.

Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications.

Surface tension: concept, units, cohesive and adhesive forces, angle of contact, Ascent Formula (No derivation), applications of surface tension. Viscosity.

**Unit 7: Heat and Thermometry**

Concept of heat and temperature, modes of heat transfer (conduction, convection and radiation with examples), specific heats, scales of temperature and their relationship.

Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them, Co-efficient of thermal conductivity, engineering applications.

**Learning outcome:**

After undergoing this subject, the student will be able to:

• Identify physical quantities, select their units for use in engineering solutions, and make measurements with accuracy by minimizing different types of errors.

• Represent physical quantities as scalar and vectors and solve real life relevant problems.

• Analyse type of motions and apply the formulation to understand banking of roads/railway tracks and conservation of momentum principle to describe rocket propulsion, recoil of gun etc.

- Describe and apply the concept of gravitation in real world engineering problems.

• Define scientific work, energy and power and their units. Drive relationships for work, energy and power and solve related problems.

• Describe forms of friction and methods to minimize friction between different surfaces.

• State the principle of conservation of energy. Identify various forms of energy, and energy transformations.

• Compare and relate physical properties associated with linear motion and rotational motion and apply conservation of angular momentum principle to known problems.

• Describe the phenomenon of surface tension, effects of temperature on surface tension and solve statics problems that involve surface tension related forces.

• Describe the viscosity of liquids, coefficient of viscosity and the various factors affecting its value. Determine viscosity of an unknown fluid using Stokes' Law and the terminal velocity.
• Define stress and strain. State Hooke's law and elastic limits, stress–strain diagram, determine; (a) the modulus of elasticity, (b) the yield strength (c) the tensile strength, and (d) estimate the percent elongation.
• Illustrate the terms; heat and temperature, measure temperature in various processes on different scales (Celsius, Fahrenheit, and Kelvin etc.)
• Distinguish between conduction, convection and radiation; identify different methods for reducing heat losses and mode of heat transfer between bodies at different temperatures.
• State specific heats and measure the specific heat capacity of solids and liquids

**References:**

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi.
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
5. Engineering Physics by DK Bhhatacharya & Poonam Tandan; Oxford University Press, New Delhi.
6. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
7. Practical Physics by C. L. Arora, S. Chand Publication. 8. e-books/e-tools/ learning physics software/websites etc

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**APPLIED PHYSICS-I (PRACTICALS)**

| | | |
|---|---|---|
| Course Code | : | BS107 |
| Course Title | : | Applied Physics-I lab |
| Number of credits | : | 1 (L:0, T:0, P:2) |
| Prerequisites | : | NIL |
| Course Category | : | BS |

**Course Objectives**

Study of Applied Physics aims to give an understanding of physical world by observations and predictions. Concrete use of physical principles and analysis in various fields of engineering and technology is very prominence. The course aims to supplement the factual knowledge gained in the lecture by first hand manipulation of apparatus. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering and technology based problems. In addition, students get necessary confidence in handling equipment and thus learn various skills in measurement.

**List of Practical's/Activities (To perform minimum 10 practical's).**

1. To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier caliper and find volume of each object.
2. To determine diameter of a wire, a solid ball and thickness of cardboard using a screw gauge.
3. To determine radius of curvature of a convex and a concave mirror/surface using a spherometer.
4. To verify triangle and parallelogram law of forces.
5. To determine the acceleration due to gravity 'g' of a place by simple pendulum.
6. To determine force constant of a spring using Hook's Law.
7. To verify law of conservation of mechanical energy (PE to KE).
8. To find the moment of inertia of a flywheel.
9. To find the viscosity of a given liquid (Glycerin) by Stoke's law.
10. To find the coefficient of linear expansion of the material of a rod.
11. To determine atmospheric pressure at a place using Fortin's barometer.
12. To measure room temperature and temperature of a hot bath using mercury thermometer and convert it into different scales.

**Learning Outcome:**

After undergoing this lab work, the student will be able to:

• Select right kind of measuring tools (Meter scale, Vernier caliper, Screw gauge, Spherometer etc.) for determining dimensions of physical quantities and make measurements with accuracy and precision.

• Differentiate various shapes and determine dimensions of plane, curved and regular surfaces/bodies.

• Apply and Verify laws of forces and determine resultant force acting on a body.

• Appreciate role of friction and measure co-efficient of friction between different surfaces.

• Describe and verify Hook's law and determine force constant of spring body.

• Identify various forms of energy, energy transformations and verify law of conservation of energy.

• Understand rotational motion and determine M.I. of a rotating body (flywheel)

• Understand Stoke's law for viscous liquids and determine viscosity of a given liquid.

• Understand how materials expand on heating and determine linear expansion coefficient for a given material rod.

• Understand working and use Fortin's barometers for determining pressure at a place.

• Understand use of thermometers to measure temperature under different conditions and different scales of temperature measurements

**SUGGESTED STUDENT ACTIVITES & STRATEGIES**

Apart from classroom and laboratory learning following are the suggested student related activities which can be undertaken to accelerate the attainment of various outcomes of the course a. Make survey of different physical products and compare the following points

• Measurements of dimensions

• Properties

• Applications b. Library survey regarding engineering materials/products used in different industries c. Seminar on any relevant topic. Teachers should use the following strategies to achieve the various outcomes of the course.

• Different methods of teaching and media to be used to attain classroom attention.

• Massive open online courses (MOOCs) may be used to teach various topics/sub topics.

• 15-20% of the topics which are relatively simpler of descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.

• Micro-projects may be given to group of students for hand-on experiences.

**References**:

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi

2. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P)Ltd.,

3. Practical Physics by C. L. Arora, S. Chand Publication.

4. e-books/e-tools/ learning physics software/YouTube videos/websites etc.

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|---|---|
| Course Code | BS104 |
| Course Title | Applied Physics -II |
| Number of Credits | 3 (L: 2, T: 1, P: 0) |
| Prerequisites | BS103 |
| Course Category | BS |

| **Unit No.** | **Unit Title** | **Hours** | **Marks** | | | |
|---|---|---|---|---|---|---|
| | | | **K** | **C** | **A** | **Total Marks** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **1** | **Wave motion and its applications** | **7** | **2** | **5** | **3** | **10** |
| **2** | **Optics** | **7** | **2** | **3** | **4** | **9** |
| **3** | **Electrostatics** | **4** | **2** | **3** | **2** | **7** |
| **4** | **Current Electricity** | **8** | **3** | **4** | **4** | **11** |
| **5** | **Electromagnetism** | **4** | **2** | **4** | **1** | **7** |
| **6** | **Semiconductor Physics** | **5** | **4** | **2** | **2** | **8** |
| **7** | **Modern Physics** | **5** | **2** | **4** | **2** | **8** |
| | **Total** | **40** | **17** | **25** | **18** | **60** |

**Course Objectives**

Applied Physics aims to give an understanding of this world both by observation and by predictionof the wayin which objects behave. Concrete use of physical principles and analysis in various fieldsof engineering andtechnology are given prominence in the course content. The course will help thediploma engineers to apply the basic concepts and principles to solve broad-based engineering problemsand to understand different technology-based applications.

**Teaching Approach**

Teachers should give examples from daily routine as well as, engineering/technology applicationson variousconcepts and principles in each topic so that students are able to understandand grasp these concepts andprinciples. In all contents, SI units should be followed. Use of demonstration can make the subject interestingand develop scientific temper in thestudents. Student activities should be planned on all the topics.

Activity- Theory - Demonstrate/practice approach may be followed throughout the course sothat learning may be outcome and employability based.

**Course Content**

**UNIT - 1: Wave motion and its applications (10 Marks)**

Wave motion, transverse and longitudinal waves with examples, definitions of wave velocity, frequencyandwave length and their relationship, sound and light waves and their properties, waveequation ($y = r \sin\omega t$) amplitude, phase, phase difference.
(numerical problems)

Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency. Free, forced and resonant vibrations with examples.
(numerical problems)

Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption ofsound. Ultrasonic waves – Introductionand properties, engineering and medical applications of ultrasonic.

**UNIT - 2: Optics (9 Marks)**
Basic optical laws; reflection and refraction, refractive index, Images and image formation by mirrors and lens, lens formula (no derivation), power of lens, magnification. Total internal reflection, Critical angle and conditions for total internal reflection, applications of total internal reflection inoptical fiber.
(numerical problems)

Optical Instruments; compound microscope, astronomical telescope in normal adjustment, uses of compound and astronomical telescope.

**UNIT - 3: Electrostatics (7 Marks)**
Coulombs law, unit of charge, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference, Gauss law: Application of Gauss law to find electric fieldintensity ofstraight charged conductor, plane charged sheet.

Capacitor and its working, Types ofcapacitors, Capacitance and its units. Capacitance of a parallelplate capacitor, series and parallel combinationof capacitors
(numerical problems).

**UNIT - 4: Current Electricity (11 Marks)**
Electric Current and its units, Direct and alternating current, Resistance and its units, Specific resistance, Series and parallel combination of resistances. Factorsaffecting resistance of a wire, carbon resistances and colour coding.
(numerical problems)

Ohm's law, Kirchhoff's laws, Wheatstone bridge and its applications (slide wirebridge only), Concept of terminal potential difference andElectro motive force (EMF)
(numerical problems)

Heating effect of current, Electric power, Electric energy and its units, Advantages of Electric Energy over other forms of energy.
(numerical problems)

**UNIT - 5: Electromagnetism (7 Marks)**
Types of magnetic materials; dia, para and ferromagnetic with their properties, Magnetic field and itsunits, magnetic intensity, magnetic lines of force, magnetic flux and units, magnetization.

Concept of electromagnetic induction, Faraday's Laws, Lorentz force (force on moving charge in magnetic field).Moving coilgalvanometer; principle, construction and working, Conversion of a galvanometer intoammeter and voltmeter.

**UNIT - 6: Semiconductor Physics (8 Marks)**
Energy bands in solids, Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsicsemiconductors, p-n junction, junction diode and V-I characteristics, types of junction diodes. Diode as rectifier – half wave and full wave rectifier.

Transistor; description and three terminals, Types- pnp and npn, some electronic applications (listonly).

Photocells, Solar cells; working principle and engineering applications.

**UNIT - 7: Modern Physics (8 Marks)**

Lasers (simple ideas): Energy levels, ionization and excitation potentials; spontaneous and stimulated emission; population inversion, pumping, Types of lasers; He-Ne laser, characteristics, engineering and medical applications of lasers.

Fiber Optics: Introduction to optical fibers, light propagation, fiber types, applications in; telecommunication, medical and sensors.

Nanoscience and Nanotechnology: Introduction, nanoparticles and nanomaterials, nanotechnology-based devices and applications.

**Learning Outcome:**

After undergoing this subject, the student will be able to;

a) Describe waves and wave motion, periodic and simple harmonic motions and solve simpleproblems. Establish wave parameters: frequency, amplitude, wavelength, and velocity andable to explain diffraction, interference, polarization of waves.

b) Explain ultrasonic waves and engineering, medical and industrial applications of Ultrasonics. Apply acoustics principles to various types of buildings for best sound effect.

c) State basic optical laws, establish the location of the images formed by mirrors and thin converginglens**,** design and assemble microscope using lenses combination.

d) Describe refractive index of a liquid or a solid and will be able to explain conditions for totalinternal reflection.
e) Define capacitance and its unit, explain the function of capacitors in simple circuits, and solvesimple problems.
f) Differentiate between insulators, conductors and semiconductors, and define the terms: potential, potential difference, electromotive force.
g) Express electric current as flow of charge, concept of resistance, measure of the parameters: electric current, potential difference, resistance.
h) List the effects of an electric current and its common applications, State Ohm's law, calculatethe equivalent resistance of a variety of resistor combinations, distinguish between AC andDC currents, determine the energy consumed by an appliance,
i) State the laws of electromagnetic induction, describe the effect on a current-carrying conductorwhen placed in a magnetic field.
j) Explain the operation of appliances like moving coil galvanometer, simple DC motors.
k) Apply the knowledge of diodes in rectifiers, power adapters and various electronic circuits. Use the knowledge of semiconductors in various technical gadgets like mobile phones, computers, LED, photocells, solar lights etc.
l) Illustrate the conditions for light amplification in various LASER and laser based instrumentsand optical devices.
m) Appreciate the potential of optical fiber in fields of medicine and communication.
n) Express importance of nanoscience and nanotechnology and impact of nanotechnology tothe society.

**References:**

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi.
5. Modern approach to Applied Physics-I and II, AS Vasudeva, Modern Publishers.
6. A Textbook of Optics, N Subramanyam, Brij Lal, MN Avahanulu, S Chand and Company Ltd.
7. Introduction to Fiber Optics, Ajoy Ghatak and K Thyagarajan, Cambridge University PressIndia Pvt. Ltd, New Delhi.
8. Nanoscience and Nanotechnology, KK Choudhary, Narosa Publishing House, Pvt. Ltd. NewDelhi.
9. Nanotechnology: Importance and Applications, M.H. Fulekar, IK International Publishing House Pvt. Ltd, New Delhi.
10. e-books/e-tools/ learning physics software/websites etc.

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|---|---|
| Course Code | BS 106 |
| Course Title | Applied Physics II Lab |
| Number of Credits | 1 (L: 0, T: 0, P: 2) |
| Prerequisites | BS-107 |
| Course Category | BS |

**Course Objectives:**

Concrete use of physical principles and analysis in various fields of engineering and technology is very prominence. The course aims to supplement the factual knowledge gained in the lecture by first hand manipulation of apparatus. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering and technology based problems. In addition, students get necessary confidence in handling equipment and thus learn various skills in measurement.

**List of Practicals/Activities:** (To perform minimum 10Practicals)

1. To determine and verify the time period of a cantilever.
2. To determine velocity of ultrasonic in different liquids using ultrasonic interferometer.
3. To verify laws of reflection from a plane mirror/ interface.
4. To verify laws of refraction (Snell's law) using a glass slab.
5. To determine focal length and magnifying power of a convex lens.
6. To verify Ohm's law by plotting graph between current and potential difference.
7. To verify laws of resistances in series and parallel combination.
8. To find the frequency of AC main using electrical vibrator.
9. To verify Kirchhoff's law using electric circuits.
10. To study the dependence of capacitance of a parallel plate capacitor on various factors and determines permittivity of air at a place.
11. To find resistance of a galvanometer by half deflection method.
12. To convert a galvanometer into an ammeter.
13. To convert a galvanometer into a voltmeter.
14. To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage.
15. To verify inverse square law of radiations using a photo-electric cell.
16. To measure wavelength of a He-Ne/diode laser using a diffraction grating.
17. To measure numerical aperture (NA) of an optical fiber.
18. Study of an optical projection system (OHP/LCD) - project report.

**Suggested Student Activities & Strategies**

Apart from classroom and laboratory learning following are the suggested student related activities which can be undertaken to accelerate the attainment of various outcomes of the course.

a. Make survey of different physical products and compare the following points

- Measurements of dimensions
- Properties

- Applications

b. Library survey regarding engineering materials/products used in different industries
c. Seminar on any relevant topic.
Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- 5-20% of the topics which are relatively simpler or descriptive in nature should be given tothe students for self-learning and assess the development of competency through classroompresentations/projects.
- Micro-projects on relevant may be given to group of students for hand-on experiences.

**Learning Outcome:**
After undergoing this subject, the student will be able to;
a) Apply concept of vibrations and determine the time period of vibrating objects.
b) Use of equipment for determining velocity of ultrasonics in different liquids.
c) Verify optical laws; reflection, refraction from plane interfaces and surfaces.
d) Apply knowledge of optics to determine focal length and magnifying power of optical lenses.
e) Understand uses of electrical components and meters and verify Ohm's law for flow of current.
f) Quantify resistances and verify laws of series and parallel combination of resistances.
g) Apply concept of electrical vibrations in determine frequency of AC main.
h) Analyse electrical circuits and verify Kirchhoff's law governing electrical circuits.
i) Measure resistance of a galvanometer and how it is converted into an ammeter and voltmeter.
j) Investigate characteristics of semiconductor diodes, photoelectric cells and determine operational parameters associated with their performance.
k) Work with laboratory lasers and understand method to measure the wavelength of the light emitted from a laser.
l) Handle optical fibers and determine numerical aperture of given optical fiber.
m) Understand construction and working of an optical projection system.

**Recommended Books:**
1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
3. Practical Physics by C. L. Arora, S. Chand & Company Ltd.
4. e-books/e-tools/ learning physics software/you Tube videos/ websites etc.

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|---|---|---|---|---|
| **Course Title:** | **Applied Chemistry (Theory)** | | | |
| **Course Code:** | **BS 105** | | | |
| **Number of Credits:** | **3 (L-2, T-1, P-0)** | | | |
| **Prerequisites:** | **High School Level Chemistry** | | | |
| **Course category:** | **Basic Science (BS)** | | | |
| **Evaluation Scheme:** | **End Exam** | **Progressive Assessment** | | |
| | | **Class Test** | **Assignment** | **Attendance** |
| | **60** | **20** | **15** | **5** |

**RATIONALE:**

With the increasing use of various chemicals and chemical products in diverse technical and engineering fields the importance of Applied Chemistry has significantly increased. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma-engineering courses. Principles of Applied Chemistry will

enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

**COURSE OBJECTIVES/COURSE OUTCOME (CO):**

On successful completion of this course content, the technocrats are expected to understand, ascertain and analyse the properties of different engineering materials and have the competence to think critically, choose and apply it to solve various engineering problems and to produce economical and eco-friendly finished products.

**COURSE SPECIFIC OUTCOMES (CSO)**:

On successful completion of the course the students will learn and be able to;

1. Understand the building blocks of all matters, substantiate the laws and principles on which structure of atom is established. The nature of different types of bonding in a molecule/compound. Concept of preparing solution and to measure its concentration by various methods.
2. Explain the sources of water and various characteristics of water (quantitatively). Explain causes and factors which can adversely affecting natural water quality and remedial measures available for water purification. Think critically, develop and adapt water conservation techniques.
3. Understand the sources of metals and its metallurgical operations, qualitatively analyse the engineering materials and understand their properties and applications.
4. Explain the chemistry of various polymers and plastics, verify suitability and select polymer/rubber/plastic materials for engineering applications.
5. Explain chemistry of fuels and their relative advantages, select most efficient fuel and lubricant for the engine and engineering applications, suggest how to subside air pollution caused by the use of fossil fuels.
6. Understand the general concept of electrochemical reactions and its application for engineering purposes, ascertain construction, mechanism and efficiency of electrochemical cells, solar cell, fuel cells.
7. Explain chemical nature and causes of corrosion, apply correct and efficient methods of corrosion prevention.

**COURSE CONTENT:**

**Unit 1: Atomic Structure, Chemical Bonding and Solution** (Contact hours- 10 Hrs.)

Rutherford model of an atom, Bohr's model of an atom and its limitations, Heisenberg uncertainty principle, Quantum numbers – orbital concept. Shapes of s, p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity, Aufbau rule, electronic configuration (up to atomic number 30).

Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bond (example -NaCl), covalent bond (example – $CH_4$), coordinate bond (example- $NH_4^+$ ) , metallic bond (example- Na) and hydrogen bond (example- $H_2O$).

Solution – idea of solute, solvent and solution, methods to express the concentration of solution-normality, molarity, ppm, mass percentage, volume percentage and mole fraction.

**Unit 2: Chemistry of Water** (Contact hours - 8 Hrs)

Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness. Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion).

Water softening techniques – soda lime process, zeolite process and ion exchange process. Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization.

Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collect data and understand standards).

**Unit 3: Engineering Materials** Contact hours - 10 Hrs.

Natural occurrence of metals – minerals, ores of iron, aluminium and copper, gangue (matrix), flux, slag, metallurgy – brief account of general principles of metallurgy.

Extraction of iron from haematite ore using blast furnace, aluminium from bauxite along with reactions.

Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous alloys with suitable examples, properties and applications.

General chemical composition, composition based applications (elementary idea only details omitted) of Port land cement, Glasses, Refractory and Composite materials.

Polymers – monomer, homopolymers and copolymers, degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, nylon – 6, nylon-6,6 and Bakelite), rubber and vulcanization of rubber.

**Unit 4: Chemistry of Fuels and Lubricants** Contact hours - 10 Hrs**.**

Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula.

Proximate analysis of coal solid fuel.

Petrol and Diesel - fuel rating (octane and cetane numbers).

Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.

Lubrication – function and characteristic properties of good lubricant, classification with examples, lubrication mechanism – hydrodynamic and boundary lubrication, physical properties (viscosity and viscosity index, oiliness, flash and fire point) and chemical properties (coke number, total acid number and saponification value) of lubricants.

**Unit 5: Electro Chemistry** Contact hours - 10 Hrs.

Electronic concept of oxidation, reduction and redox reactions.

Definition of terms: electrolytes and non-electrolytes with suitable examples,

Postulates of Arrhenius electrolytic theory of dissociation.
Faradays laws of electrolysis and simple numerical problems.
Industrial Application of Electrolysis –

- Electrometallurgy
- Electroplating
- Electrolytic refining.

Application of redox reactions in electrochemical cells –

- Primary cells – dry cell,
- Secondary cell - commercially used lead storage battery, fuel and Solar cells.

Introduction to Corrosion of metals –

- Definition, types of corrosion (chemical and electrochemical), H2 liberation and O2 absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion.

Internal corrosion preventive measures –

- Purification, alloying and heat treatment and

External corrosion preventive measures: a) Metal (anodic, cathodic) coatings,
b) Organic inhibitors.

**TEACHING PEDAGOGY:**

Teachers should use the following strategies to achieve the various outcomes of the course;

1. Different methods of teaching and media such as ICT tools, smart board, Models & Charts to be used to attain classroom attention.
2. Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
3. 15-20% of the topics which are relatively simpler of descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.
4. Micro-projects may be given to group of students for hands-on experiences.
5. Encouraging students to visit sites such as water treatment plant, oil refineries and research establishment around the institution.

**References/Suggested Learning Resources:**

**(a) Books** :


1. Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
2. Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.
3. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
4. Dara, S. S. & Dr. S. S. Umare, Engineering Chemistry, S. Chand. Publication, New Delhi, New Delhi, 2015.
5. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
6. Dr. Vairam, S., Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.
7. Dr. G. H. Hugar & Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.

8. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.

**(b) Open source software and website address**:

1. www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2. www.visionlearning.com (Atomic structure and chemical bonding)
3. www.chem1.com (Atomic structure and chemical bonding)
4. https://www.wastewaterelearning.com/elearning/ (Water Treatment)
5. www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
6. www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf (Fuel and Combustion)
7. www.chemcollective.org (Metals, Alloys)
8. www.wqa.org(Water Treatment)

**SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION**

Legends: K= Knowledge Level; C= Comprehension Level; A= Application Level

| Unit No. | Course Title | Hours | Marks | | | Total Marks |
|---|---|---|---|---|---|---|
| | | | K | C | A | |
| 1 | Atomic Structure, Chemical Bonding and Solution | 10 | 3 | 4 | 5 | 12 |
| 2 | Chemistry of Water | 8 | 2 | 4 | 4 | 10 |
| 3 | Engineering Materials | 10 | 4 | 4 | 7 | 15 |
| 4 | Chemistry of Fuels and Lubricants | 10 | 4 | 4 | 4 | 12 |
| 5 | Electro Chemistry | 10 | 2 | 4 | 5 | 11 |
| | **TOTAL** | **48** | **15** | **20** | **25** | **60** |

**Course Title : Applied Chemistry Lab**

**Course Code : BS109**

**Number of Credits : 1 (L: 0, T: 0, P: 2)**

**Prerequisites : NIL**

**Course Category : Basic Science**

**Course Objectives/ Course Outcome (CO)**: There are numerous number of materials used in fabricating and manufacturing devices for the comfort of life. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians. The course aims to supplement the factual knowledge gained in the lectures by first hand manipulation of processes and apparatus. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering problems.

**Course Specific Outcome (CSO):**

At the end of the course student will be able to

- Prepare the standard/working solutions for various volumetric titrations.
- Express quantitative measurements accurately.
- Practice and adapt good measuring techniques.
- Use various apparatus for precise measurements.
- Understand and differentiate different methods of quantitative analysis.
- Know and understand principles of quantitative analysis using instruments.
- Construct different electrochemical cells used in developing batteries.
- Understand and appreciate methods of corrosion abetments.

**LIST OF PRACTICALS: Perform any 10 (ten) Laboratory Practical's.**

**I. Volumetric and Gravimetric analysis:**

1. Preparation of standard solution of oxalic acid or potassium permanganate.
2. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
3. Standardization of $KMnO_4$ solution using standard oxalic acid and Determine the percentage of iron present in a given Hematite ore by $KMnO_4$ solution.
4. To study the pH change in the titration of 0.1 N NaOH with 0.1 N $H_2C_2O_4$. 2 $H_2O$ using universal indicator.
5. Volumetric estimation of
 a) Total hardness of given water sample using standard EDTA solution.
 b) Total TDS alkalinity of given water sample using 0.01M sulphuric acid
6. Proximate analysis of coal
 a) Gravimetric estimation moisture in given coal sample
 b) Gravimetric estimation ash in given coal sample

**II. Instrumental analysis**;
1. Determine the conductivity of given water sample.
2. Determination of the Iron content in given cement sample using colorimeter.
3. Determination of calorific value of solid or liquid fuel using bomb calorimeter.

4. Determination of viscosity of lubricating oil using Redwood viscometer.
5. Determination of flash and fire point of lubricating oil using Able's flash point apparatus.
6. To verify the first law of electrolysis of copper sulfate using copper electrode.
7. Construction and measurement of emf of elector chemical cell (Daniel cell).
8. To determine the pKa of week acid using pH meter.

**Teaching pedagogy:**

Teachers should use the following strategies to achieve the various outcomes of the course; Demonstration, Chalk & Talk, Hands-on experiment, ICT tools, Smart board, mini-projects, Site visitation etc.

**Reference Books:**

1. Text Book of Chemistry for Class XI & XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
2. Dr. G. H. Hugar and Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
3. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt. Ltd., 2014.
4. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015

| | | | | |
|---|---|---|---|---|
| **COURSE TITLE:** | **COMMUNICATION SKILLS IN ENGLISH** | | | |
| **COURSE CODE:** | **HS101** | | | |
| **CREDITS:** | **2 (L:2, T:0, P:0)** | | | |
| **PRE REQUISITES:** | **NIL** | | | |
| **COURSE CATEGORY:** | **HS** | | | |
| **EVALUATION SCHEME:** | **END EXAM** | **PROGRESSIVE ASSESSMENT** | | |
| | | **Class Test** | **Assignment** | **Attendance** |
| | **60** | **20** | **15** | **5** |

**SPECIFICATION TABLE OF MARKS AND HOURS DISTRIBUTION:**

| Unit | Title | Hours | Marks | | | |
|---|---|---|---|---|---|---|
| | | | K | C | A | Total |
| 1. | Communication: An Introduction | 6 | 7 | 6 | | 13 |
| 2. | Soft Skills for Professional Excellence | 6 | | 5 | 4 | 09 |
| 3. | Reading Comprehension of Technical Texts, Manuals and Instructions | 6 | | 4 | 8 | 12 |
| 4. | Professional Writing | 7 | 3 | 4 | 7 | 14 |
| 5. | Vocabulary and Grammar | 7 | | 2 | 10 | 12 |
| Total | | 32 | 10 | 21 | 29 | 60 |

**Course Objectives:** Communication skills play an important role in career development. This course aims at introducing basic concepts of communication skills with an emphasis on developing personality of the students. Thus, the main objectives of this course are:

To develop confidence in speaking English with correct pronunciation.

To develop communication skills of the students i.e. listening, speaking, reading and writing skills.

To introduce the need for personality development- Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc.

**Course Content**

**Unit-1 Communication: An Introduction** **Marks 13**

1.1 Basics of communication
- 1.1.1 Communication and Communications
- 1.1.2 Meaning and definition
- 1.1.3 Importance of communication
- 1.1.4 Essential components in the process of communication

1.2 Types of communication on the basis of – Flow; Nature; Location/Relation; Modes and Medium/Method/Expression

1.3 7 Cs for effective communication
- 1.3.1 Considerate
- 1.3.2 Concrete
- 1.3.3 Concise
- 1.3.4 Clear
- 1.3.5 Complete
- 1.3.6 Correct
- 1.3.7 Courteous

1.4 Art of Effective communication
- 1.4.1 Choosing words
- 1.4.2 Voice
- 1.4.3 Modulation
- 1.4.4 Clarity
- 1.4.5 Time
- 1.4.6 Simplification of words
- 1.4.7 Technical Communication

1.5 Barriers to effective communication
- 1.5.1 Improper encoding
- 1.5.2 Bypassing
- 1.5.3 Frame of reference
- 1.5.4 Physical distraction
- 1.5.5 Psychological or emotional interference
- 1.5.6 Cultural difference

**Unit-2 Soft Skills for Professional Excellence** **Marks 09**

2.1 Introduction: Soft Skills and Hard Skills.

2.2 Importance of soft skills.

2.3 Life skills: Self-awareness and Self-analysis, adaptability, resilience, emotional intelligence and empathy.

2.4 Applying soft skills across cultures.

**Unit-3: Reading Comprehension of Technical Texts, Manuals and Instructions Marks 12**

1.1 Recognising important information in the texts

1.2 Note-taking with the use of abbreviations, charts, diagrams and symbols

1.3 Interpreting with visuals and illustrating with visuals like tables, charts and graphs

**Unit-4: Professional Writing Marks 14**

4.1 The art of précis writing

4.2 Letters: job application and CV/Resume

4.3 Drafting e-mail, notices, agenda and minutes of a meeting

4.4 Filling-up different forms such as banks and on-line forms for placement, admission, and entrance exams

**Unit-5: Vocabulary and Grammar Marks 12**

5.1 Vocabulary of commonly used words

5.2 Glossary of administrative terms (English)

5.3 One-word substitution, Idioms and phrases, homophone homonym and homograph

5.4 Parts of speech, active and passive voice, tenses, transformation of sentences (simple, compound, and complex),

5.5 Punctuation

**References:**

1. J.D.O' Connor. Better English Pronunciation. Cambridge: Cambridge University Press, 1980.
2. Lindley Murray. An English Grammar: Comprehending Principles and Rules. London: Wilson and Sons, 1908.
3. K.R. Lakshminarayanan & T. Murugavel. Communication Skills for Engineers. Chennai: Scitech Publications (India) Pvt. Ltd.
4. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Revised Edition 2018)
5. Margaret M. Maison. Examine your English. Orient Longman: New Delhi, 1964.
6. M. Ashraf Rizvi. Effective Technical Communication. Mc-Graw Hill: Delhi, 2002.
7. John Nielson. Effective Communication Skills. Xlibris, 2008.
8. Oxford Dictionary
9. Roget's Thesaurus of English Words and Phrases
10. Collin's English Dictionary

**Course outcomes:**

At the end of this course, the participants will:

- Develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers.
- Be informed of the latest trends in basic verbal activities such as presentations, facing interviews and other forms of oral communication.
- Develop skills of group presentation and communication in team.
- Develop non-verbal communication such as proper use of body language and gestures

| | | | |
|---|---|---|---|
| **COURSE TITLE:** | **COMMUNICATION SKILLS IN ENGLISH LAB-I** | | |
| **COURSE CODE:** | **HS105** | | |
| **CREDITS:** | **1 (L:0, T:0, P:2)** | | |
| **PRE REQUISITES:** | **NIL** | | |
| **COURSE CATEGORY:** | **HS** | | |
| **EVALUATION SCHEME:** | **END EXAM** | **PROGRESSIVE ASSESSMENT** | |
| | | **Sessional** | **Viva-voce** |
| | **40** | **40** | **20** |

**Course Objectives:**

Communication skills play an important role in career development. This lab course aims at actively involving students in various activities to improve their communication skills with an emphasis on developing personality of the students. Thus, the objectives of this course are:

1. To develop speaking skills with a focus on correct pronunciation and fluency.
2. To develop listening skills for enhancing communication.

**Course Content:**

**Unit 1 Introduction to Phonetics**

1.1 Phonetic symbols and transcription

1.2 Sounds of English language:

1.2.1 Vowels, 1.2.2 Diphthongs, 1.2.3 Consonant sounds,

1.2.4 Classification of Consonant Sounds:

a) Place of articulation, b) Manner of articulation, c) Voice of articulation- voiced and voiceless

1.3 Consonant, vowel, diphthongs, etc.

1.4 Transcription of words (IPA)

**Unit 2 Listening Skills**

2.1 Introduction to Listening skills

2.2 Difference between Listening and Hearing

2.3 Listening Process and Practice: Introduction to recorded poems, interviews, instructions, stories and speeches etc

2.4 Listening tests

**Recommended Readings:**

1. Daniel Jones. The Pronunciation of English. Cambridge: Cambridge University Press, 1956.
2. James Hartman& et al. Ed. English Pronouncing Dictionary. Cambridge: Cambridge University 35 First Year Curriculum Structure Common to All Branches, Press, 2006.
3. J.D.O' Connor. Better English Pronunciation. Cambridge: Cambridge University Press, 1980.
5. Lindley Murray. An English Grammar: Comprehending Principles and Rules. London: Wilson and Sons, 1908.
4. J. Sethi & et al. A Practice Course in English Pronunciation. New Delhi: Prentice Hall, 2004.
5. T M Farhathullah. Communication Skills for Technical Students. Hyderabad: Orient Black Swan, 2016.

**Learning Outcome:**

- At the end of this course the students will be able to communicate effectively with an increase in their confidence to speak and write English fluently with correct pronunciation, stress and spelling.
- The variety of exercises and activities that will be conducted in the Language Lab will develop their skills needed to participate in a conversation like listening carefully and respectfully to others' viewpoints; articulating their own ideas and questions clearly and over all students will be able to prepare, organize, and deliver an engaging oral presentation.

| | | | |
|---|---|---|---|
| **COURSE TITLE:** | **COMMUNICATION SKILLS IN ENGLISH LAB-II** | | |
| **COURSE CODE:** | **HS106** | | |
| **CREDITS:** | **1 (L:0, T:0, P:2)** | | |
| **PRE REQUISITES:** | **HS-105** | | |
| **COURSE CATEGORY:** | **HS** | | |
| **EVALUATION SCHEME:** | **END EXAM** | **PROGRESSIVE ASSESSMENT** | |
| | | **Sessional** | **Viva-voce** |
| | **40** | **40** | **20** |

**Course Objectives:**

In a job-oriented education, learners need to learn English not as a subject but as a service language-serving as a vehicle for his/her educational as well as professional needs. These are the needs for communication. The course will help learners to enhance their communication skills in terms of both spoken and written communication with enriched appropriate vocabulary knowledge. Thus, the objectives of this course are:

1. To introduce the need for Personality development- Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc. for that purpose group discussion, extempore and other activities should be conducted during lab classes.
2. To enrich the vocabulary knowledge to express ideas and communicate effectively for both social and academic purposes
3. To deliver with confidence, relevant well prepared public speeches and presentations, engaging the interest of the audience

**Course Content:**

**Unit I Speaking Skills**

1.1. Presentation

- 1.1.1 Rationale of Presentation
- 1.1.2 Types of presentation
- 1.1.3 Planning of presentation
- 1.1.4 Guidelines for use of visual aids
- 1.1.5 Practice of presentation on relevant topics
- 1.1.6 Non-verbal communication

1.2.Public speaking

- 1.2.1 Planning of a speech
- 1.2.2 Designing the speech
- 1.2.3 Deliver the speech
- 1.2.4 Evaluate the speech

1.3.Group discussion

1.3.1 Importance and rationale

1.3.2 Required non-verbal behaviour

1.3.3 Appropriate use of language in Group Interaction

- Entry/Taking the lead
- Asking for opinion/Creating turns for others speak
- Expressing opinion (agreeing)
- Expressing opinion (disagreeing)
- Making suggestions
- Politely interrupting
- Stopping or blocking interruptions

1.4.Mock job interviews

1.4.1 Importance

1.4.2 Prepare for an interview

1.4.3 Anticipating possible questions and framing appropriate answers to them

1.4.4 Responding politely and appropriately

1.4.5 Non-verbal communication- body language, postures, gestures, facial expressions, use of space, modulation, pitch and intonation.

**Unit II Building vocabulary**

3.1 Vocabulary Building Skills

3.1.1 Reading

3.1.2 Journaling

3.1.3 Word games

3.1.4 Dictionary reference

3.2 Etymological study of words and construction of words

3.3 Phrasal verbs

3.4 Jargon/ Register related to organizational set up

**Recommended Readings:**

1. Daniel Jones. The Pronunciation of English. Cambridge: Cambridge University Press, 1956.

2. James Hartman& et al. Ed. English Pronouncing Dictionary. Cambridge: Cambridge University 35 First Year Curriculum Structure Common to All Branches
Press, 2006.

3. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Revised Ed. 2018)

4. J.D.O' Connor. Better English Pronunciation. Cambridge: Cambridge University Press, 1980.

5. Lindley Murray. An English Grammar: Comprehending Principles and Rules. London: Wilson and Sons, 1908.

6. Margaret M. Maison. Examine your English. Orient Longman: New Delhi, 1964,

7. J. Sethi & et al. A Practice Course in English Pronunciation. New Delhi: Prentice Hall, 2004.

8. Pfeiffer, William Sanborn and T.V.S Padmaja. Technical Communication: A Practical Approach. 6th ed. Delhi: Pearson, 2007.

**Learning Outcome:**

- At the end of this course the students will be able to communicate effectively with an increase in their confidence to read, write and speak English fluently.
- They will also demonstrate a significant increase in word power.
- The variety of exercises and activities that will be conducted in the Language Lab will develop their skills needed to participate in a conversation like listening carefully and respectfully to others' viewpoints; articulating their own ideas and questions clearly and over all students will be able to prepare, organize, and deliver an engaging oral presentation.
- They will also develop non-verbal communication such as proper use of body language and gestures.
- They will also develop the confidence to face interviews

| Name of the course: ENGINEERING GRAPHICS | |
|---|---|
| **Course Code : ES101** | **Semester : I** |
| | **Maximum Marks : 100** |
| **Teaching Scheme** | **PA & End Examination Scheme** |
| Theory : 0 hrs/week<br><br>Tutorial : 0 hrs/week<br><br>Practical : 60 | Theory PA |
| | Internal Exam/ Class Test : 20<br>Assignment / Quiz etc. : 15<br>Attendance : 5 |
| | Practical PA : N/A |
| | End Semester Theory Exam : N/A<br>End Semester Practical Exam : 60 |
| Credit : 3 | |

**RATIONALE**

Engineering Drawing is the precise means of communicating the ideas of the engineer, designer, and architect to the workmen who will produce/ build the desired object. It is necessary that all diploma engineers have command over making and reading of engineering drawing and have thorough understanding of geometric principles on which engineering drawing is based.

**Course Objectives**

| | Following are the objectives of this course : |
|---|---|
| 1. | To understand the language of graphics which is used to express ideas, convey instructions while carrying out engineering jobs. |
| 2. | To develop drafting and sketching skills, to know the applications of drawing equipments, and get familiarize with Indian Standards related to engineering drawings. |
| 3. | To develop skills to visualize actual object or a part of it, on the basis of drawings. |
| 4. | To develop skills to translate ideas into sketches and to draw and read various engineering curves, projections and dimensioning styles. |
| 5. | To understand the basis commands and develop basic skills related to computer aided drafting, of how to draw, modify, and edit basic shapes (2D), using AUTOCAD. |

| | Course Contents | Hrs | Marks |
|---|---|---|---|
| **UNIT – I** | **1. BASIC ELEMENTS OF DRAWING**<br>1.1 Drawing Instruments and supporting materials: method to use them with applications.<br>1.2. Convention of lines and their applications.<br>1.3. Representative Fractions – reduced, enlarged and full size of scales;<br>Engineering Scales such as plain and diagonal scale.<br>1.4. Dimensioning techniques as per SP-46:2003 – types and Application of chain, parallel and coordinate dimensioning.<br>1.5. Geometrical and Tangency constructions. | **7** | **9** |

| | | | |
|---|---|---|---|
| **UNIT – II** | **2. ORTHOGRAPHIC PROJECTTIONS**<br>2.1. Introduction of projections- orthographic, perspective, isometric and oblique: concept and applications.(No question to be asked in examination).<br>2.2. Introduction to orthographic projection, First angle and Third angle method, their symbols.<br>2.3. Conversion of pictorial view into Orthographic Views – object Containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection method only ) | **7** | **11** |
| **UNIT – III** | **3. ISOMETRIC PROJECTIONS**<br>3.1. Introduction to isometric projections.<br>3.2. Isometric scale and Natural scale.<br>3.3. Isometric view and isometric projection.<br>3.4. Illustrative problems related to objects containing lines, circles and arcs shape only.<br>3.4. Conversion of orthographic views into isometric view/ projection. | **8** | **12** |
| **UNIT – IV** | **4. FREE HAND SKETCHES OF ENGINEERING ELEMENTS**<br>4.1. Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washer, locking arrangements. (For branches other than Mechanical Engineering, the teacher should select branch specific elements for free hand sketching).<br>4.2. Free hand sketches of orthographic view (on squared graph paper) and Isometric view (on isometric grid paper) | **6** | **8** |
| **UNIT – V** | **5. COMPUTER AIDED DRAFTING INTERFACE**<br>5.1. Computer Aided Drafting: concept.<br>5.2. Hardware and various CAD software available.<br>5.3. System requirements and understanding the interface.<br>5.4. Components of AutoCAD software window: Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify tool bar, cursor cross hair. Command window, status bar, drawing area, UCS icon.<br>5.5. File features: New file, Saving the file, Opening an existing drawing file, Creating templates, Quit.<br>5.6. Setting up new drawing: Units, Limits, Grid, Snap.<br>5.7. Undoing and redoing action. | **10** | **10** |
| **UNIT – VI** | **6. COMPUTER AIDED DRAFTING**<br>6.1. Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Polyline.<br>6.2. Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates.<br>6.3. Modify and edit commands like trim, extend, delete, copy, offset, array, block, layers.<br>6.4. Dimensioning: Linear, Horizontal Vertical, Aligned, Rotated, Baseline, Continuous, Diameter, Radius, Angular Dimensions.<br>6.5. Dim scale variable.<br>6.6. Editing dimensions.<br>6.7. Text: Single line Text, Multiline text.<br>6.8. Standard sizes of sheet, Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview. | **10** | **10** |
| | **Total** | **48** | **60** |

| Sl. No. | Practical Exercises | Unit No. | Approx. Hrs. |
|---|---|---|---|
| 1. | Draw horizontal, Vertical, 30 degree, 45 degree, 60 and 70 degrees lines, different types of lines, dimensioning styles using Tee and Set squares/ drafter. (do this exercise in sketch book) | I | 02 |
| 2. | Write alphabets and numerical (Vertical only) (do this exercise in sketch book) | I | 02 |
| 3. | Draw regular geometric constructions and redraw the given figure (do this exercise in sketch book) part I | II | 02 |
| 4. | Draw regular geometric construction and redraw the given figure (do this exercise in sketch book) part II | II | 02 |
| 5. | Draw a problem on orthographic projections using first angle method of projection having plain surfaces and slanting. Part I | III | 02 |
| 6. | Draw another problem on orthographic projections using first angle method of projection having slanting surfaces with slots. Part II | III | 02 |
| 7. | Draw two problem on orthographic projections using first angle method of projection having cylindrical surfaces, ribs. Part I | III | 02 |
| 8. | Draw two problems on isometric view of simple objects having plain and slanting surface y using natural scale. Part I | IV | 02 |
| 9. | Draw some problems on isometric projection of simple objects having cylindrical surface by using isometric scale. Part I | IV | 02 |
| 10. | Draw free hand sketches/ conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. Part I | V | 02 |
| 11. | Problem based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views in sketch book. Part I | III, II, V | 02 |
| 12. | Draw basic 2D entities like: Rectangle, Rhombus, Polygon using AutoCAD (Print out should e a part of progressive assessment). Part II | V | 02 |
| 13. | Draw basic 2D entities like: Circles, Arcs, Circular using AutoCAD (Printout should be apart of progressive assessment). Part II | V | 02 |
| 14. | Draw basic 2D entities like: Circular and rectangular array using AutoCAD (Printout should be a part of progressive assessment). Part III | V | 02 |
| 15. | Draw blocks of 2D entities comprises of Rectangle, Rhombus, Polygon, Circles, Arcs, Circular and rectangular array, locks using AutoCAD (Printout should be a part of progressive assessment). Part I | V | 02 |
| 16. | Draw basic branch specific components in 2D using AutoCAD (Print out should be a part of progressive assessment). Part I | VI | 02 |
| 17. | Draw complex branch specific component in 2D using AutoCAD (Print out should be a part of progressive assessment). Part I | VI | 02 |
| | **Total** | | 34 |

| **Course Outcomes** | |
|---|---|
| | After completing this course, student will be able to perform: |
| 1. | Select and construct appropriate drawing scales, use draw equipment's, understand Indian Standards of engineering drawing. |
| 2. | Draw views of given object and components 3) Sketch orthographic projections into |

| | |
|---|---|
| | isometric projections and vice versa. |
| 3. | Apply computer aided drafting tools to create 2D engineering drawings |

| Text/ Reference books | | |
|---|---|---|
| **Name of the Authors** | **Title of the books** | **Name of the Publisher** |
| | SP 46: Engineering Drawing Practice for School & Colleges | Bureau of Indian Standard |
| N. D. Bhatt | Elementary Engineering Drawing | Charotar Publishing House, Anand |
| Jain & Gautam | Engineering Graphics & Design | Khana Publishing House |
| Jolhe D. A | Engineering Drawing | Tata McGraw Hill Edu. |
| Dhawan , R.K. | Engineering Drawing | S. Chand and Company |
| Shah, P. J | Engineering Drawing | S. Chand and Company |
| Kulkarni, D.M.; Rastogi, A.P.; Sarksr, A.K. | Engineering Graphics with AutoCAD | Vikas Publishing House Pvt. Ltd, Noida |
| Jeyapoovan, T. | Essentials of Engineering Drawing and Graphics using AutoCAD | Vikas Publishing House Pvt. Ltd, Noida |
| | Autodesk. AutoCAD User Guide | Autodesk Press |
| Sham, Tickoo | AutoCAD 2016 for Engineering and Designers | Dream tech Press; Galgotia Publication |

**SPECIFICATION TABLE OF MARKS & HOURS DISTRIUTION**

Legends: K = Knowledge Level , C = Comprehension Level, A= Application Level

| Chapter | Chapter Title | Hours | Marks |
|---|---|---|---|

| No. | | | K | C | A | Total Marks |
|---|---|---|---|---|---|---|
| 1. | Basic elements of Drawing | 7 | 4 | 5 | 0 | 9 |
| 2. | Orthographic projections | 7 | 2 | 3 | 6 | 11 |
| 3. | Isometric projections | 8 | 2 | 4 | 6 | 12 |
| 4. | Free Hand Sketches of Engineering elements | 6 | 2 | 2 | 4 | 8 |
| 5. | Computer Aided drafting interface | 10 | 2 | 2 | 6 | 10 |
| 6 | Computer aided drafting | 10 | 2 | 2 | 6 | 10 |
| | **Total** | **48** | **14** | **18** | **28** | **60** |

| **Name of the course : ENGINEERING MECHANICS** | |
|---|---|
| **Course Code: ES 106** | **Semester: II** |
| **Course Category: ES** | **Maximum Marks: 100** |
| **Pre-Requisites:** | **BS103 & BS104** |
| **Teaching Scheme** | **PA & End Examination Scheme** |
| Theory : 2 hrs/week | **Theory PA** |

| | | |
|---|---|---|
| Tutorial : 1 hr/week | 1. Internal Exam/Class Test | **20 Marks** |
| | 2. Assignment / Quiz etc. | **15 Marks** |
| | 3. Attendance | **5 Marks** |
| | **End Semester Theory Exam** | **60 Marks** |
| | **Total** | **100 Marks** |

**Credit : 3**

| Unit No | Unit Title | Hours | Marks | | | |
|---|---|---|---|---|---|---|
| | | | K | C | A | Total Marks |
| 1 | **Basics of mechanics and force system** | 11 | 4 | 6 | 6 | 16 |
| 2 | **Equilibrium** | 10 | 3 | 6 | 4 | 13 |
| 3 | **Friction** | 4 | 3 | 2 | 2 | 7 |
| 4 | **Centroid and centre of gravity** | 10 | 4 | 6 | 4 | 14 |
| 5 | **Simple lifting machines** | 7 | 4 | 4 | 2 | 10 |
| **Total** | | 42 | 18 | 24 | 18 | 60 |

**Course objectives**

Following are the objectives of this course

1. To obtain resultant of various forces
2. To calculate support reactions through conditions of equilibrium for various structures
3. To understand role of friction in equilibrium problems
4. To know fundamental laws of machines and their applications to various engineering problems

| | COURSE CONTENTS (THEORY) | Hours | Marks |
|---|---|---|---|
| **Unit-I** | **1. Basics of mechanics and force system.**<br><br>1.1. Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics.<br>1.2. Space, time, mass, particle, flexible body and rigid body<br>1.3. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units.<br>1.4. Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification.<br>1.5. Resolution of a force - Orthogonal components of a force, moment of a force, Varignon's Theorem.<br>1.6. Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces. | **11** | **16** |

| | | | |
|---|---|---|---|
| **Unit-II** | **2. Equilibrium**<br><br>1.1. Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analysing equilibrium, types of equilibrium.<br>1.2. Lami's Theorem – statement and explanation, Application for various engineering problems.<br>1.3. Types of beam, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple)<br>1.4. Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load.<br>1.5. Beam reaction graphically for simply supported beam subjected to vertical point loads only | **10** | **13** |
| **Unit-III** | **3. Friction**<br><br>1.1. Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction.<br>1.2. Equilibrium of bodies on level surface subjected to force parallel and inclined to plane.<br>1.3. Equilibrium of bodies on inclined plane subjected to force parallel to the plane only. | **4** | **7** |
| **Unit-IV** | **4. Centroid and centre of gravity**<br><br>1.1. Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle)<br>1.2. Centroid of composite figures composed of not more than three geometrical figures.<br>1.3. Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere) Centre of Gravity of composite solids composed of not more than two simple solids.<br>1.4 Theorem of parallel and perpendicular axis, moment of inertia of , rectangular section and moment of inertia for L, T and I section. | **10** | **14** |
| **Unit-V** | **5. Simple lifting machine**<br><br>1.1. Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity ratio, efficiency of machines, law of machine.<br><br>1.2. Ideal machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility.<br>1.3. Velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack, Weston's differential | **7** | **10** |

| | | | |
|---|---|---|---|
| | pulley block, geared pulley block. | | |
| **Total** | | **42** | **60** |

| |
|---|
| **Course Outcomes:** |
| After completing this course, student will be able to: |
| 1. Identify the force systems for given conditions by applying the basics of mechanics. |
| 2. Determine unknown force(s) of different engineering systems. |
| 3. Apply the principles of friction in various conditions for useful purposes. |
| 4. Find the centroid and centre of gravity of various components in engineering systems. |
| 5. Select the relevant simple lifting machine(s) for given purposes |
| |
| **Suggested Learning Resources:** |
| 1. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi (2008) |
| 2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi. |
| 3. Bansal R K, A text book of Engineering Mechanics, Laxmi Publications. |
| 4. Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi. |
| 5. Dhade, Jamadar & Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh. |
| 6. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, Cambridge University Press. |
| 7. Meriam, J. L., Kraige, L.G., Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi. |

**********

| **Name of the course : ENGINEERING MECHANICS LAB** | | |
|---|---|---|
| **Course Code: ES 112** | **Semester: II** | |
| **Course Category: ES** | **Maximum Marks: 100** | |
| **Pre Requisites:** | **BS107 & BS106** | |
| **Teaching Scheme** | **PA & End Examination Scheme** | |
| Tutorial : 0 hrs/week<br>Practical : 2 hrs/week | **Practical PA** | |
| | 1. Sessional | **40 Marks** |
| | 2. Viva Voce | **20 Marks** |
| | **End Semester Practical Exam** | **40 Marks** |
| | **Total** | **100 Marks** |

| |
|---|
| **Credit: 1** |
| |
| **Course Objectives:** |
| Following are the objectives of this course: |
| 1) To obtain resultant of various forces. |
| 2) To calculate support reactions through conditions of equilibrium for various structures. |
| 3) To understand role of friction in equilibrium problems. |
| 4) To know fundamental laws of machines and their applications to various engineering problems. |
| |
| **List of Practical to be performed:** |
| 1. To study various equipments related to Engineering Mechanics. |
| 2. To find the M.A., V.R., Efficiency and law of machine for Differential Axle and Wheel. |
| 3. To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack. |
| 4. Derive Law of machine using Worm and worm wheel. |
| 5. Derive Law of machine using Single purchase crab. |
| 6. Derive Law of machine using double purchase crab. |
| 7. Derive Law of machine using Weston's differential or wormed geared pulley block. |
| 8. Determine resultant of concurrent force system applying Law of Polygon of forces using force table. |
| 9. Determine resultant of concurrent force system graphically. |
| 10. Determine resultant of parallel force system graphically. |
| 11. Verify Lami's theorem. |
| 12. Study forces in various members of Jib crane. |
| 13. Determine support reactions for simply supported beam. |
| 14. Obtain support reactions of beam using graphical method. |
| 15. Determine coefficient of friction for motion on horizontal and inclined plane. |
| 16. Determine centroid of geometrical plane figures. |
| |
| **Course Outcomes:** |
| After completing this course, student will be able to |
| 1. Identify the force systems for given conditions by applying the basics of mechanics. |
| 2. Determine unknown force(s) of different engineering systems. |
| 3. Apply the principles of friction in various conditions for useful purposes. |
| 4. Find the centroid and centre of gravity of various components in engineering systems. |
| 5. Select the relevant simple lifting machine(s) for given purposes. |
| |
| **Suggested Learning Resources**: |
| 1. Bedi D.S., Engineering Mechanics, Khanna Publishing House |
| 2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi. |
| 3. Bansal R K, A text book of Engineering Mechanics, Laxmi Publications. |
| 4. Ramamrutham, Engineering Mechanics, S.,S Chand & Co. New Delhi. |
| 5. Dhade, Jamadar & Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh. |

| |
|---|
| 6. Ram, H. D.; Chauhan, A. K. Foundations and Applications of Applied Mechanics, Cambridge University Press. |
| 7. Meriam, J. L., Kraige, L.G. , Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi. |


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| **Name of the Course: ENGINEERING WORKSHOP PRACTICE** | | |
|---|---|---|
| **Course Code: ES 103** | **Semester: I** | |
| **Course Category: ES** | **Maximum Marks: 100** | |
| **Teaching Scheme** | **Progressive Assessment (PA)** | |
| T-L-P<br>0-0-3<br>Contact hours/week | **Practical PA** | |
| | 1. Sessional | **60 Marks** |
| | 2. Assignment / Quiz etc. | **40 Marks** |
| | **Total** | **100 Marks** |
| **Credit: 1.5** | | |
| | | |
| **Course objectives** | | |

| Following are the objectives of this course |
|---|
| 1. To practice wood working operations. |
| 2. To practice the joining of metals using the Arc welding process. |
| 3. To practice the different types of fitting processes in metal. |
| 4. To practice the different ways in which pipes can be fitted. |
| 5. To practice different Lathe operations. |
| 6. To practice basic electrical wiring. |

**COURSE OUTCOMES:**

After completion of the course, the student will be able to:

CO1: Prepare the wood for doing various applications.
CO2: Prepare the edges for welding and select the proper voltage, current and electrode.
CO3: Prepare the edges for metal fitting.
CO4: Identify and use the different types of pipe fittings.
CO5: Center the job and select the tool to perform the job on a Lathe.
CO6: Perform various electrical wirings.

## COURSE CONTENT:

**UNIT 1: WOOD WORKING SHOP**

1. Introduction to the trade.
2. Types of wood and its characteristics.
3. Defects in timber and identifying them.
4. Wood working hand tools.
5. Wood working machine tools.
6. Wood working processes.
7. Joints and joinery processes.
8. Varnishing and painting.
9. Safety precautions.

**UNIT 2: WELDING SHOP**

1. Introduction to metal joining.
2. Electric Arc Welding.
3. Equipment and consumables used in Welding.
4. Types of Welding Joints.
5. Welding defects.
6. Safety precautions.

**UNIT 3: FITTING SHOP**

1. Introduction to the tools and equipment used in Fitting Shop.

2. Types of files and filing processes.
3. Types of Fitting processes.
4. Drill bits and drilling processes.
5. Safety precautions.

**UNIT 4: PLUMBING SHOP**

1. Type of pipes and its applications.
2. Pipe fitting tools
3. Pipe bending.
4. Pipe fitting operations.
5. Pipe joints.
6. Safety precautions.

**UNIT 5: MACHINE SHOP**

1. Types of cutting tools, cutting tool materials and tool parameters.
2. Principle of turning.
3. Classification and specification of various types of Lathe.
4. Description and functions of various parts of Lathe.
5. Drives, transmission and work holding devices of a Lathe.
6. Cutting parameters: speed, feed and depth of cut.
7. Basic Lathe operations.
8. Drilling.
9. Cutting fluids and lubricants.
10. Safety precautions.

**UNIT 6: ELECTRICAL SHOP**

1. Types of tools, equipment and materials used in Electrical Shop.
2. Instruments used for measuring current, voltage and power.
3. Study the different components of a Switchboard.
4. Soldering.
5. Laying and wiring of cables.
6. House wiring.
7. Safety precautions.

**SUGGESTED LIST OF PRACTICALS/DEMONSTRATIONS:**

1. Making a Mortise and Tennon joint using wood and wood working tools.
2. Making a T-Half Lap joint using wood and wood working tools.
3. Doing the Arc Welding process and producing a Lap Joint on MS Plate.

4. Doing the Arc Welding process and producing a Tee Joint on MS Plate.
5. Dove Tail fitting on MS Plate.
6. Radial Fitting on MS Plate.
7. Pipe threading on PVC Pipe.
8. Pipe threading on GI Pipe.
9. Exercise of simple turning and step turning on a MS Rod.
10. Construct a basic switchboard and learn the basics of soldering.
11. Measurement of current and voltage.

| | |
|---|---|
| COURSE TITLE | ENVIRONMENTAL SCIENCE |
| COURSE CODE | AU102 |
| NO. OF CREDITS | 0 (Non-Credit) (L:2, T:0, P:0) |
| PRE-REQUISITES | High School Science |
| COURSE CATEGORY | AU |

**RATIONALE:**

For the peaceful co- existence of all living creature on this planet earth, it is necessary to have an in-depth knowledge about the complexity of our environment. The introduction of environmental education course in every level of education is essential to create awareness and concerned about the degradation of environment that we are living in. Technically qualified people, such as the diploma engineers, should not only be aware about new technologies to combat environmental degradation at their disposal but also various aspects of environment, ecology, bio-diversity, management and legislation so that they can perform their jobs with a wider perspective and informed citizen. This course can be taken by all diploma students irrespective of their specialization.

**COURSE OBJECTIVES/COURSE OUTCOME (CO):**

On successful completion of this course content, the technicians working in industries or elsewhere are expected to understand the basic essential knowledge of environmental science and thereby enable them to work and produce most efficient, economical and eco-friendly finished products.

**COURSE SPECIFIC OUTCOME (CSO):**

On successful completion of the course the students will learn and be able to;
1. Understand the ecosystem and terminology and solve various engineering problems applying ecosystem knowledge to produce eco – friendly products.
2. Understand the suitable air, extent of noise pollution, and control measures and acts.
3. Understand the water and soil pollution, and control measures and acts.
4. Understand different renewable energy resources and efficient process of harvesting.
5. Understand solid Waste Management, ISO 14000 & Environmental Management

**COURSE CONTENT:**

**UNIT-1: ECOSYSTEM** **Contact hours: 5 Hrs.**

Structure of ecosystem, Biotic & Abiotic components
Food chain and food web
Aquatic (Lentic and Lotic) and terrestrial ecosystem
Carbon, Nitrogen, Sulphur, Phosphorus cycle
Global warming -Causes, effects, process, Green House Effect, Ozone depletion

**UNIT– 2: AIR AND, NOISE POLLUTION** **Contact hours: 6 Hrs.**

Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler)
Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator)
Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler
Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000

**UNIT- 3: WATER AND SOIL POLLUTION** **Contact hours: 7 Hrs.**

Sources of water pollution, Types of water pollutants, Characteristics of water pollutants
Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation Waste Water Treatment:
Primary methods: sedimentation, froth floatation,

Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor,
Tertiary Method: Membrane separation technology, RO (reverse osmosis).
Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.

**UNIT– 4: RENEWABLE SOURCES OF ENERGY** **Contact hours: 7 Hrs.**

Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills. Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas. Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy.
New Energy Sources: Need of new sources. Different types new energy sources.
Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.)
Concept, origin and power plants of geothermal energy

**UNIT-5: SOLID WASTE MANAGEMENT, ISO 14000 & ENVIRONMENTAL MANAGEMENT** **Contact hours: 7 Hrs.**

Solid waste generation- Sources and characteristics of: Municipal solid waste, E- waste, bio-medical waste.
Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries.
Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste.
Air quality act 2004, air pollution control act 1981 and water pollution and control act1996.
Structure and role of Central and state pollution control board.
Concept of Carbon Credit, Carbon Footprint.
Environmental management in fabrication industry.
ISO14000: Implementation in industries, Benefits.

## SPECIFICATION TABLE OF HOURS DISTRIBUTION

| Unit No. | Course Title | Hours |
|---|---|---|
| 1 | ECOSYSTEM | 5 |
| 2 | AIR AND, NOISE POLLUTION | 6 |

| | | |
|---|---|---|
| 3 | WATER AND SOIL POLLUTION | 7 |
| 4 | RENEWABLE SOURCES OF ENERGY | 7 |
| 5 | SOLID WASTE MANAGEMENT, ISO 14000 & ENVIRONMENTAL MANAGEMENT | 7 |
| | **TOTAL** | **32** |

**References:**

**(a) Suggested Learning Resources:**

**Books:**


1. S.C. Sharma & M.P. Poonia, Environmental Studies, Khanna Publishing House, NewDelhi

2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011. First Year Curriculum Structure Common to All Branches 52

3. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and

4. Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099-

5. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.

6. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi

7. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.

8. Rao, M. N. Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New Delhi, 1988, ISBN: 0-07- 451871-8.

9. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York; 1978, ISBN: 9780070354760.

10. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.

11. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6

12. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.

13. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

**(b) Open source software and website address:**

1) www.eco-prayer.org

2) www.teriin.org

3) www.cpcp.nic.in

4) www.cpcp.gov.in

5) www.indiaenvironmentportal.org.in

6) www.whatis.techtarget.com

7) www.sustainabledevelopment.un.org

8) www.conserve-energy-future.com)

**Teachers should use the following strategies to achieve the various outcomes of the course.**

• Different methods of teaching and media to be used to attain classroom attention.

• Massive open online courses (MOOCs) may be used to teach various topics/sub topics.

• 15-20% of the topics which are relatively simpler of descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.

• Micro-projects may be given to group of students for hand-on experiences

• Encouraging students to visit to sites such as Railway station and research establishment around the institution.

| | | | | |
|---|---|---|---|---|
| **COURSE TITLE** | **ESSENCE OF INDIAN KNOWLEDGE & TRADITION** | | | |
| **COURSE CODE** | **AU202** | | | |
| COURSE CATEGORY | Mandatory Course | | | |
| CREDITS | NIL (L:2, T:0, P:0) | | | |
| EVALUATION SCHEME: | Theory Marks | | Practical Marks | |
| | PA | ET | PA | ET |
| | - | - | - | - |

**1. RATIONALE:**

National education Policy 2020, has given ample emphasis on Indian Knowledge system. The

significance of teaching of Indian knowledge and Tradition is very much required as for centuries this great tradition had been trampled under the feet of invaders. Even after Independence, Indian Knowledge System had been neglected and only Western parameters have been considered as standard.

The essence of Indian culture has been carried through centuries only because of its scientific and humanitarian approach. It is the need of the hour that young students learn the significance of the contribution made by Indian Knowledge Systems and contribute to the world with pride and confidence even in the field of science and technology which had been mastered centuries ago but was perished by invaders. This course will provide an opportunity to the students the hidden secrets of the great heritage of knowledge that existed thousands of years ago in IndianTradition.

It also introduces Nagas indigenous knowledge systems in the ancient time where Naga ancestors were able to make lunar calendar and effective water management for rice cultivation.

**2. COMPETENCY:**

1) Study of IKS will enable students to respect and relish the greatness of our tradition. The awareness of IKS will make them feel proud about their own culture.
2) The knowledge of Indian knowledge will enable and empower them with the first hand knowledge of India's great heritage, culture and traditions.
3) This will create a scope and awareness amongst the foreigners regarding India and its contribution to the world.

**3. COURSE OUTCOMES**

1. Students will attain awareness regarding the significance of IKS
2. The syllabus will enhance their confidence in Indian traditional knowledge system and enable them to perceive at the problems with Indian perspective
3. This will also enable them to analyze the issues on their own and enable them for critical thinking.
4. The knowledge about the ancient Indian Scientific traditions will generate more confidence in themselves.
5. This will lead them to make research and innovative thinking which can result in global contribution at later stage.

**4.PRACTICAL / PROJECT:** The student can visit any historical / monumental sights like Kisama (Traditional houses, Kachari ruins in Dimapur, Arts & Museum Department, wet terrace cultivation, water harvesting collection method in village.

**Topics:-**

**Unit I**

**Basic structure of Indian Knowledge System**

- Indian Tradition and culture
- Difference between custom and tradition
- Difference between tradition and heritage
- Indian Philosophy

**A. CONCEPT OF RELIGION**

**4 Vedas:**

Rig- (Veda Knowledge of the Hymns of Praise)
Sama- (Veda Knowledge of the Melodies)
Yajur- (Veda Knowledge of the Sacrificial formulas)
Atharva- (Veda Knowledge of the Magic formulas)

B. Hinduism, Jainism, Buddhism, Sikhism, Animistic religion in Nagaland

**UNIT II**

**Modern Science and Traditional Knowledge**

- Traditional Knowledge
- Relevance of Science and Spirituality

**B. Science and Technology in Ancient India**

India's Contribution to Science and Technology (From Ancient to Modern)

- -Pre independence
- Post – Independence

**C. Indian Traditional health care system**

**D. Ayurveda**

- Ayurveda Vs Western medicine
- Benefits of Ayurveda

**E. Origin, history, purpose and technique of Yoga**

**UNIT III**

**Ancient Indian Astronomy:**

- **Development of Astronomy:**

A) Consideration of Purnima and Amavasya

B) Beginning of The New Year- Vasant Ritu- (Vernal Equinox)

C) Ancient Indian Calender

- **Knowledge about Constellations / planets / distance between planets etc.**

A) Saptarushi – seven Seers- Significant Knowledge of star and constellations

B) Knowledge of Speed of Light – Rigveda

- **Advances in Mathematics and Geometry in Ancient India**

A) Sulbha- Sutra (Kalpa Sutra) composed by Baudhayana, Manava, Apastamba and Katyayana

B) Contribution of Ancient Rushis to Mathematics

A)Bodhayana's value of pie

B) Lilavati

C) Bhaskaracharya

D) Arya Bhatt.

**UNIT IV**

**Town Planning in Ancient India**

A) Roads in Ancient India – Uttarpath by Chandra Gupta

B) Ancient Indian Trade Routs/ Waterways

C)Ship- Building In Ancient India

D)Temple Architecture

-Nagar Style/ Dravida style/ Vesara style

**UNIT V**

**Metallurgical Discoveries in Ancient India**

- Lime a Mortar
- Bronze
- Gold & Silver
- Glass / Iron
- Nagarjuna's Contribution in making Alloys

**UNIT VI**

**Nagas Indigenous knowledge system**

- Naga traditional houses/morung designs
- Paddy rice cultivation (wet terrace cultivation) and water harvesting
- Naga lunar calendar

**6.REFERENCE BOOKS:**

1)History of Science, Arts & Technology By Dr. Shripad Dattatrya Kulkarni, Bhishma

Prakashan, Mumbai -1998.

2)Introduction to Indian Knowledge System: Concepts and Applications by B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana, PHI Learning Pvt. Ltd., Delhi

3)Town Planning in Ancient India by Binode Bihari Dutt, Thacker, Spink & Co.

4) Traditions and practices of India, NCERT Textbook for Class 11, 12

| | | |
|---|---|---|
| Course Code | : | ES104 |
| Course Title | : | Fundamentals of Electrical and Electronics Engineering |
| Number of Credits | : | 3 (L: 2, T: 1, P: 0) |
| Prerequisites | : | NIL |
| Course Category | : | ES |

K=Knowledge Level, C=Comprehension Level, A=Application Level

| Unit No. | Unit Title | Hours | Marks | | | |
|---|---|---|---|---|---|---|
| | | | K | C | A | Total Marks |
| I | Overview of Electronic Components & Signals | 7 | 4 | 3 | 2 | 9 |
| II | Overview of Analog Circuits | 5 | 2 | 2 | 3 | 7 |
| III | Overview of Digital Electronics | 8 | 2 | 3 | 5 | 10 |
| IV | DC & A.C. Circuits | 9 | 3 | 5 | 4 | 12 |
| V | Electric and Magnetic Circuits | 9 | 3 | 4 | 5 | 12 |
| VI | Transformer and Machines | 7 | 2 | 5 | 3 | 10 |
| | **Total** | **45** | | | **22** | **60** |

**Course Objectives:**

To provide basic knowledge of the different elements and concepts of electrical engineering field and to learn basic concepts of various active and passive electronic components, Signals, Op-Amp and their applications, Digital Electronics and their applications, Transformer and Machines to help students deal with electrical and electronics engineering principles and applications in industrial processes of different fields.

**Course Content:**

**UNIT I- Overview of Electronic Components & Signals:**

Passive Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, FET, MOS and CMOS and their Applications.

Signals: DC/AC, voltage/current, periodic/non-periodic signals, average, RMS, peak values, different types of signal waveforms, Ideal/non-ideal voltage/current sources, independent/dependent voltage current sources.

**UNIT II- Overview of Analog Circuits:**

Operational Amplifiers-Ideal Op-Amp, Practical op amp, Open loop and closed loop configurations.

Application of Op-Amp as amplifier, adder, differentiator and integrator.

**UNIT III- Overview of Digital Electronics:**

Introduction to different number systems – Binary, Octal, Decimal, Hexadecimal, Conversion from one number system to another.

Introduction to Boolean Algebra, Electronic Implementation of Boolean Operations, Gates-Functional Block Approach.

**Unit IV -DC & A.C. Circuits:**

Units, Work, Energy, Power, series-parallel combination of resistance, Ohms law, KVL, KCL.

Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor, Peak Factor, impedance, phase angle, and power factor; Mathematical and phasor representation of alternating emf and current; A.C in resistors, inductors and capacitors.

**Unit V- Electric and Magnetic Circuits:**

EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hysteresis loop, reluctance, leakage factor and BH curve; Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law; Dynamically induced emf; Statically induced emf; Equations of self and mutual inductance; Analogy between electric and magnetic circuits.

**Unit VI- Transformer and Machines:**

General construction and principle of different type of transformers; Emf equation and transformation ratio of transformers; Auto transformers; Construction and Working principle of motors; Basic equations and characteristic of motors.

**References:**

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House

2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN: 9781107464353
4. Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924375
6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513
7. Sedha, R.S., A text book of Applied Electronics, S. Chand, New Delhi, 2008, ISBN-13: 978-8121927833
8. Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Education, New Delhi,2015, ISBN-13**:** 0070634244-978
9. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN-13-9788121924504
10. Bell Devid, Fundamental of Electronic Devices and Circuits, Oxford University Press, New Delhi 2015 ISBN: 9780195425239

**Course Outcomes:**

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

1. Describe basic components and signals with their applications.

2. Understand the effect on DC and AC in different elements.

3. Understand the behavior of electric and magnetic circuits.

4. Understand the number systems and its conversion.

6. Understand logic gates and apply them in various electronic circuits.

7. Understand the basic concepts of op-amps, and their applications

| | | |
|---|---|---|
| Course Code | : | ES110 |
| Course Title | : | Fundamentals of Electrical and Electronics Engineering Lab |
| Number of Credits | : | 1 (L: 0, T: 0, P: 2) |
| Prerequisites | : | NIL |
| Course Category | : | ES |

**Suggested Practical/Exercises:**

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the

Student for the attainment of the competency.

| S. No. | Practical Outcomes (PrOs) | Approx. Hrs. |
|---|---|---|
| 1. | Determine the permeability of magnetic material by plotting its B-H curve. | 02 |
| 2. | Measure voltage, current and power in 1-phase circuit with resistive load. | 02 |
| 3. | Measure voltage, current and power in R-L series circuit. | 02 |
| 4. | Determine the transformation ratio (K) of 1-phase transformer. | 02 |
| 5. | Connect single phase transformer and measure input and output quantities. | 02 |
| 6. | Make Star and Delta connection in induction motor starters and measure the line and phase values. | 02 |
| 7. | Identify various passive electronic components in the given circuit | 02 |
| 8. | Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter. | 02 |
| 9. | Connect capacitors in series and parallel combination on bread board and measure its value using multimeter. | 02* |
| 10. | Identify various active electronic components in the given circuit. | 02 |
| 11. | Use multimeter to measure the value of given resistor. | 02 |
| 12. | Use LCR-Q tester to measure the value of given capacitor and inductor. | 02 |
| 13. | Determine the value of given resistor using digital multimeter to confirm<br>with colour code. | 02 |

| | | |
|---|---|---|
| 14. | Test the PN-junction diodes using digital multimeter. | 02 |
| 15. | Test the performance of PN-junction diode. | 02 |
| 16. | Test the performance of Zener diode. | 02 |
| 17. | Test the performance of LED. | 02 |
| 18. | Identify three terminals of a transistor using digital multimeter. | 02 |
| 19. | Test the performance of NPN transistor. | 02 |
| 20. | Determine the current gain of CE transistor configuration. | 02 |
| 21. | Test the performance of transistor switch circuit. | 02 |
| 22. | Test the performance of transistor amplifier circuit. | 02 |
| 23. | Test Op-Amp as amplifier and Integrator | 02 |
| | **Total** | **46** |

**References:**

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House, 2018

2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5

3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN: 9781107464353

4. Theraja, B. L., Electrical Technology Vol – I, S. Chand publications, New Delhi, 2015, ISBN: 9788121924405

5. Theraja, B. L., Electrical Technology Vol – II, S. Chand publications, New Delhi, 2015, ISBN:

9788121924375

6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN: 97881236529513

7. Sedha, R.S., A text book of Applied Electronics, S. Chand ,New Delhi, 2008, ISBN-13: 978-8121927833

8. Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Education, New Delhi,2015, ISBN-13**:** 0070634244-978

9. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN-13-9788121924504

10. Bell Devid, Fundamental of Electronic Devices and Circuits, Oxford University Press, New Delhi 2015 ISBN: 9780195425239

**Suggested Softwares/Learning Websites:**

a. en.wikipedia.org/wiki/Transformer

b. www.animations.physics.unsw.edu.au//jw/AC.html

c. www.alpharubicon.com/altenergy/understandingAC.htm

d. www.electronics-tutorials

e. learn.sparkfun.com/tutorials/transistors

f. www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf

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g. www.technologystudent.com/elec1/transis1.htm

h. www.learningaboutelectronics.com

i. www.electrical4u.com

**Course Outcomes:**

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

1. Understand basic principle and operation of electric circuits and machines.

2. Solve basic problems related to electrical circuits and machines. Explain the operation of different electrical technologies.

3. Demonstrate an understanding of the control systems.

4. Understand the basic circuit elements

5. Understand different types of signal waveforms.

6. Understand logic gates and apply them in various electronic circuits.

7. Understand the basic concepts of op-amps, and their applications.

8. Use relevant electric/electronic protective devices safely.

| INTRODUCTION TO IT SYSTEM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course code: ES102** | | | | **Semester: II** | | | | |
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | | |
| **Contact Hours/Week** | | | | **Theory** | | | | |
| | | | | **End Term** | **Progressive Assessment** | | | **Total Marks** |
| **L** | **T** | **P** | **Credit** | | **Class Test** | **Assignment** | **Attendance** | |
| 2 | 0 | 0 | 2 | 60 | 20 | 15 | 5 | 100 |

**Rationale / Course Learning Objectives: -**

This course is intended to make new students comfortable with computing environment - Learning

basic computer skills, Learning basic application software tools, Understanding Computer Hardware, Cyber security awareness

**Course Content:**

| UNIT NO | UNIT | HOURS | MARKS |
|---|---|---|---|
| 1 | **Basic Internet skills**:<br>Understanding browser, efficient use of search engines, awareness about Digital<br>India portals (state and national portals) and college portals.<br>General understanding of various computer hardware components – CPU, Memory, Display, Keyboard,<br>Mouse, HDD, SSD and other Peripheral Devices. | 6 | 11 |
| 2 | **OS Installation (Linux and MS Windows)**<br>Unix Shell: Introduction, vi editor<br>Basic Unix Commands: ls, cp, mkdir, rmdir, cd, chmod, pwd | 6 | 11 |
| 3 | **HTML4 and CSS**<br>HTML4: Introductions, Elements, Attributes, Headings, Paragraph, Styles, Formatting, Page Title, Links, Tables, List, Div, Classes, Forms and Media.<br>CSS: Introductions, Syntax, Selectors, The Three Ways to Insert CSS, Colors, Background, Borders, Margins, Paddings, Outline, Text, Font, Icon, Link, Lists, Tables, Position, Z-Index, Float, Align.<br>Develop basic personal webpage using HTML4 and CSS. | 10 | 20 |
| 4 | **Office Tools**:<br>OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress. | 5 | 9 |
| 5 | **Information Security Basics**<br>Introduction to Information Security, The CIA Triad, Best Practices of Information Security. | 5 | 9 |

| | | | |
|---|---|---|---|
| | **TOTAL** | **32** | **60** |

**Specification Table Showing Distribution of Marks and Hours**

| Unit No | UNIT | HOURS | Marks | | | |
|---|---|---|---|---|---|---|
| | | | K | C | A | Total Mark |
| 1 | **Basic Internet skills**: | 6 | 4 | 4 | 3 | 11 |
| 2 | **OS Installation (Linux and MS Windows)** | 6 | 3 | 4 | 4 | 11 |
| 3 | **HTML4 and CSS** | 10 | 5 | 5 | 10 | 20 |
| 4 | **Office Tools** | 5 | 3 | 3 | 3 | 9 |
| 5 | **Information Security Basics** | 5 | 4 | 3 | 2 | 9 |
| | **TOTAL** | **32** | **19** | **19** | **22** | **60** |

**Abbreviations:** **K**=Knowledge level, **C**= Comprehension Level, **A**=Application level

**Reference Books:**


1. Russell, Norvig, Artificial intelligence: A modern approach, 2nd edition. Pearson/Prentice Hall.
2. M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House, New Delhi (2018)
3. V.K. Jain, Machine Learning, Khanna Publishing House, New Delhi (2018)
4. Ethem Alpaydin, Introduction to Machine Learning, Second Edition, http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12012.


**Course Outcomes:**

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

| | |
|---|---|
| CO1 | Identify problems that are amenable to solution by AI methods. |
| CO2 | Design and carry out an empirical evaluation of different algorithms on a problem formalization and state the conclusions that the evaluation supports. |
| CO3 | Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc. |
| CO4 | Able to design and implement various machine learning algorithms in a range of real-world applications. |
| CO5 | Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning. |

**INTRODUCTION TO IT SYSTEMS LAB**

| Course code: ES108 | | | | Semester: II | | | |
|---|---|---|---|---|---|---|---|
| **Teaching Scheme** | | | | **Evaluation Scheme** | | | |
| **Contact Hours/Week** | | | | **Theory** | | | |
| | | | | **End Term** | **Progressive Assessment** | | **Total Marks** |
| **L** | **T** | **P** | **Credit** | | **Sessional** | **Viva Voce** | |
| 0 | 0 | 2 | 1 | 40 | 40 | 20 | 100 |
| **Rationale / Course Learning Objectives: -** | | | | | | | |
| This Lab course is intended to practice whatever is taught in theory class of 'Introduction of IT Systems and become proficient in using computing environment - basic computer skills, basic application software tools, Computer Hardware, cyber security features, etc. | | | | | | | |

**Course Content:**

| SL. NO | UNIT | HOURS |
|---|---|---|
| 1 | Browser features, browsing, using various search engines, writing search queries | 4 |
| 2 | Visit various e-governance/Digital India portals, understand their features, services offered | 4 |
| 3 | Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognise various ports/interfaces and related cables, etc. | 4 |
| 4 | Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times | 4 |
| 5 | Connect various peripherals (printer, scanner, etc.) to computer, explore various features<br>of peripheral and their device driver software. | 4 |
| 6 | Practice HTML commands, try them with various values, make your own Webpage | 4 |
| 7 | Explore features of Open Office tools, create documents using these features, do it multiple<br>times | 4 |
| 8 | Explore security features of Operating Systems and Tools, try using them and see what<br>happens. | 4 |
| | **TOTAL** | **32** |

**References:**

1. Online resources, Linux man pages, Wikipedia.

2. R.S. Salaria, Computer Fundamentals, Khanna Publishing House.

3. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.

4. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett.

5. IT Essentials PC Hardware and Software Companion Guide, Davis Anfinson and Ken Quamme, CISC Press, Pearson Education.

6. PC Hardware and A+ Handbook, Kate J. Chase PHI (Microsoft).

**Course outcomes:**

At the end of the course student will be able to comfortably work on computer, install and configure OS, assemble a PC and connect it to external devices, write documents, create worksheets, prepare presentations, protect information and computers from basic abuses/attacks.

| | | |
|---|---|---|
| Course code | : | BS101 |
| Course title | : | Mathematics -I |
| Number of credits | : | 3(L: 2, T: 1, P: 0) |
| Prerequisites | : | NIL |

| | | |
|---|---|---|
| Course category | : | BS |

SUGGESTED SPECIFICATION TABLE OF MARKS &HOURS DISTRIBUTION

K= Knowledge Level, C= Comprehension Level, A=Application Level

| Unit | Title | Hours | Marks | | | |
|---|---|---|---|---|---|---|
| | | | K | C | A | Total |
| 1 | Trigonometry | 10 | 3 | 6 | 4 | 13 |
| 2 | Differential Calculus | 20 | 5 | 16 | 4 | 25 |
| 3 | Algebra | 18 | 7 | 11 | 4 | 22 |
| | **Total** | **48** | **15** | **33** | **12** | **60** |

**Rationale**: Mathematics is an important tool to solve wide variety of engineering problems. Most of the technological processes in industry are described effectively by using mathematical framework. The purpose of Mathematics-I is to enable the understanding of fundamental topics in mathematics necessary for solving engineering problems. The topics included are Trigonometry, Differential calculus and Algebra which will provide a satisfactory foundation for technical applications in various fields of studies.

**Course objectives**:
This course is designed to give a comprehensive coverage at an introductory level to the subject of Trigonometry, Differential calculus and Basic elements of algebra.

**Course Content:**

| **UNIT** | Topic/Sub-Topic |
|---|---|

| | |
|---|---|
| 1.0 | **Trigonometry.** |
| | **1.1** Concepts of angles. |
| | i) Measurement of angles in degrees, grades and radians. |
| | ii) Conversions of degree to radian and radian to degree |
| | **1.2** T-Ratios of allied angles (without proof) |
| | i) Sum, difference and product formulae. |
| | ii) Applications of Sum, difference and product formulae. |
| | iii)Transformation of product to sum, difference and vice versa. |
| | **1.3** Multiple and sub-multiple angles of angles (2A,3A, A/2). |
| | **1.4** Graphs of sinx, cosx, tanx and $e^x$. |
| 2.0 | **Differential Calculus.** |
| | **2.1** Limits and functions. |
| | i) Definition and types of functions. |
| | ii)Concept of limits, standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}$ $\lim_{x\to 0}\frac{sinx}{x}$ $\lim_{x\to a}\frac{a^x-1}{x}$ $\lim_{x\to a}(1+x)^{\frac{1}{x}}$ |
| | **2.2** Differentiation |
| | i)Differentiation by $x^n$, sinx, cosx, tanx, $e^x$ and $\log_a x$ |
| | ii) Differentiation of Sum, Product and quotient rule. |
| | iii) Differentiation of trigonometric and inverse trigonometric function, Logarithmic, exponential. |
| 3.0 | **Algebra**. |
| | **3.1** Complex numbers. |
| | i)Definition of complex numbers, its real and imaginary parts. |
| | ii) Its representation and its conversion from one form to another. |
| | iii) modulus and amplitude, Conjugate of a complex number |
| | iv) Addition, subtraction, multiplication and division of complex numbers. |
| | **3.2** De-movier's theorem and its application. |
| | **3.3** Partial fractions |
| | i) Definition of polynomial fraction |
| | ii) Definition of Proper and improper fraction. |
| | **3.4** To resolve proper fraction into partial fraction when denominator contains |
| | i) non-repeated linear factors |
| | ii) repeated linear factors |
| | iii) irreducible non-repeated quadratic factors |
| | **3.5** To resolve improper fraction into partial fraction. |
| | **3.6** Permutation and combination |
| | i)Value of ${}^nP_r$ and ${}^nC_r$ |
| | **3.7** Binomial theorem (without proof). |
| | i) Binomial theorem for positive integral index |
| | ii) its expansion and general form |
| | iii) Binomial theorem for any index(expansion without proof) |
| | iv) First and second binomial approximation with applications to engineering problems. |

**References:**


1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018)

4. V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e., Vi kas Publishing House.
5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

**Course Outcomes:**

By the end of the course, the students are expected to learn

(i) The students are expected to acquire necessary background in Trigonometry to appreciate the importance of the geometric study as well as for the calculation and the mathematical analysis.

(ii) The ability to find the effects of changing conditions on a system.

(iii) Complex numbers enter into studies of physical phenomena in ways that most people cannot imagine.

(iv) The partial fraction decomposition lies in the fact that it provides an algorithm for computing the antiderivative of a rational function.

| | | |
|---|---|---|
| Course code | : | BS102 |
| Course Title | : | Mathematics-II |

| | | |
|---|---|---|
| Number of credits | : | 4 (L: 3, T: 1, P:0) |
| Prerequisites | : | BS101 |
| Course category | : | BS |

SUGGESTED SPECIFICATION TABLE OF MARKS &HOURS DISTRIBUTION

K= Knowledge Level, C= Comprehension Level, A=Application Level

| Unit | Title | Hours | Marks | | | |
|---|---|---|---|---|---|---|
| | | | K | C | A | Total |
| 1 | Determinant and matrices | 18 | 5 | 7 | 4 | 16 |
| 2 | Integral Calculus | 18 | 2 | 10 | 4 | 16 |
| 3 | Co-ordinate geometry | 16 | 3 | 8 | 4 | 15 |
| 4 | Vector algebra | 7 | 2 | 2 | 4 | 8 |
| 5 | Differential equations | 5 | 2 | 3 | 0 | 5 |
| | **Total** | **64** | **14** | **30** | **16** | **60** |

**Rationale:** The purpose of teaching Mathematics-II to diploma students is to enable them to understand advanced uses of mathematics and solving engineering problems. The topic includes Determinant and Matrices, Integral calculus, Co-ordinate geometry, Vector algebra, Differential Equations. This course will be helpful for the learners in their higher studies.

**Course Objectives:**

This course is designed to give a comprehensive coverage at an introductory level to the subject of matrices, integral calculus, co-ordinate geometry, vector algebra and first order differential equation.

**Course contents:**

| **Unit** | Topic/Sub-topic |
|---|---|

| | |
|---|---|
| 1.0 | **Determinant and Matrices**. |
| | 1.1 Elementary properties of determinants upto third order |
| | 1.2 Consistency of equation |
| | 1.3 Crammer's rule |
| | 1.4 Algebra of matrices |
| | i) inverse of a matrix |
| | ii) Matrix inverse method to solve a system of linear equations in 3 variables. |
| 2.0 | **Integral calculus.** |
| | 2.1 Integration as inverse operation of differentiation. |
| | 2.2 Integration by the method of |
| | i)substitution |
| | ii) by parts |
| | iii)by partial fraction (for linear factors only) |
| | 2.3 Solve problems using the following formulae $\int_0^{\frac{\pi}{2}} sin^n x dx$ $\int_0^{\frac{\pi}{2}} cos^n x dx$ and $\int_0^{\frac{\pi}{2}} sin^n x cos^n x dx$. |
| | 2.4 Applications of integration. |
| | i)Evaluation of area bounded by a curve and axes |
| | ii) Volume of a solid formed by revolution of an area about axes (simple problems) |
| 3.0 | **Co-ordinate geometry**. |
| | 3.1 Straight lines |
| | i)Equation of straight line in various standard forms (without proof) |
| | ii) Intersection of two straight lines |
| | iii) angle between two lines |
| | iv) Parallel and perpendicular distance formula. |
| | 3.2 Circle |
| | i)general equation of circle and its characteristics. |
| | ii) To find the equation of a circle given centre and radius, three points lying on it, coordinates of end points of a diameter. |
| | 3.3 Conics. |
| | i)Definition of conics |
| | ii) standard equation of Parabola, Ellipse, Hyperbola (without proof) |
| | iii) Solve problems when foci, directories or vertices are given. |
| 4.0 | **Vector algebra**. |
| | 4.1 Vector |
| | i)Definition of vector |
| | ii) Notation and rectangular resolution of vector. |
| | iii) Addition and subtraction of vectors. |
| | iv) Scalar and vector products of two vectors. |
| | 4.2 Simple problems related to work, moment and angular velocity. |
| 5.0 | **Differential Equations.** |
| | 5.1 Solution of first order and first-degree differential equation by variable separable method. |
| | 5.2 MATLAB-simple Introduction. |

**References:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol. I & II, Jalandhar.
4. Comprehensive Mathematics, Vol. I & II by Laxmi Publications, Delhi.
5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

**Course Outcomes:**

By the end of the course the students are expected to learn
(i) the students are expected to acquire necessary background in Determinants and Matrices so as to appreciate the importance of the Determinants are the factors that scale different parameterizations so that they all produce same overall integrals, i.e. they are capable of encoding the inherent geometry of the original shape.
(ii) the cumulative effect of the original quantity or equation is the Integration
(iii) the coordinate geometry provides a connection between algebra and geometry through graphs of lines and curves.
(iv) Tell the difference between a resultant and a concurrent force to model simple physical problems in the form of a differential equation, analyze and interpret the solutions.

| | | |
|---|---|---|
| **Corse Code** | **:** | **HS103** |
| **Course Title** | **:** | **Sports and Yoga/NCC/NSS** |
| **Number of Credits** | **:** | **1 (L:0, T:0, P:2)** |
| **Prerequisites** | **:** | **Nil** |
| **Course Category** | **:** | **HS** |

**Course Objectives:**

- To make the students understand the importance of sound health and fitness principles as they relate to better health.
- To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.
- To create a safe, progressive, methodical and efficient activity-based plan to enhance improvement and minimize risk of injury. • To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

**Course Content:**

- **Introduction to Physical Education**

  o Meaning & definition of Physical Education

  o Aims & Objectives of Physical Education

  o Changing trends in Physical Education

- **Olympic Movement**

  o Ancient & Modern Olympics (Summer & Winter)

  o Olympic Symbols, Ideals, Objectives & Values

  o Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

- **Physical Fitness, Wellness & Lifestyle**

- o Meaning & Importance of Physical Fitness & Wellness
- o Components of Physical fitness o Components of Health-related fitness
- o Components of wellness
- o Preventing Health Threats through Lifestyle Change
- o Concept of Positive Lifestyle

- **Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga**
  - o Define Anatomy, Physiology & Its Importance
  - o Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)

- **Kinesiology, Biomechanics & Sports**
  - o Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
  - o Newton's Law of Motion & its application in sports.
  - o Friction and its effects in Sports.

- **Postures o Meaning and Concept of Postures.**
  - o Causes of Bad Posture.
  - o Advantages & disadvantages of weight training.
  - o Concept & advantages of Correct Posture.
  - o Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis.
  - o Corrective Measures for Postural Deformities

- **Yoga**
  - o Meaning & Importance of Yoga
  - o Elements of Yoga

- Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas
- Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana)
- Relaxation Techniques for improving concentration - Yog-nidra

- **Yoga & Lifestyle o Asanas as preventive measures.**
  - Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana
  - Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana.
  - Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.
  - Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana.
  - Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.

- **Training and Planning in Sports**
  - Meaning of Training o Warming up and limbering down
  - Skill, Technique & Style
  - Meaning and Objectives of Planning.
  - Tournament – Knock-Out, League/Round Robin & Combi nation.

- **Psychology & Sports**
  - Definition & Importance of Psychology in Physical Edu. & Sports
  - Define & Differentiate Between Growth & Development
  - Adolescent Problems & Their Management
  - Emotion: Concept, Type & Controlling of emotions o Meaning, Concept & Types of Aggressions in Sports.

- o Psychological benefits of exercise.
- o Anxiety & Fear and its effects on Sports Performance.
- o Motivation, its type & techniques.
- o Understanding Stress & Coping Strategies.

- **Doping**
  - o Meaning and Concept of Doping
  - o Prohibited Substances & Methods
  - o Side Effects of Prohibited Substances

- **Sports Medicine**
  - o First Aid – Definition, Aims & Objectives.
  - o Sports injuries: Classification, Causes & Prevention.
  - o Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

- **Sports / Games**

  Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.

  - o History of the Game/Sport.
  - o Latest General Rules of the Game/Sport.
  - o Specifications of Play Fields and Related Sports Equipment.
  - o Important Tournaments and Venues.
  - o Sports Personalities.
  - o Proper Sports Gear and its Importance.

**References:**

1. Modern Trends and Physical Education by Prof. Ajmer Singh.

2. Light On Yoga By B.K.S. Iyengar.

3. Health and Physical Education – NCERT (11th and 12th Classes)

**Course Outcomes:**

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

(i) Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.

(ii) Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.

(iii) Learn breathing exercises and healthy fitness activities

(iv) Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.

(v) Perform yoga movements in various combination and forms.

(vi) Assess current personal fitness levels.

(vii) Identify opportunities for participation in yoga and sports activities.

(viii) Develop understanding of health-related fitness components: cardiorespiratory endurance, flexibility and body composition etc.

(ix) Improve personal fitness through participation in sports and yogic activities.

(x) Develop understanding of psychological problems associated with the age and lifestyle.

(xi) Demonstrate an understanding of sound nutritional practices as related to health and physical performance.

(xii) Assess yoga activities in terms of fitness value.

(xiii) Identify and apply injury prevention principles related to yoga and physical fitness activities.

(xiv) Understand and correctly apply biomechanical and physiological principles elated to exercise and training.

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