

# **REVISED COURSE CURRICULUM FOR SECOND SEMESTER**

**(COMMON TO ALL BRANCHES OF ENGINEERING COURSES)**

**W.E.F. 2023-24**



**BOARD OF TECHNICAL EDUCATION**

**MUNI MAYA RAM MARG**

**PITAMPURA, DELHI-110034**

## **Second Year Curriculum Structure Common to All Branches**

- 1. Computer Engineering**
- 2. Electronics & Communication Engineering**
- 3. Information Technology Enabled Services And Management**
- 4. Instrumentation & Control Engineering**
- 5. Electronic Engineering (Digital Electronics)**
- 6. Medical Electronics**
- 7. Electrical Engineering**
- 8. Civil Engineering**
- 9. Mechanical Engineering**
- 10. IC Manufacturing**

**STUDY SCHEME / CREDIT**

Sl. No	Category of Course	Code No.	Course Title	Hours per week			Total contact hrs/ week	Marking Scheme		Credits
				L	T	P		Internal	External (3hr.)	
1.	Basic Science	BS102	Mathematics-II	3	2	0	5	50	100	5
2.	Basic Science	BS104	Applied Physics-II	2	1	0	3	50	100	3
3.	Engineering Science	ES102	Introduction to IT Systems	2	0	0	2	50	100	2
4.	Engineering Science	ES104	Fundamentals of Electrical & Electronics Engineering	2	0	0	2	50	100	2
5.	Engineering Science	ES106	Engineering Mechanics	2	1	0	3	50	100	3
6.	Basic Science	BS106	Applied Physics-II Lab	0	0	2	2	50	50	1
7.	Engineering Science	ES108	Introduction to IT Systems Lab	0	0	4	4	50	50	2
8.	Engineering Science	ES110	Fundamentals of Electrical & Electronics Engineering Lab	0	0	2	2	50	50	1
9.	Engineering Science	ES112	Engineering Mechanics Lab	0	0	2	2	50	50	1
10.	Audit	AU102	Environmental Science	2	0	0	2	50	100	2
<b>Total Credits</b>								<b>500</b>	<b>800</b>	<b>22</b>

<b>Detailed First Year Curriculum Contents</b>		
<b>SEMESTER - II</b>		
Course Code	:	BS102
Course Title	:	Mathematics- II
Number of Credits	:	5 (L:3, T:2, P:0)
Prerequisites	:	NIL
Course Category	:	BS

### **Course Objectives:**

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 Order Differential Equations.

### **Course Content:**

#### **UNIT - I: Determinants and Matrices**

Elementary properties of determinants up to 3rd order, consistency of equations, Cramer's rule. Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.

#### **UNIT - II: Integral Calculus**

**Indefinite Integration:** Primitive of a function, Integration as inverse operation of differentiation. Simple integration by substitution, by parts and by partial fractions. Evaluation of simple integrals of the following types and problems based on them.

$$\int \frac{1}{x^2 \pm a^2} dx, \int \frac{1}{\sqrt{x^2 \pm a^2}} dx, \int \frac{1}{a^2 - x^2} dx \text{ and } \int \frac{1}{\sqrt{a^2 - x^2}} dx$$

**Definite Integrals:** Fundamental Theorem of Integral Calculus (Statement only) and evaluation of Definite Integrals by using it, Evaluation of Definite Integrals by using substitution, simple properties of Definite Integrals (Statement only not their application for evaluation of Definite Integrals). Evaluation of integrals of form  $\int_0^{\pi/2} \sin^n x dx$ ,  $\int_0^{\pi/2} \cos^n x dx$  and  $\int_0^{\pi/2} \sin^m x \cos^n x dx$  for solving problems, where m and n are positive integers.

#### **UNIT - III: Co-Ordinate Geometry**

**Straight Lines:** Equation of straight line in various standard forms (without proof), intersection of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula.

**Circles:** General equation of a circle and its characteristics. 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;

**Conic Sections:** Definition of conics (Parabola, Ellipse, Hyperbola) their standard equations without proof. Problems on conics when their foci, directories or vertices are given.

#### **UNIT - IV: Vector Algebra**

Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector products of 2 vectors. Simple problems related to work, moment and angular velocity.

#### **UNIT-V: Differential Equations**

Definition, Order and Degree, General and Particular solutions of a Differential Equation. Solution of first order and first degree differential equation by variable separation method (simple problems)

#### **References:**

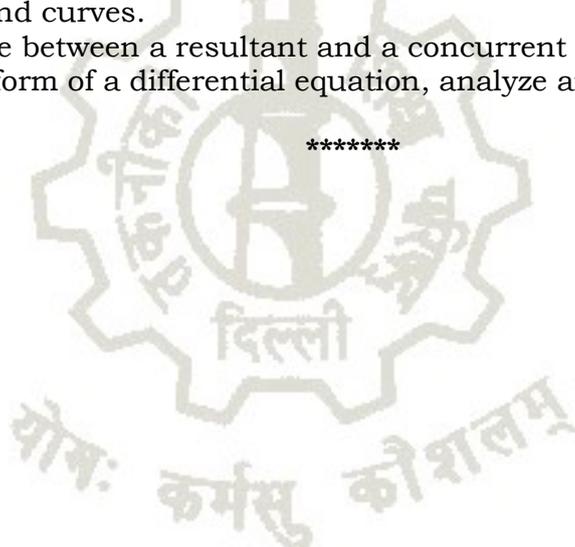
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40<sup>th</sup> Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol. I & II, Jalandhar.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

#### **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.

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Course Code	:	BS104
Course Title	:	Applied Physics –II
Number of Credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	High School Level Physics
Course Category	:	BS

### Course Objectives

Applied Physics aims to give an understanding of this world both by observation and by prediction of the way in which 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 broad-based 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.

### Course Content

#### UNIT - 1: Wave motion and its applications

Wave motion, Concept of wave motion, characteristics of wave motion, types of wave motion, various terms related to wave motion, equation of a plane progressive wave, principle of superposition of waves and its applications to interference, beats and stationary waves (Graphical only).

Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency etc. Study of vibration of cantilever and determination of its time period, Free, forced and resonant vibrations with examples.

Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications, Ultrasonic waves – Introduction and properties, engineering and medical applications of ultrasonic.

#### UNIT - 2: Optics

Basic optical laws; reflection and refraction, refractive index, Image formation by thin lenses, lens formula, 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; simple and compound microscope, astronomical telescope in normal adjustment, magnifying power, resolving power, uses of microscope and telescope, optical projection systems.

### **UNIT - 3: 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), dielectric and its effect on capacitance, dielectric break down.

### **UNIT - 4: 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.

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.

### **UNIT - 5: 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.

Concept of electromagnetic induction, Faraday's Laws, Lorentz force (force on moving charge in magnetic field). Force on current carrying conductor, force on rectangular coil placed in magnetic field.

Moving coil galvanometer; principle, construction and working, Conversion of a galvanometer into ammeter and voltmeter.

### **UNIT - 6: 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 tapped).

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

Photocells, Solar cells; working principle and engineering applications.

### **UNIT - 7: Modern Physics**

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, laser characteristics, engineering and medical applications of lasers.

Radioactivity: Atomic Nucleus, Units of Mass and Energy, Natural and Artificial Radioactivity, Radio Isotopes and its uses, Nature of Radioactive Radiations ( $\alpha$ -particle,  $\beta$ - particle and  $\gamma$ - particle), Laws of Radioactive Disintegration, The Law of exponential Decay, Half Life Time and Mean Life Time (No derivation), Relation between Half Life Time and Mean Life Time, Units of Radioactivity, Carbon Dating, Mass Defect and Nuclear Binding Energy, Nuclear Fission, Nuclear Chain Reaction, Controlled Chain Reaction and Nuclear Reactor, Nuclear Fusion, Health hazards of Radioactive Radiations, Prevention of Radiation hazards.

**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 simple problems. Establish wave parameters: frequency, amplitude, wavelength, and velocity and able to explain diffraction, interference, polarization of waves.
- b) Explain ultrasonic waves and engineering, medical and industrial applications of Ultrasonic's. 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 thin converging lens, 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 total internal reflection.
- e) Define capacitance and its unit, explain the function of capacitors in simple circuits, and solve simple 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, calculate the equivalent resistance of a variety of resistor combinations, distinguish between AC and DC currents, determine the energy consumed by an appliance
- i) State the laws of electromagnetic induction, describe the effect on a current-carrying conductor when 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 instruments and optical devices.
- m) Express importance and use of radioactivity, radio isotopes & nuclear energy.

**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. e-books/e-tools/ learning physics software/websites etc.
8. A text book of Basic Applied Physics by H.R. Meena, N. Pant, etal, Suhavi Publication, New Delhi
9. A text book of Basic Applied Physics by Dr. P. Kaur, Amit Sharma, Satya Prakashan Publication, Delhi

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Course Code	:	ES102
Course Title	:	Introduction to IT Systems
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	ES

**Course 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 1:**

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.

**UNIT 2:**

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

**UNIT 3:**

HTML4, CSS, making basic personal webpage, javascript

**UNIT 4:**

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

**UNIT 5:**

Information security best practices. Class lectures will only introduce the topic or demonstrate the tool, actual learning will take place in the Lab by practicing regularly.

**Suggested Lab Work:**

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. This course is all about some theory and a lot of practice.

**References:**

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

**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.

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

**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 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 Components: Types of Circuit Elements, Resistances, Inductors, Capacitors, Series and Parallel Circuits

Active Components: Formation of P N Junction Diode, Concept of PNP and NPN Transistor with their applications, Concept of FET, MOSFET & CMOS with their applications

Signals: Classification of Signals, Electrical signal

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

Introduction; Basics of Op-Amp; Op-Amp parameters; Ideal Op-Amp; Op-Amp operating modes, Applications of OP-AMP .

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

Introduction; Number System; Number Conversion; Rules and laws of Boolean Algebra; **Logic Gates:** positive and negative logic, types of logic gates; Combinational Circuits (Half adder, full adder, Decoder, MUX), Sequential Circuits (flipflops: RS, JK, T). Introduction to Digital IC Logic Gates (TTL only), Digital IC Applications.

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

Parameters of an Electric Circuit; Ohm's Law; Electric Circuit Analysis: Kirchoff's Current Law (KCL), Kirchoff's Voltage Law (KVL); Parameters of a Magnetic Circuit; Electromagnetic Induction; Faraday's Law of Electromagnetic; Lenz's Law; Dynamically induced emf; statically induced emf; Analogy between electric and magnetic circuit.

**Unit V - A.C. Circuits:**

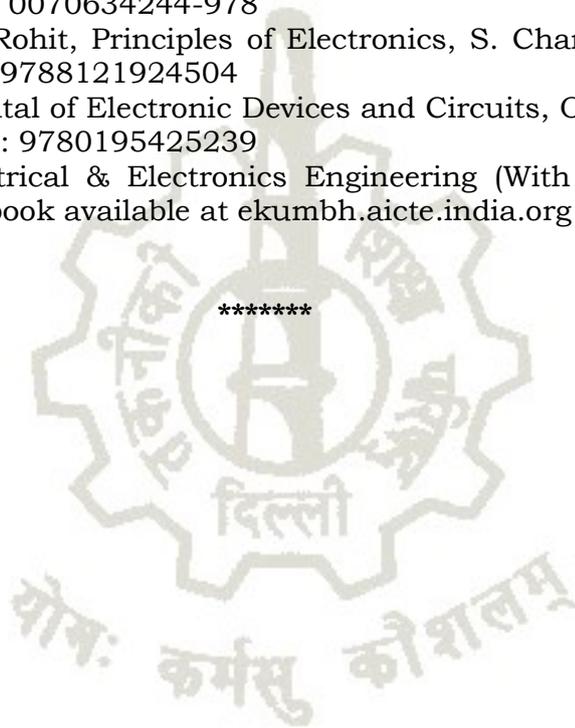
Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor, Peak Factor, impedance, phase angle and power factor; Mathematical and phasor representation of alternating emf and current; Voltage and Current relationship in Star and Delta connections; A.C in resistors,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

**Unit VI - Transformer and Machines:**

General construction and principle of different type of transformers; Emf equation and transformation ratio of transformers; Auto transformers; basic concept of single phase and three phase induction motor (without any derivation)

**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
11. Fundamental of Electrical & Electronics Engineering (With Lab Manual) by Prof. Susan S. Mathew. E-book available at [ekumbh.aicte.india.org](http://ekumbh.aicte.india.org)



Course Code	:	ES106
Course Title	:	Engineering Mechanics
Number of Credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	NIL
Course Category	:	ES

### 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:

#### Unit – I Basics of mechanics and force system

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 concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.

#### Unit- II Equilibrium

Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods 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

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.

Equilibrium of bodies on level surface subjected to force parallel and inclined to plane.

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

#### Unit- IV Centroid and centre of gravity

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 Simple lifting machine**

Simple lifting machine, load, effort, mechanical advantage, applications and advantages.  
Velocity ratio, efficiency of machines, law of machine.

Ideal machine, friction in machine, maximum Mechanical advantage and efficiency,  
reversible and non-reversible machines, conditions for reversibility

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 pulley block, geared pulley block.

### **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.

### **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.

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शोकः कर्मसु कौशलम्

Course Code	:	BS106
Course Title	:	Applied Physics –II Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	BS

### Course Objectives:

Concrete use of physical principles and analysis in various fields of engineering and technology is very prominent. 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 confidence in handling equipment and thus learn various skills in measurement.

### List of Practical/Activities: (To perform any 08 Practical)

1. To determine and verify the time period of a cantilever.
2. To determine the velocity of sound in air at room temperature using Resonance tube apparatus.
3. To determine focal length and magnifying power of a convex lens.
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 verify Kirchhoff's law using electric circuits.
7. To find resistance of a galvanometer by half deflection method.
8. To convert a galvanometer into an ammeter.
9. To convert a galvanometer into a voltmeter.
10. To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage.
11. To measure wavelength of a He-Ne/diode laser using a diffraction grating.
12. 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.
- 15-20% of the topics which are relatively simpler or descriptive in nature should be given to the students for self-learning and assess the development of competency

through classroom presentations/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 sound in air.
- 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) Analyse electrical circuits and verify Kirchhoff's law governing electrical circuits.
- h) Measure resistance of a galvanometer and how it is converted into an ammeter and voltmeter.
- i) Investigate characteristics of semiconductor diodes, photoelectric cells and determine operational parameters associated with their performance.
- j) Work with laboratory lasers and understand method to measure the wavelength of the light emitted from a laser.
- k) 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. 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 & PoonamTandan; 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. Basic Applied Physics by H.R. Meena, Dr. N. Pant, Suhavi Publications, Delhi
9. Basic Applied Physics by Dr. P. Kaur, Amit Sharma, Satya Prakashan, Delhi
10. Applied Physics Vol.-I, Vol.-II by Vibha Jain, Dhanpat Rai & Co.

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Course Code	:	ES108
Course Title	:	Introduction to IT Systems Lab
Number of Credits	:	2 (L: 0, T: 0, P: 4)
Prerequisites	:	NIL, Should be doing ES102 in parallel
Course Category	:	ES

### Course 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:

S.No.	Topics for Practice
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, recognise various ports/interfaces and related cables, etc.
4	Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times
5	Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
6	Practice HTML commands, try them with various values, make your own Webpage
7	Explore features of Open Office tools, create documents using these features, do it multiple times
8	Explore security features of Operating Systems and Tools, try using them and see what happens.
9	Design a Static Website for your Institute

This is a skill course. More you practice, better it will be.

### 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.

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Course Code	:	ES110
Course Title	:	Fundamental 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. Any **Ten (10)** number of practical experiments are to be performed

S.No.	Practical Outcomes (PrOs)
1	Realization of Truth Table of different Logic Gates (TTL only) and verification of DeMorgan's Theorem.
2	Measure voltage, current and power in 1-phase circuit with resistive load.
3	Measure voltage, current and power in R-L series circuit.
4	Determine the transformation ratio (K) of 1-phase transformer.
5	Connect single phase transformer and measure input and output quantities.
6	To reverse the direction of rotation of 1 phase and 3 phase induction motor
7	Identify various passive electronic components in the given circuit
8	Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter.
9	Connect capacitors in series and parallel combination on bread board and measure its value using multimeter.
10	Identify various active electronic components in the given circuit.
11	Use multimeter to measure the value of given resistor.
12	Use LCR-Q tester to measure the value of given capacitor and inductor.
13	Determine the value of given resistor using digital multimeter to confirm with colour code.
14	Test the PN-junction diodes using digital multimeter.
15	Identify three terminals of a transistor using digital multimeter.
	<b>TOTAL</b>

### 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
11. Fundamental of Electrical & Electronics Engineering (With Lab Manual) by Prof. Susan S. Mathew. E-book available at ekumbh.aicte.india.org

**Suggested Softwares/Learning Websites:**

- a. [en.wikipedia.org/wiki/Transformer](http://en.wikipedia.org/wiki/Transformer)
- b. [www.animations.physics.unsw.edu.au//jw/AC.html](http://www.animations.physics.unsw.edu.au//jw/AC.html)
- c. [www.alpharubicon.com/altenergy/understandingAC.htm](http://www.alpharubicon.com/altenergy/understandingAC.htm)
- d. [www.electronics-tutorials](http://www.electronics-tutorials)
- e. [learn.sparkfun.com/tutorials/transistors](http://learn.sparkfun.com/tutorials/transistors)
- f. [www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf](http://www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf)
- g. [www.technologystudent.com/elec1/transis1.htm](http://www.technologystudent.com/elec1/transis1.htm)
- h. [www.learningaboutelectronics.com](http://www.learningaboutelectronics.com)
- i. [www.electrical4u.com](http://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.

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Course Code	:	ES112
Course Title	:	Engineering Mechanics Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	ES

### 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 (Any Ten):

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. 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 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.

### 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.

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Course Code	:	AU102
Course Title	:	Environmental Science
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	High School Science
Course Category	:	AU

### Course Objectives:

Technicians working in industries or elsewhere essentially require the knowledge of environmental science so as to enable them to work and produce most efficient, economical and eco-friendly finished products.

- Solve various engineering problems applying ecosystem to produce eco – friendly products.
- Use relevant air and noise control method to solve domestic and industrial problems.
- Use relevant water and soil control method to solve domestic and industrial problems.
- To recognize relevant energy sources required for domestic and industrial applications.
- Solve local solid and e-waste problems.

### Course Content:

#### Unit-1 Ecosystem

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

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

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**

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 06 hrs.**

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 act 1996.

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, New Delhi
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 Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099-
4. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.
5. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
6. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
7. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07-451871-8.
8. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York; 1978, ISBN: 9780070354760.
9. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.

10. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6
11. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
12. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

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

- 1) [www.eco-prayer.org](http://www.eco-prayer.org)
- 2) [www.teriin.org](http://www.teriin.org)
- 3) [www.cpcp.nic.in](http://www.cpcp.nic.in)
- 4) [www.cpcp.gov.in](http://www.cpcp.gov.in)
- 5) [www.indiaenvironmentportal.org.in](http://www.indiaenvironmentportal.org.in)
- 6) [www.whatis.techtarget.com](http://www.whatis.techtarget.com)
- 7) [www.sustainabledevelopment.un.org](http://www.sustainabledevelopment.un.org)
- 8) [www.conserve-energy-future.com](http://www.conserve-energy-future.com)

**Course outcomes**

At the end of the course student will 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.

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