First Draft

REVISED DIPLOMA CURRICULUM OF FIRST YEAR (PART – I)

For the State of Meghalaya

(APRIL, 2023)

National Institute of Technical Teachers' Training & Research
Block – FC, Sector – III, Salt Lake City, Kolkata – 700 106

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CURRICULUM STRUCTURE FOR DIPLOMA PROGRAMME IN CIVIL ENGG., MECHANICAL ENGG, AUTOMOBILE ENGG. , ELECTRICAL ENGG. , ELECTRONICS AND COMMUNICATION ENGG., COMPUTER SCIENCE AND ENGG., COMPUTER APPLICATION, FOOD PROCESSING AND PRESERVATION AND MEDICAL ELECTRONICS
FOR THE STATE OF MEGHALAYA

SEMESTER- I

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assignment	Attendance		Sessional	Viva voce		
1	Basic Science	BS101	Mathematics -I		**2**	**1**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**3**
2		BS103	Applied Physics -I		**2**	**1**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**3**
3		BS 105	Applied Chemistry		**2**	**1**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**3**
4		BS107	Applied Physics –I Lab		**0**	**0**	**2**	**0**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**1**
5		BS109	Applied Chemistry Lab		**0**	**0**	**2**	**0**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**1**
6	Humanities & Social Science	HS101	Communication skills in English		**2**	**0**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**2**
7		HS 103	Sports & Yoga/ NCC/NSS		**0**	**0**	**2**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**1**
8		HS 105	Communication skills in English Lab		**0**	**0**	**2**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**1**
9	Engineering Science	ES101	Engineering Graphics		**0**	**0**	**3**	**-**	**-**	**-**	**-**	**-**	**60**	**40**	**100**	**1.5**
10		ES103	Engineering Workshop Practice		**0**	**0**	**3**	**-**	**-**	**-**	**-**	**-**	**60**	**40**	**100**	**1.5**
TOTAL					**8**	**3**	**14**	**240**	**80**	**60**	**20**	**160**	**280**	**160**	**1000**	**18**

SEMESTER- II

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assignment	Attendance		Sessional	Viva voce		
1	Basic Science	BS102	Mathematics - II	BS101	**3**	**1**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**4**
2		BS104	Applied Physics - II	BS103	**2**	**1**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**3**
3		BS106	Applied Physics – II Lab	BS107	**0**	**0**	**2**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**1**
4	Engineering Science	ES102	Introduction to IT Systems		**2**	**0**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**2**
5		ES104	Fundamentals of Electrical & Electronics Engineering		**2**	**1**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**3**
6		ES106	Engineering Mechanics		**2**	**1**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**3**
7		ES108	Introduction to IT Systems Lab		**0**	**0**	**4**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**2**
8		ES110	Fundamentals of Electrical & Electronics Engineering Lab		**0**	**0**	**2**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**1**
9		ES112	Engineering Mechanics Lab		**0**	**0**	**2**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**1**
10	Mandatory	AU102	Environmental Science		**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
`TOTAL					**13**	**4**	**10**	**300**	**100**	**75**	**25**	**160**	**160**	**80**	**900**	**20**

CURRICULUM STRUCTURE FOR DIPLOMA PROGRAMME IN COSTUME DESIGN & GARMENT TECHNOLOGY FOR THE STATE OF MEGHALAYA

SEMESTER- I

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assignment	Attendance		Sessional	Viva voce		
1	Prog. Core	CGTPC101	History of Fashion		**3**	**0**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**3**
2		CGTPC103	Introduction to Textiles		**3**	**0**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**3**
3		CGTPC105	Material Studies		**1**	**1**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**2**
4		CGTPC107	Machine Tools & Equipment		**2**	**0**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**2**
5		CGTPC109	Introduction to Textiles Lab		**0**	**0**	**2**	**-**	**-**	**-**		**40**	**40**	**20**	**100**	**1**
6		CGTPC111	Material Studies Lab		**0**	**0**	**4**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**2**
7		CGTPC113	Machine Tools & Equipment lab		**0**	**0**	**2**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**1**
8	Humanities & Social Science	CGTHS101	Communication skills in English		**2**	**0**	**0**	**60**	**20**	**15**	**5**	**-**	**-**	**-**	**100**	**2**
9		CGTHS103	Sports & Yoga/ NCC/NSS		**0**	**0**	**2**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**1**
10		CGTHS105	Communication skills in English Lab		**0**	**0**	**2**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**1**
TOTAL					**11**	**1**	**12**	**300**	**100**	**75**	**25**	**200**	**200**	**100**	**1000**	**18**

SEMESTER- II

SL. No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assignment	Attendance		Sessional	Viva voce		
1	Program Core	CGTPC102	Fashion Illustration Lab		**0**	**0**	**4**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**2**
2		CGTPC104	Introduction to Coral draw and Photoshop lab		**0**	**0**	**6**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**3**
3		CGTPC106	Basic Garment Design Lab		**0**	**1**	**4**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**3**
4		CGTPC108	Pattern making Lab		**0**	**1**	**6**	**-**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**4**
5		CGTPC110	Garment Construction I lab		**0**	**1**	**4**	**--**	**-**	**-**	**-**	**40**	**40**	**20**	**100**	**3**
6	Engg. Sc.	CGTES102	Introduction to IT Systems		**2**	**0**	**0**	**60**	**20**	**15**	**5**	**0**	**0**	**0**	**100**	**2**
7		CGTES104	Introduction to IT Systems Lab		**0**	**0**	**4**	**0**	**0**	**0**	**0**	**40**	**40**	**20**	**100**	**2**
8	Audit	AU102	Environmental Science		**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL					**4**	**3**	**28**	**60**	**20**	**15**	**05**	**240**	**240**	**120**	**700**	**19**

CURRICULUM STRUCTURE FOR DIPLOMA PROGRAMME IN ARCHITECTURAL ASSISTANTSHIP

FOR THE STATE OF MEGHALAYA

SEMESTER- I

Sl. No	Category of Course	Code	Course	Study Scheme				Evaluation Scheme							Total Marks	Credit
					Contact Hour/Week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assignment*	Attendance		Sessional	Viva		
1	Basic Science	BS101	Mathematics -I	-	2	1	0	60	20	15	5	0	0	0	100	3
2		BS103	Applied Physics-I	-	2	0	0	60	20	15	5	0	0	0	100	2
3		BS105	Applied Chemistry	-	2	0	0	60	20	15	5	0	0	0	100	2
4		BS107	Applied Physics-I Lab	-	0	0	2	0	0	0	0	40	40	20	100	1
5		BS109	Applied Chemistry Lab		0	0	2	0	0	0	0	40	40	20	100	1
6	Humanities & Social Science	HS101	Communication Skills in English	-	2	0	0	60	20	15	5	0	0	0	100	2
7		HS103	Sports/NCC/NSS		0	0	2	0	0	0	0	0	100	0	100	1
8		HS105	Communication Skills in English Lab	-	0	0	2	0	0	0	0	40	40	20	100	1
9	Program Core	AAPC101	Descriptive Geometry-I	-	0	0	4	0	0	0	0	0	100	0	100	2
10		AAPC103	Basic Design-I	-	0	0	4	0	0	0	0	0	100	0	100	2
11		AAPC105	Architectural Delineation		0	0	4	0	0	0	0	0	100	0	100	2
TOTAL				**-**	**08**	**01**	**20**	**240**	**80**	**60**	**20**	**120**	**520**	**60**	**1100**	**19**

Semester – II

Sl. No	Category of Course	Code	Course	Study Scheme				Evaluation Scheme							Total Marks	Credit
					Contact Hour/Week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assign ment*	Atten dance		Sessio nal	Viva		
1	Basic Science	BS102	Mathematics -II	BS101	2	1	0	60	20	15	5	0	0	0	100	3
2		BS104	Applied Physics-II	BS103	2	0	0	60	20	15	5	0	0	0	100	2
3		BS106	Applied Physics-II Lab	BS107	0	0	2	0	0	0	0	40	40	20	100	1
4	Engg. Sc.	ES102	Introduction to IT System		2	0	0	60	20	15	5	0	0	0	100	2
5		ES106	Engineering Mechanics	-	2	1	0	60	20	15	5	0	0	0	100	3
6		ES108	Introduction to IT System Lab		0	0	2	0	0	0	0	0	100	0	100	1
7		ES112	Engineering Mechanics Lab		0	0	2	0	0	0	0	40	40	20	100	1
8	Program Core	AAPC102	Descriptive Geometry-II	AAPC 101	0	0	4	0	0	0	0	0	100	0	100	2
9		AAPC104	Basic Design-II	AAPC 103	0	0	4	0	0	0	0	0	100	0	100	2
10		AAPC106	Building Material	-	3	0	0	60	20	15	5	0	0	0	100	3
11		AAPC108	Model Making and Workshop	-	1	0	2	0	0	0	0	0	100	0	100	2
TOTAL				**-**	**12**	**02**	**16**	**300**	**100**	**75**	**25**	**80**	**480**	**40**	**1100**	**22**

FIRST YEAR COURSES

(For Civil Engg. , Mechanical Engg, Automobile Engg. , Electrical Engg. , Electronics and Communication Engg., Computer Science and Engg., Computer Application, Food Processing and preservation and Medical Electronics)

MATHEMATICS- I

L	T	P		**Course Code No.:** BS101
2	1	0		
Total Contact hrs.: Lecture: 30 Tutorial: 15 Practical: 0 **Credit :3**			**Total marks: 100**	**Theory:** End Term Exam.:60 P.A: 40

RATIONALE

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

COURSE OUTCOMES

By the end of the course, the students will be able to

- Apply Trigonometry for the calculation and the mathematical analysis.
- Find the effects of changing conditions on a system.
- Relate application of Complex numbers in studies of physical phenomena
- Use the concept of partial fraction decomposition.

COURSE CONTENT DETTAILS

NIT NO. & TITLE	**CONTENT**	**TIME ALLOTTED (HRS.)**
UNIT - I: TRIGONOMETRY	Concept of angles, measurement of angles in degrees, grades and radians and their conversions, T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T- Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2). Graphs of sin x, cos x, tan x and e^x	**08 + 02**
UNIT – II: DIFFERENTIAL CALCULUS	Definition of function; Concept of limits. Four standard limits $\lim_{x \to a} \frac{x^n - a^n}{x-a}$, $\lim_{x \to 0} \frac{\sin x}{x}$, $\lim_{x \to a} \left(\frac{a^x - 1}{x}\right)$ and $\lim_{x \to a} (1+x)^{\frac{1}{x}}$. Differentiation by definition of $x^n, \sin x \ \cos x, \tan x$, e^x and $\log_a x$. Differentiation of sum, product and quotient of functions. Differentiation of function of a function. Differentiation of trigonometric and inverse trigonometric functions, Logarithmic differentiation, Exponential functions.	**13+ 06**
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 com-plex 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 and irreducible non-repeated quadratic factors. To resolve improper fraction into partial fraction. **Permutations and Combinations:** Value of ${}^nP_r$ and ${}^nC_r$. **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	**14 +07**

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

APPLIED PHYSICS –I

L	T	P		**Course Code No**.: BS103
2	1	0		
Total Contact hrs.: Lecture:30 Tutorial:15 Practical: 0 Credit :3			**Total marks: 100**	**Theory:** End Term Exam.:60 P.A: 40

RATIONALE

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

LEARNING OUTCOME

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

- Select physical quantities and their units for use in engineering solutions
- Represent physical quantities as scalar and vectors
- Apply the formulation to understand banking of roads/railway tracks and conservation of momentum principle to describe rocket propulsion, recoil of gun etc.
- Solve simple problems related to work, energy and power and their relationship.
- Describe forms of friction and methods to minimize friction between different surfaces.
- Explain various forms of energy, and energy transformations and the principle of conservation of energy.
- 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
- Describe the viscosity of liquids, coefficient of viscosity and the various factors affecting its value.
- Explain stress and strain and Hooke's law, 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.
- Explain specific heats

COURSE CONTENT DETAILS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
UNITS-: DIMENSION AND MEASUREMENTS	**1.1 Units, Dimension**[i] • Concept of unit of physical parameters • Fundamental and derived units – FPS, CGS and SI • SI system of units of different physical parameters • Dimension with examples of different physical parameters. **1.2 Measurements** • Measuring devices e.g., slide callipers, screw gauge, spherometer with concept of Vernier constant, least count and zero error. • Physical Balance	**02+01**
Unit II: MECHANICS	**2.1 Motion along a straight line and Force** • Concept of scalar and vector quantities. Resolution of a Vector and its application to inclined plane and lawn roller (introductory idea). • Speed, velocity and linear acceleration • Equations of motion with constant acceleration (derivation not required) • Equations of motion of falling body under gravity • Simple problems on linear motion • Newton's laws of motion, Action and reaction, tension • Force, inertia, momentum, impulse and impulsive force with practical examples • Conservation of linear momentum, its applications such as recoil of gun, rockets. **2.2 Rotational Motion** • Translational and rotational motions with examples • Definition of torque and angular momentum, moment of inertia and their examples • Concept of conservation of angular momentum with its applications • Simple examples such as banking of roads and bending of cyclist.	**04+02**
Unit -III: GRAVITATION	**3.1 Newton's laws of gravitation** • Newton's gravitational constant G and its SI unit • Acceleration due to gravity (g) and its relation with "G". • Variation of g with altitude and latitude (deduction not required) • Difference between mass and weight • Simple problems	**03+02**
Unit IV: **WORK, POWER AND ENERGY**	**4.1 Work, power and energy** • Definition with their units and mathematical expressions • Relation between Horse power and Watt • Different forms of mechanical energy : PE, KE and their expressions • Conservation of energy and transformation of energy with examples • Simple problems	**03+02**

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
Unit V: **PROPERTIES OF MATTER**	**5.1 Properties of solid** Plasticity and elasticity in solids • Deformation of bodies by the action of external forces change in size and change in shape • Unit of stress – tensile stress, compressive stress and Shear stress with examples • Unit of strain – tensile strain., volumemetric strain and shear strain & Hooke's law • Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications. • Modulus of elasticity – Young's modulus, Bulk modulus and Modulus of rigidity, Poison's ratio and their units. Stress – Strain curve • Definition & basic concepts only, no deduction. **5.2 Properties of Fluid** • Thrust and pressure • Law of fluid pressure, Pascal's law and working principles of hydraulic press • Archimedes Principle and its applications • Specific gravity and relative density • Hydrometers and their uses • Properties of gas : Toricelli's Expt. & Simple Barometer • Simple idea of surface tension , viscosity with applications.	**06+02**
Unit VI: **HEAT**	**6.1 Heat and temperature** • Heat and temperature • Fixed points and different scales of temperature - Fahrenheit, Celsius and Kelvin and their relationships • Simple problems **6.2 Measurement of heat** • Quantity of heat, units of heat:Joule and Calorie • Specific heat of solid, heat capacity, water equivalent • Principle of calorimeter, Measurement of specific heat • Change of state: Latent heat, evaporation & boiling, effect of pressure • Boyle's law and Charles law, Universal gas law and universal gas constant. • Idea of two specific heat capacities of gas: Cp and Cv and their relationships (deduction not required) **6.3 Thermal expansion & Transmission of heat** • Expansion of solid – linear, superficial and cubical co-efficient of expansion & their units • Interrelationship between different • co-efficient of expansion with examples • Different methods of transmission of heat: conduction, convection and radiation • Co-efficient of thermal expansion & its unit • Good conductors and bad conductors of heat	**06+03**

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
Unit VII: SOUND	**7.1 Simple Harmonic Motion** • Simple harmonic motion and its characteristics • Time period, frequency & amplitude of vibration • Mathematical expression of SHM • Examples of SHM: Simple Pendulum • Idea on Longitudinal & Transverse wave **7.2 Production and propagation of Sound** • Natural vibration, forced vibration with examples • Resonance of sound with examples • Principle of resonance to find out velocity of sound in air. • Velocity of sound, Newton's formula and Laplace correction (Idea only, no deduction) **7.3 Reflection of sound** • Echo, reverberation • Simple problems **7.4 Musical sound, noise** • Characteristics of musical sound and noise with examples • Factors affecting sound	**06+03**

REFERENCES:

1. Principle of Physics – Subrahmanyan & Brizal
2. Intermediate Physics – S.C.Roy Chaudhury & D.B.Sinha
3. Fundamentals Of Physics – David Halliday, Robert Resnick & Jeal Walka
4. University Physics – Francis W. Sears, Mark W. Zemans Key & Hugh D. Young
5. University Physics – Hugh D. Young & Roger H. Freedman
6. A text book of Physics (Part I) – C. R. Dasgupta
7. Elements of Higher Secondary Physics (Part I) - D. Dutta, B. Pal & B.Chaudhuri
8. Physics (Volume I) - Ajoy Chakraborty
9. Applied Physics (Vol. 1) - Saxena H.C. & Singh Prabhakar
10. Physics for 10+2 students (Part I) - Das, S.K, Sisodia M.L, Neher P.K.,Kachhawa C.M.
11. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
12. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi.
13. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
14. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
15. Engineering Physics by DK Bhhatacharya & PoonamTandan; Oxford University Press, New Delhi.
16. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
17. e-books/e-tools / learning physics software / websites etc.

APPLIED CHEMISTRY

L	T	P		**Course Code No.:** BS105
2	1	0		
Total Contact hrs.: Lecture:30 Tutorial:15 Practical: 0 **Credit : 3**			**Total marks: 100**	**Theory:** End Term Exam.:60 P.A: 40

RATIONALE:

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

COURSE OUTCOMES

At the end of the course student will be able to

- 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 DETAILS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
Unit I: **ATOMIC STRUCTURE, CHEMICAL BONDING AND SOLUTIONS**	Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted), and hydrogen spectrum explanation based on Bohr's model of atom, Heisenberg uncertainty principle, Quantum numbers – orbital concept. Shapes of s,p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration. Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example), covalent bond (H_2, F_2, HF hybridization in $BeCl_2$, BF_3, CH_4, NH_3, H_2O), coor- dination bond in NH_4^+, and anomalous properties of NH_3, H_2O due to hydrogen bonding, and metallic bonding. Solution – idea of solute, solvent and solution, methods to express the concentration of solution- molarity (*M* = mole per liter), ppm, mass percentage, volume percentage and mole fraction.	**06+03**
Unit II: **WATER**	Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness. Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc), and quantitative measurement of water hardness by ETDA method, total dissolved solids (TDS) alkalinity estimation. i. Water softening techniques – soda lime process, zeolite process and ion exchange process. ii. Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization. Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collect data and understand standards).	**06+03**
Unit III:	Natural occurrence of metals – minerals, ores of iron, aluminium and	**06+03**

ENGINEERING MATERIALS	copper, gangue (ma-trix), flux, slag, metallurgy – brief account of general principles of metallurgy. Extraction of - iron from haematite ore using blast furnace, aluminium from bauxite alongwith reactions. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications. General chemical composition, composition based applications (elementary idea only detailsomitted): Port land cement and hardening, Glasses Refractory and Composite materials. Polymers – monomer, homo and co polymers, degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, nylon – 6, nylon-6,6 and Bakelite), rubber and vulcanization of rubber.	
Unit IV: CHEMISTRY OF FUELS AND LUBRICANTS	Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula. Proximate analysis of coal solid fuel petrol and diesel - fuel rating (octane and cetane numbers), Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas. Lubrication – function and characteristic properties of good lubricant, classification with examples, lubrication mechanism – hydrodynamic and boundary lubrication, physical proper- ties (viscosity and viscosity index, oiliness, flash and fire point, could and pour point only) and chemical properties (coke number, total acid number saponification value) of lubricants.	**08+03**
Unit V: ELECTRO CHEMISTRY	Electronic concept of oxidation, reduction and redox reactions. Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of electrolysis and simple numerical problems. Industrial Application of Electrolysis – • Electrometallurgy • Electroplating • Electrolytic refining. Application of redox reactions in electrochemical cells – • Primary cells – dry cell, • Secondary cell - commercially used lead storage battery, fuel and Solar cells.Introduction to Corrosion of metals – • definition, types of corrosion (chemical and electrochemical), H2 liberation and O2 absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion. Internal corrosion preventive measures – • Purification, alloying and heat treatment and External corrosion preventive measures: a) metal (anodic, cathodic) coatings, b) organic inhibitors.	**06+03**

REFERENCES/SUGGESTED LEARNING RESOURCES:

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 Del-hi, 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.

APPLIED PHYSICS –I LAB

L	T	P		**Course Code No**.: BS107
0	0	2		
Total Contact hrs.: Lecture:0 Tutorial:0 Practical: 30 Credit :1			**Total marks: 100**	**Practical:** End Term Exam.:40 P.A: 60

RATIONALE

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.

LEARNING OUTCOME

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

- Select right kind of measuring tools (Meter scale, Vernier caliper, Screw gauge, Spherometer etc.) for determining dimensions of physical quantities and make measurements with accuracy and precision.
- Determine dimensions of plane, curved and regular surfaces/bodies.
- Apply laws of forces to determine resultant force acting on a body.
- Measure co-efficient of friction between different surfaces.
- Verify Hook's law and law of conservation of energy.
- Identify various forms of energy, energy transformations
- Demonstrate rotational motion and M.I. of a rotating body (flywheel)
- Determine linear expansion coefficient for a given material rod.
- Use Fortin's barometers for determining pressure at a place.
- Demonstrate use of thermometers to measure temperature under different conditions and different scales of temperature measurements.

LIST OF PRACTICALS

SL. NO.	**EXPERIMENTS**
1	To measure the volume of a wooden block by using Vernier callipers.
2	To measure the surface area of a metal washer by Vernier inside callipers
3	To measure the depth of a hole by Depth Gauge (Vernier callipers)
4	To measure the cross-section of a wire by Screw Gauge.
5	To determine radius of curvature of a convex and a concave mirror/surface using a spherometer.
6	To adjust a common balance and to determine the specific gravity of a liquid by specific gravity bottle.
7	To establish the relation between pressure and volume of a fixed mass of gas at aconstant temperature using Boyle's apparatus.
8	To determine the acceleration due to gravity (g) of a place by simple pendulum
9	To measure the velocity of sound in air by air resonance column method.
10	To measure room temperature and temperature of a hot bath using mercury thermometer and convert it into different scales.
11	To determine atmospheric pressure at a place using Fortin's barometer.

REFERENCE BOOK

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

L	T	P		**Course Code No.**: BS109
0	0	2		
Total Contact hrs.: Lecture:0 Tutorial:0 Practical: 30 **Credit : 1**			**Total marks: 100**	**Practical:** End Term Exam.:40 P.A: 60

RATIONALE:

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.

COURSE OUTCOMES

At the end of the course student will be able to

- Express quantitative measurements accurately.
- Practice and adapt good measuring techniques.
- Use various apparatus for precise measurements.
- Differentiate different methods of quantitative analysis.
- Explain principles of quantitative analysis using instruments.
- Construct different electrochemical cells used in developing batteries.
- Explain methods of corrosion abetments.

COURSE CONTENT DETAILS

LIST OF PRACTICALS (Perform any 12 (twelve)).

Sl. No.	Experiments
1	**Volumetric and Gravimetric analysis:**
	i. Preparation of standard solution of oxalic acid or potassium permanganate. ii. Determination of strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator. iii. Standardization of KMn04 solution using standard oxalic acid and Determine the percentage of iron present in given Hematite ore by KMn04 solution. iv. Iodometric estimation of copper in the copper pyrite ore. v. Volumetric estimation of total acid number (TAN) of given oil. vi. Volumetric estimation of a. Total hardness of given water sample using standard EDTA solution. b. Alkalinity of given water sample using 0.01M sulphuric acid vii. Proximate analysis of coal a. Gravimetric estimation moisture in given coal sample b. Gravimetric estimation ash in given coal sample
2	**Instrumental analysis**
	i. Determine the conductivity of given water sample. ii. Determination of the Iron content in given cement sample using colorimeter. iii. Determination of calorific value of solid or liquid fuel using bomb calorimeter. iv. Determination of viscosity of lubricating oil using Redwood viscometer. v. Determination of flash and fire point of lubricating oil using Able's flash point apparatus. vi. Verification of the first law of electrolysis of copper sulfate using copper electrode. vii. Construction and measurement of emf of elector chemical cell (Daniel cell). viii. Study of the effect of dissimilar metal combination.

REFERENCE BOOKS

1. Text Book of Chemistry for Class Xl & Xll (Part-I, Part-Il); 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. Il, 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.

COMMUNICATION SKILLS IN ENGLISH

L	T	P		**Course Code No.**: HS101
2	0	0		
Total Contact hrs.: Lecture:30 Tutorial:0 Practical: 0 **Credit : 2**			**Total marks: 100**	**Theory:** End Term Exam.:60 P.A: 40

RATIONALE

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:

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

To introduce the need for personality development- Focus will be on developing certain qualitieswhich will aid students in handling personal and career challenges, leadership skills etc.

COURSE OUTCOMES

At the end of this course, the participants will be able to

- Demonstrate basic speaking and writing skills including proper usage of language and vocabulary
- Demonstrate the latest trends in basic verbal activities such as presentations, facing interview sand other forms of oral communication.
- Develop skills of group presentation and communication in team.
- Develop non-verbal communication such as proper use of body language and gestures.

COURSE CONTENT DETAILS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS)
Unit I: **COMMUNICATION: THEORY AND PRACTICE**	• Basics of communication: Introduction, meaning and definition, process of communication etc. • Types of communication: formal and informal, verbal, non-verbal and written Barriers to effective communication. • 7Cs for effective communication (considerate, concrete, concise, clear, complete, correct, courteous). • Art of Effective communication, o Choosing words o Voice o Modulation o Clarity o Time o Simplification of words • Technical Communication.	**03**
Unit II: **SOFT SKILLS FOR PROFESSIONAL EXCELLENCE**	• Introduction: Soft Skills and Hard Skills. • Importance of soft skills. • Life skills: Self-awareness and Self-analysis, adaptability, resilience, emotional intelligence and empathy etc. • Applying soft skills across cultures. • Case Studies.	**03**
Unit III: **READING COMPREHENSION**	• Comprehension, vocabulary enhancement and grammar exercises based on reading of the following texts:	**16**

	❖ **Section-1** o Malgudi Days: R.K. Narayan o The Room on Roof: Ruskin Bond o "The Gift of the Magi" by O. Henry o "Uncle Podger Hangs a Picture" Jerome K. Jerome ❖ **Section-2** o Night of the Scorpion by Nissim Ezekiel, o Stopping by Woods on a Snowy Evening by Robert Frost, o Where the Mind is Without Fear by Rabindranath Tagore, o Ode to Tomatoes by Pablo Neruda	
Unit IV: **PROFESSIONAL WRITING**	• The art of précis writing, • Letters: business and personnel, • Drafting e-mail, notices, minutes of a meeting etc. • Filling-up different forms such as banks and on-line forms for placement etc.	**06**
Unit V: **VOCABULARY AND GRAMMAR**	• Vocabulary of commonly used words • Glossary of administrative terms (English and Hindi) • One-word substitution, Idioms and phrases etc. • Parts of speech, active and passive voice, tenses etc., Punctuation	**02**

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

SPORTS AND YOGA

L	T	P		**Course Code No.**: HS103
0	0	2		
Total Contact hrs.: Lecture:0 Tutorial:0 Practical: 30 **Credit : 1**			**Total marks: 100**	**Practical:** End Term Exam.:40 P.A: 60

RATIONALE

This course will enable students to understand the importance of sound health and fitness principles as they relate to better health. Students will be exposed to a variety of physical and yogic activities aimed at stimulatingtheir continued inquiry about Yoga, physical education, NCC, NSS, health and fitness. Students will develop an appreciation of physical activity as a lifetime pursuit and a means to better health.

COURSE OUTCOMES

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

- Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
- Demonstrate techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
- Demonstrate breathing exercises and healthy fitness activities
- Explain basic skills associated with yoga and physical activities including strength and flexibility, balance, and coordination.
- Perform yoga movements in various combination and forms.
- Assess current personal fitness levels.
- Identify opportunities for participation in yoga and sports activities.
- Develop understanding of health-related fitness components: cardiorespiratory endurance, flexibility and body composition etc.
- Participate in sports and yogic activities.
- Demonstrate understanding of psychological problems associated with the age and lifestyle.
- Demonstrate understanding of sound nutritional practices as related to health andphysical performance
- Assess yoga activities in terms of fitness value.
- Apply injury prevention principles related to yoga and physical fitness activities.
- Apply biomechanical and physiological principles elated to exercise and training.

COURSE CONTENT DETAILS

UNIT NO. & TITLE	**CONTENT**
UNIT – I INTRODUCTION TO PHYSICAL EDUCATION	• Meaning & definition of Physical Education • Aims & Objectives of Physical Education • Changing trends in Physical Education
UNIT – II 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, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)
UNIT – III 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
UNIT – IV FUNDAMENTALS OF ANATOMY & PHYSIOLOGY IN	• Define Anatomy, Physiology & Its Importance • Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)

PHYSICAL EDUCATION, SPORTS AND YOGA	
UNIT – V 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.
UNIT – VI 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, Ky- phosis, Bow Legs and Scoliosis. • Corrective Measures for Postural Deformities
UNIT -VII 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
UNIT – VIII YOGA & LIFESTYLE	• Asanas as preventive measures. • Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana. • Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, • Ardh Matsyendrasana. • Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana. • Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, • Pavan Muktasana, Ardh Matsyendrasana. • Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, • Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana
UNIT – IX 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.
UNIT – X 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.
UNIT – XI DOPING	• Meaning and Concept of Doping • Prohibited Substances & Methods • Side Effects of Prohibited Substances
UNIT – XII SPORTS MEDICINE	• First Aid – Definition, Aims & Objectives. • Sports injuries: Classification, Causes & Prevention.

	• Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries
UNIT - XIII 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, Vol- leyball, 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)

COMMUNICATION SKILLS IN ENGLISH LAB

L	T	P		**Course Code No**.: HS105
0	0	2		
Total Contact hrs.: Lecture:0 Tutorial:0 Practical: 30 **Credit : 1**			**Total marks: 100**	**Practical:** End Term Exam.:40 P.A: 60

RATIONALE

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.

COURSE OUTCOMES

At the end of this course the students will be able to

- Communicate effectively with an increase in their confidence to read, write and speak English fluently.
- Demonstrate a significant increase in word power.
- Participate in a conversation like listening carefully and respectfully to others' viewpoints; articulating their own ideas and questions clearly
- Engage audience through preparation, organization, and effective delivery of oral presentation.
- Demonstrate non-verbal communication such as proper use of body language and gestures.

COURSE CONTENT DETAILS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (Hrs.)
UNIT - I LISTENING SKILLS	Listening Process and Practice: Introduction to recorded lectures, poems, interviews, and speeches, listening tests	06
UNIT – II INTRODUCTION TO PHONETICS	Sounds: consonant, vowel, diphthongs, etc. transcription of words (IPA), weak forms, syllable division, word stress, intonation, voice etc.	06
UNIT – III SPEAKING SKILLS	Standard and formal speech: Group discussion, oral presentations, public speaking, business presentations etc. Conversation practice and role playing, mock interviews etc.	**10**
UNIT – IV BUILDING VOCABULARY	Etymological Study Of Words And Construction Of Words, Phrasal Verbs, Jargon/ Register Related To Organizational Set Up, Word Exercises And Word Games To Enhance Self-Expression And Vocabulary Of Participants	**08**

REFERENCES:

1. Daniel Jones. The Pronunciation of English. Cambridge: Cambridge University Press, 1956.
2. James Hartman& et al. Ed. English Pronouncing Dictionary. Cambridge: Cambridge University Press, 2006.
3. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Revised Ed. 2018)
4. J.D.O'Connor. Better English Pronunciation. Cambridge: Cambridge University Press, 1980.
5. Lindley Murray. An English Grammar: Comprehending Principles and Rules. London: Wilson and Sons, 1908.
6. Margaret M. Maison. Examine your English. Orient Longman: New Delhi, 1964.
7. J. Sethi& et al. A Practice Course in English Pronunciation. New Delhi: Prentice Hall, 2004.
8. Pfeiffer, William Sanborn and T.V.S Padmaja. Technical Communication: A Practical Approach.6th ed. Delhi: Pearson, 2007.

ENGINEERING GRAPHICS

L	T	P		**Course Code No.**: ES101
0	0	3		
Total Contact hrs.: Lecture:0 Tutorial:0 Practical: 45 **Credit : 1.5**			**Total marks: 100**	**Practical:** End Term Exam.:00 P.A: 100

RATIONALE

Engineering Graphics is the precise means of communicating the ideas of the engineer, designer, and architect to the workmen who will produce/build the desired object. It is necessary that all diploma engineers have command over making and reading of engineering drawing and For which they have thorough understanding of engineering graphics.

COURSE OUTCOMES

After completion of the course, the students will be able to

- Illustrate the language of graphics which is used to express ideas, convey instructions while carrying out engineering jobs.
- Make draft and sketches using drawing equipment and Indian Standards related to engineering drawings.
- Develop skills to visualize actual object or a part of it, on the basis of drawings.
- Translate ideas into sketches
- Draw various engineering curves, projections and dimensioning styles.
- Demonstrate basic skills related to computer aided drafting including how to draw, modify, and edit basic shapes (2D), using AUTOCAD

COURSE CONTENT DETAILS

UNIT NO. & TITLE	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 andcoordinate dimensioning. • Geometrical and Tangency constructions. (Redraw the figure)
UNIT – II **ORTHOGRAPHIC PROJECTIONS**	• Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications. (No question to be asked in examination). • Introduction to orthographic projection, First angle and Third angle method, their symbols. • Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection method only)
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, wash- er, 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. • Standard sizes of sheet. Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview.

Sl. No.	**Practical Exercises**	**Unit No.**	**Time Allotted (Hrs.)**
1	Draw horizontal, Vertical, 30 degree, 45 degree, 60 and 75 degrees lines, different types of lines, dimensioning styles using Tee and Set squares/ drafter. (do this exercise in sketch book)	I	02
2	Write alphabets and numerical (Vertical only) (do this exercise in sketch book)	I	02
3	Draw regular geometric constructions and redraw the given figure (do this exercise in sketch book) Part I	II	02
4	Draw regular geometric construction and redraw the given figure (do this exercise in sketch book) Part II	II	02
5	Draw a problem on orthographic projections using first angle method of projection having plain surfaces and slanting. Part I	III	02
6	Draw another problem on orthographic projections using first angle method of projection having slanting surfaces with slots. Part II	III	02
7	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs. Part I	III	02
8	Draw two problems on Isometric view of simple objects having plain and slanting surface by using natural scale. Part I	IV	02
9	Draw some problems on Isometric projection of simple objects having cylindrical surface by using isometric scale. Part I	IV	02
10	Draw free hand sketches/ conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. Part I	V	02
11	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. Part I	III, II, V	02
12	Draw basic 2D entities like: Rectangle, Rhombus, Polygon using AutoCAD(Print out should be a part of progressive assessment). Part I	V	02
13	Draw basic 2D entities like: Circles, Arcs, circular using AutoCAD (Printoutshould be a part of progressive assessment). Part II	V	02
14	Draw basic 2D entities like: Circular and rectangular array using AutoCAD(Printout should be a part of progressive assessment). Part III	V	02
15	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). Part IV	V	02
16	Draw basic branch specific components in 2D using AutoCAD (Print out should be a part of term work). Part I	VI	02
17	Draw complex branch specific components in 2D using AutoCAD (Print should be a part of progressive assessment). Part I	VI	02

REFERENCES

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. Jeyapoovan, T. *Essentials of Engineering Drawing and Graphics using AutoCAD*. Vikas PublishingHouse 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

ENGINEERING WORKSHOP PRACTICE

L	T	P		**Course Code No.**: ES103
0	0	3		
Total Contact hrs.: Lecture:0 Tutorial:0 Practical: 45 **Credit : 1.5**			**Total marks: 100**	**Practical:** End Term Exam.:00 P.A: 100

RATIONALE

Workshop practice is an important work related to the direct hands-on experiences of learners, which are useful for application of engineering and technology. All engineering / technological activities demand more of such workshop practices of different kinds which are vital for the ongoing processes of various manufacturing industries. This course will develop abilities for different skills through direct hands-on-experiences of learners, related to various works on (a) Carpentry (b) Fittings (c) Sheet metal/Smithy (d) Welding (e) Electrical wiring.

COURSE OUTCOMES

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

- Demonstrate skills in basic engineering practice to identify, select and use various marking, measuring, and holding, striking and cutting tools & equipment's and machines
- Prepare jobs as per specifications in allotted time
- Inspect the job for the desired dimensions and shape
- Operate different machines and equipment following safety practices

COURSE CONTENT DETAILS

UNIT NO. & TITLE	**CONTENT**
UNIT –I CARPENTRY	• Demonstration of different wood working tools / machines. • Demonstrationof different wood working processes, like plaining, marking, chiseling, grooving, turning of wood etc. • One simple job involving any one joint like mortise and tenon dovetail, bridle,half lap etc.
UNIT – II FITTING	• Demonstration of different fitting tools and drilling machines and power tools • Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc. • One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc.
UNIT – III WELDING	• Demonstration of different welding tools / machines. • Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding. • One simple job involving butt and lap joint
UNIT – IV SHEET METAL WORKING	• Demonstration of different sheet metal tools / machines. • Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting. • One simple job involving sheet metal operations and soldering and riveting.
UNIT – V ELECTRICAL HOUSE WIRING	Practice on simple lamp circuits • one lamp controlled by one switch by surface conduit wiring, • Lamp circuits- connection of lamp and socket by separate switches, • Connection of Fluorescent lamp/tube light, • simple lamp circuits-in- stall bedroom lighting. • Simple lamp circuits- install stair case wiring.
UNIT – VI DEMONSTR-ATION	• Demonstration of measurement of Current, Voltage, Power and Energy. • Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. • iii) Tools for Cutting and drilling

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

MATHEMATICS – II

L	T	P		**Course Code No**.: BS102
3	1	0		
Total Contact hrs.: Lecture:45 Tutorial:15 Practical: 0 **Credit : 4**			**Total marks: 100**	**Theory:** End Term Exam.:60 P.A: 40

RATIONALE

The purpose of teaching Engineering Mathematics-II to diploma students is to enable them to understand advance uses of mathematics and solving engineering problems. Continuity and sequence is necessary for logical Development of subject. The topic includes Determinants and Matrices, Integral Calculus, Coordinate geometry and Vector Algebra. This course will be helpful for the learners those who like to go for higher studies.

COURSE OUTCOMES

By the end of the course the students will be able to

- Apply the knowledge of Determinants and Matrices with an understanding of importance of that for solving problems.
- Demonstrate capability of encoding the inherent geometry of the original shape.
- Explain cumulative effect of the original quantity or equation is the Integration
- Relate coordinate geometry with algebra and geometry through graphs of lines and curves.
- Differentiate between a resultant and a concurrent force to model simple physical problems in the form of a differential equation with analyze and interpretation of the solutions.

COURSE CONTENT DETAILS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
UNIT - I: DETERMINANTS AND MATRICES	Elementary properties of determinants up to 3rd order, consistency of equations, Crammer's rule. Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.	**08**

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 formu $\int_0^{\frac{\pi}{2}} \sin^n x\,dx$, $\int_0^{\frac{\pi}{2}} \cos^n x\,dx$ and $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x\,dx$ 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) .	**15**
UNIT - III: CO-ORDINATE GEOMETRY	Equation of straight line in various standard forms (without proof), inter section of two straightlines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula. General equation of a circle and its characteristics. To find the equation of a circle, given: i. Centre and radius, ii. Three points lying on it and iii. Coordinates of end points of a diameter; Definition of conics (Parabola, Ellipse, Hyperbola) their standard equations without proof. Problems on conics when their foci, directories or vertices are given.	**10**
UNIT - IV: VECTOR ALGEBRA	Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector products of 2 vectors. Simple problems related to work, moment and angular velocity.	**06**
UNIT-V: DIFFERENTIAL EQUATIONS	Solution of first order and first degree differential equation by variable separation method (simple problems). MATLAB – Simple Introduction	**06**

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 PublishingHouse, New Delhi

APPLIED PHYSICS –II

L	T	P		**Course Code No.**: BS104
2	1	0		
Total Contact hrs.: Lecture:30 Tutorial:15 Practical: 0 **Credit : 3**			**Total marks: 100**	**Theory:** End Term Exam.:60 P.A: 40

RATIONALE

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

LEARNING OUTCOME:

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

- Solve simple problems on waves and wave motion, periodic and simple harmonic motions.
- Establish wave parameters: frequency, amplitude, wavelength, and velocity
- Explain ultrasonic waves and engineering, medical and industrial applications of Ultrasonic
- Apply acoustics principles to various types of buildings for best sound effect
- Establish the location of the images formed by mirrors and thin converging lens,
- Describe refractive index of a liquid or a solid and conditions for total internal reflection
- Solve simple problems on capacitors in simple circuits
- Illustrate the differentiate between insulators, conductors and semiconductors, and potential, potential difference, electromotive force
- Explain measurement of the circuit parameters: electric current, potential difference, resistance.
- Calculate the equivalent resistance of a variety of resistor combinations, the energy consumed by an appliance
- Describe the effect on a current-carrying conductor when placed in a magnetic field
- Explain the operation of appliances like moving coil galvanometer, simple DC motors.
- Apply the knowledge of diodes in rectifiers, power adapters and various electronic circuits.
- Demonstrate the use of semiconductors in various technical gadgets like mobile phones, computers, LED, photocells, solar lights etc.
- Illustrate the conditions for light amplification in various LASER and laser-based instruments and optical devices
- Discuss the potential of optical fiber in fields of medicine and communication.
- Express importance of nanoscience and nanotechnology and impact of nanotechnology to the society

COURSE CONTENT DETAILS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
UNIT - I: LIGHT	**1.1 Reflection of light** **1.1.1. Reflection of light on plane surface (Review) :** • Laws of reflection • Image formation for reflection in a plane mirror. • Geometrical method of locating image. **1.1.2 Reflection of light on spherical surface :** • Different types of spherical mirror • Radius of curvature and focus of a spherical mirror. • Reflection by a spherical mirror: real and virtual images, magnification	**08+03**

	• Geometrical method of determination of image position, size and nature of the images formed • Relation between focal length and radius of curvature of the spherical mirror, • Relation between object distance, image distance and focal length (no deduction). • Uses of different types of mirrors. **1.2 Refraction of light:** **1.2.1 Refraction of light through plane surface (Review)** • Laws of refraction • Refractive index in terms of velocity of light in different media • Total internal reflection and critical angle, concept of fibre optics & its various practical applications • Dispersion of light through a prism. **1.2.2 Optical Lens :** • Different types of lenses • Position and nature of images formed by convex and concave lenses • Image formation formula (no deduction) • Power of a lens • Electromagnetic spectrum : Infrared, Ultra violet & visible light • Simple problems	
UNIT - II: MAGNETISM	**2.1 Magnetic properties (Review)** • Natural and artificial magnets • Properties of magnets • Types of magnets – bar, horse-shoe, needle • Preparation of temporary and permanent magnets • Induced magnetism **2.2 Magnetic Measurements:** • Uniform and non-uniform field • Magnetic moment • Inverse square law • Magnetic lines of force • Elements of Earth magnetism : dip, declination and horizontal component	**03+01**
UNIT- III: ELECTROSTATICS	**3.1 Electrostatics Basic:** • Basic concept of Electric charge • Its production and nature – electrification by rubbing : Kinds of electrification • Electrostatic induction and conduction • Conductors and non-conductors • Surface density of charge, The lightening conductor • Coulomb's law between electric charges • Field intensity and electric potential • Electric permittivity • Lines of force in electrostatic field	**03+01**
UNIT - IV: CURRENT ELECTRICITY	**4.1 Electric current:** • Cell: Primary & Secondary • Flow of charge – electric current and its unit • Electric motive force (EMF) • Ohm's law • Resistance and its unit, specific resistance • Resistance in series and parallel • Factors affecting resistance • Wheatstone bridge circuit • Relation for balanced Wheatstone bridge (No deduction) • Meter bridge, P.O. Box • Simple problems	**10+06**

	4.2 Heating Effects of Current: • Joule's law • Electrical work, energy and power with units • Simple problems. **4.3 Magnetic Effect of Electric Current:** • Magnetic effect of electric current, Bio-Savart law • Fleming's left-hand rule • Application of Magnetic effect of electric current – Galvanometer (concept only) • Electromagnetic Induction: Faraday's law, Fleming right-hand rule, Basic concept of A.C. generator.	
UNIT - V: MODERN PHYSICS	**5.1 Photo-electric effect:** • Photo-electron, Work function, photo electric effect • Photo cell • Einstein photo electric equation • Stopping potential, Threshold Frequency • Principle of solar photo-voltaic cell and its uses. **5.2 Semiconductor:** • Energy band in solids (Idea) • Distinction between conductor, insulators & semi-conductors in terms of energy band diagram, • Intrinsic and extrinsic (P-type; N-type) semiconductor, • P – N junction diode, depletion region, potential barrier. • Forward and reverse biasing; Forward and reverse bias characteristic curve. • Application of P – N junction diode	**06+04**

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 PressIndia Pvt. Ltd, New Delhi.
8. Nanoscience and Nanotechnology, KK Choudhary, Narosa Publishing House, Pvt. Ltd. NewDelhi.
9. Nanotechnology: Importance and Applications, M.H. Fulekar, IK International PublishingHouse Pvt. Ltd, New Delhi.
10. e-books/e-tools/ learning physics software/websites etc.

APPLIED PHYSICS -II LAB

L	T	P		**Course Code No**.: BS 106
0	0	2		
Total Contact hrs.: Lecture:00 Tutorial:00 Practical: 30 **Credit: 1**			**Total marks: 100**	**Practical:** End Term Exam.:40 P.A: 60

RATIONALE

The course will help the diploma engineers to apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology-based applications.

LEARNING OUTCOME

On completion of this course, the student will be able to;

- Verify optical laws; reflection, refraction from plane interfaces and surfaces.
- Apply knowledge of optics to determine focal length and magnifying power of optical lenses.
- Use electrical components and meters to verify Ohm's law for flow of current.
- Quantify resistances for series and parallel combination of resistances.
- Demonstrate measurement of unknown resistance of a wire.

SUGGESTED LIST OF EXPERIMENTS / PRACTICALS

SL. NO.	EXPERIMENTS
1	To determine refractive index of the material of glass slab by pin method.
2	To determine the focal length of a concave mirror by u , v method
3	To determine the focal length of the convex lens by u , v method
4	To plot magnetic lines of force of a bar magnet with North Pole pointing north and tolocate the neutral points & measure the magnetic length
5	To plot magnetic lines of force of a bar magnet with South Pole pointing north and tolocate the neutral points & measure the magnetic length.
6	To verify Ohm's law by ammeter and Voltmeter method with — Series connection of resistances; Parallel connection of resistances.
7	To measure the unknown resistance / resistivity of the material of a wire by meter Bridge
8	To measure the unknown resistance of the material of a wire by P. O. box.

REFERENCE

1. Principle of Physics – Subrahmanyan & Brizal
2. Intermediate Physics – S.C.Roy Chaudhury & D.B.Sinha
3. Fundamentals of Physics – David Halliday, Robert Resnick & Jeal Walka
4. University Physics – Francis W. Sears, Mark W. Zemans Key & Hugh D. Young
5. University Physics – Hugh D. Young & Roger H. Freedman
6. A text book of Physics (Part II) – C. R. Dasgupta
7. Elements of Higher Secondary Physics (Part II) - D. Dutta, B. Pal & B. Chaudhuri
8. Physics (Volume II) - Ajoy Chakraborty
9. Applied Physics (Vol. II) –H.C. Saxena & Singh Prabhakar
10. Physics for 10+2 students (Part II) - Das, S.K, Sisodia M.L, Neher P.K.,Kachhawa C.M
11. Optical Fibre and Laser: Principles and Applications –Anuradha De, 2nd Edition, New Age International Publications.

INTRODUCTION TO IT SYSTEMS

L	T	P		**Course Code No.**: ES102
2	0	0		
Total Contact hrs.: Lecture:30 Tutorial:0 Practical: 0 **Credit : 2**			**Total marks: 100**	**Theory:** End Term Exam.:60 P.A: 40

RATIONALE

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

COURSE OUTCOMES

At the end of the course student will be able to

- install OS, assemble a PC
- configure OS, assemble a PC
- connect it to external devices,
- write documents,
- create worksheets,
- prepare presentations,
- protect information and computers from basic abuses/ attacks.

COURSE CONTENT DETAILS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (Hrs.)
UNIT-I	Basic Internet skills: Understanding browser, efficient use of search engines, awareness about Digital India portals (state and national portals) and college portals. General understanding of various computer hardware components – CPU, Memory, Display, Key-board, Mouse, HDD and other Peripheral Devices.	**06**
UNIT-II	OS Installation (Linux and MS Windows), Unix Shell and Commands, vi editor.	**08**
UNIT-III	HTML4, CSS, making basic personal webpage.	**06**
UNIT-IV	Office Tools: OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress.	**10**

NOTE: Class lectures will only introduce the topic or demonstrate the tool, actual learning will take place in the Lab by practicing regularly.

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).

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P		**Course Code No.**: ES104
2	1	0		
Total Contact hrs.: Lecture:30 Tutorial:15 Practical: 0 **Credit : 3**			**Total marks: 100**	**Theory:** End Term Exam.:60 P.A: 40

RATIONALE

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

COURSE OUTCOMES

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

- Explain basic principle and operation of electric circuits and machines.
- Solve basic problems related to electrical, magnetic circuits and machines.
- Explain the operation of different electrical technologies.
- Describe the basic electronic circuit elements
- Explain different types of signal waveforms.
- Apply understanding of logic gates in various electronic circuits.
- Illustrate the basic concepts of op-amps, and their applications.
- Use relevant electric/electronic protective devices safely.

COURSE CONTENT DETAILS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
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, aver- age, rms, peak values, different types of signal waveforms, Ideal/non-ideal voltage/current sources,independent/dependent voltage current sources.	**03+01**
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.	**03+01**
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).	**04+01**
UNIT IV ELECTRIC AND MAGNETIC CIRCUITS	EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hyster- esis 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.	**06+04**
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.	**08+04**
UNIT VI TRANSFORMER	General construction and principle of different type of trans- formers; EMF equation and transformation ratio of transformers; Auto	**06+04**

AND MACHINES	transformers; Construction and Working principle of motors; Basic equations and characteristic of motors.	

REFERENCES

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

ENGINEERING MECHANICS

L	T	P		**Course Code No.**: ES106
2	1	0		
Total Contact hrs.: Lecture:30 Tutorial:15 Practical: 0 **Credit : 3**			**Total marks: 100**	**Theory:** End Term Exam.:60 P.A: 40

RATIONALE

The subject of Engineering mechanics deals with the static and dynamic behaviour of rigid bodies under the action of forces. This course will develop basic concepts and working principles of mechanics applied to engineering problems dealing mainly with statics and dynamics of materials under the action of mechanical forces.

COURSE OUTCOMES

After completing this course, student will be able to:

- Obtain resultant of various forces
- Calculate support reactions through conditions of equilibrium for various structures
- Explain role of friction in equilibrium problems
- Explain fundamental laws of machines and their applications to various engineering problems

COURSE CONTENT DETAILS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
UNIT – I BASICS OF MECHANICS AND FORCE SYSTEM	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.	**04+02**
UNIT– II EQUILIBRIUM	Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analysing equilibrium Lami's Theorem – statement and explanation, Application for various engineering problems. Types of beam, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple), Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load. Beam reaction graphically for simply supported beam subjected to vertical point loads only.	**06+03**
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 coefficient 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. First Year Curriculum Structure Common to All Branches	**06+03**
UNIT– IV CENTROID AND CENTRE OF GRAVITY	Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle) Centroid of composite figures composed of not more than three geometrical figures Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere) Centre of Gravity of composite solids composed of not more than two simple solids.	**06+04**

UNIT – V SIMPLE LIFTING MACHINE	Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity ratio, efficiency of machines, law of machine. Ideal machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility Velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block.	**08+03**

REFERENCES:

1. D. S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi (2008)
2. Khurmi, R. S., Applied Mechanics, S. Chand & Co. New Delhi.
3. Bansal R. K., A text book of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi.
5. Dhade, Jamadar & Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh.
6. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, Cambridge University Press.
7. Meriam, J. L., Kraige, L.G., Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

INTRODUCTION TO IT SYSTEMS LAB

L	T	P		**Course Code No.**: ES 108
0	0	4		
Total Contact hrs.: Lecture:00 Tutorial:00 Practical: 60 **Credit : 2**			**Total marks: 100**	**Practical:** End Term Exam.:40 P.A: 60

RATIONALE

This Lab course is intended to practice whatever is taught in theory class of 'Introduction of IT Systems' and become proficient in using computing environment - basic computer skills, basic application software tools, Computer Hardware, cyber security features, etc.

LEARNING OUTCOME

At the end of the course student will be able to

- install OS, assemble a PC
- configure OS, assemble a PC
- connect it to external devices,
- write documents,
- create worksheets,
- prepare presentations,
- protect information and computers from basic abuses/ attacks.

LIST OF PRACTICALS

SL. NO.	EXPERIMENTS / ACTIVITIES FOR PRACTICE
1	Browser features, browsing, using various search engines, writing search queries
2	Visit various e-governance/Digital India portals, understand their features, services offered
3	Read Wikipedia pages on computer hardware components, look at those components inlab, identify them, recognize various ports/interfaces and related cables, etc.
4	Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times
5	Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
6	Practice HTML commands, try them with various values, make your own Webpage
7	Explore features of Open Office tools, create documents using these features, do it multiple times
8	Explore security features of Operating Systems and Tools, try using them and see what happens.

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).

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB

L	T	P		**Course Code No.**: ES 110
0	0	2		
Total Contact hrs.: Lecture:00 Tutorial:00 Practical: 30 **Credit : 1**			**Total marks: 100**	**Practical:** End Term Exam.:40 P.A: 60

RATIONALE

This course will develop an understanding of components of electrical and electronic circuits and machines and enable the learners to be familiar with the basic applications through practical exposure.

LEARNING OUTCOME

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

1. Demonstrate basic operation of electric circuits and machines.
2. Demonstrate use of measuring instruments for voltage, current and power measurement in electrical circuits and machines.
3. Demonstrate operation of different electrical technologies.
4. Identify different types of signal waveforms.
5. Test logic gates in various electronic circuits.
6. Demonstrate basic applications of op-amps.
7. Use relevant electric/electronic protective devices safely.

LIST OF PRACTICALS (Any 15 experiments)

S. No.	List of Experiments / Practical	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 inductor.	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

REFERENCES:

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

SUGGESTED SOFTWARES/LEARNING WEBSITES:

- en.wikipedia.org/wiki/Transformer
- www.animations.physics.unsw.edu.au//jw/AC.html
- www.alpharubicon.com/altenergy/understandingAC.htm
- www.electronics-tutorials
- learn.sparkfun.com/tutorials/transistors
- www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf
- www.learningaboutelectronics.com
- www.electrical4u.com

ENGINEERING MECHANICS LAB

L	T	P		**Course Code No.**: ES 112
0	0	2		
Total Contact hrs.: Lecture:00 Tutorial:00 Practical: 30 **Credit : 1**			**Total marks: 100**	**Practical:** End Term Exam.:40 P.A: 60

RATIONALE

In most of the engineering applications of all disciplines the material bodies are subjected to various forces and to understand the behaviour of such bodies, knowledge and use of engineering mechanics is essential.

LEARNING OUTCOME

After completing this course, student will be able to:

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

LIST OF PRACTICALS

SL. NO.	EXPERIMENTS / ACTIVITIES FOR PRACTICE
1	To study various equipment related to Engineering Mechanics.
2	To find the M.A., V.R., Efficiency and law of machine for Differential Axle and Wheel.
3	To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack.
4	Derive Law of machine using Worm and worm wheel.
5	Derive Law of machine using Single purchase crab.
6	Derive Law of machine using double purchase crab.
7	Derive Law of machine using Weston's differential or wormed geared pulley block.
8	Determine resultant of concurrent force system applying Law of Polygon of forces using force table.
9	Determine resultant of concurrent force system graphically.
10	Determine resultant of parallel force system graphically.
11	Verify Lami's theorem.
12	Determine coefficient of friction for motion on horizontal and inclined plane.
13	Determine centroid of geometrical plane figures.

REFERENCES:

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.

ENVIRONMENTAL SCIENCE (AUDIT COURSE)

L	T	P		**Course Code No.**: AU102
2	0	0		
Total Contact hrs.: Lecture:30 Tutorial:00 Practical: 00 **Credit : 0**			**Total marks: 00**	**Theory:** End Term Exam.:00 P.A: 00

RATIONALE

Management of Environmental Degradation and its control using innovative technologies is of prime importance. Technically qualified people, such as the Diploma Engineers, should not only be aware about new technologies to combat environmental degradation at their disposal but also various aspects of environment, ecology, bio-diversity, management, and legislation so that they can perform their jobs with a wider perspective and informed citizens. This course can be taken by all diploma students irrespective of their specializations.

COURSE OUTCOMES

At the end of the course student will be able to

- Explain the ecosystem and terminology
- Solve various engineering problems applying ecosystem knowledge to produce eco-friendly products.
- Explain suitable air, extent of noise pollution, and control measures and acts.
- Discuss water and soil pollution, and control measures and acts.
- Identify different renewable energy resources and efficient process of harvesting.
- Explain solid Waste Management, ISO 14000 & Environmental Management.

COURSE CONTENT DETAILS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HRS.)
UNIT-I 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	**04**
UNIT- II AIR AND, NOISE POLLUTION	• Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, l.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, l.c., Boiler • Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000	**06**
UNIT- III WATER AND SOIL POLLUTION	• Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation • Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis). • Causes, Effects and Preventive measures of Soil Pollution: Causes- Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.	**08**

UNIT- IV 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.	**10**

REFERENCES

BOOKS:

1. S.C. Sharma & M.P. Poonia, Environmental Studies,Khanna Publishing House,NewDeIhi
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 PublicaMon, 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: 0-07451871-8.
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)

OPEN SOURCE SOFTWARE AND WEBSITE ADDRESS:

I) www.eco-prayer.org

2) www.teriin.org
3) www.cpcp.nic.in
4) www.cpcp.gov.in
5) www.indiaenvironmentportal.org.in
6) ww.whatis.techtarget.com
7) www.sustainabledevelopment.un.org
8) www.conserve-energy-future.com)