

MAULANA AZAD NATIONAL URDU UNIVERSITY

(A Central University established by an Act of Parliament
in 1998)

Accredited 'A' Grade by NAAC
Gachibowli, Hyderabad - 500 032, T.S.

AICTE Model Curriculum with effect from 2020-21 for MANUU Polytechnics



General Course Structure

&

Credit Distribution

**Diploma in Engineering
Courses**

POLYTECHNICS

Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hours Practical (P) per week	1 credit

A. Program Credits:

The total number of credits proposed for the three-year Diploma program in Engineering & Technology is 120.

B. Structure of Diploma Engineering Program:

The structure of Diploma Engineering program shall have essentially the following categories of courses with the breakup of credits as given:

Sr. No.	Category	Suggested Breakup of Credits
1.	Humanities & Social Sciences courses	7
2.	Basic Science courses	18
3.	Engineering Science courses	16
4.	Program Core courses (Branch specific)	46
5.	Program Elective courses (Branch specific)	12
6.	Open Elective courses (from other technical and /or emerging subjects)	9
7.	Project work, seminar and internship in industry or elsewhere	12
8.	Audit Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge etc.]	(non-credit)
	Total	120

C. Course code and definition:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
HS	Humanities & Social Sciences Courses
BS	Basic Science Courses
ES	Engineering Science Courses
PC	Program Core Courses
PE	Program Elective Courses
OE	Open Elective Courses
AU	Audit Courses
SI	Summer Internship
PR	Project
SE	Seminar

D. Course level coding scheme:

As per the CBCS Rules and Regulations of Examination Branch of MANUU.

E. Category-wise Courses**HUMANITIES & SOCIAL SCIENCES COURSES [HS]****Note:**

(i) Number of Humanities & Social Sciences Courses: 4

(ii) Credits: 7

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1.		Communication Skills in English	2	0	0	I	2
2.		Sports and Yoga	0	0	2	I	1
3.		Communication Skills in English Lab	0	0	2	I	1
4.		Entrepreneurship and Start-ups	3	0	0	VI	3
Total Credits							7

BASIC SCIENCES COURSE [BS]**Note:**

(i) Number of Basic Sciences Courses: 8

(ii) Credits: 18

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1.		Mathematics-I	2	1	0	I	3
2.		Applied Physics-I	2	1	0	I	3
3.		Applied Chemistry	2	1	0	I	3
4.		Applied Physics-I Lab	0	0	2	I	1
5.		Applied Chemistry Lab	0	0	2	I	1
6.		Mathematics-II	3	0	0	II	3
7.		Applied Physics-II	2	1	0	II	3
8.		Applied Physics-II Lab	0	0	2	II	1
Total Credits							18

ENGINEERING SCIENCE COURSES [ES]

Note:

(i) Number of Engineering Sciences Courses: 8

(ii) Credits: 16

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1.		Engineering Graphics	0	0	3	I	1.5
2.		Engineering Workshop Practice	0	0	3	I	1.5
3.		Introduction to IT Systems	2	1	0	II	3
4.		Fundamentals of Electrical & Electronics Engineering	2	1	0	II	3
5.		Engineering Mechanics	2	1	0	II	3
6.		Introduction to IT Systems Lab	0	0	4	II	2
7.		Fundamentals of Electrical & Electronics Engineering Lab	0	0	2	II	1
8.		Engineering Mechanics Lab	0	0	2	II	1
Total Credits							16

PROGRAM CORE COURSES [PC]

Note:

(i) Number of Program Core Courses: 20 to 30 (including lab courses)

(ii) Credits: **46**

(iii) Number of contact hours per week of a subject may vary as per subject contents without affecting the subject credits.

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1							
.							
.							
n							
Total Credits							46

PROGRAM ELECTIVE COURSES [PE]

Note:

- (i) Number of Program Elective Courses: 4 to 6
(minimum ten Branch Specific courses to be specified for the students to choose from)
- (ii) Credits: 12

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1							
.							
.							
n							
Total Credits							12

OPEN ELECTIVE COURSES [OE]

Note:

- (i) Number of Open Elective Courses: 3 to 4 (minimum ten courses to be specified out of the suggestive list of open elective courses given as Appendix III)
- (ii) Credits: 9
- (iii) The Open Elective Courses to be offered preferably in III year (one course may be offered in V Semester and two courses in VI Semester)
- (iv) The students can opt only for those open elective courses that are offered by other than their respective departments

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1							
.							
.							
n							
Total Credits							9

PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY OR ELSEWHERE

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1.		Summer Internship – I (3-4 weeks) after II nd Sem					2
2.		Summer Internship – II (4-6 weeks) after IV th Sem					3
3.		Minor Project	0	0	4	IV	2
4.		Major Project	0	0	2	V	4
5.			0	0	6	VI	
6.		Seminar	1	0	0	VI	1
Total Credits							12

Note:

- Summer Internship – I should be undertaken in an industry/Govt. or Pvt. Certified Agencies which are in social sector/ Govt. Skill Centres/Institutes/Schemes.
- Summer Internship – II should be undertaken in an industry only
- Seminar should be based on real/ live problems of the Industry/Govt./NGO/ MSME/Rural Sector or an innovative idea having the potential of a Startup

AUDIT COURSES [AU]

Note: These are mandatory non-credit courses.

Sl. No	Code No.	Course Title	Hours per week			Semester	Credits
			L	T	P		
1.		Environmental Science	2	0	0	II	0
2.		Essence of Indian Knowledge and Tradition	2	0	0	IV	0
3.		Indian Constitution	2	0	0	VI	0
Total Credits							0

DESCRIPTION OF BRANCH CODES

Sr. No.	Branch	Code
1.	Civil Engineering	CE
2.	Computer Engineering	CO
3.	Electronics and Communication Engineering	EC
4.	Electrical Engineering	EE
5.	Mechanical Engineering	ME
6.	Production Engineering	PE
7.	Information Technology	IT
8.	Chemical Engineering	CH

INDUCTION PROGRAM

Please refer Appendix IV for guidelines.

The Essence and Details of Induction program can also be understood from the 'Detailed Guide on Student Induction program', as available on AICTE Portal, although that is for UG students of Engineering & Technology (Link:<https://www.aicteindia.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf>).

Induction program (mandatory)	Two-week duration
Induction program for students to be offered right at the start of the first year.	<ul style="list-style-type: none">• Physical activity• Creative Arts• Universal Human Values• Literary• Proficiency Modules• Lectures by Eminent People• Visits to local Areas• Familiarization to Dept./Branch & Innovations

F. Mandatory Visits/Workshop/Expert Lectures:

- a. It is mandatory to arrange one industrial visit every semester for the students of each branch.
- b. It is mandatory to conduct a One-week workshop during the winter break after fifth semester on professional/ industry/ entrepreneurial orientation.
- c. It is mandatory to organize at least one expert lecture per semester for each branch by inviting resource persons from domain specific industry

G. Evaluation Scheme:

- a) **For Theory Courses:** As per the CBCS Rules and Regulations of Examination Branch of MANUU.
- b) **For Practical Courses:** As per the CBCS Rules and Regulations of Examination Branch of MANUU.
- c) **For Summer Internship / Projects / Seminar etc.**

Evaluation is based on work done, quality of report, performance in viva-voce and presentation by the student in front of Internship & project review committees consist of HoD, Principal Nominated Member and Concerned Faculty.

**Implementation of AICTE Model Curriculum 2019 for
Diploma in Engineering Courses in MANUU Polytechnics
(Hyderabad, Bangalore, Darbhanga, Kadapa, Cuttack)**

**Semester I –Pool: 1
(Common to CIVIL, MECH, ECE Branches)
Curriculum Structure**

Sl. No	Category of Course	Code No.	Course Title	Hours per week			Total contact hrs/ week	Credits
				L	T	P		
1	Basic Science		Mathematics-I	2	1	0	3	3
2	Basic Science		Applied Physics-I	2	1	0	3	3
3	Basic Science		Applied Chemistry	2	1	0	3	3
4	Engineering Science		Engineering Graphics	0	0	3	3	1.5
5	Basic Science		Applied Chemistry Lab	0	0	2	2	1
6	Engineering Science		Introduction to IT Systems	2	1	0	3	3
7	Engineering Science		Introduction to IT Systems Lab	0	0	3	3	1.5
8.	Basic Science		Applied Physics-I Lab	0	0	2	2	1
9	Humanities & Social Science		Sports and Yoga	0	0	2	2	1
	Total Credits							18

**Implementation of AICTE Model Curriculum 2019 for
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(Hyderabad, Bangalore, Darbhanga, Kadapa, Cuttack)**

**Semester I –Pool:2
(Common to CSE, IT, EEE Branches)
Curriculum Structure**

Sl. No	Category of Course	Code No.	Course Title	Hours per week			Total contact hrs/ week	Credits
				L	T	P		
1	Basic Science		Mathematics-I	2	1	0	3	3
2	Basic Science		Applied Physics-I	2	1	0	3	3
3	Engineering Science		Engineering Mechanics	2	1	0	3	3
4	Humanities & Social Science		Communication Skills in English	2	0	0	2	2
5	Engineering Science		Fundamentals of Electrical & Electronics Engineering	2	1	0	3	3
6	Humanities & Social Science		Communication Skills in English Lab	0	0	2	2	1
7	Engineering Science		Engineering Workshop Practice	0	0	3	3	1.5
8	Basic Science		Applied Physics-I Lab	0	0	2	2	1
9	Engineering Science		Engineering Mechanics Lab	0	0	2	2	1
10	Engineering Science		Fundamentals of Electrical & Electronics Engineering Lab	0	0	3	3	1.5
11	Audit		Environmental Science	2	0	0	2	0
Total Credits								20

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**Semester II –Pool:1
(Common to CIVIL, MECH, ECE Branches)
Curriculum Structure**

Sl. No	Category of Course	Code No.	Course Title	Hours per week			Total contact hrs/ week	Credits
				L	T	P		
1	Basic Science		Mathematics-II	2	1	0	3	3
2	Basic Science		Applied Physics-II	2	1	0	3	3
3	Humanities & Social Science		Communication Skills in English	2	0	0	2	2
4	Engineering Science		Fundamentals of Electrical & Electronics Engineering	2	1	0	3	3
5	Engineering Science		Engineering Mechanics	2	1	0	3	3
6	Basic Science		Applied Physics-II Lab	0	0	2	2	1
7	Engineering Science		Engineering Workshop Practice	0	0	3	3	1.5
8	Engineering Science		Fundamentals of Electrical & Electronics Engineering Lab	0	0	3	3	1.5
9	Engineering Science		Engineering Mechanics Lab	0	0	2	2	1
10	Humanities & Social Science		Communication Skills in English Lab	0	0	2	2	1
11	Audit		Environmental Science	2	0	0	2	0
Total Credits								20

**Implementation of AICTE Model Curriculum 2019 for
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**Semester II –Pool:2
(Common to CSE, IT, EEE Branches)
Curriculum Structure**

Sl. No	Category of Course	Code No.	Course Title	Hours per week			Total contact hrs/ week	Credits
				L	T	P		
1	Basic Science		Mathematics-II	2	1	0	3	3
2	Basic Science		Applied Physics-II	2	1	0	3	3
3	Engineering Science		Introduction to IT Systems	2	1	0	3	3
4	Engineering Science		Engineering Graphics	0	0	3	3	1.5
5	Basic Science		Applied Chemistry	2	1	0	3	3
6	Basic Science		Applied Physics-II Lab	0	0	2	2	1
7	Engineering Science		Introduction to IT Systems Lab	0	0	3	3	1.5
8	Basic Science		Applied Chemistry Lab	0	0	2	2	1
9	Humanities & Social Science		Sports and Yoga	0	0	2	2	1
Total Credits								18

Mathematics- I

Course

Objectives:

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

Course Outcomes:

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

- (i) The students are expected to acquire necessary background in Trigonometry to appreciate the importance of the geometric study as well as for the calculation and the mathematical analysis.
- (ii) The ability to find the effects of changing conditions on a system.
- (iii) Complex numbers enter in to studies of physical phenomena in ways that most people cannot imagine.
- (iv) The partial fraction decomposition lies in the fact that it provides an algorithm for computing the anti derivative of a rational function.

Course Content:

UNIT-I: Trigonometry

Concept of angles, measurement of angles in degrees, grades and radians and their conversions, T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T- Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2). Graphs of $\sin x$, $\cos x$, $\tan x$ and e^x .

UNIT-II:Differential Calculus

$$\lim_{x \rightarrow 0} \frac{\sin x}{x}, \lim_{x \rightarrow a} \left(\frac{a^x - 1}{x} \right)$$

Definition of function; Concept of limits. Four standard limits

and $\lim_{x \rightarrow a} (1+x)^{\frac{1}{x}}$ Differentiation by definition of $x^n, \sin x, \cos x, \tan x, e^x$ and $\log_a x$.

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.

UNIT - III: Algebra

Complex Numbers: Definition, real and imaginary parts of a Complex number, polar and Cartesian, representation of a complex number and its conversion from one form to other, conjugate of a complex number, modulus and amplitude of a complex number Addition, Subtraction, Multiplication and Division of a complex number. De-moivre's theorem, its application.

UNIT - IV: Partial fractions: Definition of polynomial fraction proper & improper fractions and definition of partial fractions. To resolve proper fraction into partial fraction with denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors. To resolve improper fraction into partial fraction.

Permutations and Combinations: Value of ${}^n P_r$ and ${}^n C_r$.

Binomial theorem: Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems

Text Books:

1. Text book of Intermediate Mathematics-I & II by Telugu Academy.
2. A Text book of Engineering Mathematics –I , II by Radiant Publication.

APPLIED PHYSICS-I

Course Objectives:

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

Learning Outcome:

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

- Identify physical quantities, select their units for use in engineering solutions, and make measurements with accuracy by minimizing different types of errors.
- Represent physical quantities as scalar and vectors and solve real life relevant problems.
- Analyse type of motions and apply the formulation to understand banking of roads/railway tracks and conservation of momentum principle to describe rocket propulsion, recoil of gun etc.
- Define scientific work, energy and power and their units. Drive relationships for work, energy and power and solve related problems.
- Describe forms of friction and methods to minimize friction between different surfaces.

Course Content:

Unit 1: Physical world, Units, Dimensions and Vectors

Physics – scope and nature– physics in relation to technology, Physical quantities, Fundamental physical quantities, Derived physical quantities with examples, units, Fundamental units, Derived Units. State S.I. Units of various physical quantities with symbols, Rules for writing SI units. Dimensions of physical quantity, dimensional formulae and Dimensional Equations, Statement of principle of Homogeneity of Dimensions, State the applications of Dimensional Analysis, problems solving.

Scalar and Vector quantities – examples, representation of vector, types of vectors. Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product, Resolution of a Vector and its application to inclined plane and lawn roller

Unit 2: Force, Motion, Work, Power and Energy

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

Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period, Relation between linear and angular velocity, Centripetal and Centrifugal forces with live examples,

Define the terms work, power, energy and State their SI units, Define potential Energy and Kinetic Energy give examples and derive their expression. State and explain the law of conservation of Energy, verify in the case of freely falling body. Define simple harmonic motion and give examples, State the conditions of S.H.M, Define simple pendulum and second's pendulum, derive an expression for time period of simple pendulum

Unit 3: Properties of Matter

Elasticity: definition of stress and strain, moduli of elasticity, Hooke's law, Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications.

Surface tension: concept, units, cohesive and adhesive forces, angle of contact, , applications of surface tension, effect of temperature and impurity on surface tension. Capillarity and states examples, Experimental determination of surface tension based on capillarity tube method. Viscosity and coefficient of viscosity: and effect of temperature on viscosity.

Unit 4: Heat and Thermometry

Concept of heat and temperature, modes of heat transfer (conduction, convection and radiation with examples), specific heats, scales of temperature and their relationship, Types of Thermometer (Mercury thermometer, Bimetallic thermometer, Platinum resistance thermometer, Pyrometer) and their uses. Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them.

Applied Physics-I Lab

Course Objectives

Study of Applied Physics aims to give an understanding of physical world by observations and predictions. Concrete use of physical principles and analysis in various fields of engineering and technology is very 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 necessary confidence in handling equipment and thus learn various skills in measurement.

Learning Outcome:

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

- Select right kind of measuring tools (Meter scale, Vernier caliper, Screw gauge, Spherometer etc.) for determining dimensions of physical quantities and make measurements with accuracy and precision.
- Differentiate various shapes and determine dimensions of plane, curved and regular surfaces/bodies.
- Apply and Verify laws of forces and determine resultant force acting on a body.
- Appreciate role of friction and measure coefficient of friction between different surfaces.
- Describe and verify Hook's law and determine force constant of spring body.
- Identify various forms of energy, energy transformations and verify law of conservation of energy.
- Understand rotational motion and determine M.I. of a rotating body (flywheel)
- Understand Stoke's law for viscous liquids and determine viscosity of a given liquid.
- Understand how materials expand on heating and determine linear expansion coefficient for a given material rod.
- Understand working and use Fortin's barometers for determining pressure at a place.
- Understand use of thermometers to measure temperature under different conditions and different scales of temperature measurements.

List of Practical's

1. To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier caliper and find volume of each object.
2. To determine diameter of a wire, a solid ball and thickness of cardboard using a screw gauge.
3. To determine radius of curvature of a convex and a concave mirror/surface using a spherometer.
4. To verify triangle and parallelogram law of forces.
5. To determine force constant of a spring using Hook's Law.
6. To find the viscosity of a given liquid (Glycerin) by Stoke's law
7. To determine atmospheric pressure at a place using Quill Tube Method
8. To measure room temperature and temperature of a hot bath using mercury thermometer and convert it into different scales.
9. To verify law of conservation of mechanical energy (PE to KE).
10. To find the surface Tension of a given liquid by capillary Rise Method.

Applied Chemistry

Course Objectives:

There are numerous number materials are used in fabricating and manufacturing devices for the comfort of life. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians. On successful completion of this course content will enable technicians to understand, ascertain and analyse and properties of natural raw materials require for producing economical and eco-friendly finished products.

- Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding.
- Use relevant water treatment method to solve domestic and industrial problems.
- Solve the engineering problems using knowledge of engineering materials and properties.
- Use relevant fuel and lubricants for domestic and industrial applications
- Solve the engineering problems using concept of Electrochemistry and corrosion.

Learning Outcomes

At the end of the course student will be able to

1. Understand the classification and general properties of engineering materials such as metal, alloys, glasses, cement, refractory and composite materials using knowledge of chemical bonding.
2. Understand and assess the suitability of water source for domestic and industrial application, effluents and minimize water pollution.
3. Qualitatively analyze the engineering materials and understand their properties and applications.
4. Choose fuel and lubricants suitable for economical industrial processing to obtain eco-friendly finished products.
5. a) Ascertain construction, mechanism efficiency of electrochemical cells, solar cell fuel cells
b) Understand corrosion and develop economical prevention techniques.

Course Content:

Unit 1: Atomic Structure, Chemical Bonding and Solutions

Bohr's theory (expression of energy and radius to be omitted), Quantum numbers orbital concept. Shapes of s, p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration.

Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example), covalent bond, co-ordination bond in NH_4^+ .

Solution – idea of solute, solvent and solution, methods to express the concentration of solution – molarity (M = mole per liter), ppm.

Unit 2: Water, Chemistry of Fuels and Lubricants

Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness.

Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc). Water softening techniques – soda lime process, zeolite process and ion exchange process.

Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization.

Chemistry of Fuels and Lubricants:

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

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

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

Unit 3: Engineering Materials

Natural occurrence of metals – minerals, ores of iron, aluminium and copper, gangue (matrix), flux, slag, metallurgy – brief account of general principles of metallurgy. Extraction of iron from haematite ore using blast furnace. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications.

Portland cement and hardening, Glasses Refractory and Composite materials.

Polymers – monomer, homo and co polymers, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, nylon – 6, nylon – 66, Bakelite only), rubber and vulcanization of rubber.

Unit 4: ElectroChemistry

Electronic concept of oxidation, reduction and redox reactions.

Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of

electrolysis and simple numerical problems. Industrial Application

of Electrolysis –

- Electrometallurgy
- Electroplating
- Electrolytic refining.

Application of redox reactions in electrochemical cells –

- Primary cells – dry cell,
- Secondary cell-commercially used lead storage battery,

fuel and Solar cells. Introduction to Corrosion of metals–

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

Internal corrosion preventive measures –

- Purification, alloying and heat treatment and

External corrosion preventive measures: a) metal (anodic, cathodic) coatings, b) organic inhibitors.

Text Books:

- 1) Text Book of Chemistry for Class XI & XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
- 2) Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.

Applied Chemistry Lab

Course Objectives:

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

Learning Outcomes:

At the end of the course student will be able to

- To express quantitative measurements accurately.
- To practice and adapt good measuring techniques.
- To use various apparatus for precise measurements.
- To understand and differentiate different methods of quantitative analysis.
- To know and understand principles of quantitative analysis using instruments.

LIST OF PRACTICALS:

Perform any 12 (twelve) Laboratory Practicals.

Volumetric and Gravimetric analysis:

- 1 Preparation of standard solution of oxalic acid or potassium permanganate.
- 2 To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
- 3 Standardization of KMnO_4 solution using standard oxalic acid and Determine the percentage of Iron present in given Hematite ore by KMnO_4 solution.
- 4 Iodometric estimation of copper in the copper pyrite ore.
- 5 Volumetric estimation of total acid number (TAN) of given oil.
- 6 Volumetric estimation of
 - a) Total hardness of given water sample using standard EDTA solution.
 - b) Alkalinity of given water sample using 0.01M sulphuric acid
- 7 Proximate analysis of coal
 - a) Gravimetric estimation moisture in given coal sample
 - b) Gravimetric estimation ash in given coal sample

Instrumental analysis

8. Determine the conductivity of given water sample.
9. Determination of the Iron content in given cement sample using colorimeter.
10. Determination of calorific value of solid or liquid fuel using bomb calorimeter.
11. Determination of viscosity of lubricating oil using Redwood viscometer.
12. Determination of flash and fire point of lubricating oil using Able's flash point apparatus.
13. To verify the first law of electrolysis of copper sulfate using copper electrode.
14. Construction and measurement of emf of electrochemical cell (Daniel cell).
15. To study the effect of dissimilar metal combination.

Text Book:

1. Text Book of Chemistry for Class XI & XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.

Communication Skills in English

Course Objectives:

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

To develop confidence in speaking English with correct pronunciation.

To develop communication skills of the students i.e. listening, speaking, reading and writing skills. To introduce the need for personality development- Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc.

Course outcomes:

At the end of this course, the participants will:

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

Course Content

Unit-1 Communication: Theory and Practice

- Basics of communication: Introduction, meaning and definition, process of communication etc.
- Types of communication: formal and informal, verbal, non-verbal and written Barriers to effective communication.
- 7 Cs for effective communication (considerate, concrete, concise, clear, complete, correct, courteous).
- Art of Effective communication,
 - Choosing words
 - Voice
 - Modulation
 - Clarity
 - Time
 - Simplification of words
- Technical Communication.

Unit-2 Soft Skills for Professional Excellence

- Introduction: Soft Skills and Hard Skills.
- Importance of soft skills.
- Life skills: Self-awareness and Self-analysis, adaptability, resilience, emotional intelligence and empathy etc.
- Applying soft skills across cultures.
- Case Studies.

Unit-3: Reading Comprehension

Comprehension, vocabulary enhancement and grammar exercises based on reading of the following texts:

Section-1

Malgudi Days: R.K. Narayan

The Room on

Roof: Ruskin

Bond “The Gift
of the Magi” by

O. Henry

“Uncle Podger Hangs a Picture” Jerome K. Jerome

Section-2

Night of the Scorpion by Nissim Ezekiel,

Stopping by Woods on a Snowy

Evening by Robert Frost, Where the

Mind is Without Fear by Rabindranath

Tagore, Ode to Tomatoes by Pablo

Neruda,

Unit-4: Professional Writing

The art of
précis writing,

Letters:

business and
personnel,

Drafting e-mail, notices, minutes of a meeting etc.

Filling-up different forms such as banks and on-line forms for placement etc.

Vocabulary and Grammar

Vocabulary of commonly used words

Glossary of administrative terms

(English and Hindi) One-word

substitution, Idioms and phrases

etc.

Parts of speech, active and passive voice, tenses etc., Punctuation

References:

1. M. Ashraf Rizvi. *Effective Technical Communication*. Mc-Graw Hill: Delhi, 2002.

Communication Skills in English – Lab

Course Objectives:

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

1. To develop listening skills for enhancing communication.
2. To develop speaking skills with a focus on correct pronunciation and fluency.
3. To introduce the need for Personality development- Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc. for that purpose group discussion, extempore and other activities should be conducted during lab classes.

Learning Outcome:

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

Course Content:

Unit 1 Listening Skills

Listening Process and Practice: Introduction to recorded lectures, poems, interviews and speeches, listening tests.

Unit II Introduction to Phonetics

Sounds: consonant, vowel, diphthongs, etc. transcription of words (IPA), weak forms, syllable division, word stress, intonation, voice etc.

Unit III Speaking Skills

Standard and formal speech: Group discussion, oral presentations, public speaking, business presentations etc. Conversation practice and role playing, mock interviews etc.

Unit IV Building vocabulary

Etymological study of words and construction of words, phrasal verbs, foreign phrases, idioms and phrases. Jargon/ Register related to organizational set up, word exercises and word games to enhance self-expression and vocabulary of participants.

Recommended Readings:

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

Engineering Graphics

Course Objectives:

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

Course Outcomes

Following outcomes will be achieved:

- 1) Select and construct appropriate drawing scales, use drawing equipment's, and understand Indian Standards of engineering drawing
- 2) Draw views of given object and components 3) Sketch orthographic projections into isometric projections and vice-versa.
- 3) Apply computer aided drafting tools to create 2D engineering drawings

Course Content

Unit – I Basic elements of Drawing

Drawing Instruments and supporting materials: method to use them with applications. Convention of lines and their applications.

Representative Fractions – reduced, enlarged and full size scales; Engineering Scales such as plain and diagonal scale.

Dimensioning techniques as per SP-46:2003 – types and applications of chain, parallel and coordinate dimensioning.

Geometrical and Tangency constructions. (Redraw the figure)

Unit – II Orthographic projections

Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications(No question to be asked in examination).

Introduction to orthographic projection, First angle and Third angle method, their symbols.

Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection method only)

Isometric Projections

Introduction to isometric projections. Isometric scale and Natural scale. Isometric view and isometric projection.

Illustrative problems related to objects containing lines, circles and arcs shape only. Conversion of orthographic views into isometric view/projection.

Unit – III Free Hand Sketches of engineering elements

Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washer, locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching)

Free hand sketches of orthographic view (on squared graph paper) and isometric view (on isometric grid paper)

Unit – IV Computer aided drafting interface

Computer Aided Drafting: concept.

Hardware and various CAD software available.

System requirements and Understanding the interface.

Components of AutoCAD software window: Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify tool bar, cursor cross hair. Command window, status bar, drawing area, UCS icon.

File features: New file, Saving the file, Opening an existing drawing file, Creating templates, Quit.

Setting up new drawing: Units, Limits, Grid, Snap. Undoing and redoing action.

Computer aided drafting

Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, PolyLine.

Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates.

Modify and edit commands like trim, extend, delete, copy, offset, array, block, layers.

Dimensioning: Linear, Horizontal Vertical, Aligned, Rotated, Baseline, Continuous, Diameter, Radius, Angular Dimensions.

Continuous, Diameter, Radius, Angular Dimensions.

Text Books: Single line Text, Multiline text.

Standard sizes of sheet. Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview.

Text: Single line Text, Multiline text.

Environmental 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.

- 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 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:

Pre requisite: - High School Chemistry

Unit-1 Ecosystem

- Structure of ecosystem, Biotic & Abiotic components
- Food chain and food web
- 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
- Air Pollutants: Types, Particulate Pollutants: Effects and control of air pollution
- Noise pollution: sources of pollution, Effects and control of Noise pollution

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
- Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers,
Pesticides and Insecticides, Irrigation, E-Waste.

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

Unit– 4 Renewable sources of Energy

- Solar Energy: Basics of Solar energy. Solar pond. Solar water heater, solar dryer.
- 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
- Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste.

References:

Text 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.
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Introduction to IT Systems

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 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, Key-board, 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: OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress.

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

Introduction to IT Systems Lab

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.

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.

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

References:

1. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.
2. IT Essentials PC Hardware and Software Companion Guide, Davis Anfinson and Ken Quamme, CISC Press, Pearson Education.

Applied Physics –II

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.

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 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.

Course Content

UNIT - 1: Wave motion and Optics

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.

Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications,

Basic optical laws; reflection and refraction, refractive index, Images and image formation by mirrors, lens and thin lenses, lens formula, power of lens, magnification. Total internal reflection, Critical angle and conditions for total internal reflection, applications of total internal reflection in optical fiber

UNIT -2 : Electrostatics and Current Electricity

Coulombs law, unit of charge, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference

Capacitor and its working, Types of capacitors, Capacitance and its units. Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors

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, Kirchoff's laws, Wheatstone bridge and its applications, Describe Meter bridge Experiment for determination of specific resistance with neat circuit diagram, problems Solving

UNIT - 3: Electromagnetism

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 - 4: Modern 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. Photocells, Solar cells; working principle and engineering applications.

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.

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

Applied Physics Labs –II

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 necessary confidence in handling equipment and thus learn various skills in measurement.

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 volt- meter.
- 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.

List of Practicals/Activities:

1. Determine the Velocity of sound in air using resonance column Apparatus at room temperature and at 0°C.
2. To verify laws of refraction (Snell's law) using a glass slab.

3. To determine focal length and magnifying power of a convex lens.
4. Determine the resistance and specific resistance of the wire using Meter Bridge
5. To verify laws of resistances in series and parallel combination.
6. To verify Ohm's law by plotting graph between current and potential difference.
7. Draw the lines of force of combined magnetic field due to bar magnet in earth's magnetic field by locating the null points when North pole of the bar magnet pointing towards Geographical North of the Earth.
- 8.. Draw the lines of force of combined magnetic field due to bar magnet in earth's magnetic field by locating the null points when North pole of the bar magnet pointing towards Geographical North of the Earth
9. To convert a galvanometer into an ammeter.
10. To convert a galvanometer into a voltmeter.
11. To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage.
12. To measure numerical aperture (NA) of an optical fiber.

Engineering Mechanics

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

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.

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 diagram, Analytical method of analysing equilibrium.

Lami's Theorem – statement and explanation, Application for various engineering problems.

Types of beams, supports (hinge, roller and fixed) and loads (vertical, inclined point load & uniformly distributed load) acting on the beam.

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

Unit– III Friction

Introduction - Theory of Friction - Angle of friction - Laws of Friction - Static

and Dynamic Frictions- Wedge Friction, Screw-jack and Differential Screw-jack

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

Unit– IV Centroid

Introduction to Centroid, Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle). Centroid of T, L, I, Channel section, Z section, Unsymmetrical I section and Built-up sections.

Text Book:

1. Khurmi, R.S., Applied Mechanics, S. Chand &Co. NewDelhi.

Engineering Mechanics Lab

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. To study various equipments related to Engineering Mechanics.
2. To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack.
3. Determine resultant of concurrent force system applying Law of Polygon of forces using force table.
4. Determine resultant of concurrent force system graphically.
5. Determine resultant of parallel force system graphically.
6. Verify Lami's theorem.
7. Study forces in various members of Jib crane.
8. Determine support reactions for simply supported beam.
9. Obtain support reactions of beam using graphical method.
10. Determine coefficient of friction for motion on horizontal and inclined plane.
11. Determine centroid of geometrical plane figures.

Text Book:

1. Khurmi, R.S., Applied Mechanics, S.Chand & Co. New Delhi.

Fundamentals of Electrical and Electronics Engineering

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.

Outcomes:

1. Understand the basics of analog and digital electronics
2. Analyze eclectic and magnetic circuits
3. Understand the working of transformers and machines.

Course Contents:

UNIT I Overview of Electronic Components & Signals:

Passive Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, FET, MOS and CMOS and their Applications. Signals: DC/AC, voltage/current, periodic/non-periodic signals, average, rms, peak values.

UNIT II Overview of Analog and Digital Circuits:

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

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

Unit III Electric and Magnetic Circuits:

EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hysteresis loop, reluctance, 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 IV A.C. Circuits, Transformers and Machines

Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor; General construction and principle of transformer; Emf equation and transformation ratio of transformers; Construction and Working principle of motors; Basic equations and characteristic of motors.

Text Book:

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

Fundamentals of Electrical and Electronics Engineering Lab

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 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.	List of Experiments	Approx. Hrs.
1.	Determine the value of given resistor using digital multimeter to confirm with colour code.	02
2	Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter.	02
3	Use LCR-Q tester to measure the value of given capacitor and inductor.	02
4	Connect capacitors in series and parallel combination on bread board and measure its value using multimeter.	02
5	Measure voltage, current and power in 1-phase circuit with resistive load.	02

6	Measure voltage, current and power in R-L series circuit.	02
7	Test the performance of PN-junction diode.	02
8	Test the performance of Zener diode.	02
9	Determine the current gain of CE transistor configuration.	03
10	Determine the transformation ratio (K) of 1-phase transformer.	03

Text Book:

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

Mathematics - II

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

- (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.

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

Integration as inverse operation of differentiation. Simple integration by substitution, by parts

and by Partial fractions (for linear factors only). Use of formulas $\int_0^{\frac{\pi}{2}} \sin^n x dx$, $\int_0^{\frac{\pi}{2}} \cos^n x dx$ and

$$\int_0^{\frac{\pi}{2}} \sin^n x \cos^n x dx$$

UNIT - II: Integral Calculus

Integration as inverse operation of differentiation. Simple integration by substitution, by parts

and by partial fractions (for linear factors only). Use of formulas $\int_0^{\frac{\pi}{2}} \sin^n x dx,$

$\int_0^{\frac{\pi}{2}} \cos^n x dx,$ and $\int_0^{\frac{\pi}{2}} \sin^n x \cos^n x dx$ for solving problems Where m and n are

positive integers. Applications of integration for i. Simple problem on evaluation of area bounded by a curve and axes. ii. Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems).

UNIT - III: Co-Ordinate Geometry

Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula.

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;

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.

Differential Equations

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

Text Books:

1. Text book of Intermediate Mathematics-I & II by Telugu Academy.
2. A Text book of Engineering Mathematics –II , III by Radiant Publication.

Engineering Workshop Practice

Course Objectives:

- To understand basic engineering processes for manufacturing and assembly.
- To understand, identify, select and use various marking, measuring, and holding, striking and cutting tools and equipment's
- To understand and interpret job drawings, produce jobs, and inspect the job for specified Dimensions
- To understand the various types of wiring systems and acquire skills in house wiring
- To understand, operate, control different machines and equipment's adopting safety practice

Course outcomes

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

CO1	Acquire skills in basic engineering practice to identify, select and use various marking, measuring, and holding, striking and cutting tools & equipment's and machines
CO2	Understand job drawing and complete jobs as per specifications in allotted time
CO3	Inspect the job for the desired dimensions and shape
CO4	Operate, control different machines and equipment's adopting safety practices

Course Content:

S.No.	Details Of Practical Content
I	<p>Carpentry: i) Demonstration of different wood working processes, like planing, marking, chiseling, turning of wood etc ii) One simple job involving any one joint like mortise and tendon dovetail, bridle, half lap etc.</p> <p>Fitting: i) Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc. ii) One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc</p>
II	<p>Welding: i) Demonstration of different welding tool. ii) Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding. iii) One simple job involving butt and lap joint</p> <p>Sheet Metal Working: i) Demonstration of different sheet metal operations like sheet cutting, bending, edging, lancing, soldering, and riveting. ii) One simple job involving sheet metal operations and soldering and riveting</p>
III	<p>Electrical House Wiring: Practice on simple lamp circuits (i) one lamp controlled by one switch by surface conduit wiring, (ii) Lamp circuits- connection of lamp and socket by separate switches,</p>
IV	<p>Demonstration: i) Demonstration of measurement of Current, Voltage, Power and Energy. ii) Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. iii) Tools for Cutting and drilling</p>

References:

1. S.K. Hajara Chaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi, 2015