

CURRICULUM

First Year (1st and 2nd Semester)

THREE YEAR DIPLOMA PROGRAMME IN

Group- A (Computer Engineering, Information Technology, Electrical Engineering, Agriculture Engineering, Electronics and Communication Engineering)

Group-B (Civil Engineering, Mechanical Engineering, Automobile Engineering, Instrumentation Engineering, Electrical & Electronics Engineering)

(N-2022 SCHEME)

FOR THE STATE OF HIMACHAL PRADESH



Session 2022-23

Prepared by:-

Composite Curriculum Development Centre

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Vocational & Industrial Training, Sundernagar(H.P.)

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SALIENT FEATURES

Programme	Three Year Diploma Group-A (Computer Engineering, Information Technology, Electrical Engineering, Agriculture Engineering, Electronics and Communication Engineering) Group-B (Civil Engineering, Mechanical Engineering, Automobile Engineering, Instrumentation Engineering, Electrical & Electronics Engineering)
Duration	Three years (Six Semesters)
Entry Qualification	As prescribed by H.P. Takniki Shiksha Board /AICTE
Intake	As approved by H.P. Takniki Shiksha Board
Pattern	Semester System
Curriculum for	First Year Common For Branches: Computer Engineering, Information Technology, Electrical Engineering, Agriculture Engineering, Electronics and Communication Engineering, Civil Engineering, Mechanical Engineering, Automobile Engineering, Instrumentation Engineering, Electrical & Electronics Engineering.

Course code and definition:

Course code	Definitions
L	Lecture
DCS	Doubt Clearing Session
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

GENERAL GUIDELINES FOR CURRICULUM IMPLEMENTATION

1. Weightage for the internal assessment in respect of theory subjects will be as follow:
 - a. House Test: 40%
 - b. Class Test: 20%
 - c. Home Assignment: 20%
 - d. Attendance: 20%
2. There will be two class tests in every semester and the average of the two tests will be taken into account.
3. The syllabus for the class tests will be as under:
 - a. Class Test-I: 30% of syllabus
 - b. Class Test-II: next 30% of syllabus
4. Class Test-I &II will be conducted as per Academic Calendar.
5. The 30%, 60% and 80% contents of the syllabus will be based on the number of hours allocated for the topics in the detailed curriculum of each subject.
6. The question paper for both the class tests will be of 30 marks each and of one-hour duration.
7. Improvement test can be conducted after every class test on the basis of some genuine reason to be judged by the Head of concerned Department.
8. There will be one house test as per Academic Calendar and syllabus coverage will be 80%.
9. The house test will be of total 60 marks and the duration of House Test should be two hours.
10. In case student fails to attend the house test due to genuine reasons, re-examination will be conducted with the approval of concerned Principal on the recommendation of concerned Head of Department.
11. There will be minimum two home assignments per subject per semester.
12. Weightage for the internal assessment in respect of Practical subject should be:
 - a. Practical Performance: 60%, Report Writing: 20% and Viva Voce : 20%
13. Weightage for Internal Assessment in respect of Drawing subjects will be as under:
 - a. House Test and Class Test =40%

- a) Class performance/Drawings Sheets 40%
- b) Attendance/punctuality =10%
- c) Viva Voce =10%

- 14. For 13 a), b), c) marks should be given in each drawing sheet by concerned teacher during evaluation.
- 15. It is suggested that students may be taken for industrial visits for industrial exposure in second year and third year.
- 16. **Student Centered Activities:** A provision has been made for organizing Student Centered Activities for overall personality development of students. SCA will comprise co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, cultural activities and participation in programs like technical and cultural events etc.

Distribution of marks for SCA will be as follows:

- 20% marks shall be given for general behaviour.
- 20% marks for attendance.
- 60% Marks shall be given for the Sports/Cultural and Co-curricular activities /other activities after due consideration.

Note: These marks are to be sent to the H.P. Takniki Shiksha Board, Dharmashala at the end of semester along with internal assessment.

- 17. **INDUCTION PROGRAM:-**The students will have to undergo a mandatory induction program for one week as per Academic Calendar as per the suggestive list of activities mentioned in the AICTE Model Curriculum 2019.

STUDY AND EVALUATION SCHEME

Semester- I (Group- A)

Sr. No.	Category of Course	Code No.	Course Title	Hours/Week			Total Hrs/week	Credits	Evaluation Scheme						
				L	P	DCS			Internal		External			Total	
							Th	Pr	Th	Hrs.	Pr	Hrs.			
1.	Basic Science	BS101	Mathematics-I	3	0	2	5	3	40		60	3			100
2.	Basic Science	BS103	Applied Physics-I	3	0	1	4	3	40		60	3			100
3.	Basic Science	BS105	Applied Chemistry	3	0	1	4	3	40		60	3			100
4.	Humanities & Social Science	HS101	Communication Skills in English	2	0	1	3	2	40		60	3			100
5.	Engineering Science	ES101	Engineering Graphics	0	3	1	4	1.5		40	60	3			100
6.	Engineering Science	ES103	Engineering Workshop Practice	0	3	3	6	1.5		40			60	3	100
7.	Basic Science	BS107	Applied Physics-I Lab	0	2	0	2	1		40			60	3	100
8.	Basic Science	BS109	Applied Chemistry Lab	0	2	0	2	1		40			60	3	100
9.	Humanities & Social Science	HS103	Sports and Yoga	0	2	0	2	1		40			60	3	100
10.	Humanities & Social Science	HS105	Communication Skills in English Lab	0	2	0	2	1		40			60	3	100
11.			SCA	0	2	0	2	0		25			0		25
Total Teaching Load				11	16	9	36								
Total								18	160	265	300		300		1025

STUDY AND EVALUATION SCHEME

Semester- I (Group-B)

Sr. No.	Category of Course	Code No.	Course Title	Hours/Week			Total Hrs/week	Credits	Evaluation Scheme						
				L	P	DCS			Internal		External			Total	
									Th	Pr	Th	Hrs.	Pr		Hrs.
1.	Basic Science	BS101	Mathematics-I	3	0	2	5	3	40		60	3			100
2.	Basic Science	BS103	Applied Physics-I	3	0	1	4	3	40		60	3			100
3.	Basic Science	BS105	Applied Chemistry	3	0	1	4	3	40		60	3			100
4.	Humanities & Social Science	HS101	Communication Skills in English	2	0	1	3	2	40		60	3			100
5.	Engineering Science	ES102	Introduction to IT Systems	2	0	0	2	2	40		60	3			100
6.	Engineering Science	ES101	Engineering Graphics	0	3	1	4	1.5		40	60	3			100
7.	Engineering Science	ES108	Introduction to IT Systems Lab	0	4	0	4	2		40			60	3	100
8.	Basic Science	BS107	Applied Physics-I Lab	0	2	0	2	1		40			60	3	100
9.	Basic Science	BS109	Applied Chemistry Lab	0	2	0	2	1		40			60	3	100
10.	Humanities & Social Science	HS103	Sports and Yoga	0	2	0	2	1		40			60	3	100
11.	Humanities & Social Science	HS105	Communication Skills in English Lab	0	2	0	2	1		40			60	3	100
			SCA	0	2	0	2	0		25			0		25
Total Teaching Load				13	17	6	36								
Total								20.5	200	265	360		300		1125

STUDY AND EVALUATION SCHEME

Semester- II (Group- A)

Sr. No.	Category of Course	Code No.	Course Title	Hours/Week			Total Hrs/week	Credits	Evaluation Scheme						
				L	P	DCS			Internal		External			Total	
							Th	Pr	Th	Hrs.	Pr	Hrs.			
1.	Basic Science	BS102	Mathematics-II	4	0	1	5	4	40		60	3			100
2.	Basic Science	BS104	Applied Physics-II	3	0	1	4	3	40		60	3			100
3.	Engineering Science	ES102	Introduction to IT Systems	2	0	0	2	2	40		60	3			100
4.	Engineering Science	ES104	Fundamentals of Electrical & Electronics Engineering	3	0	1	4	3	40		60	3			100
5.	Engineering Science	ES106	Engineering Mechanics	3	0	1	4	3	40		60	3			100
6.	Basic Science	BS106	Applied Physics-II Lab	0	2	0	2	1		40			60	3	100
7.	Engineering Science	ES108	Introduction to IT Systems Lab	0	4	0	4	2		40			60	3	100
8.	Engineering Science	ES110	Fundamentals of Electrical & Electronics Engineering Lab	0	2	0	2	1		40			60	3	100
9.	Engineering Science	ES112	Engineering Mechanics Lab	0	2	0	2	1		40			60	3	100
10.	Audit	AU102	Environmental Science	2	0	0	2	0	40		60	3			100
11.			SCA	0	2	0	2	0		25			0		25
Total Teaching Load				17	12	4	33								
Total								20	240	185	360		240		1025

STUDY AND EVALUATION SCHEME

Semester- II (Group- B)

Sr. No.	Category of Course	Code No.	Course Title	Hours/Week			Total Hrs/ week	Credits	Evaluation Scheme						
				L	P	DCS			Internal		External			Total	
									Th	Pr	Th	Hrs.	Pr		Hrs.
1.	Basic Science	BS102	Mathematics-II	4	0	1	5	4	40		60	3			100
2.	Basic Science	BS104	Applied Physics-II	3	0	1	4	3	40		60	3			100
3.	Engineering Science	ES104	Fundamentals of Electrical & Electronics Engineering	3	0	1	4	3	40		60	3			100
4.	Engineering Science	ES106	Engineering Mechanics	3	0	1	4	3	40		60	3			100
5.	Basic Science	BS106	Applied Physics-II Lab	0	2	0	2	1		40			60	3	100
6.	Engineering Science	ES103	Engineering Workshop Practice	0	3	3	6	1.5		40			60	3	100
7.	Engineering Science	ES110	Fundamentals of Electrical & Electronics Engineering Lab	0	2	0	2	1		40			60	3	100
8.	Engineering Science	ES112	Engineering Mechanics Lab	0	2	0	2	1		40			60	3	100
9.	Audit	AU102	Environmental Science	2	0	0	2	0	40		60	3			100
10.			SCA	0	2	0	2	0		25			0		25
Total Teaching Load				15	11	7	33								
Total								17.5	200	185	300		240		925

DETAILED CONTENTS OF FIRST YEAR

Mathematics- I (BS101)

Course Code	:	BS101
Course Title	:	Mathematics- I
Number of Credits	:	3(L: 3, DCS: 2, P: 0)
Prerequisites	;	NIL
Course Category	:	BS

Course Objectives:

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

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 $\sin x$, $\cos x$.

UNIT-II Differential Calculus

Definition of function; Concept of limits. Four standard limits $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$, $\lim_{x \rightarrow 0} \frac{\sin x}{x}$, $\lim_{x \rightarrow 0} (1 + x)^{\frac{1}{x}}$ and $\lim_{x \rightarrow 0} \frac{a^x - 1}{x}$.

Differentiation by definition of x^n , $\sin x$, $\cos x$, $\tan x$ and e^x . Differentiation of sum, product and quotient of functions. Differentiation of function of a function. Differentiation of trigonometric and inverse trigonometric functions, Logarithmic differentiation.

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-movier's theorem, its application.

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.

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.

References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018)
4. V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e., Vikas Publishing House.
5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi.

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 into 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.

Distribution of Time and Marks

Unit	Time (Hours)	Marks %age
1	22	30
2	22	30
3	36	40
Total	80	100

APPLIED PHYSICS –I (BS103)

Course Code	:	BS103
Course Title	:	Applied Physics-I
Number of Credits	:	3(L: 3;DCS: 1, P: 0)
Prerequisites	:	High School Level Physics
Course Category	:	BS

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.

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: Physical world, Units and Measurements

Physical quantities: fundamental and derived, Units and systems of units (FPS, CGS and SI units), Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other, checking of dimensional equations and derivation of simple equations), Limitations of dimensional analysis. Errors in measurements (systematic and random), absolute error, relative error, error estimation and significant figures.

Unit 2: Force and Motion

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 (Rectangular components) and lawn roller.

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, linear acceleration and angular acceleration (related numerical), Centripetal and Centrifugal forces with live examples, Expression and applications such as banking of roads and bending of cyclist.

Unit 3: Work, Power and Energy

Work: Concept and units, examples of zero work, positive work and negative work
Friction: concept, types, laws of limiting friction, coefficient of friction, methods for reducing friction and its engineering applications, Work done in moving an object on horizontal and inclined plane for rough and plane surfaces and related applications.

Energy and its units, kinetic energy, gravitational potential energy with examples and derivations,

Mechanical energy, conservation of mechanical energy for freely falling bodies, transformation of energy (examples).

Power and its units, power and work relationship, calculation of power (numerical problems).

Unit 4: Rotational Motion

Translational and rotational motions with examples.

Definition of torque and angular momentum and their examples.

Conservation of angular momentum (quantitative) and its applications.

Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid): (Formulae only).

Unit 5: Properties of Matter

Elasticity: Definition of stress and strain, different types of moduli of elasticity, Hooke's law, significance of stress-strain curve.

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, Ascent Formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension.

Unit 6: Heat and Thermometry

Concept of heat and temperature.

Modes of heat transfer (conduction, convection and radiation with examples), 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, Co-efficient of thermal conductivity.

Course Outcomes:

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.
- Analyze 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.
- State the principle of conservation of energy. Identify various forms of energy, and energy transformations.
- Compare and relate physical properties associated with linear motion and rotational motion and apply conservation of angular momentum principle to known problems.
- Describe the phenomenon of surface tension, effects of temperature on surface tension and solve statics problems that involve surface tension related forces.
- Define stress and strain. State Hooke's law and elastic limits, stress-strain diagram, determine; (a) the modulus of elasticity, (b) the yield strength (c) the tensile strength, and (d) estimate the percent elongation.
- Illustrate the terms; heat and temperature, measure temperature in various processes on different scales (Celsius, Fahrenheit, and Kelvin etc.).

- Distinguish between conduction, convection and radiation; identify different methods for reducing heat losses and mode of heat transfer between bodies at different temperatures.

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. Engineering Physics by DK Bhattacharya & PoonamTandan; Oxford University Press, New Delhi.
6. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
7. Practical Physics by C. L. Arora, S. Chand Publication.
8. e-books/e-tools/ learning physics software/websites etc.

SUGGESTED DISTRIBUTION OF MARKS

UNIT/TOPIC	TIME ALLOTTED	MARKS ALLOTTED (%)
1	10	15
2	12	20
3	10	15
4	10	15
5	12	20
6	10	15
TOTAL	64	100

APPLIED CHEMISTRY (BS105)

Course Code	:	BS105
Course Title	:	Applied Chemistry
Number of Credits	:	3 (L: 3,DCS:1, P: 0)
Prerequisites	:	High School Level Chemistry
Course Category	:	BS

Course Objectives:

There are numerous number 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. 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.

Course Content:

1. Atomic Structure

1.1 Fundamental particles of atoms : Electron, proton, neutron (Definitions) **1.2** Atomic Structure: Bohr's theory, successes and limitations(expression of energy and radius to be omitted), and Hydrogen spectrum explanation based on Bohr's model of atom, **1.3** Heisenberg uncertainty principle, Quantum numbers – orbital concept, Shapes of s, p orbitals , difference between orbit and orbital **1.4** Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration(Z=1 to 30).

2. Chemical bonding and Solutions

2.1 Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example) **2.2** Lewis concept of covalent bond (H₂, F₂, HF). Electronegativity, Difference between sigma and pie bond **2.3** Electron sea model of metallic bond. **2.4** Idea of solute, solvent and solution

2.5 Methods to express the concentration of solution- molarity (M = mole per liter), molality, mass percentage (Numerical excluded).

3. Electro Chemistry and Corrosion

3.1 Electronic concept of oxidation, reduction and redox reactions. Definition of terms: electrolytes, non-electrolytes with suitable examples, **3.2** Faradays laws of electrolysis and simple numerical problems. **3.3** Industrial application of Electrolysis – • Electrometallurgy • Electroplating • Electrolytic refining. **3.4** Application of redox reactions in electrochemical cells – • Primary cells – dry cell, • Secondary cell - commercially used lead acid storage battery. **3.5** Introduction to Corrosion of metals – definition, types of corrosion (electrochemical), H₂ liberation and O₂ absorption mechanism of electrochemical corrosion, **3.6** Internal corrosion preventive measures – Purification, alloying and heat treatment and External corrosion preventive measures: metal (anodic, cathodic) coatings.

4. Engineering Materials

4.1 Natural occurrence of metals – minerals, ores of iron, aluminium and copper, gangue (matrix), flux, slag, metallurgy – brief account of general principles of metallurgy (a) Crushing and grinding (b) Concentration of ore (Levigation, Froth flotation, Magnetic separation) (c) Extraction (Roasting and calcinations & smelting) (d) Refining (Electro refining, zone refining). **4.2** Extraction of - iron from haematite ore using blast furnace along with reactions. **4.3** Alloys – definition, purposes of alloying, ferrous alloys (Invar steel) and non-ferrous (Simple Brass & Bronze, Nichrome, Duralumin, Magnesium) with suitable examples, properties and applications.

5. Water

5.1 Classification of soft and hard water based on soap test, salts causing water hardness, units of hardness (mg/L and ppm) and simple numerical on water hardness. Cause of poor lathering of soap in hard water, **5.2** Problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion.) **5.3** i) water softening techniques- zeolite process ii). Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization. **5.4** Properties of water used for human consumption for drinking and cooking purposes from any water sources and Indian standard specification of drinking water.

6. Fuels

6.1 Definition of fuel and combustion of fuel, classification of fuels **6.2** calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula. Characteristics of good fuel **6.3** Petrol and diesel - fuel rating (octane and cetane numbers) **6.4** Chemical composition, calorific values and applications of LPG, CNG, water gas, producer gas and biogas.

7. Lubrication

7.1 Function and characteristic properties of good lubricant, **7.2** classification with examples **7.3** Lubrication mechanism – hydrodynamic and boundary lubrication **7.4** 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.

8. Polymers

8.1 Monomer, homo and co polymers , degree of polymerization **8.2** simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using Polythene, PVC, PS, PTFE, nylon-6,6 and Bakelite only) **8.3** Vulcanization of rubber and properties of vulcanised rubber.

References/Suggested Learning Resources:

(a) 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.
- 3) C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
- 4) Dara, S. S. & Dr.S.S.Umare, Engineering Chemistry, S.Chand. Publication, New Delhi, New Delhi, 2015.
- 5) Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
- 6) Dr. Vairam, S., Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.
- 7) Dr. G. H. Hugar & Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
- 8) Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.

(b) Open source software and website address:

- 1 www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
- 2 www.visionlearning.com (Atomic structure and chemical bonding)
- 3 www.chem1.com (Atomic structure and chemical bonding)
- 4 <https://www.wastewaterelearning.com/elearning/> (Water Treatment)
- 5 www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
- 6 www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf (Fuel and Combustion)

Course 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, and refractory using knowledge of chemical bonding.
2. Understand and assess the suitability of water source for domestic and industrial application, effluents and minimise 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.
b) Understand corrosion and develop economical prevention techniques.

SUGGESTED DISTRIBUTION OF HOURS & MARKS

Units	Time Allotted(Hrs)	Marks Allotted(%)
1.	8	12
2.	8	12
3.	11	17
4.	8	14
5.	9	12
6.	8	12
7.	8	12
8.	4	9
Total	64	100

Communication Skills in English (HS101)

Course Code	:	HS101
Course Title	:	Communication Skills in English
Number of Credits	:	2(L: 2,DCS: 1, P: 0)
Prerequisites	:	NIL
Course Category	:	HS

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 are:

1. To develop confidence in speaking English with correct pronunciation.
2. To develop communication skills of the students i.e. listening, speaking, reading and writing skills.
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.

Unit-1 Communication: Theory and Practice

1. Basics of communication: Introduction, meaning and definition, process of communication etc.
2. Types of communication: formal and informal, verbal, non-verbal and written
Barriers to effective communication.
3. 7Cs for effective communication (considerate, concrete, concise, clear, complete, correct, courteous).
4. Art of Effective communication,
 - A. Choosing words
 - B. Voice
 - C. Modulation
 - D. Clarity
 - E. Time
 - F. Simplification of words
5. Technical Communication.

Unit-2 Soft Skills for Professional Excellence

1. Introduction: Soft Skills and Hard Skills.
2. Importance of soft skills.

3. Life skills: Self-awareness and Self-analysis, adaptability, resilience, emotional intelligence and empathy etc.
4. Applying soft skills across cultures.

Unit-3: Reading Comprehension

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

Section-1 Short Stories

1. “The Gift of the Magi” by O. Henry.
2. “Uncle Podger Hangs a Picture” Jerome K. Jerome.

Section-2 Poetry

1. “Night of the Scorpion” by Nissim Ezekiel.
2. “Stopping by Woods on a Snowy Evening” by Robert Frost.
3. “Where the Mind is Without Fear” by Rabindranath Tagore.

Unit-4 Professional Writing

1. The art of précis writing.
2. Letters: business and personal.
3. Drafting e-mail, notices, minutes of a meeting etc.

Unit-5 Vocabulary and Grammar

1. Glossary of administrative terms (English and Hindi).
2. One-word substitution, Idioms and phrases etc.
3. Parts of speech, active and passive voice, tenses etc., Punctuation.

References:

1. J.D.O'Connor. *Better English Pronunciation*. Cambridge: Cambridge University Press, 1980.
2. Lindley Murray. *An English Grammar: Comprehending Principles and Rules*. London: Wilson and Sons, 1908.
3. Kulbhusan Kumar, *Effective Communication Skills*, Khanna Publishing House, New Delhi (Revised Edition 2018)
4. Margaret M. Maison. *Examine your English*. Orient Longman: New Delhi, 1964.
5. M. Ashraf Rizvi. *Effective Technical Communication*. Mc-Graw Hill: Delhi, 2002.
6. John Nielson. *Effective Communication Skills*. Xlibris, 2008.
7. Oxford Dictionary

8. Roget's Thesaurus of English Words and Phrases
9. Collin's English Dictionary

Course Outcomes:

At the end of this course, the participants will:

1. 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.
2. Be informed of the latest trends in basic verbal activities such as presentations, facing interviews and other forms of oral communication.
3. Also develop skills of group presentation and communication in team.
4. Develop non-verbal communication such as proper use of body language and gestures.

SUGGESTED DISTRIBUTION OF HOURS & MARKS

Topic No.	Time Allotted(Hrs)	Marks Allotted
1	11	20
2	7	10
3	13	30
4	8	20
5	9	20
Total	48	100

Engineering Graphics

Course Code	:	ES101
Course Title	:	Engineering Graphics
Number of Credits	:	1.5 (L: 0,DCS:1, P: 3)
Prerequisites	:	NIL
Course Category	:	ES

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 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.

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)

Unit – III 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 – IV 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 – V 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.

Unit – VI 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.

Dim scale variable. Editing dimensions. Text: Single line Text, Multiline text.

Sr. No.	Practical Exercises	ED Sheets	Approx. Hrs
1	Draw horizontal, Vertical, 30 degrees, 45 degrees, 60 and 75 degrees lines, different types of lines, dimensioning styles using Tee and Set squares/drafter.	1	05
2	Write alphabets and numerical in 7:4 scale (Vertical only) (do this exercise in sketch book).		
3	Draw some problems on Engineering Plain and	2	06

	diagonal scale.		
4	Draw some problems on orthographic projections using first angle method of projection having plain and slanting, cylindrical surfaces, ribs and slots.	3	08
5	Draw some problems on Isometric view of simple objects having plain and slanting and cylindrical surface (e.g. Cube, Cone and cylinder etc.) by using natural scale.	2	08
6	Draw free hand sketches/ conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements.	2	06
7	Problem based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views in sketch book.	1	05
8	Draw basic 2D entities like: Rectangle, Rhombus, Polygon using AutoCAD (Print out should be a part of progressive assessment).	1	03
9	Draw basic 2D entities like: Circles, Arcs, circular using AutoCAD (Printout should be a part of progressive assessment).		03
10	Draw basic 2D entities like: Circular and rectangular array using AutoCAD (Printout should be a part of progressive assessment).		03
11	Draw blocks of 2D entities comprises of Rectangle, Rhombus, Polygon, Circles, Arcs, circular and rectangular array, blocks using AutoCAD (Print out should be a part of progressive assessment).	1	05
12	Draw basic branch specific components in 2D using AutoCAD (Print out should be a part of term work).	2	06
13	Draw complex branch specific components in 2D using AutoCAD (Print should be a part of progressive assessment).	2	06
	Total	Instrumental :11 +CAD:6 = 17	64

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

Note: 1. Minimum 14 sheets to be prepared with at-least 4 sheets in Auto CAD.

2. AutoCAD sheets will be considered for internal evaluation only.

SUGGESTED LEARNING RESOURCES

1. Bureau of Indian Standards. Engineering Drawing Practice for Schools and Colleges IS: Sp-46. BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
2. Bhatt, N. D. *Engineering Drawing*. Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978- 93- 80358-17-8.
3. Jain & Gautam, *Engineering Graphics & Design*, Khanna Publishing House, New Delhi (ISBN: 978- 93-86173-478).
4. Jolhe, D. A. *Engineering Drawing*. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978-0-07- 064837-1.
5. Dhawan, R. K. *Engineering Drawing*. S. Chand and Company, New Delhi; ISBN:81-219-1431-0.
6. Shah, P.J. *Engineering Drawing*. S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4.
7. Kulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. *Engineering Graphics with AutoCAD*. PHI Learning Private Limited-New Delhi (2010); ISBN: 978-8120337831.
8. Jeyapooan, T. *Essentials of Engineering Drawing and Graphics using AutoCAD*. Vikas Publishing House Pvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
9. Autodesk. *AutoCAD User Guide*. Autodesk Press, USA, 2015.
10. Sham, Tickoo. *AutoCAD 2016 for Engineers and Designers*. Dreamtech Press; Galgotia Publication, New Delhi, 2015; ISBN 978-9351199113.

Software/Learning Websites

1. <https://www.youtube.com/watch?v=TJ4jGyD-WCw>
2. https://www.youtube.com/watch?v=dmt6_n7Sgcg
3. <https://www.youtube.com/watch?v=MQScnLXL0M>
4. <https://www.youtube.com/watch?v=3WXPanCq9LI>
5. <https://www.youtube.com/watch?v=fvjk7PlxAuo>
6. <http://www.me.umn.edu/coursesme2011/handouts/engg%20graphics.pdf>
7. <https://www.machinedesignonline.com>

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.

Engineering Workshop Practice

Course Code	:	ES103
Course Title	:	Engineering Workshop Practice
Number of Credits	:	1.5 (L: 0,DCS:3, P: 3)
Prerequisites	:	NIL
Course Category	:	ES

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 practices.

Course Content:

Sr. No.	Details Of Practical Content
1.	Carpentry: i) Demonstration of different wood working tools / machines. ii) Demonstration of different wood working processes, like planing, marking, chiseling, grooving, turning of wood etc.iii) One simple job involving any one joint like mortise and tenon dovetail, bridle, half lap etc.
2.	Fitting: i) Demonstration of different fitting tools and drilling machines and power tools ii) Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc. iii) One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc.
3.	Welding: i) Demonstration of different welding tools / machines. 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.
4.	Sheet Metal Working: i) Demonstration of different sheet metal tools / machines. ii) Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting. iii) One simple job involving sheet metal operations and soldering and riveting.
5.	Smithy Shop*: i) Demonstration and explanation of tools & equipment used. Safety measure to be observed in smithy shop. ii) Demonstration of bending operation, up-setting operation. iii) Description and specifications of anvils, swage blocks, hammer etc. IV) Demonstration and description of tongs, fullers. V) To forge a L-hook.

6.	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, (iii) Connection of Fluorescent lamp/tube light, (iv) simple lamp circuits-in- install bedroom lighting. (v) Simple lamp circuits- install stair case wiring. vi) Demonstration of measurement of Current, Voltage, Power and Energy.vii) Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. viii) Tools for Cutting and drilling.
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References:

1. S.K. Hajara Chaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi, 2015
2. B.S. Raghuwanshi, Workshop Technology, Dhanpat Rai and sons, New Delhi 2014
3. K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014
4. Kents Mechanical Engineering Hand book, John Wiley and Sons, New York

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.

SUGGESTED DISTRIBUTION OF HOURS & MARKS

Topic No.	Time Allotted(Hrs) For *	Time Allotted For Rest Branches
1	16	19
2	16	19
3	16	19
4	16	19
5	16	0
6	16	20
Total	96	96

Note: *- Smithy Shop will be taught only to branches Automobile Engineering, Agriculture Engineering, Civil Engineering and Mechanical Engineering.

Applied Physics-I Labs

Course Code	:	BS107
Course Title	:	Applied Physics-I Labs
Number of Credits	:	1 (L: 0,DCS:0,P: 2)
Prerequisites	:	NIL
Course Category	:	BS

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 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/Activities (To perform minimum 08 practicals).

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 find the co-efficient of friction between wood and glass using a horizontal board.
6. To determine force constant of a spring using Hook's Law.
7. To verify law of conservation of mechanical energy (PE to KE).
8. To find the moment of inertia of a flywheel.
9. To find the coefficient of linear expansion of the material of a rod.
10. To determine atmospheric pressure at a place using Fortin's barometer.
11. To measure room temperature and temperature of a hot bath using mercury thermometer and convert it into different scales.

Course Outcomes:

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 co-efficient 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 how materials expand on heating and determine linear expansion coefficient for a given material rod.
- Understand working and use of 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.

References:

1. Text Book of Physics for Class XI & XII (Part-I, Part-II); N.C.E.R.T., Delhi.
2. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P)Ltd.
3. Practical Physics by C. L. Arora, S. Chand Publication.
4. e-books/e-tools/ learning physics software/YouTube videos/websites etc.

APPLIED CHEMISTRY LAB (BS109)

Course Code	:	BS109
Course Title	:	Applied Chemistry Lab
Number of Credits	:	1 (L: 0,DCS:0, P: 2)
Prerequisites	:	NIL
Course Category	:	BS

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.

LIST OF PRACTICALS:

1. Preparation of standard solution of oxalic acid.
2. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
3. Experimental verification of Faraday's first law of Electrolysis using Copper sulphate solution and Copper electrodes.

OR

To construct and measure emf of Electro Chemical cell (Daniel cell).

4. Iodometric estimation of Copper in the given Copper ore using standard Hypo solution.

OR

To determine the percentage of Iron present in the given Haematite ore by standard Potassium permanganate solution.

5. To estimate of hardness of water using standard EDTA solution and Eriochrome black indicator and neutral buffer solution(pH range 7-11).

OR

To estimate total alkalinity of given water sample by titrating it against standard Sulphuric acid solution.

6. To estimate moisture in given coal sample gravimetrically.
7. To estimate ash in given coal sample gravimetrically.
8. To determine viscosity of given lubricating oil by Redwood viscometer.

Reference Books:

1. Text Book of Chemistry for Class XI & XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
2. Dr. G. H. Hugar and Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
3. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.
4. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015

Course 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.
- To construct different electrochemical cells used in developing batteries

Sports and Yoga (HS103)

Course Code	:	HS103
Course Title	:	Sports and Yoga
Number of Credits	:	1(L:0,DCS:0,P:2)
Prerequisites	:	NIL
Course Category	:	HS

Course Objectives:

- To make the students understand the importance of sound health and fitness principles as they relate to better health.
- To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.
- To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury.
- To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

Course Content:

- **Introduction to Physical Education**
 - Meaning & definition of Physical Education.
 - Aims & Objectives of Physical Education.
 - Changing trends in Physical Education.
- **Olympic Movement**
 - Ancient & Modern Olympics (Summer & Winter.)
 - Olympic Symbols, Ideals, Objectives & Values.
 - Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhyanchand Award, Rajiv Gandhi Khel Ratna Award etc.).
- **Physical Fitness, Wellness & Lifestyle**
 - Meaning & Importance of Physical Fitness & Wellness.
 - Components of Physical fitness.
 - Components of Health related fitness.
 - Components of wellness.
 - Preventing Health Threats through Lifestyle Change.
 - Concept of Positive Lifestyle.

- **Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga**
 - Define Anatomy, Physiology & Its Importance.
 - Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.).
- **Kinesiology, Biomechanics & Sports**
 - Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports.
 - Newton's Law of Motion & its application in sports.
 - Friction and its effects in Sports.
- **Postures**
 - Meaning and Concept of Postures.
 - Causes of Bad Posture.
 - Advantages & disadvantages of weight training.
 - Concept & advantages of Correct Posture.
 - Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis.
 - Corrective Measures for Postural Deformities.
- **Yoga**
 - Meaning & Importance of Yoga.
 - Elements of Yoga.
 - Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas
 - Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana).
 - Relaxation Techniques for improving concentration Yognidra.
- **Yoga & Lifestyle**
 - Asanas as preventive measures.
 - Hypertension: Tadasana, Vajrasana, Pawanuktasana, Ardha Chakrasana, Bhujangasana, Shavasana.
 - Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardha Matsyendrasana.
 - Back Pain: Tadasana, Ardha Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.
 - Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pawanuktasana, Ardha Matsyendrasana.

- Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.
- **Training and Planning in Sports**
 - Meaning of Training.
 - Warming up and limbering down.
 - Skill, Technique & Style.
 - Meaning and Objectives of Planning.
 - Tournament – Knock-Out, League/Round Robin & Combination.
- **Psychology & Sports**
 - Definition & Importance of Psychology in Physical Edu. & Sports.
 - Define & Differentiate Between Growth & Development
 - Adolescent Problems & Their Management.
 - Emotion: Concept, Type & Controlling of emotions.
 - Meaning, Concept & Types of Aggressions in Sports.
 - Psychological benefits of exercise.
 - Anxiety & Fear and its effects on Sports Performance.
 - Motivation, its type & techniques.
 - Understanding Stress & Coping Strategies.
- **Doping**
 - Meaning and Concept of Doping.
 - Prohibited Substances & Methods.
 - Side Effects of Prohibited Substances.
- **Sports Medicine**
 - First Aid – Definition, Aims & Objectives.
 - Sports injuries: Classification, Causes & Prevention.
 - Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries.
- **Sports / Games**
 - Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.
 - History of the Game/Sport.
 - Latest General Rules of the Game/Sport.

- Specifications of Play Fields and Related Sports Equipment.
- Important Tournaments and Venues.
- Sports Personalities.
- Proper Sports Gear and its Importance.

References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga By B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes).

Course Outcomes:

On successful completion of the course the students will be able to:

- (i) Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
- (ii) Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
- (iii) Learn breathing exercises and healthy fitness activities.
Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
- (iv) Perform yoga movements in various combination and forms.
- (v) Assess current personal fitness levels.
- (vi) Identify opportunities for participation in yoga and sports activities.
- (vii) Develop understanding of health-related fitness components: cardiorespiratory endurance, flexibility and body composition etc.
- (viii) Improve personal fitness through participation in sports and yogic activities.
- (ix) Develop understanding of psychological problems associated with the age and lifestyle.
- (x) Demonstrate an understanding of sound nutritional practices as related to health and physical performance.
- (xi) Assess yoga activities in terms of fitness value.
- (xii) Identify and apply injury prevention principles related to yoga and physical fitness activities.
- (xiii) Understand and correctly apply biomechanical and physiological principles related to exercise and training.

Communication Skills in English - Lab (HS105)

Course Code	:	HS105
Course Title	:	Communication Skills in English - Lab
Number of Credits	:	1 (L: 0, DCS-0,P: 2)
Prerequisites	:	NIL
Course Category	:	HS

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.

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

1. Sounds: consonant, vowel, diphthongs, etc. transcription of words (IPA), syllable division,
2. Word stress, intonation, voice modulation etc.

Unit III Speaking Skills

Standard and formal speech:

- Group discussion,
- Oral presentations,
- Public speaking, business presentations etc.
- Conversation practice
- Role playing,
- Mock interviews etc.

References:

1. J.D.O'Connor. *Better English Pronunciation*. Cambridge: Cambridge University Press, 1980.
2. Lindley Murray. *An English Grammar: Comprehending Principles and Rules*. London: Wilson and Sons, 1908.
3. Kulbhushan Kumar, *Effective Communication Skills*, Khanna Publishing House, New Delhi (Revised Edition 2018).
4. Margaret M. Maison. *Examine your English*. Orient Longman: New Delhi, 1964.
5. M. Ashraf Rizvi. *Effective Technical Communication*. Mc-Graw Hill: Delhi, 2002.
6. John Nielson. *Effective Communication Skills*. Xlibris, 2008.
7. Oxford Dictionary.
8. Roget's Thesaurus of English Words and Phrases.
9. Collin's English Dictionary.

Course Outcomes:

At the end of this course, the participants will:

1. 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.
2. Be informed of the latest trends in basic verbal activities such as presentations, facing interviews and other forms of oral communication.
3. Also develop skills of group presentation and communication in team.
4. Develop non-verbal communication such as proper use of body language and gestures.

Mathematics - II (BS102)

Course Code	:	BS102
Course Title	:	Mathematics - II
Number of Credits	:	4 (L: 4,DCS:1, P: 0)
Prerequisites	:	NIL
Course Category	:	BS

Course Objectives:

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

Course Content:

UNIT - I: Determinants and Matrices

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

UNIT - II: Integral Calculus

Integration as inverse operation of differentiation. Simple integration by substitution, by parts and by partial fractions (for linear factors only). Use of formulae $\int_0^{\pi/2} \sin^n x dx$, $\int_0^{\pi/2} \cos^n x dx$ and $\int_0^{\pi/2} \sin^m x \cos^n x dx$ for solving problems where m and n are positive integers.

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, directrices or vertices are given.

UNIT-IV : Differential Equations

Solution of first order and first degree differential equation by variable separable method (simple problems).

References:

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

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.

Distribution of Time and Marks

Unit	Time (Hours)	Marks %age
1	15	20
2	30	40
3	25	30
4	10	10
Total	80	100

APPLIED PHYSICS –II (BS104)

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

Course Objectives

Applied Physics aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content. The course will help the diploma engineers to apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology based applications.

Course Content

UNIT - 1: Wave motion and its applications

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.

Free, forced and resonant vibrations and their examples.

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

Ultrasonic waves – Introduction and properties, engineering and medical applications of ultrasonic.

UNIT - 2: Optics

Basic optical laws- reflection and refraction, refractive index, 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.

Optical Instruments- simple and compound microscope, astronomical telescope in normal adjustment and their magnifying powers.

UNIT - 3: Electrostatics

Coulomb's law, unit of charge.

Electric field, Electric lines of force and their properties.

Electric flux, Electric potential and potential difference, Gauss's law.

Capacitor and its working, Capacitance and its units. Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors (related numerical), dielectric and its effect on capacitance, dielectric break down.

UNIT - 4: Current Electricity

Electric Current and its units, Direct and alternating current.

Resistance and its units, Specific resistance, Conductance, Specific conductance, Series and parallel combination of resistances. Factors affecting resistance of a wire, carbon resistances and colour coding.

Ohm's law and its verification, Kirchhoff's laws.

Concept of terminal potential difference and Electro motive force (EMF)

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

UNIT - 5: Electromagnetism

Types of magnetic materials: dia, para and ferromagnetic with their properties.

Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and units, magnetization.

Lorentz force (force on moving charge in magnetic field), Force on current carrying conductor.

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

UNIT - 6: Semiconductor Physics

Energy bands in solids, Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semiconductors.

p-n junction, junction diode and V-I characteristics.

Diode as rectifier – half wave and full wave rectifier (centre taped).

Photocells, Solar cells; working principle and engineering applications.

UNIT - 7: Modern Physics

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

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

Course Outcomes:

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

- a) Describe waves and wave motion, periodic and simple harmonic motions and solve simple problems. Establish wave parameters: frequency, amplitude, wavelength, and velocity and able to explain diffraction, interference, polarization of waves.
- b) Explain ultrasonic waves and engineering, medical and industrial applications of Ultrasonic. 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.
- 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) Explain the operation of appliances like moving coil galvanometer, simple DC motors.
- j) 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.

k) Illustrate the conditions for light amplification in various LASER and laser based instruments and optical devices.

l) Appreciate the potential of optical fiber in fields of medicine and communication.

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. e-books/e-tools/ learning physics software/websites etc.

SUGGESTED DISTRIBUTION OF MARKS

UNIT/TOPIC	TIME ALLOTED	MARKS ALLOTED (%)
1	14	20
2	10	15
3	7	15
4	7	10
5	8	15
6	7	10
7	11	15
Total	64	100

Introduction to IT Systems (ES102)

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

Course Objectives:

This course is intended to make new students comfortable with Computing environment- Learning basic computer skills, learning basic application software tools, Understanding Computer Hardware, Cyber security awareness.

Course Content:

UNIT 1: Basics of Computer System

Block Diagram of Computer System, General Understanding of various hardware components- CPU, Memory, Display Devices (CRT and LCD Monitors), Keyboard, Mouse, HDD.

UNIT 2: Software Concepts

Software and its types, Operating System: Definition, types and function of Operating System, Booting the system (Cold and warm).

UNIT 3: Internet Skills

Understanding the terminology of internet-web browser, search engine, world wide web, Types of Networks. Awareness about the government portals (state portals and national portals) and institute portals.

UNIT 4: Working with MS- Word

File Management (Creating new document, saving a document, printing a document), Editing a document, use of Home, Insert, Design Layout ribbons.

UNIT 5: Working with MS- Excel

Working with spread sheets, entering data into the cells, merging cells, formula bar, usage of simple functions such as sum, average, min, max, percentage, round, floor, ceiling, conditional formatting of cells.

UNIT 6: Information Security

Concept of online frauds, threats of online crime, virus attacks and use of antivirus.

Reference Books

- R.S. Salaria, Computer Fundamentals, Khanna Publishing House.
- Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi.
- Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi.
- Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi.

Course Outcomes:

At the end of the course the students will be able to comfortably work on computer, install and configure operating system, assemble a PC and connect it to external devices, write documents, create worksheets, protect information and computers from basic abuses and attacks.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted(Hrs)	Marks Alotted
1	7	25
2	5	15
3	7	20
4	5	15
5	5	15
6	3	10
Total	32	100

FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING (ES104)

Course Code	:	ES104
Course Title	:	FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING
Number of Credits	:	3 (L:3, DCS:1 ,P:0)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

To provide basic knowledge of the different elements and concepts of electrical engineering field and to learn basic concepts of various active and passive electronic components, Signals, Op-Amp and their applications, Digital Electronics and their applications to help students deal with electrical and electronics engineering principles and applications in industrial processes of different fields.

Course Content:

UNIT I Overview of Electronic Components & Signals: Passive 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, different types of signal waveforms, Ideal/non-ideal voltage/current sources, independent/dependent voltage current sources.

UNIT II Overview of Analog Circuits: 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 Overview of Digital Electronics: Introduction to Boolean Algebra, Electronic Implementation of Boolean Operations, Gates-Functional Block Approach, Storage elements-Flip Flops-A Functional block approach, Counters: Ripple, Up/down and decade, Introduction to digital IC Gates (of TTL Type).

Unit IV Electric and Magnetic Circuits: 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: A.C. Circuits: Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor; Mathematical and phasor representation of alternating emf

and current; Voltage and Current relationship in Star and Delta connections; A.C in resistors, inductors and capacitors; A.C in R-L series, R-C series, R-L-C series and parallel circuits; Power in A. C. Circuits, power triangle.

Unit VI Transformer and Machines: General construction and principle of core and shell type of transformers; Emf equation and transformation ratio of transformers; Auto transformers; Basic principle of Electromechanical energy conversion.

Course Outcomes:

At the end of the course student will be able to

- To express different elements and concepts of electrical engineering field
- To understand basic concepts of various active and passive electronic components, Signals, Op-Amp
- To use Digital Electronics and their applications

SUGGESTED DISTRIBUTION OF MARKS

Units	Time Allotted (Hour)	Marks Allotted (%)
Unit-I	12	15
Unit-II	8	10
Unit-III	10	20
Unit-IV	12	20
Unit-V	14	25
Unit-VI	8	10
Total	64	100

Engineering Mechanics (ES 106)

Course Code	:	ES 106
Course Title	:	Engineering Mechanics
Number of Credits	:	3 (L: 3,DCS:1, P: 0)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

Following are the objectives of this course:

- 1) To obtain resultant of various forces.
- 2) To calculate support reactions through conditions of equilibrium for various structures.
- 3) To understand role of friction in equilibrium problems.
- 4) To know fundamental laws of machines and their applications to various engineering problems.

Course Contents:

Unit – I Basics of mechanics and force system

Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body.

Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units.

Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification.

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

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

Unit– II Equilibrium

Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analyzing 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 point load, uniformly distributed load), Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load.

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

Unit– III Friction

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

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

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

Unit– IV Centroid and centre of gravity

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

Centroid of composite figures composed of not more than two geometrical figures.

Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere)

Centre of Gravity of composite solids composed of not more than two simple solids.

Unit – V Simple lifting machine

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

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

Velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel, Simple screw jack.

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 VidhyarthiGruh.
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, NewDelhi.

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-II Labs (BS 106)

Course Code	:	BS 106
Course Title	:	Applied Physics II Lab
Number of Credits	:	1 (L: 0,DCS:0, P: 2)
Prerequisites	:	NIL
Course Category	:	BS

Course Objectives:

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

List of Practical's/Activities: (To perform minimum 08 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 verify Kirchhoff's laws using electric circuits.
9. To study the dependence of capacitance of a parallel plate capacitor on various factors and determine permittivity of air at a place.
10. To find resistance of a galvanometer by half deflection method.
11. To convert a galvanometer into an ammeter.
12. To convert a galvanometer into a voltmeter.
13. To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage.

14. To verify inverse square law of radiations using a photo-electric cell.
15. To measure wavelength of a He-Ne/diode laser using a diffraction grating.
16. To measure numerical aperture (NA) of an optical fiber.

Course Outcomes:

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) Analyze electrical circuits and verify Kirchhoff's law governing electrical circuits.
- h) Measure resistance of a galvanometer and how it is converted into an ammeter and voltmeter.
- i) Investigate characteristics of semiconductor diodes, photoelectric cells and determine operational parameters associated with their performance.
- j) Work with laboratory lasers and understand method to measure the wavelength of the light emitted from a laser.
- k) Handle optical fibers and determine numerical aperture of given optical fiber.

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 (ES 108)

Course Code	:	ES 108
Course Title	:	Introduction to IT Systems Lab
Number of Credits	:	2 (L:0,DCS:0, P:4)
Prerequisites (Course Code)	:	NIL, should be doing ES102 in parallel
Course Category	:	ES

Course Objectives:

This lab course is intended to practice whatever is taught in theory class of “Introduction to IT Systems” and become proficient in using computer environment- basic computer skills, basic application software tools, computer hardware, cyber security features.

Course Content:

Sr. No.	Topics For Practice
1	To identify the various hardware components of computer system.
2	To assemble hardware components of Computer System.
3	To install Windows OS on computer system.
4	To study the various features offered on the desktop, creating new folder and new file on the desktop.
5	To work on different web browsers(google chrome , internet explorer), setting up default homepage on browser and study the various settings available.
6	To open search engines (google and yahoo) and search different information using the search engines. Creating an e-mail Account.
7	Visit various e-governance/digital India Portals and understanding the services offered.
8	Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, giving password protection for a file, Setting margins, tab setting, ruler, indenting, Entering text, cut, copy, paste using tool- bars.
9	Formatting a document, Creating and editing tables, mail-merge.
10	Working on MS – EXCEL- Creating a worksheet in Excel. Copy, Move and Merge the cells and Use various Formatting features.
11	Using formula and functions prepare worksheet for storing subject marks of ten students and perform the following: <ul style="list-style-type: none"> ➤ Calculate the student wise total and average. ➤ Calculate the subject wise total and average. ➤ Calculate the overall percentage and also individual percentage of the student. ➤ Create a chart for the above.

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 (ES110)

Course Code	:	ES110
Course Title	:	Fundamentals of Electrical and Electronics Engineering Lab
Number of Credits	:	1 (L: 0, DCS:0,P: 2)
Prerequisites	:	NIL
Course Category	:	ES

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.

Sr. No.	Practical Outcomes (PrOs)	Approx. Hrs.
1.	Determine the permeability of magnetic material by plotting its B-H curve.	02*
2.	Measure voltage, current and power in 1-phase circuit with resistive load.	02*
3.	Measure voltage, current and power in R-L series circuit.	02*
4.	Determine the transformation ratio (K) of 1-phase transformer.	02
5.	Connect single phase transformer and measure input and output quantities.	02
6.	Make Star and Delta connection in induction motor starters and measure the line and phase values.	02
7.	Identify various passive electronic components in the given circuit.	02
8.	Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter.	02
9.	Connect capacitors in series and parallel combination on bread board and measure its value using multimeter.	02*
10.	Identify various active electronic components in the given circuit.	02
11.	Use multimeter to measure the value of given resistor.	02
12.	Use LCR-Q tester to measure the value of given capacitor and	02
13.	Determine the value of given resistor using digital multimeter to confirm with colour code.	02*
14.	Test the PN-junction diodes using digital multimeter.	02*
15.	Test the performance of PN-junction diode.	02
16.	Test the performance of Zener diode.	02
17.	Test the performance of LED.	02
18.	Identify three terminals of a transistor using digital multimeter.	02

19.	Test the performance of NPN transistor.	02*
20.	Determine the current gain of CE transistor configuration.	02
21.	Test the performance of transistor switch circuit.	02
22.	Test the performance of transistor amplifier circuit.	02
23.	Test Op-Amp as amplifier and Integrator.	02
	Total	46

References:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House, 2018.
2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5.
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353.
4. Theraja, B. L., Electrical Technology Vol – I, S. Chand publications, New Delhi, 2015, ISBN:9788121924405.
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand publications, New Delhi, 2015, ISBN:9788121924375.
6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513.
7. Sedha, R.S., A text book of Applied Electronics, S.Chand ,New Delhi, 2008, ISBN-13: 978-8121927833.
8. Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Education, New Delhi,2015,ISBN-13: 0070634244-978.
9. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014,ISBN-13-9788121924504.
10. Bell Devid, Fundamental of Electronic Devices and Circuits, Oxford University Press, New Delhi 2015 ISBN : 9780195425239.

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(ES 112)

Course Code	:	ES 112
Course Title	:	Engineering Mechanics Lab
Number of Credits	:	1 (L: 0,DCS:0, P: 2)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

Following are the objectives of this course:

- 1) To obtain resultant of various forces.
- 2) To calculate support reactions through conditions of equilibrium for various structures.
- 3) To understand role of friction in equilibrium problems.
- 4) To know fundamental laws of machines and their applications to various engineering problems.

List of Practical to be performed:

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

Suggested Learning Resources:

1. Bedi D.S., Engineering Mechanics, Khanna Publishing House
2. Khurmi, R.S., Applied Mechanics, S.Chand & Co. New Delhi.

3. Bansal R K, A text book of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S.,S Chand & Co. New Delhi.
5. Dhade, Jamadar & Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh.
6. Ram, H. D.; Chauhan, A. K. Foundations and Applications of Applied Mechanics, Cambridge University Press.
7. Meriam, J. L., Kraige, L.G. , Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

Course Outcomes:

After completing this course, student will be able to

1. Identify the force systems for given conditions by applying the basics of mechanics.
2. Determine unknown force(s) of different engineering systems.
3. Apply the principles of friction in various conditions for useful purposes.
4. Find the centroid and centre of gravity of various components in engineering systems.
5. Select the relevant simple lifting machine(s) for given purposes.

Environmental Science (AU102)

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

Course Objectives:

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

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

Course Content:

Pre requisite: - High School Chemistry.

Unit-1 Ecosystem

Structure of ecosystem, Biotic & Abiotic components Food chain and food web Aquatic (Lentic and Lotic) and terrestrial ecosystem Carbon, Nitrogen, Sulphur, Phosphorus cycle. Global warming -Causes, effects, process, Green House Effect, Ozone depletion.

Unit– 2 Air and, Noise Pollution

Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refriger- ants, I.C., Boiler) ,Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator).

Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler.

Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000.

Unit- 3 Water and Soil Pollution

Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Tur-bidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation.

Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis).

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

Unit– 4 Renewable sources of Energy

Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills.

Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas.

Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy.

New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy.

Unit-5 Solid Waste Management, ISO 14000 & Environmental Management

Solid waste generation- Sources and characteristics of : Municipal solid waste, E- waste, bio-medical waste. Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries.

Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous.

Waste Air quality act 2004, air pollution control act 1981 and water pollution and control act 1996. Structure and role of Central and state pollution control board.

Concept of Carbon Credit, Carbon Footprint. Environmental management in fabrication industry. ISO14000: Implementation in industries, Benefits.

References:

(a) Suggested Learning Resources:

Books:

1. S.C. Sharma & M.P. Poonia, Environmental Studies, Khanna Publishing House, New Delhi.
2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
3. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and.
4. Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099-

5. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000,ISBN 10: 0471144940.
6. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi.
7. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
8. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07-451871-8.
9. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978,ISBN: 9780070354760.
10. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford,UK; 2013. ISBN: 9780123978257.
11. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6.
12. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
13. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018).

(b) 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

Course Outcomes:

At the end of the course student will be able to

1. Understand the ecosystem and terminology and solve various engineering problems ap-plying 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.