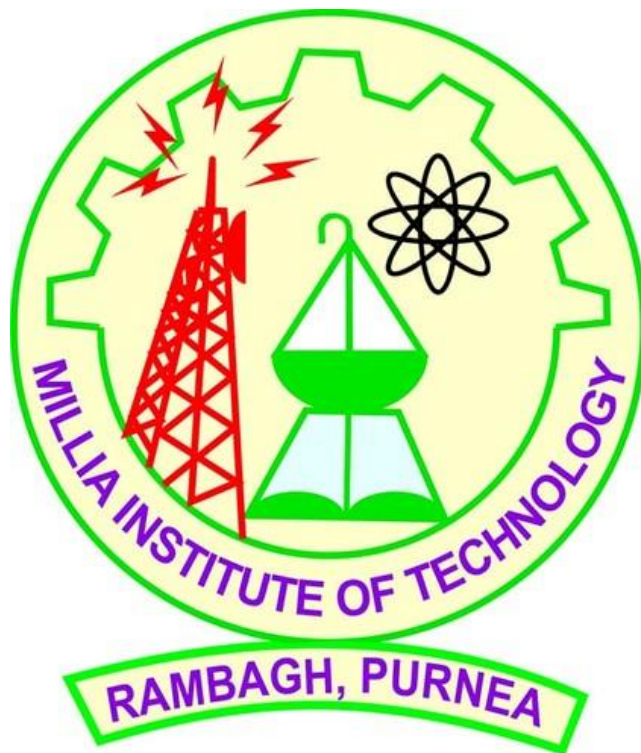# Millia Institute of Technology Rambagh, Purnea

Affiliated to STATE BOARD OF TECHNICAL EDUCATION, BIHAR

NAAC Accredited & ISO 9001:2015

SYLLABUS

Department of Mechanical Engineering
2ND SEMESTER

STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for
IInd Semester
(Effective from Session 2020-21)
THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per Week			Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
			L	T	L+T								
1.	Mathematics-II	2002201	03	01	04	03	10	20	70	100	28	40	04
2.	Applied Physics-II	2002202	02	01	03	03	10	20	70	100	28	40	03
3.	Introduction to IT Systems	2002203	02	01	03	03	10	20	70	100	28	40	02
4.	Fundamental of Electrical & Electronics Engg.	2002204	02	01	03	03	10	20	70	100	28	40	03
5.	Engg. Mechanics	2002205	02	01	03	03	10	20	70	100	28	40	03
	Total:-		11	05	16				350	500			15

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per Week	Hours of Exam.	Practical Internal(PA)	Practical External(ESE)	Total Marks	Pass Marks in the Subject	Credits
6.	Applied Physics Lab-II	2002206	02	03	15	35	50	20	01
7.	Introduction to IT Systems Lab	2002207	04	03	15	35	50	20	02
8.	Fundamental of Electrical & Electronics Engg. Lab	2002208	04	03	15	35	50	20	01
9.	Engg. Mechanics Lab	2002209	03	03	15	35	50	20	02
	Total:-		13				200		06

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per week	Marks of Internal (PA)	Marks of External (ESE)	Total Marks	Pass Marks in the Subject	Credits
10.	Course under MOOCS / SWAYAM / ETC / Others	2002210	-	06	14	20	08	02
11.	KYP/IT Essential/Python/Others	2002211	-	06	14	20	08	01
12.	Environmental Science	2002212	02	10	-	10	04	-
	Total:-		02			50		03

Total Periods per week Each of duration One Hours   31

Total Marks = 750   **24**

MATHEMATICS - II

Subject Code 2002201	Theory			No of Periods in One Session : 60			Credits
	No. of Periods Per Week			Full Marks	:	100	04
	L	T	P/S	ESE	:	70	
	03	01	-	TA	:	10	
	-	-	-	CT	:	20	

Course Objectives:

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

Course Content:

UNIT - I: Differential Calculus [18]

Definition of function; Types of function & simple examples, Concept of limits. Four standard limits

$$\lim_{x \to a} \frac{x^n - a^n}{x - a}, \qquad \lim_{x \to 0} \frac{\sin x}{x}, \qquad \lim_{x \to a} \left(\frac{a^x - 1}{x}\right) \text{ and} \qquad \lim_{x \to a} (1 + x)^{\frac{1}{x}}$$

Concept of Continuity (Simple Problems)

Differentiation by definition of $x^n, \sin x \cos x, \tan x, e^x$ and $\log_a$. Differentiation of sum, product and quotient of functions. Differentiation of function of a function. Differentiation of trigonometric and inverse trigonometric functions, Logarithmic differentiation, Exponential functions. Differentiation of implicit and Parametric function. Differentiation of one function with respect to another function.

UNIT - II: Integral Calculus [18]

Integration as inverse operation of differentiation. Simple integration by transformation, by substitution, by parts and by partial fractions (for linear factors only). Definite Integration & its properties, simple problems. Applications of integration for (i) Simple problem on evaluation of area bounded by a curve and axes. (ii) Area bounded by two curves .(Simple problems).

UNIT-III: Differential Equations [08]

Definition of differential equations. Order and degree of a differential equation. Formation of differential equation. Solution of first order and first degree differential equation by variable separation method (simple problems). MATLAB – Simple Introduction.

UNIT - IV: Vector Algebra [16]

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.

References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40thEdition, 2007.

2. S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol. I & II,Jalandhar.

3. Comprehensive Mathematics, Vol. I & II by Laxmi Publications,Delhi.

4. Mathematics today XI & XII (Part I & II) by Lalji Prasad (Paramount Publication, GovindMitra Road)

5. A Text Book of Mathematics-XI & XII (Vol-1 & Vol-2) - by K.C. Sinha- Rastogi Publication, Meerut.

Course Outcomes:

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

(i) the cumulative effect of the original quantity or equation is theIntegration

(ii) 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.

APPLIED PHYSICS -II

Subject Code 2002202	Theory			No of Periods in One Session : 45			Credits
	No. of Periods Per Week			Full Marks	:	100	
	L	**T**	**P/S**	ESE	:	70	03
	02	01	-	TA	:	10	
	-	-	-	CT	:	20	

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 [07]

Wave motion, transverse and longitudinal waves with examples, definitions of wave velocity, frequency and wave length and their relationship, Sound and light waves and their properties, wave equation ($y = r \sin \omega t$) amplitude, phase, phase difference, principle of superposition of waves and beat formation.

Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency etc. Simple harmonic progressive wave and energy transfer, 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 [07]

Basic optical laws; reflection and refraction, refractive index, Images and image formation by mirrors, lens and 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 [06]

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 [06]

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 color 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.

UNIT - 5: Electromagnetism [06]

Types of magnetic materials; diamagnetic , Paramagnetic 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 [06]

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- p-n-p and n-p-n, some electronic applications (list only). Photocells, Solar cells; working principle and engineering applications.

UNIT - 7: Modern Physics [07]

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.

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

Nano-science and Nanotechnology: Introduction, nano-particles and nano-materials, properties at nano-scale, nanotechnology, nanotechnology based devices and applications.

Learning Outcome:

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

a) Describe waves and wave motion, periodic and simple harmonic motions and solve 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 Ultrasonics. Apply acoustics principles to various types of buildings for best sound effect.

c) State basic optical laws, establish the location of the images formed by mirrors and thin con- verging 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) Appreciate the potential of optical fiber in fields of medicine and communication.

n) Express importance of nanoscience and nanotechnology and impact of nanotechnology to the society.

References:

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

2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi

3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi

4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi.

5. Modern approach to Applied Physics-I and II, AS Vasudeva, Modern Publishers.

6. A Textbook of Optics, N Subramanyam, Brij Lal, MN Avahanulu, S Chand and Company Ltd.

7. Introduction to Fiber Optics, Ajoy Ghatak and K Thyagarajan, Cambridge University 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

Subject Code 2002203	Theory			No of Periods in One Session : 45			Credits
	No. of Periods Per Week			Full Marks	:	100	02
	L	T	P/S	ESE	:	70	
	02	01	-	TA	:	10	
	-	-	-	CT	:	20	

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.

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.

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code 2002204	Theory			No of Periods in One Session : 45			Credits
	No. of Periods Per Week			Full Marks	:	100	
	L	T	P/S	ESE	:	70	03
	02	01	-	TA	:	10	
	-	-	-	CT	:	20	

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 <u>Overview of Electronic Components & Signals:</u>

Passive Active Components: Resistances, Capacitors, Inductors. Basic Concept of Diodes, Transistors, FET, MOS and CMOS and their Applications. Signals: DC / AC, voltage / current, periodic / non-periodic signals, Ideal / non-ideal voltage / current sources, independent / dependent voltage current sources.

UNIT- II <u>Overview of Analog Circuits:</u>

Operational Amplifiers-Ideal Op-Amp, Practical op amp, Open loop and closed loop configurations, Application of Op-Amp as amplifier, adder, differentiator and integrator.

UNIT- III <u>Overview of Digital Electronics:</u>

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

UNIT - IV <u>Electric and Magnetic Circuits:</u>

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

UNIT - V <u>A.C. Circuits:</u>

Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor KCL and KVL 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; A.C in R-L series, R-C series, R-L-C series Circuits.

UNIT VI <u>Transformer and Machines:</u> General construction and principle of different type of

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

References:

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

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

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

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

5. Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924375

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

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

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

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

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

ENGINEERING MECHANICS

Subject Code 2002205	Theory			No of Periods in One Session : 45			Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	02	01	-	TA	:	10	
	-	-	-	CT	:	20	

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   [11]

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   [10]

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   [06]

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 [08]

Centroid of geometrical plane figures (square, rectangle, triangle, circle, semicircle, 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 [10]

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, Cam- bridge 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.

APPLIED PHYSICS LAB II

Subject Code 2002206	Practical			No of Periods in One Session : 30			Credits
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	Internal(PA)	:	15	01
	-	-	02	External(ESE)	:	35	
	-	-	-	-	:	-	

Course Objectives:

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

List of Practical's (To perform minimum 12 Practical's)

1. To determine and verify the time period of a cantilever.

2. To determine velocity of ultrasonic in different liquids using ultrasonic interferometer.

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

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

5. To determine focal length and magnifying power of a convex lens.

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

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

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

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

10. To study the dependence of capacitance of a parallel plate capacitor on various factors and determines permittivity of air at a place.

11. To find resistance of a galvanometer by half deflection method.

12. To convert a galvanometer into an ammeter.

13. To convert a galvanometer into a voltmeter.

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

15. To verify inverse square law of radiations using a photo-electric cell.

16. To measure wavelength of a He-Ne/diode laser using a diffraction grating.

17. To measure numerical aperture (NA) of an optical fiber.

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

Suggested Student Activities & Strategies :-

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

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

- Measurements of dimensions
- Properties
- Applications

b. Library survey regarding engineering materials/products used in different industries

c. Seminar on any relevant topic.

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

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

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

- 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 ultrasonics in different liquids.*

c) Verify optical laws; reflection, refraction from plane interfaces and surfaces.

d) Apply knowledge of optics to determine focal length and magnifying power of optical lenses.

e) Understand uses of electrical components and meters and verify Ohm's law for flow of current.

f) Quantify resistances and verify laws of series and parallel combination of resistances.

g) Apply concept of electrical vibrations in determine frequency of AC main.

h) Analyse electrical circuits and verify Kirchhoff's law governing electrical circuits.

i) Measure resistance of a galvanometer and how it is converted into an ammeter and voltmeter.

j) Investigate characteristics of semiconductor diodes, photoelectric cells and determine operational parameters associated with their performance.

k) Work with laboratory lasers and understand method to measure the wavelength of the light emitted from a laser.

l) Handle optical fibers and determine numerical aperture of given optical fiber.

m) Understand construction and working of an optical projection system.

Recommended Books:

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

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

3. Practical Physics by C. L. Arora, S. Chand & Company Ltd.

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

INTRODUCTION TO IT SYSTEMS LAB

Subject Code 2002207	Practical			No of Periods in One Session : 60			Credits
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	Internal(PA)	:	15	02
	-	-	04	External(ESE)	:	35	
	-	-	-	-	:	-	

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, recognize 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.

   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.

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Subject Code 2002208	Practical			No of Periods in One Session : 60			Credits
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	Internal(PA)	:	15	01
	-	-	04	External(ESE)	:	35	
	-	-	-	-	:	-	

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.

S. No.	Practical Outcomes (PrOs)	Approx. Hrs.
1.	Determine the permeability of magnetic material by plotting its B-H curve.	05
2.	Measure voltage, current and power in 1-phase circuit with resistive load.	05
3.	Measure voltage, current and power in R-L series circuit.	05
4.	Determine the transformation ratio (K) of 1-phase transformer.	05
5.	Connect single phase transformer and measure input and output quantities.	05
6.	Make Star and Delta connection in induction motor starters and measure the line and phase values.	05
7.	Identify various passive electronic components in the given circuit	05
8.	Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter.	05
9.	Connect capacitors in series and parallel combination on bread board and measure its value using multimeter.	05
10.	Use multimeter to measure the value of given resistor.	05
11.	Determine the value of given resistor using digital multimeter to confirm with colour code.	05
12.	Test the PN-junction diodes using digital multimeter.	05
	Total	**60**

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 Eduction, New Delhi,2015, ISBN-13**:** 0070634244-978

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

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

Suggested Softwares/Learning Websites:

a. en.wikipedia.org/wiki/Transformer

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

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

d. www.electronics-tutorials

e. learn.sparkfun.com/tutorials/transistors

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

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

h. www.learningaboutelectronics.com

i. www.electrical4u.com

Course Outcomes:

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

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

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

3. Demonstrate an understanding of the control systems.

4. Understand the basic circuit elements

5. Understand different types of signal waveforms.

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

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

8. Use relevant electric/electronic protective devices safely.

ENGINEERING MECHANICS LAB.

Subject Code 2002209	Practical			No of Periods in One Session : 45			Credits
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	Internal(PA)	:	15	02
	-	-	03	External(ESE)	:	35	
	-	-	-	-	:	-	

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 (Perform any 10 Practicals) :

1. Determine resultant of concurrent force system applying Law of Polygon of forces using force table.

2. Verify Lami's theorem.

3. Study forces in various members of Jib crane.

4. Determine support reactions for simply supported beam.

5. Determine coefficient of friction for motion on horizontal and inclined plane.

6. Determine centroid of geometrical plane figures.

7. To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack.

8. To find the M.A., V.R., Efficiency and law of machine for Differential Axle and Wheel.

9. Derive Law of machine using Worm and worm wheel.

10. Derive Law of machine using Single purchase crab.

11. Derive Law of machine using double purchase crab.

12. Derive Law of machine using Weston's differential or wormed geared pulley block.

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 Uni- versity 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.

COURSE UNDER MOOCS / SWAYAM / ETC / OTHERS

Subject Code 2002210	Term Work			No of Periods in One Session :			Credits
	No. of Periods Per Week			Full Marks	:	20	02
	L	T	P/S	Internal(PA)	:	06	
	-	-	-	External(ESE)	:	14	
	-	-	-	-	:	-	

KYP / IT ESSENTIAL / PYTHON / OTHERS

Subject Code **2002211**	**Term Work**			**No of Periods in One Session :**			**Credits**
	No. of Periods Per Week			**Full Marks**	:	20	01
	L	**T**	**P/S**	**Internal**	:	06	
	-	-	-	**External Comm.**	:	14	
	-	-	-	-	:	-	

ENVIRONMENTAL SCIENCE

Subject Code 2002212	Term Work			No of Periods in One Session : 30			Credits
	No. of Periods Per Week			Full Marks	:	10	
	L	T	P/S	Internal(PA)	:	10	-
	-	-	02		:	-	
	-	-	-	-	:	-	

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.

Course Content:

Pre requisite: - High School Chemistry

ENVIRONMENTAL SCIENCE

UNIT-1 Environmental Studies :

Definition of Environment, Components of Environment, Biotic and Abiotic Components, Layers **[06]** of Atmosphere, Greenhouse Effect and Global Warming, Ozone Layer-Earth's Protective Umbrella, Depletion of Ozone Layer. Consequences of Ozone Depletion.

UNIT– 2 Water Pollution and Soil Pollution

Introduction, Sources of Water Pollution, Effects of Water Pollution, Control of Water **[07]** Pollution, Oxygen Demanding Waste, Determination of Dissolved Oxygen, Turbidity, pH, Biological Oxygen Demand, Chemical Oxygen Demand. Soil Pollution: Introduction, Composition of the Soil, Types of Soil, Causes, Effects and control of Soil Pollution.

UNIT- 3 Air Pollution and Noise Pollution :

Introduction, Composition of Air, Causes and effects of Air Pollution, Primary and **[07]** Secondary Pollutants, Control of Air Pollution, Acid Rain, Harmful effects of Acid Rain. Smog and its kind, Difference between Classical smog and Photochemical Smog. Causes and effects of Noise Pollution.

UNIT– 4 Radioactive Pollution :   [06]

Introduction, Kind of Radiation, Law of Radioactivity Decay, Mass Defect and Binding Energy, Nuclear Fission and Fusion, Harmful effects of Radiation.

UNIT-5 Renewable Sources of Energy :   [04]

Introduction of Solar Energy, Wind Energy, Tidal Energy, Biogas.

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

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.

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

(a) Open source software and website address :

1)   www.eco-prayer.org

2)   www.teriin.org

3)   www.cpcp.nic.in

4)   www.cpcp.gov.in

5)   www.indiaenvironmentportal.org.in

6)   www.whatis.techtarget.com

7)   www.sustainabledevelopment.un.org

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

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

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

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

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

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

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

Course 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.