Detailed First Year Curriculum Contents

(Semester II)

Mathematics II

Course Code	BS 201
Course Title	Mathematics – II
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	BS

This course is designed to give a comprehensive coverage at an introductory level to the subject of matrices, Integral Calculus coordinate geometry, Basic elements of vector algebra and First & second Order Differential Equations.

Course Outcomes:

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

C.O.1: Solve different problems related to Matrices and Determinants for applications in various Engineering problems. (K3)

C.O.2: Evaluate integration of different functions for applications in the field of Engineering and their higher course of studies. (K5)

C.O.3: Identify the basic about geometry and realize that the coordinate geometry provides a connection between algebra and geometry through graphs of lines and curves. (K4)

C.O.4: Determine the amount of work done and the moment or torque on application of forces. (K5)

C.O.5: Solve differential equations and apply them in different Engineering problems. (K3)

Course Content:

Module - I: Determinants and Matrices

Number of Class hours: 10

Learning Outcomes:

1. Use Matrices for presentation of large data in an organised expression.(K3)
2. Applying algebraic operations on matrices under certain conditions.(K3)
3. Analysis and solution of system of linear equations.(K4)

Detailed content of the unit:

1) Definition & Expansion of determinants of order 2 & 3.
2) Elementary properties of determinants upto 3^{rd} order.
3) Minors & Cofactors.
4) Consistency of equations, Crammer's rule.
5) Definition of a matrix of order m x n.
6) Types of matrices-null matrix, square matrix, diagonal matrix, identity matrix etc.
7) Symmetric and skew symmetric matrices.
8) Algebra of matrices-addition, subtraction, scalar multiplication, multiplication of matrices.
9) Inverse of a matrix
10) Matrix inverse method to solve a system of linear equations in 3 variables.

Module - II: Integral Calculus

Number of Class hours: 12
Learning Outcomes:

1) Explain the meaning of Integration.(K4)
2) Learn to use different methods of Integration.(K3)
3) Apply different properties of definite integral to solve problems.(K3)
4) Apply definite integral in calculation of area and volume.(K3)

Detailed content of the unit:

1) Concept of Integration: Integration as inverse operation of differentiation.
2) Fundamental Theorem of Integral calculus
3) Simple integration by substitution.
4) Integration by parts
5) Integration by partial fractions (for linear factors only).
6) Use of formulas $\int_0^{\frac{\pi}{2}} sin^n x\, dx$, $\int_0^{\frac{\pi}{2}} cos^n x\, dx$ and $\int_0^{\frac{\pi}{2}} sin^m x\, cos^n x\, dx$ for solving problems where m and n are positive integers.
7) Properties of definite Integral.
8) Applications of integration for - i). Simple problem on evaluation of area bounded by a curve and axes. ii). Calculation of Volume of a solid formed by revolution of an area about axes - Simple problems.

Module - III: Co-ordinate Geometry

Number of Class hours: 10
Learning Outcomes:

1) Identify and use of Cartesian and Polar co-ordinates. (K4)
2) Identify different forms of straight lines, there formation and some properties with respect to each other.(K4)
3) Analyzing different types of conic sections, their similarities and differences.(K4)

Detailed content of the unit:

1) Equation of straight line in various standard forms (without proof).
2) Intersection of two straight lines.
3) Angle between two lines.
4) Parallel and perpendicular lines.
5) Perpendicular distance formula.
6) General equation of a circle and its characteristics.
7) To find the equation of a circle, given: i) Centre and radius, ii) Three points lying on it and iii) Coordinates of end points of a diameter.
8) Definition of conics (Parabola, Ellipse, Hyperbola) their standard equations without proof.
9) Problems on conics when their foci, directories or vertices are given.

Module - IV: Vector Algebra

Number of Class hours: 8
Learning Outcomes:

1) Apply the concept of directed line segment or vector and various laws related to it.(K3)
2) Apply products of vectors and application of the product.(K3)

Detailed content of the unit:

1) Definition, different types of vectors, rectangular resolution of a vector.
2) Addition and subtraction of vectors.
3) Scalar and vector products of two vectors with properties.
4) Problems related to scalar & vector product.
5) Simple problems related to work, moment and angular velocity.

Module – V: Differential Equations

Number of Class hours: 10
Learning Outcomes:

1) Identify different types of differential equation with respect to their order and degree.(K4)
2) Solve differential equations and apply them in different Engineering problems. (K3)

Detailed content of the unit:

1) Definition of ordinary differential equation, order & degree.
2) Solution of first order and first degree differential equation by i) variable separation method ii) homogeneous type, iii) exact type iv) Linear differential equation – simple problems.
3) Solution of 2nd order linear differential equation with constant coefficients - i) Evaluation of complementary functions, ii) Evaluation of Particular Integral(P.I) for exponential function, polynomial function, sine & cosine functions and functions of the form where V is any one of the above – simple examples.
4) MATLAB–Simple Introduction.

References:

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

Applied Physics II

Course Code	BS 202
Course Title	Applied Physics-II
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	High School Level Physics
Course Category	Basic Science

Course Outcome:-

After the course the students will be able to-

CO1: Illustrate the phenomenon of Reflection & Refraction. (K3)
CO2: Identify the laws of electro-magneto statics to illustrate electrical components & instruments. (K4)
CO3: Explain and apply the Ohm's & Chirchoffs Laws to find solutions to electrical engineering problems.(K4)
CO4: Apply the concepts of semiconductor physics to identify the working of some modern electronic gadgets. (K3)
CO5: Explain the potential of LASER, nanotechnology and optical fibre in modern engineering & medical world. (K4)

Module- 1: Optics
Number of class hours: 3-4
Learning Outcomes:-

Students will be able to

- State basic optical laws. (K1)
- Illustrate the location of the images formed by mirrors and thin converging lens. (K3)
- Outline the conditions for total internal reflection. (K3)
- Outline the uses of microscope and telescope. (K2)

Content:-

Optics Basic optical laws; reflection and refraction, refractive index (expression and simple numerical problems), Images and image formation by lens, lens formula (expression only), power of lens, magnification and defects. Total internal reflection, Critical angle and conditions for total internal reflection, applications of total internal reflection in optical fiber.

Optical Instruments; Magnifying power, resolving power of simple and compound microscope and astronomical telescope in normal adjustment (Expression only), uses of microscope and telescope.

Module- 2: Electro-Magneto statics
Number of class hours: 6-7
Learning Outcomes:-

Students will be able to-

- Define electric field, electric lines of force, electric flux, potential difference, capacitor, capacitance, magnetic field, magnetic intensity, magnetic flux, magnetization and their units and properties. (K1)
- Explain the types of capacitor and types of magnetic material. (K2)
- Solve the simple numerical problems on capacitor and combination of capacitor. (K3)
- Explain the conversion of ammeter and voltmeter from galvanometer. (K4)

Content:-

Electrostatics 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 field intensity of straight charged conductor, plane charged sheet and charged sphere. Capacitor and its working, Types of capacitors, Capacitance and its units. Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors (related numerical).

Electromagnetism Types of magnetic materials; dia, para and ferromagnetic with their properties, Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and units, magnetization. Measuring instruments: Galvanometer, Ammeter, Voltmeter, Conversion of a galvanometer into ammeter and voltmeter.

Module- 3: Current Electricity
Number of class hours: 4-5
Learning Outcomes:-

Students will be able to

- Explain electric current, DC and AC current, concept of Resistance and its units, conductance, specific conductance,. Electric power, electric energy and its units. (K2)
- State Ohm's law, Kirchaff's law. (K1)
- Identify different resistances with their colour coding and the factors which affect their values. (K4)
- Apply the knowledge of electric energy over other form of energy to construct daily life appliances. (K3)

Content:- Current Electricity: Electric Current and its units, Direct and alternating current, Resistance and its units, Specific resistance, Conductance, Specific conductance, Series and parallel combination of resistances. Factors affecting resistance of a wire, carbon resistances and colour coding. Ohm's law and its verification, Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge only), Concept of terminal potential difference and Electro motive force (EMF)

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

Module- 4: Semiconductor Physics
Number of class hours: 10-12
Learning Outcomes:-

Students will be able to

- Explain the differences among insulators, semiconductors, conductors and intrinsic, extrinsic semiconductors. (K2)
- Apply the knowledge of diodes in rectifiers and various electronic circuits. (K3)
- Use the knowledge of semiconductor in various technical gadgets like mobile phones, computer, LED, photocells. (K3)

Content: - Semiconductor Physics Energy bands in solids, Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction, junction diode and V-I characteristics, types of junction diodes. Diode as rectifier – half wave and full wave rectifier (centre taped). Transistor; description and three terminals, Types- pnp and npn, some electronic applications (list only). Photocells, Solar cells; working principle and engineering applications.

Module- 5: Modern Physics
Number of class hours: 10-12
Learning Outcomes:-

Students will be able to

- Explain spontaneous and stimulated emission, population inversion, optical pumping etc. (K2)
- Identify the use optical fibre and LASER in the field of medicine and communication engineering. (K4)
- Discuss the importance of nanoscience and nanotechnology. (K2)
- Identify the impact of nanotechnology to the society. (K4)

Content:- Lasers: Energy levels, ionization and excitation potentials; spontaneous and stimulated emission; population inversion, pumping methods, optical feedback, Types of lasers; Ruby, He-Ne and semiconductor (characteristics only), engineering and medical applications of lasers.

Fiber Optics: Introduction to optical fibers, light propagation, acceptance angle and numerical aperture (Expression only), fiber types, applications in; telecommunication, medical and sensors.

Nanoscience and Nanotechnology: Introduction, nanoparticles and nanomaterials, properties at nanoscale, nanotechnology, nanotechnology based devices and applications.

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 Press India Pvt. Ltd, New Delhi.
8. Nanoscience and Nanotechnology, KK Choudhary, Narosa Publishing House, Pvt. Ltd. New Delhi.
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.

****

Introduction to IT Systems

Course Code	ES 203
Course Title	**Introduction to IT Systems**
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites (Course code)	NIL
Course Category	ES

Course Outcomes:

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

C.O.1: Comfortably work on Computer **(K2)**
C.O.2: Install and Configure Operating System **(K3)**
C.O.3: Assemble a PC and connect it to external devices **(K3)**
C.O.4: Write documents, create worksheets, and prepare presentations (**K2)**
C.O.5: Protect information and computers from basic abuses/attacks.**(K2)**

Course contents:

Module 1: Basic Internet skills and hardware components
No of. class hours: 5-8 hrs

Learning Outcomes: After completing this module students will be able to:

1) Understand browser**(K2)**
2) Explore search engines efficiently.**(K2)**
3) Understand various computer hardware components **(K2)**

Detail content of the unit:

Basic Internet skills: Understanding browser, efficient use of search engines, awareness about Digital India portals (state and national portals) and college portals
.
General understanding of various computer hardware components – CPU, Memory, Display, Keyboard, Mouse, HDD and other Peripheral Devices.

Module 2: Operating System Installation and shell commands
No of. Class hours: 6-8 hrs

Learning Outcomes: After completing this module students will be able to:
1) Install Operating System (Linux & MS Windows)**(K3)**
2) Apply and utilize different Unix Shell and Commands, vi editor **(K2)**

Detail content of the unit:

OS Installation (Linux and MS Windows), Unix Shell and Commands, vi editor.

Module 3: HTML4,CSS and personal webpage design
No of. Class hours: 6-8 hrs
Learning Outcomes: After completing this module students will be able to:

1) Understand and apply the basics of HTML4, CSS**(K2)**
2) Develop personal webpage**(K3)**

Detail content of the unit:

HTML4, CSS, making basic personal webpage.

Module 4: Office Tools
No of. Class hours: 5-7 hrs
Learning Outcomes: After completing this module students will be able to:

1) Understand OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress.**(K2)**
2) Create documents, spreadsheets and presentations**(K3)**

Detail content of the unit:

Office Tools: OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress.

Module 5: Information security
No of. Class hours:
Learning Outcomes: After completing this module students will be able to:

1) Understand different information security aspects**(K2)**
2) Analyze various security concepts**(K2)**

Detail content of the unit:
Information security best practices.

References:

1) R.S. Salaria, Computer Fundamentals, Khanna Publishing House
2) Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House
3) Online Resources, Linux man pages, Wikipedia
4) Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett

Fundamentals of Electrical & Electronics Engineering

Course Code	ES 204
Course Title	Elements of Electrical and Electronics Engineering.
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	NIL
Course Category	Engineering Science

Course Outcomes:

After Completion of the course students would be able to

CO1: Gather knowledge for different passive and active elements like resistors, inductors, capacitors, diode, transistors etc.(Cognitive level K1)

CO2: Analyse Resistive Circuits and Solve different resistive circuits with AC and DC

sources.(Cognitive level K4)

CO3: Analyse Single Phase AC Circuits, magnetic circuits and the power in these circuits. (Cognitive level K4)

CO4: To acquire the knowledge about the characteristics and working principles of semiconductor diodes, Bipolar Junction Transistor, FET, MOSFET etc..(Cognitive level K1)

CO5: To apply their knowledge on basics of Digital electronics.(Cognitive level K3)

Unit-I Overview of Active and Passive Components & Signals.

Total class hours-7

Learning Outcomes

After Completion of Unit-1 students would be able to

1. Define different types of active and passive components.(k1)
2. Define A.C & D.C quantities, periodic & nonperiodic signals.(k1)
3. Solve problems on Kirchhoff's voltage and current laws, Star-delta transformations(k3)

Content: Introduction to Passive and Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, Voltage Source, Current Source, A.C & D.C Signal, periodic/non-periodic signals, Kirchhoff's voltage and current laws, Star-delta transformations – Simple problems on all topics.

Unit-IIA.C. Circuits.

Total class hours-7

Learning Outcomes

After Completion of Unit-II students would be able to

1. Analyze the AC quantities with the help of frequency, Periodic time, RMS value, Average value etc.(k4)
2. Analyze the variables in R-L, R-C andR-L-C series/parallel circuit.(k4)
3. Analyze the power in AC circuits.(k4)

Content: 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; A.C in R-L series, R-C series, R-L-C series and parallel circuits; Power in A. C. Circuits, power triangle, simple numerical on all relevant topics.

Unit-III Electric and Magnetic Circuits.

Total class hours-9

Learning Outcomes

After Completion of Unit-III students would be able to

1. Differentiate between magnetic and electric circuits.(k4)
2. Analyze the different laws of electromagnetic induction.(k4)
3. Relate the different laws of electromagnetic induction in connection with transformer, DC motors and generators. (k4)

Content: 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. Basic construction, working principle and emf equations of transformer, DC motor and generator, simple numericals on all relevant topics.

Unit-IV Overview of Analog Circuits.

Total class hours-11

Learning Outcomes

After Completion of Unit-IV students would be able to

1. Differentiate various configurations of BJT.(k4)
2. Analyze the differences of operations between BJT and FET.(k4)
3. Apply Op-amp device to design electronic circuits for numerical computations. (k4)

Content: Semiconductor, type, biasing of PN diode, VI characteristics of PN diode, Rectifier-type and operation, Bipolar Junction Transistor-types, operation, configurations, applications, JFET and MOSFET-type, operation, VI characteristics, idea of drain resistancs, transconductance, amplification factor, Operational amplifiers- ideal Op-amp, practical Op-amp, open loop and closed loop configurations, design of adder, substractor, comparator, differentiator and integrator circuits, simple numericals on all relevant topics.

Unit-V Overview of Digital Electronics.

Total class hours-6

Learning Outcomes

After Completion of Unit-V students would be able to

1. Differentiate various logic gates used in digital circuits.(k4)
2. Minimize a logical function using Boolean algebra method.(k4)

Content: Difference between analog and digital operations, Logic levels, Logic gates, Boolean algebra, idea of combinational and sequential circuits, simple 13umerical on all relevant topics.

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

****

Engineering Mechanics

Course Code	:	ES 205
Course Title	:	Engineering Mechanics
Number of Credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	NIL
Course Category	:	ES

Course outcomes:

After completing this course, student will be able to:

C.O.1: Identify and determine the force systems for given conditions by applying the basics of mechanics (K2).

C.O.2: Determine unknown force(s) of different engineering systems (K3).

C.O.3: Apply the principles of friction in various conditions for useful purposes (K3).

C.O.4: Find the centroid and centre of gravity of various components in engineering systems (K2).

C.O.5: Analyze statically determinate Plane Trusses (K2).

Course Contents:

Unit – I Basics of mechanics and force system

No. of Lectures required: 5-8

Unit Learning Outcomes:

1. Identify flexible body and rigid body; Scalar and vector quantity (K1)
2. Recognize characteristics and effects of a force, Force system and its classification(K1)
3. Explain Orthogonal components and moment of a force(K2)
4. Determine resultant for concurrent, non-concurrent and parallel co-planar force systems(K2)

Contents:

Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units.

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.

Resolution of a force - Orthogonal components of a force, moment of a force, Varignon's Theorem.

Composition of forces – Resultant, analytical method for determination of resultant for concur- rent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon offorces.

Unit– II Equilibrium

No. of Lectures required: 10-12

Unit Learning Outcomes:

1. Express Conditions of Equilibrium (K2)

2. Identify plane structures and support conditions (K1)

3. Calculate Statically determinate Beam reaction subjected to combination of Point load and uniformly distributed load (K2)

4. Apply graphical methods of analyzing Statically determinate Beam reaction(K3)

Contents:

Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical meth- ods of analysing equilibrium

Lami's Theorem – statement and explanation, Application for various engineering problems. Types of beam, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical
and inclined point load, uniformly distributed load, couple),

Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load.

Beam reaction graphically for simply supported beam subjected to vertical point loads only.

Unit– III Friction

No. of Lectures required: 5-8

Unit Learning Outcomes:

1. Relate 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 (K1)

2. Apply conditions of Equilibrium of bodies on level surface subjected to force parallel and inclined to plane(K3)

3. Apply conditions of Equilibrium of bodies on inclined plane subjected to force parallel to the plane only (K3)

Contents:

Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, lim- iting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-effi- cient of friction and angle of friction.

Equilibriumofbodiesonlevelsurfacesubjectedtoforceparallelandinclinedto

plane. Equilibrium of bodies on inclined plane subjected to force parallel

to the planeonly.

Unit– IV Centroid and center of gravity

No. of Lectures required: 8-10

Unit Learning Outcomes:

1. Calculate Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle)(K2)

2. Determine Centroid of composite figures composed of not more than three geometrical figures (K2)

3. Identify 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 (K2)

Contents:

Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle)

Centroid of composite figures composed of not more than three geometrical figures

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.

Unit – V Trusses

No. of Lectures required: 10-12

Unit Learning Outcomes:

1. Describe Static Determinacy, Indeterminacy, and Instability of Plane Trusses(K2)
2. Determine Member forces by Method of joints(K2)
3. Determine Member forces by Method of Section(K2)

Contents:

Assumptions for Analysis of Trusses, Arrangement of Members of Plane Trusses—InternalStability,

Equations of Condition for Plane Trusses, Static Determinacy, Indeterminacy, and Instability of PlaneTrusses

Analysis of Plane Trusses by the Method of Joints

Analysis of Plane Trusses by the Method of Sections

Suggested Learning Resources:

1. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi(2008)
2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. NewDelhi.
3. Engineering Mechanics, devised by Ural Federal Universityhttps://www.edx.org/course/engineering-mechanics-2.
4. Engineering Mechanics, By Prof. K. Rameshhttps://onlinecourses.nptel.ac.in/noc19_me41/preview.
5. Dhade, Jamadar &Walawelkar, Fundamental of Applied Mechanics, Pune VidhyarthiGruh.
6. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, Cam- bridge UniversityPress.
7. Meriam, J. L., Kraige, L.G., Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

****

Applied Physics II Lab

Course Code	BS 206
Course Title	Applied Physics-II Lab
Number of Credits	3 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Basic Science

Course Outcome:

Students will be able to:-

C.O.1: Illustrate Ohm's law, Kirchoff's law and the laws of reflection & refraction. (K3)

C.O.2: Use lens equations to find focal length and magnifying power of a lens. (K3)

C.O.3: Analyze the conversion of Galvanometer in to ammeter and voltmeter. (K4)

C.O.4: Illustrate V-I Characteristics of semiconductor diode. (K3)

C.O.5: Explain the operation of OHP/ LCD projector. (K2)

List of Practical/Activities: (To perform minimum 6 Practical)

1. To verify laws of reflection from a plane mirror/ interface.

2. To verify laws of refraction (Snell's law) using a glass slab.

3. To determine focal length and magnifying power of a convex lens using optical bench.

4. To verify Ohm's law by plotting graph between current and potential difference.

5. To verify laws of resistances in series and parallel combination.

6. To find the frequency of AC main using electrical vibrator.

7. To verify Kirchhoff's law using electric circuits.

8. To convert a galvanometer into an ammeter/ voltmeter.

9. To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage.

10. Study of an optical projection system (OHP/LCD) - project report.

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., 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.

Introduction to IT Systems Lab

Course Code	ES 207
Course Title	**Introduction to IT Systems Lab**
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites (Course code)	Nil, should be doing ES102 in parallel
Course Category	ES

Course Outcomes:

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

C.O.1: Comfortably work on Computer **(K2)**
C.O.2: Install and configure Operating System **(K3)**
C.O.3: Assemble a PC and connect it to external devices **(K3)**
C.O.4: Write documents, create worksheets, and prepare presentations **(K2)**
C.O.5: Protect information and computers from basic abuses/attacks. **(K2)**

Course contents:

Module 1: Basic Internet skills and hardware components
No of. Class hours: 5-8 hrs
Learning Outcomes: After completing this module students will be able to:

1) Understand browser **(K2)**
2) Explore search engines efficiently.**(K2)**
3) Understand various computer hardware components **(K2)**

Detail content of the unit:

1. Browser features, browsing, using various search engines, writing search queries
2. Visit various e-governance/Digital India portals, understand their features, services offered
3. Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognize various ports/interfaces and related cables, etc.

Module 2: OS Installation and peripheral connection
No of. Class hours: 6-8 hrs
Learning Outcomes: After completing this module students will be able to:

1) Install Operating System (Linux & MS Windows)**(K3)**
2) Understand different peripherals& connect them to computer **(K2)**

Detail content of the unit:

1. Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times
2. Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.

Module 3: HTML4 and personal webpage design
No of. Class hours: 6-8 hrs
Learning Outcomes: After completing this module students will be able to:

1) Understand and apply the basics of HTML4**(K2)**
2) Develop personal webpage**(K3)**

Detail content of the unit:

1. Practice HTML commands, try them with various values, make your own Webpage

Module 4: Office Tools
No of. Class hours: 5-7 hrs
Learning Outcomes: After completing this module students will be able to:

1) Understand OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress.**(K2)**
2) Create documents, spreadsheets and presentations**(K3)**

Detail content of the unit:

1. Explore features of Open Office tools, create documents using these features, do it multiple times

Module 5: Operating System security features
No of. Class hours: 5-7 hrs
Learning Outcomes: After completing this module students will be able to:

1) Understand and different OS security features**(K2)**
2) Utilize various OS security features**(K2)**

Detail content of the unit:

1. Explore security features of Operating Systems and Tools, try using them and see whathappens.

References:

1. R.S. Salaria, Computer Fundamentals, Khanna Publishing House.
2. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.

3. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and
4. Shell programming, by Mokhtar Ebrahim, Andrew Mallett.
5. IT Essentials PC Hardware and Software Companion Guide, Davis Anfinson and Ken Quamme,
6. CISC Press, Pearson Education.
7. PC Hardware and A+ Handbook, Kate J. Chase PHI (Microsoft).

****

Fundamental of Electrical and Electronics Engineering Lab

Course Code	EEL 208
Course Title	Fundamentals of Electrical and Electronics Engineering Lab.
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	Engineering Science

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

1. Understand and demonstrate basic principle and operation of electric circuits and machines(K1).

2. Apply their knowledge for solving basic problems related to electrical circuits, magnetic circuits and machines(K3).

3. Identify different active and passive components. (K2)

4. Apply their knowledge to test the performances of diodes.(K3)

5. Analyse voltage, current and power in single phase AC circuits.(K4)

Sl No	Name of the Experiment
1	Identify various passive components in the given circuit
2	Identify various active components in the given circuit
3	Determine the value of given resistor using digital multimeter to confirm with colour code.
4	Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter
5	Measure voltage, current and power in 1-phase circuit with resistive load.
6	Measure voltage, current and power in R-L series circuit.
7	Measure voltage, current and power in R-C series circuit.
8	Determine the permeability of magnetic material by plotting its B-H curve
9	Determine the transformation ratio (K) of 1-phase transformer.
10	Test the PN-junction diodes using digital multimeter.
11	Test the performance of LED
12	Identify three terminals of a transistor using digital multimeter.

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

****

Engineering Mechanics Lab

Course Code	:	ES 209
Course Title	:	Engineering Mechanics Lab.
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	ES

Course outcomes:

After completing this course, student will be able to:

C.O.1: Identify and determine the force systems for given conditions by applying the basics of mechanics (K2).

C.O.2: Determine unknown force(s) of different engineering systems(K3).

C.O.3: Apply the principles of friction in various conditions for useful purposes (K3).

C.O.4: Find the centroid and centre of gravity of various components in engineering systems (K2).

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 Single purchase crab.
5. Derive Law of machine using double purchase crab.
6. Determine resultant of concurrent force system applying Law of Polygon of forces using force table.
7. Determine resultant of concurrent force system graphically.
8. Determine resultant of parallel force system graphically.
9. Verify Lami's theorem.
10. Study forces in various members of Jib crane.
11. Determine support reactions for simply supported beam.
12. Obtain support reactions of beam using graphical method.
13. Determine coefficient of friction for motion on horizontal and inclined plane.
14. Determine centroid of geometrical plane figures.

Suggested Learning Resources:

1. Bedi D.S., Engineering Mechanics, Khanna PublishingHouse
2. Khurmi, R.S., Applied Mechanics, S.Chand & Co. NewDelhi.
3. Bansal R K, A text book of Engineering Mechanics, LaxmiPublications.
4. Ramamrutham, Engineering Mechanics, S.,S Chand & Co. NewDelhi.
5. Dhade, Jamadar &Walawelkar, Fundamental of Applied Mechanics, Pune VidhyarthiGruh.
6. Ram, H. D.; Chauhan, A. K. Foundations and Applications of Applied Mechanics, Cambridge Uni- versityPress.
7. Meriam, J. L., Kraige, L.G. , Engineering Mechanics- Statics, Vol. I, Wiley Publication, NewDelhi.

Environmental Science

Course Code	AU 210
Course Title	Environmental Science
Number of Credits	0 (non-credit) (L:2, T:0, P:0)
Prerequisites	High School Science
Course Category	Audit

Course outcomes:

At the end of the course student will be able to:
C.O.1: Know the ecosystem and terminology and solve various engineering problems applying ecosystem knowledge to produce eco – friendly products. (**K_1 and K_3**)
C.O.2: Identify the factors of air and noise pollution, and know the acts and the control measures. (**K_1**and K_2)
C.O.3: Explain the water and soil pollution, and know the acts and the control measures. (**K_1 and K_2**)
C.O.4: Illustrate different renewable energy resources and efficient process of harvesting. (**K_3**)
C.O.5: Describe solid Waste Management, ISO 14000 & Environmental Management (**K_2**)

Course Content:

Unit-1: Ecosystem

Number of class Hours:- 6
Learning outcomes:
At the end of the unit- 1 student will be able to
1. Know the structure of ecosystem and various components (**K_1**)
2. Know Carbon, Nitrogen, Sulphur, Phosphorus cycle (**K_1**)
3. Solve various issues like Global warming, Green House Effect etc. (**K_3**)

Content:-
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

Number of class Hours:-6
Learning outcomes:

At the end of the unit- 2 students will be able to
1. Know about air and noise pollution, effect and control of air and noise pollution ($\mathbf{K_1}$)
2. Identify the factors air and noise pollution ($\mathbf{K_2}$)

Content:-

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

Number of class Hours:-6

Learning outcomes:
At the end of the unit- 3 students will be able to
1. Know about water and soil pollution, effect and control of air and noise pollution ($\mathbf{K_1}$)
2. Explain the water and waste treatment process ($\mathbf{K_2}$)
3. Explain the preventive measures of soil pollution ($\mathbf{K_2}$)

Content:-

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

Number of class Hours:-6

Learning outcomes:
At the end of the unit- 4 students will be able to
1. Know about solar energy, Hydrogen energy, Ocean energy resources and Tidal energy conversion ($\mathbf{K_1}$)
2. Illustrate the production and utilization of biomass ($\mathbf{K_3}$)
3. Illustrate the benefits of wind energy ($\mathbf{K_3}$)

Content:-

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

Number of class Hours:-6

Learning outcomes
At the end of the unit- 5 students will be able to
1. Knowabout solid waste, E-waste and bio-medical waste ($\mathbf{K_1}$)
2. Describe about solid waste management and various environmental act ($\mathbf{K_2}$)

Content:-

Solid waste generation- Sources and characteristics of: Municipal solid waste, E- waste, biomedical 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.

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.
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)

.

****