Common for All Branches

MATHEMATICS- II

Course Code	2001
Course Title	Mathematics-II
Number of Credits	5(L-3, T-2,P-0)
Prerequisites	None
Course Category	Basic Science

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 OUTCOMES

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

1. The students are expected to acquire necessary background in Determinants and Matrices so as to appreciate the importance of the Determinants.
2. The Basic concepts of Integration and Differential equations and able to apply them in Engineering problems.
3. The coordinate geometry provides a connection between algebra and geometry through graphs of lines and curves.
4. The concept of Vectors and able to apply them in Engineering problems.

COURSE CONTENT

1. **DETERMINANTS AND MATRICES** **(L-8)**
   - 1.1 Algebra of matrices.
   - 1.2 Elementary properties of determinants up to 3rd order.
   - 1.3 Consistency of equations, Crammer's rule.
   - 1.4 Inverse of a matrix.
   - 1.5 Inverse Matrix method to solve a system of linear equations in 3 variables.

2. INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS **(L-8)**

- 2.1 Integration as inverse operation of differentiation.
- 2.2 Simple integration by substitution, by parts and by partial fractions (for linear factors only).
- 2.3 Use of formulas $\int_0^{\pi/2} sin^m x\ cos^n x\ dx$ for solving problems Where m and n are positive integers.
- 2.4 Definition of Differential Equation, Order and Degree of Differential Equation

3. **TWO-DIMENSIONALCO-ORDINATE GEOMETRY** **(L-9)**
   - 3.1 General Introduction, Distance formula and section formula.
   - 3.2 Equation of straight line in various standard forms.
     - 3.2.1 Slope form, Intercept form, Perpendicular form.
     - 3.2.2 One-point slope form, Two-point form, General form (without proof).
   - 3.3 Angle between two lines, Parallel and perpendicular lines.
   - 3.4 Perpendicular distance formula.

4. CIRCLE AND CONICS **(L-5)**

- 4.1 General equation of a circle and its characteristics.
- 4.2 To find the equation of a circle, given:
  - 4.2.1 Centre and radius,
  - 4.2.2 Three points lying on it
  - 4.2.3 Coordinates of end points of a diameter

5. **VECTOR ALGEBRA** **(L-3)**

5.1 Definition notation and rectangular resolution of a vector.

5.2 Addition and subtraction of vectors.

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

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Common for All Branches

APPLIED PHYSICS –II

Course Code	**2002**
Course Title	**Applied Physics-II**
Number of Credits	**4 (L-3,T-1,P-0)**
Prerequisites	**None**
Course Category	**Basic Science**

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.

COURSE OUTCOMES

After undergoing this subject, the student will be able to

1. Describe waves and wave motion, periodic and simple harmonic motions and solve simple problems. Establish wave parameters: frequency, amplitude, wavelength, and velocity.
2. State basic optical laws, establish the location of the images formed by mirrors and thin converging lens, design and assemble microscope using lenses combination.
3. Describe refractive index of a liquid or a solid and will be able to explain conditions for total internal reflection.
4. Define capacitance and its unit, explain the function of capacitors in simple circuits, and solve simple problems.
5. Differentiate between insulators, conductors and semiconductors, and define the terms: potential, potential difference, electromotive force.
6. Express electric current as flow of charge, concept of resistance, measure of the parameters: electric current, potential difference, resistance.
7. 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,
8. State the laws of electromagnetic induction; describe the effect on a current-carrying conductor when placed in a magnetic field.
9. Explain the operation of appliances like moving coil galvanometer, simple DC motors.
10. Apply the knowledge of diodes in rectifiers. Use the knowledge of semiconductors in various technical gadgets like photocells, solar lights etc.
11. Illustrate the conditions for light amplification in various LASER and laser based instruments and optical devices.
12. Appreciate the potential of optical fiber in fields of medicine and communication.
13. Express importance of nano-science and nanotechnology and impact of nanotechnology to the society.

Teaching Approach

1. 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.
2. Use of demonstration can make the subject interesting and develop scientific temper in the students. Student activities should be planned on all the topics.
3. Activity- Theory - Demonstrate/practice approach may be followed throughout the course so that learning may be outcome and employability based

COURSE CONTENTS

1. **WAVE MOTION AND ITS APPLICATIONS** 6

1.1 Wave motion
1.2 Transverse and longitudinal waves with examples
1.3 Definitions of wave velocity, frequency and wave length and their relationship
1.4 Principle of superposition of waves
1.5 Stationary waves and Resonance tube
1.6 Simple Harmonic Motion (SHM):

1.6.1 Definition.
1.6.2 Simple harmonic progressive wave and energy transfer

2. **OPTICS** 6

2.1 Basic optical laws
2.1.1 Reflection and refraction
2.1.2 Lens formula, power of lens (only formula)
2.2 Total internal reflection
2.2.1 Critical angle and conditions for total internal reflection
2.2.2 Applications of total internal reflection in optical fiber
2.3 Optical Instruments
2.3.1 Simple and compound microscope (introduction and uses)

3. ELECTROSTATICS AND CURRENT ELECTRICITY 6

3.1 Coulombs law, Unit of charge
3.2 Electric field, Electric lines of force and their properties
3.3 Electric flux
3.4 Electric Current and its units
3.4.1 Direct and alternating current
3.5 Kirchhoff's law
3.6 Wheatstone bridge and its applications (meter bridge)
3.7 Concept of terminal potential difference and Electro motive force (EMF)

4. ELECTROMAGNETISM 7

4.1 Magnetic field and its units
4.1.1 Magnetic intensity
4.1.2 Magnetic lines of force
4.1.3 Magnetic flux and units
4.2 Concept of electromagnetic induction
4.2.1 Faraday's Laws and Lenz's law
4.3 Magnetic Force on moving charge
4.3.1 Force on current carrying conductor
4.3.2 Force on rectangular coil placed in magnetic field
4.4 Moving coil galvanometer:-principle, construction and working
4.4.1 Conversion of a galvanometer into ammeter and voltmeter

5. 5 SEMICONDUCTOR AND MODERN PHYSICS 11

5.1 Energy bands in solids
5.2 Types of materials (insulator, semi-conductor, conductor)
5.3 p-n junction
5.3.1 Junction diode and V-I characteristics
5.3.2 Types of junction diodes (Zener and Photo Diode)
5.3.3 Diode as rectifier – half wave and full wave rectifier (centre taped)
5.4 Lasers:
5.4.1 Energy levels, ionization and excitation potentials
5.4.2 Spontaneous and stimulated emission
5.4.3 Population inversion
5.4.4 Pumping methods
5.4.5 Types of lasers (Ruby and He-Ne Laser)
5.4.6 Laser characteristics
5.4.7 Engineering and medical applications of lasers
5.5 Nanoscience and Nanotechnology:
5.5.1 Introduction only

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, AjoyGhatak 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.

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Common for All Branches

INTRODUCTION TO IT SYSTEMS

Course Code	**2003**
Course Title	**Introduction to IT Systems**
Number of Credits	**3 (L-3,T-0,P-0)**
Prerequisites	**None**
Course Category	**Engineering Science**

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 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 CONTENTS

1. BASIC COMPUTER & INTERNET SKILLS

1.1 General understanding of various computer components: Block Diagram of Computer
- 1.1.1 CPU, Memory, Display, Keyboard, Mouse
- 1.1.2 HDD and Pen Drive
- 1.1.3 Peripheral Devices (Printers, Scanners, Web camera & Barcode Reader)

1.2 Computer Languages: Machine, Assembly & High-level Language

1.3 Computer & Communication: Meaning of Web Address, URL, IP address, E-mail

1.4 Awareness about Digital India portals (state and national portals) and college portals.

2. OPERATING SYSTEMS

2.1 Introduction and Definition Operating Systems

2.2 Brief Introduction to Types of Operating Systems

2.3 OS Installation:
- 2.3.1 MS Windows

2.4 Brief Introduction to Unix Shell

3. BASICS OF WEB DEVELOPMENT

3.1 CSS: Introduction
- 3.1.1 Font Attributes
- 3.1.2 Colour, Background

3.2 Making basic personal webpage

4. OFFICE TOOLS

4.1 Open Office Writer:
- 4.1.1 Writer Interface
- 4.1.2 Starting, Opening, Saving, Closing & Printing a document
- 4.1.3 Selecting, Cutting, Pasting, Finding & Replacing a text
- 4.1.4 Formatting Paragraph
- 4.1.5 Checking Spelling & Autocorrect

4.2 Open Office Spreadsheet (Calc):
- 4.2.1 Spreadsheets, Sheets & Cell
- 4.2.2 Starting, Opening, Saving, Closing, Printing a Spreadsheet

4.3 Open Office Impress:
- 4.3.1 Adding Animation in Slide
- 4.3.2 Printing Slide Show

5. INFORMATION SECURITY BEST PRACTICES

5.1 Desktop & Smartphone security: Password, pattern lock, Two Step authentication (OTP), Biometric Authentication

5.2 Computer Viruses: Scanning & Removing

5.3 Guidelines for:
- 5.3.1 Setting up a Secure password
- 5.3.2 Wi-fi security

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:
1. Satish Kumar Nath, J.P. Bhati, Introduction to IT Systems, C.B.H. Jaipur
2. R.S. Salaria, Computer Fundamentals, Khanna Publishing House
3. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House
4. Online Resources, Linux man pages, Wikipedia
5. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett.

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FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Code	**2004**
Course Title	**Fundamentals of Electrical and Electronics Engineering**
Number of Credits	**4 (L-2,T-2,P-0)**
Prerequisites	**None**
Course Category	**Engineering Science**

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

1. OVERVIEW OF ELECTRONIC COMPONENTS & SIGNALS

1.1 Passive components and their applications
- 1.1.1 Resistors, type of resistors
- 1.1.2 Capacitors, type of capacitor
- 1.1.3 Inductors , type of inductor

1.2 Types of waveform
- 1.2.1 Sinusoidal waveform as alternating Voltage Signal $v(t) = V_m \sin(wt)$
- 1.2.2 Non Sinusoidal alternating waveforms (triangular, rectangular, square) as voltage signals

2. OVERVIEW OF BASIC (ANALOG) & DIGITAL ELECTRONICS

2.1 Introduction to Semi-Conductors
- 2.1.1 Different Semiconductor materials (Si, Ge)

2.2 Doping (impurities) in Semiconductors
- 2.2.1 Intrinsic and Extrinsic Semiconductor
- 2.2.2 Atomic structure of Intrinsic and Extrinsic Semiconductor

2.3 Conductivity
- 2.3.1 carrier transport: diffusion & drift current, mobility, resistivity
- 2.3.2 generation and recombination of charge carriers, PN junction

2.4 Active components and their application
- 2.4.1 Diodes, VI Characteristics, forward and reverse bias
- 2.4.2 Bipolar Junction Transistors (BJT), PNP and NPN BJT, Characteristics.

2.5 Boolean Algebra
- 2.5.1 Logic Gates (NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR)
- 2.5.2 Binary code of a Decimal Number

3. ELECTRIC AND MAGNETIC CIRCUITS:

3.1 EMF, Current, Potential Difference, Power and Energy, Ohm's Law, Combination of resistances

3.2 M.M.F, magnetic flux

3.3 Analogy between electric and magnetic circuits

4. A.C. CIRCUITS:

4.1 Introduction to AC waveform and terminology
- 4.1.1 Cycle
- 4.1.2 Frequency
- 4.1.3 Time Period
- 4.1.4 Amplitude
- 4.1.5 Angular velocity
- 4.1.6 RMS value
- 4.1.7 Average value
- 4.1.8 Form Factor

5. TRANSFORMERS

5.1 Principal of operation, emf equation, Construction.

5.2 Principle of single phase transformer, transformation ratio and step up and step down transformers

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

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ENGINEERING MECHANICS

Course Code	**2005**
Course Title	**Engineering Mechanics**
Number of Credits	**4 (L-3,T-1,P-0)**
Prerequisites	**None**
Course Category	**Engineering Science**

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 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

COURSE CONTENTS

1. **BASICS OF MECHANICS AND FORCE SYSTEM**
   - 1.1 Significance and relevance of Mechanics
     - 1.1.1 Applied mechanics
     - 1.1.2 Statics
     - 1.1.3 Dynamics
   - 1.2 Definitions of Space, time, mass, particle, flexible body and rigid body
   - 1.3 Scalar and vector quantity ,Units of measurement (SI units)
     - 1.3.1 Fundamental units
     - 1.3.2 Derived units
   - 1.4 Force
     - 1.4.1 Unit
     - 1.4.2 Representation as a vector and by Bow's notation
     - 1.4.3 Characteristics and effects of a force .
   - 1.5 Law of parallelogram

2. **EQUILIBRIUM**
   - 2.1 Equilibrium and Equilibrant
     - 2.1.1 Free body and Free body diagram
   - 2.2 Lami's Theorem – statement and explanation
     - 2.2.1 Application for various engineering problems
   - 2.3 Types of beam
   - 2.4 Types of supports (simple, hinged, roller and fixed)
   - 2.5 Types of loads acting on beam (vertical and inclined point load, uniformly distributed load, couple)

3. **FRICTION**
   - 3.1 Friction and its relevance in engineering
     - 3.1.1 Types and laws of friction
     - 3.1.2 Limiting equilibrium
     - 3.1.3 Limiting friction
     - 3.1.4 Co-efficient of friction
     - 3.1.5 Angle of friction (only theoy)
     - 3.1.6 Angle of repose (only theoy)

3.1.7 Relation between co-efficient of friction and angle of friction

3.2 Equilibrium of bodies on level surface subjected to

3.2.1 Force parallel to plane

3.2.2 Force inclined to plane

4. **CENTROID AND CENTRE OF GRAVITY**

4.1 Center of gravity of : Square , Rectangle, Triangle, Circle, Semi-circle and Quarter circle(Noderivation)

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

4.3 Centre of Gravity of Cube,Cuboid,Cone,Cylinder,Sphere and hemisphere (No derivation)

5. **SIMPLE LIFTING MACHINE**

5.1 Simple lifting machine

5.1.1 Related terms: load, effort, mechanical advantage

5.1.2 Applications and advantages.

5.1.3 Velocity ratio

5.1.4 Efficiency of machines

5.2 Law of machine

5.3 Ideal machine

5.3.1 Friction in machine

5.3.2 Maximum Mechanical advantage and efficiency

REFERENCES:

1.	Engineering Statics (in Hindi)	Gokhru&Soni
2.	Applied Mechanics (in Hindi)	A. R. Paage
3.	Engineering Mechanics	D. S. Kumar
4.	Applied MechanicsS. Chand & Co. New Delhi.	R.S. Khurmi
5.	Engineering Mechanics	A. R. Basu
6.	Engineering Mechanics, Khanna Publications, New Delhi (2008)	D.S. Bedi,
7.	A text book of Engineering MechanicsLaxmi Publications.	Bansal R K
8.	Engineering Mechanics S. Chand & Co. New Delhi.	Ramamrutham
9.	Fundamental of Applied MechanicsPune VidhyarthiGruh.	Dhade, Jamadar & Walawelkar

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APPLIED PHYSICS II LAB

Course Code	**2006**
Course Title	**Applied Physics II Lab**
Number of Credits	**1 (L-0,T-0,P-2)**
Prerequisites	**None**
Course Category	**Basic Science**

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.

COURSE OUTCOMES

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

1. Apply concepts of SHM to find out the gravitational acceleration
2. Verify optical laws; reflection, refraction from plane interfaces and surfaces.
3. Apply knowledge of optics to determine focal length and magnifying power of optical lenses.
4. Understand uses of electrical components and meters and verify Ohm's law for flow of current.
5. Quantify resistances and verify laws of series and parallel combination of resistances.
6. Analyse electrical circuits and verify Kirchhoff's law governing electrical circuits.
7. Measure resistance of a galvanometer and how it is converted into an ammeter and voltmeter.
8. Investigate characteristics of semiconductor diodes, photoelectric cells and determine operational parameters associated with their performance.
9. Work with laboratory lasers and understand method to measure the wavelength of the light emitted from a laser.
10. How to handle optical fibers.

LIST OF PRACTICALS/ACTIVITIES: (To perform minimum 10 Practicals)

1. To determine acceleration due to gravity using simple pendulum.
2. To verify laws of reflection from a plane mirror/ interface.
3. To verify laws of refraction (Snell's law) using a glass slab.
4. To determine focal length and magnifying power of a convex lens.
5. To verify Ohm's law by plotting graph between current and potential difference.
6. To verify laws of resistances in series and parallel combination.
7. To determine specific resistance of material using meter bridge.
8. To determine internal resistance of a primary cell using potentiometer.
9. To compare EMF of two primary cells using potentiometer.
10. To find resistance of a galvanometer by half deflection method.
11. To convert a galvanometer into an ammeter.
12. To convert a galvanometer into a voltmeter.
13. To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage.

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.

1. Survey of different physical products and compare the following points
   - **1.1** Measurements of dimensions
   - **1.2** Properties
   - **1.3** Applications
2. Library survey regarding engineering materials/products used in different industries
3. Seminar on any relevant topic. Teachers should use the following strategies to achieve the various outcomes of the course
4. Different methods of teaching and media to be used to attain classroom attention.
5. Massive open online courses (MOOCs) may be used to teach various topics/sub topics.

6. 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.
7. Micro-projects on relevant may be given to group of students for hand-on experiences.

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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Common for All Branches

INTRODUCTION TO IT SYSTEMS LAB

Course Code	**2007**
Course Title	**Introduction to IT Systems**
Number of Credits	**2 (L-0,T-0,P-4)**
Prerequisites	**None**
Course Category	**Engineering Science**

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 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.

COUSRE CONTENT

S.No.	Topics for Practice
1	Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognise various ports/interfaces and related cables, etc.
2	Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
3	Browser features, browsing, using various search engines, writing search queries.
4	Visit various e-governance/Digital India portals, understand their features and services offered.
5	Install Windows operating system on lab machine and explore various options.
6	Install Linux operating system on lab machine and explore various options.
7	Practice various HTML tags.
8	Make your own Webpage using HTML tags.
9	Explore features of Open Office Writer and practice to create documents.
10	Explore features of Open Office Calc and practice to create spreadsheets.
11	Explore features of Open Office Impress and practice to create presentations.
12	Explore security features of Operating Systems and Tools.
13	Demonstration of various digital payment methods (Net Banking, Digital Wallet, UPI etc.)

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

REFERENCES:

1. Satish Kumar Nath, J.P. Bhati, Introduction to IT System Lab, C.B.H. Jaipur
2. Online resources, Linux man pages, Wikipedia.
3. R.S. Salaria, Computer Fundamentals, Khanna Publishing House.
4. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.
5. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett.
6. IT Essentials PC Hardware and Software Companion Guide, Davis Anfinson and Ken Quamme, CISC Press, Pearson Education.
7. PC Hardware and A+ Handbook, Kate J. Chase PHI (Microsoft)

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Common for All Branches

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Course Code	**2008**
Course Title	**Fundamentals of Electrical and Electronics Engineering Lab**
Number of Credits	**2 (L-0,T-0,P-4)**
Prerequisites	**None**
Course Category	**Engineering Science**

COURSE OBJECTIVES

Suggested Practicals/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.

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.

S. No.	Practical Outcomes (PrOs)	Approx. Hrs.
1.	Study of Symbol, Specification of Common Electrical Accessories, Tools and Wires & Cables.	**02**
2.	(A) Electric safety precaution and use of fire fighting equipment (B) Study of basic Electricity Rules for a Domestic Consumer.	**02**
3.	Use of Phase Tester, Series Test Lamp, Tong Tester and Megger in Testing of Electrical Installation	**02**
4.	Measurement of current, voltage, power and energy in AC and DC circuits.	**02**
5.	Preparation of Wiring Diagram, Wiring, Testing, Fault Finding &Costing for : 5.1 Control of one LED Lamp by one Switch (using casing capping & Flush type switch) 5.2 Control of Stair Case Wiring 5.3 Control of one Bell Buzzer and Indicator by one switch	**02**
6.	Prepare one Switch Board as per requirement (using Flush type Switches, Sockets, Ceiling rose,Lamp holder, MCB, Etc.)	**02**
7.	Study, Connecting, Testing and Fault Finding of Fluorescent Tube and its Accessories	**02**
8.	Study, Connecting, Testing and Fault Finding of Ceiling Fan with Electronic Regulator	**02**
9.	Connect single phase transformer. Measure input and output quantities determine its transformation ratio.	**02**
10.	Prepare a Potential Divider and Measure Resistance of a Filament Lamp Using Voltmeter and Ammeter.	**02**
11.	Study and functioning of automatic electric iron.	**02**
12.	Study and functioning of electric water pump and air cooler.	**02**
13.	Sketching of different Electronic Components Symbol on Drawing Sheet.	**02**
14.	Identify various passive electronic components in the given circuit 9.1 Resistors-Fixed Resistors and Variable Resistors 9.2 Capacitors- Electrolytic Capacitors and Ceramic Capacitors 9.3 Inductors	**02**
15.	Soldering of different passive component combination on general purpose PCB.	**02**
16.	Testing of the following electronic components using digital multimeter. 10.1Resistor 10.2 PN Junction Diode 10.3 Bipolar Junction Transistor	**02**

17.	Study of devices used in electronic workshop. 11.1 Function Generator 11.2 CRO 11.3 LCR Meter	**02**
18.	Use of LCR meter to measure the value of given Capacitor and Inductor.	**02**
19.	Measurement of amplitude and frequency of a sinusoidal signal using CRO.	**02**
20.	Measurement of amplitude and frequency of a Non-sinusoidal signal using CRO.	**02**
21.	Test the performance of PN Junction Diode and Zener Diode	**02**
22.	Test the performance of Transistor Amplifier Circuit.	**02**
23.	Verify the truth tables of different logic gates	**02**
24.	Verification of Ohm's law using Resistive Circuit and Analog/ Digital Meters	**02**

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Common for All Branches

ENGINEERING MECHANICS LAB.

Course Code	**2009**
Course Title	**Engineering Mechanics Lab**
Number of Credits	**1 (L-0,T-0,P-2)**
Prerequisites	**None**
Course Category	**Engineering Science**

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 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.

LIST OF PRACTICAL TO BE PERFORMED

1. Verification of the Law of Parallelogram and Polygon of Forces
   1.1 By using Force Board
   1.2 By using Force Table
2. Determination of Reactions in Case of Simply Supported Beams.
3. To Determine Coefficient of Friction between two Surfaces on
   3.1 Horizontal Plane
   3.2 Inclined Plane.
4. Determination of Mechanical Advantage, Velocity Ratio and Efficiency of Simple Wheel and Axle
5. Determination of Mechanical Advantage, Velocity Ratio and Efficiency of differential Wheel and Axle
6. Determination of Mechanical Advantage, Velocity Ratio and Efficiency of Single Purchase Crab
7. Determination of Mechanical Advantage, Velocity Ratio and Efficiency of Double Purchase Crab
8. Determination of Mechanical Advantage, Velocity Ratio and Efficiency of Worm and Worm Wheel
9. Determination of Mechanical Advantage, Velocity Ratio and Efficiency of Screw Jack
10. Determination of Mechanical Advantage, Velocity Ratio and Efficiency of First System of Pulleys
11. Determination of Mechanical Advantage, Velocity Ratio and Efficiency of Second System of Pulleys

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ENVIRONMENTAL SCIENCE

Course Code	2010
Course Title	ENVIRONMENTAL SCIENCE
Number of Credits	2 (L-2,T-0,P-0)
Prerequisites	None
Course Category	Basic Science

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.

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

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.

COURSE CONTENT

1. 1. ECOSYSTEM

1.1 Structure of ecosystem
- 1.1.1 Biotic & Abiotic components

1.2 Food chain and food web

1.3 Global warming
- 1.3.1 Causes
- 1.3.2 Effects
- 1.3.3 Process
- 1.3.4 Green House Effect
- 1.3.5 Ozone depletion

2. AIR AND NOISE POLLUTION

2.1 Definition of pollution and pollutant

2.2 Natural and manmade sources of air pollution (Refrigerants, A.C., Boiler)

2.3 Air Pollutants:
- 2.3.1 Types
- 2.3.2 Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator)

2.4 Noise pollution:
- 2.4.1 sources of pollution
- 2.4.2 measurement of pollution level
- 2.4.3 Effects of Noise pollution

3. WATER AND SOIL POLLUTION

3.1 Water pollution
- 3.1.1 Sources of water pollution
- 3.1.2 Types of water pollutants
- 3.1.3 Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids

3.2 Waste Water Treatment:
- 3.2.1 Primary methods: sedimentation, froth floatation

3.2.2 Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor
3.2.3 Tertiary Method: Membrane separation technology, RO (reverse osmosis)
3.3 3.4 Soil pollution:
3.3.1 Causes
3.3.2 Effects
3.3.3 Preventive measures of Soil Pollution

4. RENEWABLE SOURCES OF ENERGY

4.1 Solar Energy:
4.1.1 Basics of solar energy
4.2 Applications
4.2.1 Solar pond
4.2.2 Solar water heater
4.2.3 Solar dryer
4.3 Biomass:
4.3.1 Overview of biomass as energy source
4.3.2 Thermal characteristics of biomass as fuel
4.3.3 Anaerobic digestion
4.3.4 Utilization and storage of biogas
4.4 Wind energy:
4.4.1 Current status and future prospects of wind energy
4.4.2 Wind energy in India
4.5 Applications of
4.5.1 Hydrogen energy
4.5.2 Ocean energy resources

5. 5. SOLID WASTE MANAGEMENTISO 14000 & ENVIRONMENTAL MANAGEMENT

5.1 Solid waste generation
5.2 Sources and characteristics of
5.2.1 Municipal solid waste
5.2.2 E- waste
5.2.3 Biomedical waste
5.3 Collection and disposal:
5.3.1 MSW (3R, principles, energy recovery, sanitary landfill),
5.3.2 Hazardous waste
5.4 Different environmental acts
5.4.1 Air quality act 2004
5.4.2 Air pollution control act 1981
5.4.3 Water pollution and control act1996

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2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
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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.

1. Different methods of teaching and media 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 hand-on experiences
5. Encouraging students to visit to sites such as Railway station and research establishment around the institution.

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