Study & Evaluation Scheme

of

Diploma in Engineering
(CIVIL ENGINEERING)
[Applicable w.e.f. Academic Session 2024-25]
Approved by Academic Council

FUTURE UNIVERSITY

18th Milestone, Bareilly-Lucknow Highway NH-24
Near Faridpur, Bareilly, Uttar Pradesh 243503
Website: www.futureuniversity.in

FUTURE UNIVERSITY

(Established under Govt. of U. P. Act No. 12, 2024)

Study & Evaluation Scheme
of
Diploma in Engineering (CIVIL ENGINEERING)
SUMMARY

Programme	:	Diploma in Engineering (CIVIL ENGINEERING)
Duration	:	Three years full time (Six Semesters)
Medium	:	English/ Hindi
Minimum Required Attendance	:	75 percent

Credit :

Maximum Credit	:	**132**
Minimum credit required for the degree	:	**120**

Assessment (Theory) :

Internal	External	Total
30%	70%	100%

Assessment (Practical) :

Internal	External	Total
30%	70%	100%

Internal Evaluation (Theory Papers)

Class Test I	Class Test II	Assignment(s)	Other Activity (including attendance)	Total
10 Marks	10 Marks	5 Marks	5 Marks	30 Marks

Internal Evaluation (Practical Papers)

Experiment File Viva	Mid Semester Exam	Attendance	Total
10 Marks	10 Marks	10 Marks	30 Marks

Duration of Examination (Theory) :

External	Internal
3 hrs.	1 ½ hrs

Duration of Examination (Practical) **:** As per the requirement of the practical paper.

To qualify the course a student is required to secure a minimum of 40% marks in aggregate including the semester end examination and teachers' continuous evaluation. (i.e. both internal and external).

A candidate who secures less than of 40% of marks in a course shall be deemed to have failed in that course. The student should have at least 50% marks in aggregate to clear the semester. In case a student has more than 40% in each course, but less than 50% overall in a semester, he/she shall re-appear in courses where the marks are less than 50% to achieve the required aggregate percentage of 50% in the semester.

Question Paper Structure

1. *The question paper shall consist of six questions. Out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question No. 1 shall contain 8 parts representing all units of the syllabus and students shall have to answer any five (weight age 4 marks each).*
2. *Out of the rest five questions, students shall be required to attempt all five questions, but there will be an internal choice of A or B. Each question will be from one unit of the syllabus. The weight age of Question No. 2 to 6 shall be 10 marks each.*

Faculty of Engineering & Technology

Department of Diploma in Engineering

Civil Engineering

Evaluation Scheme

Credit Framework for Diploma in Engineering - NEP-2020									
Sem.	Major (Core)	Minor Stream	Multidisciplinary	Ability Enhancement course	Skill Enhancement Course	Value added Courses Common for All Diploma	Summer Internship	Research Project/Dissertation	Total Credit
1.	14	5			3	2			24
2.	17	4	2			1			24
3.	14		2		5	1			22
4.	16			3		1	2		22
5.	14	3				3			20
6.	15	2				1		2	20

Total Credit- 132

Polytechnic (Diploma in Engineering), Semester I

SN	Subject Name	Type	Category	Period			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total	Credit
				L	T	P	CT	TA	CT+TA	TE/PE	SW+ESE	Cr
1.	Mathematics-I	T	Major (Core)	3	1	-	20	10	30	70	100	4
2.	Applied Physics-I	T	Major (Core)	3	1	-	20	10	30	70	100	4
3.	Applied Chemistry	T	Major (Core)	3	1	-	20	10	30	70	100	4
4.	Communication Skills in English	T	Skill Enhancement	3	-	-	20	10	30	70	100	3
5.	Applied Physics Lab	P	Minor Stream	-	-	4	-	20	20	30	50	2
6.	Applied Chemistry Lab	P	Minor Stream	-	-	2	-	20	20	30	50	1
7.	Communication Skills Lab	P	Minor Stream	-	-	2	-	20	20	30	50	1
8.	Engineering Graphics	P	Major (Core)	-	-	4	-	20	20	30	50	2
9.	Engineering Workshop Practice Lab	P	Minor Stream	-	-	2	-	20	20	30	50	1
10.	General Proficiency	-	Value Added	-	-	2	-	50	50	-	50	1
11.	Sports & Yoga	-	Value Added	-	-	2	-	20	20	30	50	1
	Total			**12**	**3**	**18**	**80**	**210**	**290**	**460**	**750**	**24**

Polytechnic (Diploma in Engineering), Semester II

SN	Subject Name	Type	Category	Period			Evaluation Scheme				Total	Credit
							Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)		
				L	T	P	CT	TA	CT+TA	TE/PE	SW+ESE	Cr
1.	Mathematics-II	T	Major (Core)	3	1	-	20	10	**30**	70	**100**	**4**
2.	Applied Physics-II	T	Major (Core)	3	1	-	20	10	**30**	70	**100**	**4**
3.	Introduction to IT System	T	Major (Core)	2	-	-	20	10	**30**	70	**100**	**2**
4.	Fundamentals of Electrica l& Electronic Engineering	T	Major (Core)	2	1	-	20	10	**30**	70	**100**	**3**
5.	Engineering Mechanics	T	Major (Core)	3	1	-	20	10	**30**	70	**100**	**4**
6.	Environmental Sciences	T	Multidisciplinary	2	-	-	20	10	**30**	70	**100**	**2**
7.	Applied Physics-II Lab	P	Minor Stream	-	-	2	-	20	**20**	30	**50**	**1**
8.	Introduction to IT System Lab	P	Minor Stream	-	-	2	-	20	**20**	30	**50**	**1**
9.	Fundamentals of Electrical Electronic Engineering Lab	P	Minor Stream	-	-	2	-	20	**20**	30	**50**	**1**
10.	Engineering Mechanics Lab	P	Minor Stream	-	-	2	-	20	**20**	30	**50**	**1**
11.	General Proficiency	-	Value Added	-	-	2	-	50	**50**	-	**50**	**1**
	Total			**15**	**4**	**10**	**120**	**190**	**310**	**540**	**850**	**24**

Polytechnic (Diploma in Engineering), Semester III

SN	Subject Name	Type	Category	Period			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total	Credit
				L	T	P	CT	TA	CT+TA	TE/PE	SW+ESE	Cr
1.	Hydraulics and hydraulic Machines	T	Major (core)	3	1	-	20	10	30	70	100	4
2.	Communication Skill-II	T	Skill Enhancement	3	-	-	20	10	30	70	100	3
3.	AI for Everyone	T	Skill Enhancement	2	-	-	20	10	30	70	100	2
4.	Concrete Technology	T	Major (core)	2	1	-	20	10	30	70	100	3
5.	Environmental Studies	T	Multidisciplinary	2	-	-	20	10	30	70	100	2
6.	Building Construction	T	Major (core	3	1	-	20	10	30	70	100	4
7.	Hydraulics and hydraulic LAB	P	Major (core)	-	-	4	-	20	20	30	50	2
8.	Concrete Technology LAB	P	Major (core)	-	-	2	-	20	20	30	50	1
9.	General Proficiency	-	Valu Added	-	-	2	-	50	50	-	50	1
	Total			**15**	**3**	**8**	120	150	**270**	**480**	**750**	**22**

Polytechnic (Diploma in Engineering), Semester IV

SN	SubjectName	Type	Category	Period			Evaluation Scheme				Total	Credit
							Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)		
				L	T	P	CT	TA	CT+TA	TE/PE	SW+ESE	Cr
1.	Industrial Training	P	Summer Training	-	-	-	-	-	50	-	50	2
2.	Highway Engineering	T	Major (core)	2	1	-	20	10	30	70	100	3
3.	AI for Engineering	T	Major (core)	3	-		20	10	30	70	100	3
4.	Surveying- I	T	Major (core)	2	1	-	20	10	30	70	100	3
5.	Reinforced Cement Concrete Structures (RCC Structures)	T	Major (core)	2	1	-	20	10	30	70	100	3
6.	Energy Conservation	T	Ability Enhancement	3	-	-	20	10	30	70	100	3
7.	RCC Drawing	T	Major (core)	1	1		20	10	30	70	100	2
8.	Highway Engineering LAB	P	Major (core)	-	-	2	-	20	20	30	50	1
9.	Surveying- I LAB	P	Major (core)	-	-	2	-	20	20	30	50	1
10.	General Proficiency	-	Value Added	-	-	2	-	50	50	-	50	1
	Total			**13**	**4**	**6**	**120**	**150**	**320**	**480**	**800**	**22**

Polytechnic (Diploma in Engineering), Semester V

SN	Subject Code	Subject Name	Type	Category	Period L	Period T	Period P	Sessional Component CT	Sessional Component TA	Sessional (SW) (TS/PS) CT+TA	End Semester Examination (ESE) TE/PE	Total SW+ESE	Credit Cr
1.	CEET501	Water and waste water Engineering	T	Major (core)	2	1	-	20	10	30	70	100	3
2.	CEET502	Building Drawings	T	Major (core	3	1	-	20	10	30	70	100	4
3.	CEET503	Soil Mechanics and Foundation Engineering	T	Major (core)	2	1		20	10	30	70	100	3
4.	CEET504	Surveying-II	T	Major (core)	2	1	-	20	10	30	70	100	3
5.	CEET505	Industrial Management and Entrepreneurship Development	T	Multidisciplinary	3	-	-	20	10	30	70	100	3
6.	CEVA506	Universal Human Values	T	Value Added	2	-	-	20	10	30	70	100	2
7.	CESL501	Surveying-II LAB	P	Major (core)	-	-	2	-	20	20	30	50	1
8.	CEVA501	General Proficiency	-	Value Added	-	-	2	-	50	50	-	50	1
		Total			14	4	4	120	130	250	450	700	20

Polytechnic (Diploma in Engineering), Semester VI

SN	Subject Code	Subject Name	Type	Category	Period			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total	Credit
					L	T	P	CT	TA	CT+TA	TE/PE	SW+ESE	Cr
1.	CEET601	Quantity Surveying and Valuation	T	Major (core)	2	1	-	20	10	**30**	**70**	**100**	**3**
2.	CEET602	Design of Steel Structure	T	Major (core)	2	1	-	20	10	**30**	**70**	**100**	**3**
3.	CEET603	Steel Structure Drawing	T	Major (core)	2	1	-	20	10	**30**	**70**	**100**	**3**
4.	CEET604	Irrigation Engineering	T	Major (core)	2	-	-	20	10	**30**	**70**	**100**	**2**
5.	CEET605	Software Application in Civil Engineering	T	Minor Stream	2	-	-	20	10	**30**	**70**	**100**	**2**
6.	CECA606	Repair and Maintenance Buildings*	T	Major (core)	3	-	-	20	10	**30**	**70**	**100**	**3**
7.	CEMM601	Design of Steel Structure LAB	P	Major (core)	-	-	2	-	20	**20**	**30**	**50**	**1**
8.	CEPW601	Project Work	-	Project	-	-	4	-	50	**50**	**200**	**250**	**2**
9.	CEGP601	General Proficiency	-	Value Added	-	-	2	-	50	**50**	**-**	**50**	**1**
		Total			13	3	8	120	180	**300**	**650**	**950**	**20**

Note: - (*) Elective Subjects

MATHEMATICS - I

L   T   P
3   1   -

COURSE OBJECTIVES

Contents of this course provide fundamental base for understanding elementary mathematics and their uses in solving engineering problems. Contents of this course will enable students to use basic mathematical function like logarithms, partial fractions, matrices and basic 2D curves in solving various engineering problems of all fields.

COURSE OUTCOMES

After undergoing this course, the students will be able to:
- Understand and apply angle measurements, T-Ratios, and graph functions.
- Grasp the concepts of limits, differentiation and apply differentiation rules.
- Resolve proper and improper fractions into partial fractions with various factors.
- Solve problems using permutations and combinations and apply the binomial theorem.
- Understand complex numbers in different forms , perform arithmetic operations and applications of De Moivre's theorem.

COURSE CONTENT

UNIT - I: Trigonometry   **(10 Periods)**

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 | x | , sin x, cos x, tan x and e^x .

UNIT-II : Differential Calculus   *(14 Periods)*

Definition of function, concept of limits. Method to find the limits.

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

UNIT - III: Partial fractions: *(10 Periods)*

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

UNIT- IV : Permutations , Combinations and Binomial theorem   *(10 Periods)*

Value of ^nP_r ,^nC_r and formula based problems.
Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof); applications of Binomial theorem.

Definition, real and imaginary parts of a complex number, polar and Cartesian representation of a complex number and its conversion from one form to other, conjugate of a complex number, modulus and amplitude of a complex number. Addition, subtraction, multiplication and division of complex numbers. De Moivre's theorem and its applications.

INSTRUCTIONAL STRATEGY

The basic instructional strategy to teach basic mathematics, binomial theorem, trigonometry, differential calculus etc. should be conceptual with real world applications of relevant branch. More numerical and theoryexamples can be used for clear understanding of the content.

MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

RECOMMENDED BOOKS

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

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	10	15
2.	14	25
3.	10	20
4	10	20
5	12	20
Total	**56**	**100**

APPLIED PHYSICS – I

L   T   P
3   1   2

COURSE OBJECTIVES

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.

COURSE OUTCOMES

After undergoing this course, the students will be able to:

- Identify the use of S.I. system of measurement with accuracy and how it is used in   engineering
- Represent physical quantities as scalars and vectors, applying the physical laws and concepts of linear and circular motion in everyday life.
- Solve difficult problems (walking of man, horse and cart problem, flying of bird/ aircraft, etc.)
- Analyse and design banking of roads/railway tracks and apply conservation of momentum principle to Explain rocket propulsion, recoil of gun etc.
- Derive work, power and energy relationship and solve problems about work and power.
- Define work, energy and power and their units.
- Describe conservation of energy and its applications
- Understand the concept of rotational motion of a rigid body and its applications
- Apply the physical laws and concepts of gravity, its variation with longitude and latitude and its uses in space satellite etc.   .
- Understand the concept of elasticity, surface tension, pressure and the laws governing movement of fluids.
- Express physical work in term of heat and temperature; Measure temperature in various processes on different scales (Celsius, Kelvin, Fahrenheit etc.)
- Distinguish between conduction, convection and radiation, identify the different methods for reducing heat losses
- Understand the laws of thermodynamics, Carnot cycle and their applications.

COURSE CONTENTS

1. Units and Dimensions   (8 Periods)

Need of Measurement in engineering and science, unit of a physical quantities - fundamental and derived units, systems of units (FPS, CGS and SI units)
Dimensions and dimensional formulae of physical quantities.
Principle of homogeneity of dimensions

Dimensional equations and their applications, conversion of numerical values of physical quantities from one system of units into another, checking the correctness of physical equations and deriving relations among various physical quantities

Limitations of dimensional analysis

Error in measurement, accuracy and precision of instruments measuring instruments least count, random and systematic errors, absolute error, relative error, and percentage error, Estimation of probable errors in the results of measurement (combination of errors in addition, subtraction, multiplication, division and powers), rules for representing significant figures and rounding off in calculation.

2. **Force and Motion**   **(10 periods)**

Force, Momentum, Statement and Derivation of Conservation of linear momentum, its applications such as recoil of gun.

Impulse and its Applications

Circular motion (Uniform and Non-uniform), definition of angular displacement, angular velocity, angular acceleration, frequency, time period.

Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical)

Central force, Expression and Applications of Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist.

Gravitational force, Kepler's law of planetary motion.

Acceleration due to gravity and its variation with depth and height from earth surface.

3. **Work, Power and Energy**   **(8 periods)**

Work: and its units, examples of zero work, positive work and negative work.

Friction: modern concept, types, laws of limiting friction, Coefficient of friction, reducing friction and its Engineering Applications.

Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications

Energy and its units: Kinetic energy and gravitational potential energy with examples and their derivation.

Mechanical Energy, Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.

Power and its units, calculation of power in numerical problems

4 **Rotational Motion**   **(8 periods)**

Concept of translatory and rotatory motions with examples

Definition of torque with examples

Angular momentum, Conservation of angular momentum (quantitative) and its examples

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

Rotational kinetic energy, Rolling of sphere on the slant plane

Comparison of linear motion and rotational motion.

5. *Properties of Matter* *(12 periods)*

Elasticity: definition of stress and strain, different types of modulii of elasticity, Hooke's law, significance of stress strain curve

Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure,Fortin's Barometer and its applications

Surface tension: concept, its units, angle of contact cohesive and adhesive forces, Capillary action ascent formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension

Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.

Concept of fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem (only formula) and their applications.

6. *Heat and Thermometry* *(10 periods)*

Concept of Heat and Temperature.

Modes of transfer of heat (Conduction, convection and radiation with examples)

Different scales of temperature and their relationship and definition of specific heat.

Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansionsand relation amongst them
Concept of Co-efficient of thermal conductivity and its engineering application.

Types of thermometers (Mercury Thermometer And Bimetallic Thermometer And TheirUses)

LIST OF PRACTICALS (To perform any Six Practicals)

1. To measure length, radius of a given cylindrical body like test tube, beaker using a one-year calipers and find volume of each object.
2. To determine diameter of a wire, a solid ball using a screw gauge.
3. To determine the Radius of curvature of (i) convex mirror, (ii) concave mirror by spherometer
4. To verify parallelogram law of forces.
5. To find the coefficient of friction between wood and glass using a horizontal board.
6. To determine the atmospheric pressure at a place using Fortin's Barometer
7. To determine the viscosity of glycerin by Stoke's method
8. To verify law of conservation of mechanical energy (PE to KE).

9. To measure room temperature and temperature of hot bath using mercury thermometer and convert it into different scales.
10. To determine force constant of spring using Hooks law.

INSTRUCTIONAL STRATEGY

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

MEANS OF ASSESSMENTS

− Assignment & Quiz,
− Mid-Term and End-Term written test,
− Model Making,
− Actual Lab & Practical Work,
− Viva Voice

RECOMMENDED BOOKS

1 Text Book of Physics for Class XI (Part-I, Part-II); N.C.E.R.T., Delhi
2 Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3 Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
4 B.Sc.Practical Physics by C L Arora, S. Chand Publication..
5 Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6 Engineering Physics by DK Bhhatacharya& Poonam Tandan; Oxford University Press, New Delhi
7 Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications
8 V. Rajendran,physics-I, Tata McGraw-Hill raw Hill publication, New Delhi
9 Arthur Beiser, Applied Physics, Tata McGraw-Hill raw Hill publication, New Delhi
10 Physics Volume 1, 5th edition, Haliday Resnick and Krane, Wiley publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	15
2	10	18
3	08	15
4	08	15
5	12	19
6	10	18
Total	**56**	**100**

APPLIED CHEMISTRY

L   T   P
3   1   2

COURSE OBJECTIVES:

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

COURSE OUTCOMES

After undergoing this course, the students must be able to:

- Solve various engineering problems applying the basic knowledge of atomic structure andchemical 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

Unit 1: Atomic Structure, Chemical Bonding and Solutions **(11 periods)**

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 uncertaintyprinciple, Quantum numbers – orbital concept. Shapes of s,p and d orbitals, Pauli's exclusion principle, Hund's rule of maximummultiplicity 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), coordination bond ,
in NH_4^+ and anomalous properties of NH_3, H_2O due to hydrogen bonding, andmetallic bonding.

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

Unit 2: Water *(11 periods)*

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 andsimple numerical on water hardness.

Cause of poor lathering of soap in hard water, problems caused by the use of hard water inboiler (scale andsludge, foaming and priming, corrosion etc), and quantitative measurement of water

i). Water softening techniques – soda lime process, zeolite process and ion exchange process.

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

iii) *Water for human consumption for drinking and cooking purposes from any water sources andenlist Indian standard specification of drinking water (collect data and understand standards).*

Unit 3: Engineering Materials   *(11 periods)*

Natural occurrence of metals – minerals, ores of iron, aluminium and 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 along with reactions. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous withsuitable 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 inpreparation 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 4: Chemistry of Fuels and Lubricants   *(11 periods)*

Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV andLCV), 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 andbiogas.

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.

Unit 5: Electro Chemistry   *(12 periods)*

Electronic concept of oxidation, reduction and redox reactions.
Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws ofElectrolysis 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), H_2 liberation and O_2 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.

INSTRUCTIONAL STRATEGY

Unit 1: Atomic Structure, Chemical Bonding and Solutions

Assignments: Writing electronic configuration of elements up to atomic number 30 (Z= 30). Numerical on molarity, ppm, mass percentage, volume percentage and mole fractionof given solution.

Seminar: 1. Quantum numbers,

2. Discuss the metallic properties such as malleability, ductility, hardness, high melting point, conductance of heat and electricity, magnetic propertiesof metals. Projects: Model of molecules $BeCl_2$, BF_3, CH_4, NH_3, H_2O.

Unit 2: Water

Assignments: Simple problems on hardness calculation.

Seminar: 1. Quality and quantity requirement of water in house and industry.

2. Quality of control measures of effluents (BOD & COD).

Projects: Collect water samples from different water sources and measure of hardnessof water.

Unit 3: Engineering Materials

Assignments: Preparation of table showing different ores of iron, copper and aluminiummetals alongwith their chemical compositions and classify in to oxide sulphide halide ores.

Seminar: Discuss the chemical reactions taking place in blast furnace in extractionof Fe, Cu and Al metals.

Projects: Make table showing place of availability of different ores in India and show places on Indiamap.

Unit 4: Chemistry of Fuels and Lubricants

Assignments: Calculation of HCV and LCV of fuel using fuel composition in Dulong's

formula.Seminar: Chemical structure of fuel components influence on fuel rating.

Projects: Mapping of energy recourses in India. Collection of data of various lubricants available inthe market.

Unit 5: Electro Chemistry

Assignments: Simple problems on Faradays laws of electrolysis.Seminar:

1. Corrosion rate and units.
2. Corrosion preventions.

Projects: Mapping of area in India prone to corrosion. Collection of data of various electrochemical cells batteries used in equipment and devices and avail- able in market. Visit to sites such as Railway station to watch corrosion area in railways and research establishment in and around the institution.

LIST OF PRACTICALS:

Perform any Ten Laboratory Practicals.

Volumetric and Gravimetric analysis:

1. Preparation of standard solution of oxalic acid or potassium permanganate.
2. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
3. Standardization of KMnO4 solution using standard oxalic acid and determine the percentage of iron present in given Hematite ore by KMnO4 solution.
4. Iodometric estimation of copper in the copper pyrite ore.
5. Volumetric estimation of total acid number (TAN) of given oil.
6. Volumetric estimation of:
   a) Total hardness of given water sample using standard EDTA solution.
   b) Alkalinity of given water sample using 0.01M sulphuric acid.
7. Proximate analysis of coal:
   a) Gravimetric estimation of moisture in given coal sample.
   b) Gravimetric estimation of ash in given coal sample.

Instrumental analysis:

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

(a) Open source software and website address:

1. www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2. www.visionlearning.com (Atomic structure and chemical bonding)
3. www.chem1.com (Atomic structure and chemical bonding)

4   https://www.wastewaterelearning.com/elearning/ (Water Treatment)
5   www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
6   www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf
    (Fueland Combustion)
7   www.chemcollective.org (Metals, Alloys)
8   www.wqa.org(Water Treatment)

References/Suggested Learning Resources:
(b) Books :
1. Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
2. Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.
3. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
4. Dara, S. S. & Dr.S.S.Umare, Engineering Chemistry, S.Chand. Publication, New Delhi, New 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.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	11	20
2	11	20
3	11	20
4	11	20
5	12	20
Total	**56**	**100**

COMMUNICATION SKILLS IN ENGLISH

L T P

COURSE OBJECTIVES

3 - 2

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

After undergoing this course, the students must be able to:

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

COURSE CONTENTS

Unit -1 Communication: Theory and Practice   **(08 Periods)**

Basics of Communication, Definition Process of Communication
Types of communication (formal and informal, verbal and non-verbal), 7 C's of Communication
Barriers to communication and ways to overcome them
Tools or devices of Communication

Unit – 2 Soft Skills for Professional Excellence   **(04 Periods)**
2.1   Introduction to Soft skills and hard skills
2.2   Importance of soft skills
2.3   Applying soft skills across cultures

Unit – 3 Reading Comprehension: English for Communication   *(08 Periods)*
On Communication
Professional Development of Technicians
Leadership and Supervision
The Romance of Reading
Sir C V Raman

Unit: 4 Professional Writing   *(14 Periods)*

CV Writing, Covering Letter, Resume, Notices, Precis -Writing, Official Letters (Memo, Circular, Office Orders, Agenda, Minutes of Meeting, Report Wring, E-mail Drafting)

Unit: 5 Vocabulary and Grammar   *(08 Periods)*

      Sentence and its Types

      Parts of Speech

      Tenses

      Active and Passive Voice

      Punctuation

      One Word Substitution, Idioms and Phrases

LIST OF PRACTICALS

Unit-1 Listening skills

1.1   Introduction to listening process and practice

1.2   Listening to recorded lectures/speeches/poems/interviews and Dialogues

Unit 2 Introduction to phonetics

2.1   Sounds: consonants, vowels (Monophthongs and Diphthongs)

2.2   Transcription of words (IPA) syllable diversion and word stress

Unit 3 Speaking skills

3.1   Self and Peer introduction

3.2   Extempore-Just a minute session

3.3   Greeting and starting conversation

3.4   Leave taking

3.5   Wishing well

3.6   Talking about likes and dislikes

3.7   Asking questions-polite responses

3.8   Apologizing/forgiving

3.9   Complaining/Warning

4.0   Asking and giving information

4.1   Getting and giving Permission

4.2   Asking for and giving Opinion

4.3   Delivering formal speeches

4.4   Mock Interviews

4.5   Presentation

4.6   Conversation practices in various situations such as -asking address, enquiries at places like   retail shop, service center, bank, customer care etc.

Unit 4 Building Vocabulary

      Word Formation

      Phrasal Verbs, Foreign Phrases, Jargons

      Word Games such as crosswords, scrabble, quiz spell it etc. (To enhance self-expression andvocabulary of participants.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class roomand actively participate in listening exercises

MEANS OF ASSESSMENT

– Assignments and quiz/class tests, mid-semester and end-semester written tests
– Actual practical work, exercises and viva-voce
– Presentation and viva-voce

RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.

2. Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.

3. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.

4. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra

5. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria& Sons, New Delhi

6. Q. Skills for success – Level & Margaret Books, Oxford University Press.

7. E-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.

8. English for Communication (text Book Published by IRDT, Kanpur 1998).

Websites for Reference:

1.   http://www.mindtools.com/ page 8.html – 99k
2.   http://www.letstalk.com.in
3.   http://www.englishlearning.com
4.   http://learnenglish.britishcouncil.org/en/
5.   http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Unit No.	Time Allotted (Periods)	Marks Allotted (%)
1	8	20
2	4	10
3	8	20
4	14	30
5	8	20
Total	**42**	**100**

Engineering Graphics

L	T	P
-	-	4

COURSE OBJECTIVES

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, shouldbe to develop conceptual skills in the students following BISSP 46 – 1988.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

- Identify and use of different grades of pencils and other drafting instruments whichare used in engineering field
- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Use different types of scales and their utilization in reading and reproducing drawingsof objects and maps.
- Draw 2 - dimensional view of different objects viewed from different angles(orthographic views)
- Draw and interpret complete inner hidden details of an object which are otherwise notvisible in normal view
- To make projections of Solid
- Generate isometric (3D) drawing from different 2D (orthographic) views/sketches.
- Identify conventions for different engineering materials, symbols, sections of regularobjects and general fittings used in Civil and Electrical household appliances
- Use basic commands of AutoCAD.

COURSE CONTENT

Unit – I   Basic elements of Drawing   (05 Sheets)

Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards. Different types of lines as per BIS specifications Practice of vertical, horizontal and inclined lines,geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with thehelp of drawing instruments.
Common symbols and conventions of materials used in engineering.
Free hand and instrumental lettering (Alphabet and numerals) – Capital Letter, single stroke, vertical andinclined, series of 5,8,12 mm in the ratio of 7:4.

Dimensioning-

Necessity, method and principles, Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches Scales.
Scales *–Needs & importance (theory), R.F., type of scales, and length of scale, drawing of plain and diagonalscales.*

Unit – II Orthographic projections   *(05 Sheets)*

Introduction, Projection of Points in different quadrant, Projection of Straight Line- parallel to both planes, perpendicular and inclined to reference plane, Projection of Plane – Different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in 1st angle only, Three views of orthographic projection of different objects. Identification of surfaces.

Unit – III Projection of Solid and Sections   *(05 Sheets)*

Definition and types of Solids, To make projections, sources, Top view, Front view and Side view of varioustypes of Solid, Importance and salient features.
Drawing of full section, half section, partial or broken out sections, Off-set sections, revolved sections and removed sections, Convention sectional representation of various materials, conventional breaks for shafts,pipes, rectangular, square, angle, channel, rolled sections.

Unit – IV Isometric Projections   *(03 Sheets)*
Introduction, Isometric scale and Natural scale, Isometric view and isometric projection, Illustrativeproblems related to objects containing lines, circles and arcs shape only.
Conversion of orthographic views into isometric view /projection.

Unit-V Introduction to Auto CAD

Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets on AutoCAD of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.
Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.

INSTRUCTIONAL STRATEGY

Teacher should show model of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings.

Teachers should undergo training in AutoCAD/Engineering Graphic. Separate labs forpractice on AutoCAD should be established.

MEANS OF ASSESSMENT

- Sketches
- Drawing
- Use of software

RECOMMENDED BOOKS

1. A Text Book of Engineering Drawing by Surjit Singh; Dhanpat Rai & Co., Delhi
2. Engineering Drawing by PS Gill; SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt; Charotar Publishing House Pvt. Ltd., Anand
4. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar
5. Engineering Drawing I by DK Goel, GBD Publication.

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COURSE OBJECTIVES

The course aims to provide hands-on experience and practical skills in various essential workshops, including carpentry, fitting, welding, sheet metal, plumbing, and painting and polishing. Students will gain proficiency in using different tools and machines, understanding and executing various processes and operations, and completing multiple jobs that involve intricate tasks. This practical knowledge will equip students with the necessary skills to handle real-world tasks efficiently, fostering a deeper understanding of the techniques andsafety measures required in each shop.

COURSE OUTCOMES

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

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

DETAILS OF PRACTICAL CONTENTS

1. CARPENTRY SHOP

Demonstration of different wood working tools / machines.
   Demonstration of different wood working processes, like plaining, marking, chiselling, grooving, turning of wood etc.
Three jobs involving joint like mortise and tenon, dovetail, bridle, and half lap.

2. *FITTING SHOP*

Demonstration of different fitting tools and drilling machines and power tools
   Demonstration of different operations like filing, drilling, tapping, sawing, cutting etc.
   Three fitting job involving practice of cutting, chipping, filing, marking, hacksawing, drilling, tapping, etc.

3. *WELDING SHOP*

Demonstration of different welding tools/machines.
   Demonstration on Arc Welding, Gas Welding, MIG welding, gas cutting and rebuilding of broken parts with welding.
Two simple job involving butt and lap joint and T. Joint using electric arc welding.

4.   SHEET METAL SHOP

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.
Three simple job involving sheet metal operations, soldering, and riveting.
   Jobs
Cutting Practices
Single / Double Seam Joint
Cylinders

5.   PLUMBING SHOP

Demonstration of different plumbing tools, accessories, valves and different pipe fittings and joints (GI and PVC).
Demonstration of different plumbing operations like cutting, threading, pipe fitting (GI and PVC).
5.3 One simple job involving pipe cutting and external thread cutting on GI pipe.

6.   PAINTING AND POLISHING SHOP

Introduction of paints, Varnishes, Reason for Surface preparation, Advantage of painting, other method of surface coating i.e. Electroplating etc.
 Jobs
To prepare a wooden surface for painting apply primer on side and to paint in the same side.
To prepare metal surface for painting, apply primer and paint on same side.
To Prepare a metal surface for spray painting. First spray primer and paint the same by spray gun and compressor system.

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.   J.P. Bhati, Engineering Workshop, C.B.H. Publication, Jaipur.
4.   K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014
5.   Kents Mechanical Engineering Hand book, John Wiley and Sons, New York
6.   Roop Lal and Bharadwaj P. K., Prarambhik KaryashalaTakneeki (Hindi), Vayu Education of India, New Delhi

1.7 SPORTS AND YOGA

L T P

- - 2

COURSE OBJECTIVES

To make the students understand the importance of sound health and fitness principles as they relate to better health. To expose the students to a variety of physical and yogic activities aimed at stimulatingtheir continued inquiry about Yoga, physical education, health and fitness. To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury .To develop among students an appreciation of physical activity as a lifetime pursuit anda 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, andrelaxation.
- Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
- Learn breathing exercises and healthy fitness activities
- Understand 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.
- Improve personal fitness through participation in sports and yogic activities.
- Develop understanding of psychological problems associated with the age and lifestyle.
- Demonstrate an understanding of sound nutritional practices as related to health andphysical performance.
- Assess yoga activities in terms of fitness value.
- Identify and apply injury prevention principles related to yoga and physical fitness activities.
- Understand and correctly apply biomechanical and physiological principles elated to exercise and training

COURSE CONTENT

1 Introduction to Physical Education

- Meaning & definition of Physical Education
- Aims & Objectives of Physical Education

2 Yoga

- Meaning & Importance of Yoga
- Elements of Yoga- Gyan Yoga, Bhakti Yoga, Karm Yoga, Hathyoga, Astang Yoga .
- Introduction - Asans, Pranayama, Meditation & Bandh , Mudra and shat Karm .

- Meaning of Practice of various Yogic Sukhasan, Vyayams

- Practice of Asans and Benefits – Sidhasana, Padmasana,Vajrasana, Shasakasan, Singhasan, Gomukhasan, Virasan, Dhanurasan, Matsnyendrasan, Gorakhasan, Paschimottansan, Mayurasan, Garunasan, Pawanmuktasan, Kurmasan, Mandukasan, Shalabhasan, Makrasan, Bhujangasan, Naukasan, Shavasan, Sharvangasans, Halasan.

- Practice and Benefits of Pranayamas – Anulom- Vilom, Surya Bhedhi, Ujjayi, Sheetkari, Bhastrika, Bharamri, Murchha, kewali etc .

- Practice of Meditation – Meaning of Meditation, Types , Techniques, Benefits .

3   Olympic Movement

- 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.)

4   Physical Fitness, Wellness & Lifestyle

- Meaning & Importance of Physical Fitness & Wellness

- Components of Physical fitness

- Concept of Positive Lifestyle

5   Yoga & Lifestyle

- Ideal life style

- Asans and pranayams a preventive measures

- Yoga and Immunity

- Concept of Yogic diet.

- **Life Style Diseases-** Yoga management of Diseases, Yoga management of Stress, Yoga management of Obesity, Yoga management of High Blood Pressure, Yoga management of Insomia, Yoga management of Asthma, Yoga management of Joints Pains, Yoga management of Digestive Disorders .

6   Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga

- Define Anatomy, Physiology & Its Importance

- Effect of exercise on the functioning of Various Body Systems.

- Circulatory System,

- Respiratory System,

7   Postures

- Meaning and Concept of Postures.

- Causes of Bad Posture.

- Advantages & disadvantages of weight training.

8   Training and Planning in Sports

- Meaning of Training

- Warming up and limbering down

9 *Psychology & Sports*

- Definition & Importance of Psychology in Physical Edu. & Sports

- Define & Differentiate Between Growth & Development

10 *Doping*

- Meaning and Concept of Doping

11 *Sports Medicine*

- First Aid – Definition, Aims & Objectives.

- Sports injuries: Classification, Causes & Prevention.

12 *Sports / Games*
   Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.

- History of the Game/Sport.
- Specifications of Play Fields and Related Sports Equipment.
- Important Tournaments and Venues.

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)

MATHEMATICS - II

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COURSE OBJECTIVES

This course is designed to give a comprehensive coverage at an introductory level to the subject of matrices, integral calculus, coordinate geometry, basic elements of vector algebra and first order differential equations.

COURSE OUTCOMES

After undergoing this course, the students will be able to:

- Solve linear equations using determinants and matrix algebra.
- Perform integration techniques, solve area and volume problems.
- Solve first order differential equations and apply numerical methods.
- Form and interpret equations of lines, circles and conics.
- Perform vector operations and solve related engineering problems of relevant branch.

COURSE CONTENTS

UNIT - I: Determinants and Matrices **(10 periods)**

Elementary properties of determinants upto 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 three variables.

UNIT - II: Integral Calculus *(12 periods)*

Integration as inverse operation of differentiation. Simple integration by substitution, by parts and by partial fractions (for linear factors only). Introduction to definite integration. Use of formulae - $\int_{0}^{\frac{\pi}{2}} sin^{n}\theta\, d\theta$, $\int_{0}^{\frac{\pi}{2}} cos^{n}\theta\, d\theta$, $\int_{0}^{\frac{\pi}{2}} sin^{m}\theta\, cos^{n}\theta\, d\theta$ for solving problems ,where m and n are positive integers.

Applications of integration for (i). Simple problems on evaluation of area bounded by a curve and axes.(ii). calculation of volume of a solid formed by revolution of an area about axes. (Simple problems).

UNIT-III: Differential Equations & Numerical Methods *(15 periods)*

Definition of differential Equations, order and degree of a differential equation, formation of differential equations, solution of first order and first degree differential equations by variable separable method (simple problems). Trapezoidal rule, Simpson's 1/3 and Simpson's 3/8 rule and their applications in simplecases. MATLAB – Simple Introduction.

UNIT - IV: Two dimensional Co-Ordinate Geometry   (10 periods)

Equation of straight line in various standard forms (without proof), intersection 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.   Co-ordinates of end points of a diameter;

Definition of conics (Parabola, Ellipse, Hyperbola), their standard equations without proof. Problemson conics when their foci, directories or vertices are given.

UNIT - V: Vector Algebra   (9 periods)

Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector product of two vectors. Simple problems related to work, moment and angular velocity.

INSTRUCTIONAL STRATEGY

The content of this course is to be taught on conceptual basis with plenty of real world examples. Differential equations and applications of differential equations can be taught with engineeringapplications of relevant branch.

MEANS OF ASSESSMENT

– Assignments and Quiz/Class Tests
– Mid-term and End-term Written Tests
– Model/Prototype Making

RECOMMENDED BOOKS

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

2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.

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

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

5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	10	20
2.	12	20
3.	15	25
4	10	20
5	9	15
Total	**56**	**100**

APPLIED PHYSICS – II

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3   1   2

COURSE OBJECTIVES

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles.In all contents, SI units should be followed.

COURSE OUTCOMES

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

- Define wave motion its types (Transverse and Longitudinal), Periodic and Simple Harmonic Motion, solve simple problems.
- Define the terms: frequency, amplitude, wavelength, velocity of a wave.
- Explain various Engineering, Medical and Industrial applications of Ultrasonics.
- Apply acoustics principles to various types of buildings to get best sound effect
- Explain diffraction, interference, polarization.
- Define capacitance and its unit. They will be able to explain the function of capacitors in simple circuits, solve simple problems using C=Q/V
- Explain the role of free electrons in insulators, conductors and semiconductors, qualitatively the terms: potential, potential difference, electromotive force.
- Explain the concept of electric current, resistance and its measurement.
- List the effects of an electric current and their common applications, State and apply Ohm's law, calculate the equivalent resistance of a variety of resistor combinations, determine the energy consumed by an appliance, distinguish between AC and DC electricity
- Explain Bio-Savart Law, Ampere's law, Lorenz Force.
- State the laws of electromagnetic induction, describe the effect on a current-carrying conductor when placed in a magnetic field
- Explain operation of moving coil galvanometer, simple DC motor
- Apply the knowledge of diodes in rectifiers, adapters IC's and various electronic circuits. Apply the concept of light amplification in designing of various LASER based instruments and optical sources.
- Explain total internal reflection and apply this concept for optical fiber and its uses in Medical field and Communication.

COURSE CONTENTS

1.   Wave motion and its applications   (8 periods)

Wave motion, transverse and longitudinal wave motion with examples. Sound and light waves and their properties. Definition of wave velocity, frequency and wave length and their relationship.

Wave equation $y = r \sin wt$, phase, phase difference, principle of superposition of waves and amplitude

Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M., Energy of a body executing S. H. M., study of vibration of cantilever and determination of its time period, concept of simple harmonic progressive wave.

Free, Damped and forced oscillations, Resonance with examples.

Echo and reverberation, Sabine formula for reverberation time(without derivation), coefficient of absorption of sound, methods to control reverberation time and their applications, Acoustics of building.

Ultrasonic – Introduction properties and applications in engineering and medical applications.

2 Electrostatics   *(8 periods)*

Concept of charge, Coulombs law, Electric field of point charges, Electric lines of force and their properties, Electric flux, Electric potential and potential difference.

Gauss law of electrostatics: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere.

Capacitor and its working principle, Types of capacitors.Capacitance and its units. Capacitance of parallel plate capacitor. Series and parallel combination of capacitors (numerical).

Dielectric and its effect on capacitance, dielectric break down.

4.   Current Electricity   *(8 periods)*

Electric Current and its unit, direct and alternating current Resistance and its units,

Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance of a wire, Colour coding of carbon Resistances, Ohm's law.

Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge)

Concept of terminal potential difference and Electromotive force (EMF).

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

5. *Electromagnetism* *(8 periods)*

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

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

Concept of electromagnetic induction, Faraday's Laws, Lorentz force (Force on moving charge in magnetic field). Force on current carrying conductor.

6. *Semiconductor physics* *(8 periods)*

Energy bands in solids (Definition only)Types of materials (insulator, semi conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction and P N junction diode and its V-I characteristics

Diode as rectifier – half wave and full wave rectifier (center taped),

Semiconductor transistor, PNP and NPN (concepts only) and some electronic application (list only)

Application of semiconductor diodes (Zener, LED).

7. *Modern Physics* *(8 Periods)*

Lasers: Energy levels, ionization and excitation potential, spontaneous and stimulated emission, population inversion, pumping methods.

Types of lasers: Ruby, He- Ne lasers, Laser characteristic, Engineering and medical applications of lasers.

Fiber optics- introduction to optical fibers, light propagation, acceptance angle and numerical aperture, fiber types, application in telecommunication, medical and sensors.

Nano Science and Nano technology: Introduction, nano particles and nano materials, properties at Nano scale, Nano technology, nano technology based devices and applications.

LIST OF PRACTICALS (To perform minimum six experiments)

1. To determine the velocity of sound with the help of resonance tube.
2. To determine the time period of a cantilever.
3. To verify the laws of reflection from a plane mirror / interface.
4. To verify the laws of refraction (Snell's law) using a glass slab.
5. To determine the focal length and magnifying power of a convex lens.
6. To verify laws of resistances in series and parallel combination.
7. To verify ohm's laws by drawing a graph between voltage and current.
8. To measure very low resistance and very high resistances using Slide Wire bridge
9. Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
10. To draw characteristics of a PN junction diode and determine knee and break down   voltages.
11. To verify the Kirchhoff's Law using electric circuit.
12. To find numerical aperture of an optical fiber.

INSTRUCTIONAL STRATEGY

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

MEANS OF ASSESSMENT

– *Assignment & Quiz*
– *Mid-Term and End-Term written test*
– *Model Making*
– *Actual Lab & Practical Work*
– *Viva-Voice*

RECOMMENDED BOOKS

1. Text Book of Physics (Part-I, Part-II); N.C.E.R.T., Delhi
2. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
4. Practical Physics, by C. L. Arora, S Chand publications
5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6. Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications.
7. Physics Volume 2, 5th edition, Haliday Resnick and Krane, Wiley publication
8. Fundamentals of Physics by Haliday, Resnick & Walker 7th edition, Wiley publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	8	15
2	8	15
3	8	15
4	8	15
5	8	15
6	8	15
7	8	10
Total	**56**	**100**

INTRODUCTION TO IT SYSTEMS

L T P

2 - 4

COURSE OBJECTIVES

Information technology has great influence on all aspects of life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools using MS Office/Open Office/Libre Office using internet etc., form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

Note:

Explanation of Introductory part should be demonstrated with practical work. Following topics may be explained in the laboratory along with the practical exercises.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

- Identify Computer Hardware Components, Network Components and Peripherals.
- Explain the role of an Operating System.
- Install System and Application Software.
- Explain the function of the system components including Processor, Motherboard and Input-output devices.
- Use Word Processing Software to prepare document.
- Use Spreadsheet Software to create workbooks and automate calculation.
- Use Presentation Software to create interactive presentation.
- Perform fundamental tasks common to most application software including print, scan, save, edit, cut, copy, paste, format, spell and grammar check.
- Find and evaluate information on the Web.
- Install Antivirus.
- Safeguard against Online Frauds, threats and crimes.
- Use online office tools (Google suits)

COURSE CONTENTS

1. Introduction to Computers and Peripherals.   **(05 Periods)**

Introduction, Computer Generations, Components of Computer, Types of Computer, CPU, RAM, ROM, Hard disk, USB, Flash drive, Keyboard, Mouse, display devices, Printer, Scanner, Modem, Sound Cards, Speakers, CMOS battery, Sharing of Printers.

1. *Operating System and Application Software*   *(06 Periods)*

System Software, Application Software, Virtualization Software, Utility Software, MS Office/Open Office/LibreOffice, Working with windows OS, Desktop components, Menu bars, creating shortcut of program. Installation of Application software's, Antivirus and Drivers.

2. *Office Tools: MS Office/Open Office/ Libre Office   *(06 Periods)*

Creation of document, spreadsheets and presentation, Google Suits (Google drive, google sheet, google doc, google presentation)

3. *Internet   *(06 Periods)*

Network topologies, Basics of Networking,– LAN,MAN, WAN, Connecting Devices(Bridge, Switch, Router, Gateway),Wi-Fi technologies, Concept of IP Address, DNS, Search Engines, e- mail, Web Browsing.

4. *Basics of Information Security   *(05 Periods)*

Introduction to security, Security threats: detection and prevention, Indian Cyber laws.

LIST OF PRACTICAL EXERCISES

1.   Identify various components, peripherals of computer and list their functions.
2.   Installation of operating system. (windows/linux/others)
3.   Installation of various application software and peripheral drivers.
4.   Creation and Management of files and folders (Rename, delete, search)
5.   Installation of Antivirus and remove virus.
6.   Scanning and printing documents.
7.   Browsing, Downloading, Information using Internet.
8.   E-Mail ID creation, composing, sending and receiving e-mail. Attaching a file with e- mail message.

9. Word Processing (MS Office/Open Office) File Management, Editing documents, Mail Merge, Security etc.
10. Spread Sheet Processing (MS Office/Open Office/Libre Office)Addition, deletion, formulation,Securityetc.
11. PowerPoint Presentation (MS Office/Open Office/Libre Office)Preparing Slides, customization, animation, Security etc.
12. Google Suite.

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connections and proficient in making use of MS Office/Open Office/Libre office/Google Suit in addition to working on internet. The student should be made capable of working on computers independently.

MEANS OF ASSESSMENT

- Class Tests/Quiz
- Software Installation and Use
- Viva-Voce
- Presentation

RECOMMENDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi
3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New Delhi.
5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi.
6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. On Your Marks - Net…Set…Go… Surviving in an e-world by AnushkaWirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

Reference websites

1. www. tutorialspoint..com
2. www.sf.net
3. Gsuite.google.com
4. Spoken-tutorial.org

5.   Swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	5	18
2	6	21
3	6	22
4	6	21
5	5	18
Total	**28**	**100**

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L T P

3 1 2

COURSE OBJECTIVES

To learn basic concepts of various active and passive electronic components, signals, measuring instruments, digital electronics, electric and magnetic circuits, ac circuits, transformer, motors and their applications. To help the students deal with the electrical and electronics engineering principles and applications in industrial processes of different fields.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

- Understand and identify key electronic components and their applications.
- Use and understand basic electrical measuring instruments.
- Grasp the fundamentals of logic gates, Boolean algebra, and digital circuits.
- Understand basic concepts of electric and magnetic circuits.
- Analyze A.C. circuits and understand phase relationships and power calculations.
- Understand the principles and applications of transformers and electrical machines.
-

COURSE CONTENTS

UNIT- I Overview of electronic components: **(12 Periods)**

Active and Passive components, Resistor, Capacitor, Inductor and their types. Introduction to semi- conductor, Intrinsic and Extrinsic semi-conductors, P-N Junction diode - forward and reverse bias, V-I characteristics, Zener diode, LED. Bipolar Junction Transistor - PNP and NPN Transistor and their characteristics. Basics of FET, MOSFET.

UNIT- II   Basic measuring instruments: *(06 Periods)*
Basic concept of Ideal and non-ideal voltage and current sources, sinusoidal and non sinusoidal waveforms, ammeter, voltmeter, wattmeter and digital multimeter, CRO (Block diagram, working and its uses).

UNIT –III Overview of Digital Electronics: (10 Periods)

Analog and digital signal, advantages of digital system. Introduction to Logic levels and Boolean Algebra, Basics of number system, Logic Gates-Truth Table and Symbol of AND, OR, NOT, NAND, NOR, ExOR, ExNOR Gates. Introduction to Latch, Flip Flops, Combinational Circuit and Sequential Circuit.

Unit -IV Electric and Magnetic Circuits: (8 Periods)

Definitions of basic terms, such as Current, Resistance, EMF, Potential Difference, Power and Energy,Ohm's Law and its limitation, Kirchhoff's laws; M.M.F, magnetic force, flux, permeability, hysteresisloop, reluctance, leakage factor and BH curve; Electromagnetic induction, Faraday's laws ofelectromagnetic induction, Lenz's law; Dynamically induced emf; Statically induced emf; Equations ofself and mutual inductance; Analogy between electric and magnetic circuits.

Unit -V A.C. Circuits: (10 Periods)

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; A.C in resistors, inductors and capacitors; A.C in R-L series, R-C series, R- L-C series circuits; Power in A. C. Circuits, power triangle; Relationship between line and phase voltage and line and phase current in Star and Delta connections.

Unit -VI Transformers and Machines: (10 Periods)

Single phase transformer: Construction, working principle, types, EMF equation, transformation ratio oftransformers. Brief idea of Auto transformer.

Machines: DC machines: Types, EMF equation of generator and motor.

Single Phase Induction Motor: Principle of operation and introduction to methods of starting.Three Phase Induction Motor: Construction and Principle of operation.

INSTRUCTIONAL STRATEGY

The instructional strategy combines lectures, demonstrations, and hands-on labs. Lectures will cover key concepts, while demonstrations will illustrate component functions and instrument operations. Hands- on labs will provide practical experience with electronic components and measuring instruments. Interactive quizzes and problem-solving sessions will reinforce and assess understanding, ensuring practical application of theoretical knowledge.

MEANS OF ASSESSMENT

–*Assignment & Quiz*
–*Lab & Practical Work*
–*Viva-Voice*

List of Practicals

1. Identify various passive and active electronic components in the given circuit.

2. Determine the value of given resistor using digital multi-meter to confirm with color code.

3. Exercise of soldering and de-soldering of components in circuits.

4. To study performance of PN-junction diodes and draw its V-I characteristics.

5. To measure frequency, time period and amplitude of a sinusoidal signal using CRO.

6. To measure voltage and current using digital multi-meter.

7. To verify the truth tables for all logic gates – NOT, OR, AND, NAND, NOR, XOR, XNOR.

8. Implement and realize Boolean Expressions with Logic Gates

9. Verify the Kirchhoff's laws.

10. Measure voltage, current and power in 1-phase circuit with resistive load.

11. Measure voltage, current and power in R-L series circuit.

12. Verify the ohms law.

13. Use of voltmeter, ammeter, and watt-meter.

14. Connect resistors in series and parallel combination on bread board and measure its value using digital multi-meter.

15. Connect capacitors in series and parallel combination on bread board and measure its value using multi-meter.

REFERENCE BOOKS –

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 Textbook 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, David, Fundamentals of Electronic Devices and Circuits, Oxford University Press, New Delhi, 2015, ISBN: 9780195425239.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	13	20
2	05	10
3	10	15
4	8	15
5	10	20
6	10	20
Total	**56**	**100**

ENGINEERING MECHANICS

L T P
3 1 2

COURSE OBJECTIVES

The course provides a foundational understanding of mechanics, covering force systems, equilibrium, and beam analysis under different loads. It explores friction and its applications, centroids and moments of inertia for various shapes, and the principles and applications of simple lifting machines.

COURSE OUTCOMES

After completing this course, student will be able to:

1. Identify the force systems for given conditions by applying the basics of mechanics.

2. Determine unknown force(s) of different engineering systems.

3. Apply the principles of friction in various conditions for useful purposes.

4. Find the centroid and centre of gravity of various components in engineering systems.

5. Select the relevant simple lifting machine(s) for given purposes.

COURSE CONTENTS

Unit – I Basics of Mechanics and Force System :   (12 Periods)

Significance and relevance of mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units.

Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification. Resolution of a force - Orthogonal components of a force, moment of a force, Varignon's Theorem. Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.

Unit– II Equilibrium :   (11 Periods)

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.

Beam- 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.

Unit– III Friction :   (11 Periods)

Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction. Equilibrium of bodies on level surface subjected to force parallel and inclined to plane. Equilibrium of bodies on inclined plane subjected to force parallel to the plane only.

Unit– IV Centroid and Moment of Inertia :   (11 Periods)

Concept, definition and determination of Centroid of plain figures (square, rectangle, triangle, circle, semi-circle, quarter circle) and Centre of gravity of symmetrical solid bodies (Cube, cuboid, cone, cylinder, sphere, hemisphere).

Concept of moment of inertia, Radius of Gyration, Theorem of perpendicular and parallel axis theorem. Concept of Second moment of area of standard areas (Rectangle, Triangle and circle) and composite area (L,T,I section).

Unit – V Simple Lifting Machine :   *(11 Periods)*
Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity ratio,efficiency of machines, law of machine. Ideal machine, friction in machine, maximum Mechanicaladvantage and efficiency, reversible and non-reversible machines, conditions for reversibility.
System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency. Working principle and application of wheel and axle, Weston's Differential Pulley Block , simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application [Simple problems on the above topics]

List of practical to be performed:
1.   To study various equipment related to Engineering Mechanics.
2.   To find the M.A.,V.R., Efficiency and law of machine for differential Axel and Wheel.
3.   To find the M.A.,V.R., Efficiency and law of machine for Simple Screw Jack.
4.   Derive Law of machine using Worm and worm wheel.
5.   Determine resultant of concurrent force system applying law of Polygon of forces using force table.
6.   Determine resultant of concurrent force system graphically.

7.   Determine resultant of parallel force system graphically.

8.   Verify Lami's theorem.

9.   Study forces in various members of Jib crane.

10.   Determine force reaction's for simply supported beam.

11.   Determine Coefficient of friction for motion on horizontal and inclined plane.

12.   Determine centroid of geometrical plane figures.

INSTRUCTIONAL STRATEGY

The instructional strategy includes lectures, visual aids, and interactive examples for key mechanics concepts and force systems, along with problem-solving sessions. Equilibrium concepts are taught with practical demonstrations and hands-on beam analysis. Friction is explored through case studies and practical demonstrations, followed by exercises. Centroid and moment of inertia are covered with visual aids and practical tasks. Simple lifting machines are introduced through lectures and demonstrations, with problem-solving on mechanical advantage and efficiency.

MEANS OF ASSESSMENT

–*Assignment & Quiz*
–*Lab & Practical Work*
–*Viva-Voice*

RECOMMENDED BOOKS :

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.
8. Bhavikatti S.S., Engineering Mechanics, New Age International Publishers

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	12	20
2	11	20
3	11	20
4	11	20
5	11	20
Total	**56**	**100**

ENVIRONMENTAL SCIENCE

L T P

3 - -

COURSE OBJECTIVES:

A diploma holder must have knowledge of different types of pollution caused due to industriesand constructional activities so that he may help in balancing the ecosystem and controlling pollution by various control measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. He should know the concept of hazards and disaster management.

COURSE OUTCOMES:

After undergoing the subject, the student will be able to:
- Comprehend the importance of ecosystem and sustainable development.
- Demonstrate interdisciplinary nature of environmental issues
- Identify different types of environmental pollution and control measures.
- Explain environmental legislation acts.
- Demonstrate positive attitude towards judicious use of energy and environmental protection
- Practice energy efficient techniques in day-to-day life and industrial processes.
- Analyze the impact of human activities on the environment
- Understand the basic concept of disaster and hazards.
- Analyze the impact of disaster on various social components.

COURSE CONTENT

1.   Introduction   (06 Periods)

Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non- renewable. Global Warming, Climate change and its impact ,Green House Effect, Acid Rain, Conceptof Green Building, Ground water management.

2.   *Air Pollution and Noise pollution*   *(08 Periods)*

Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air Pollution Control Methods. Introduction to Air Pollution and its Prevention and Control Act 1981 & Environmental Protection Act 1986 and Function of State pollution control board and National GreenTribunal (NGT).
Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.

3.   *Water Pollution and Soil Pollution*   *(11 Periods)*

Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollutionon human health, Turbidity, pH, total suspended solids, total dissolved solids, Concept of dissolved O_2, BOD, COD. Prevention of water pollution. Introduction to Water (Prevention and Control of Pollution) Act 1974.Concept of rain water harvesting system.
Sources of soil pollution, Types of Solid waste- House hold, Hospital, From Agriculture,

Biomedical, Animal waste and human waste, sediments and E-waste, Plastic Waste .Effect of Solid waste, Disposal of Solid Waste- Solid Waste Management.

4.   *Disaster Causes and Hazards*   *(6 Periods)*

Introduction
Classification of Natural Disasters
Classification of Natural Disasters in India

- Earthquake
- Tsunami
- Flood
- Drought
- Land Slide
- Thunderstorm and Lightening

5   *Disaster Management*   *(11 Periods)*

Framework
- Yokohama Strategy for a Safer World (1999)
- The Hyogo Framework for Action (HFA) (2005-2015)
- Sendai Framework for Action (SDGS) (2015-2030)

Disaster Management, Preparedness and Response in India

- National Disaster Management Authority (NDMA) Guidelines
- National Policy on Disaster Management (2009)
- National Disaster Management Act (2005)
- NDRF (National Disaster Response Force), SDRF (State Disaster Response Force), DDRF (District Disaster Response Force), and Aapda Mitra.
- Case studies of disaster management efforts: COVID-19 Pandemic, Earthquakes, Firefighting, Thunder Storm, and Lightning.

INSTRUCTIONAL STRATEGY

In addition to theoretical instructions, different activities pertaining to Environmental Studies like expert lectures, seminars, visits to green house, effluent treatment plant of any industry, rain water harvesting plant etc. may also be organized.

MEANS OF ASSESSMENT
– Assignments and quiz/class tests,
– Mid-term and end-term written tests

RECOMMENDED BOOKS –

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.

2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and DeepPublications, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
4. Environmental Science by Deswal and Deswal; DhanpatRai and Co. (P) Ltd. Delhi.
5. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Environmental Studies by ErachBharucha; University Press (India) Private Ltd., Hyderabad.
7. Environmental Engineering and Management by Suresh K Dhamija; S K Katariaand Sons,New Delhi.
8. E-books/e-tools/relevant software to be used as recommended by AICTE/BTE/NITTTR,Chandigarh.
9. Disaster Management Second Edition AICTE Recommended by S C Sharma, Khanna Publishers
10. Bharat Bhautik Paryavaran Class 11, By NCERT.
11. S.C. Sharma & M.P. Poonia, Environmental Studies, Khanna publishing House, New Delhi

Websites for Reference:
- http://swayam.gov.in
- https://www.amazon.in/Prabhandhan
- https://ncert.nic.in/textbook.php?khgy1=0-6
- https://rb.gy/yergl

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	6	15
2	8	20
3	11	25
4	6	15
5	11	25
Total	**42**	**100**

Program Outcome (POs) – Diploma

1. **PO 1: Engineering knowledge:** An ability to apply knowledge of mathematics, science, and engineering practices.

2. **PO 2: Problem analysis**: An ability to identify and solves engineering problems.

3. **PO 3: Design/development of solutions:** An ability to design a component, or process to meet desired needs within realistic constraints.

4. **PO 4: Conduct investigations of complex problems:** An ability to use the skills, and modern engineering tools necessary for solving engineering problems.

5. **PO 5: Modern tool usage:** The broad education and understanding of new engineering techniques necessary to solve engineering problems.

6. **PO 6: The engineer and society:** Achieve professional success with an understanding and appreciation of ethical behavior, social responsibility, and diversity, both as individuals and in team environments.

7. **PO 7: Environment and sustainability:** Articulate a comprehensive world view that integrates diverse approaches to sustainability.

8. **PO 8: Ethics:** Identify and demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work

9. **PO 9: Individual and team work:** An ability to analyses the local and global impact of computing on individuals, organizations, and society.

10. **PO 10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **PO 11: Project management and finance:** Implement project management knowledge, processes, lifecycle and the embodied concepts, tools and techniques in order to achieve project success.

12. **PO 12: Life-long learning:** A recognition of the need for, and an ability to engage in life-long learning.

HYDRAULICS AND HYDRAULIC MACHINES

L T P

3 2 2

COURSE OBJECTIVES

Subject of Fluid Mechanics is a basic engineering subject and helps in solving fluid flow problems in the field of Civil Engineering. The subject deals with basic concepts and principles in hydrostatics, hydro kinematics and hydrodynamics and their application in solving fluid -mechanics problems.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Interpret the different terms related to fluids.
- Calculate the pressure exerted by fluids on the walls of containers.
- Calculate discharge through pipes, irrigation channels, and water supply pipe lines.
- use different flow measurement devices like venturimeter, mouthpiece, notches, weir, orifice meter

UNIT-1, Introduction	PERIODS
Fluids: Real and ideal fluids ,Fluid Mechanics, Hydrostatics, Hydrodynamics, Hydraulics, Properties of Fluids (definition only Mass density, specific weight, specific gravity, viscosity, surface tension - cohesion, adhesion and, capillarity, vapour pressure and compressibility. Newton's Law of viscosity, Newtonian and Non-Newtonian fluids, simple numerical problems.	**08**
UNIT-2, Hydrostatic Pressure	**PERIODS**
Pressure, intensity of pressure, pressure head, Pascal's law and its applications .Total pressure, resultant pressure, and centre of pressure. Total pressure and centre of pressure on horizontal, vertical and inclined plane surfaces of rectangular, triangular, trapezoidal shapes and circular. (No derivation - Simple Numerical Problems) Pressure on curved surfaces (concept only)	**08**
UNIT-3 Measurement of Pressure	**PERIOD**
Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure. Piezometer, simple manometer and differential manometer, micro manometers, Bourden gauge and dead weight pressure gauge, numerical problems related to manometers.	**06**
UNIT-4, Fundamentals of Fluid Flow	**PERIODS**
Types of Flow: Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow, stream line, stream tubes, streak line and path line. Discharge and continuity equation (flow equation) {No derivation}, Simple numerical problems. Types of hydraulic energy: Potential energy, kinetic energy, pressure energy , Bernoulli's theorem; statement and description (without proof of theorem), Simple numerical problems.	**08**
UNIT-5, Flow Measurements, , Flow through Pipes, Flow through open channels	**PERIOD**

DIPLOMA IN ENGINEERING

Brief description with simple numerical problems of : Venturimeter and orificemeter , Pitot tube , Orifices and mouthpieces ,Current meters , Notches and weirs, Definition of pipe flow; Reynolds number, laminar and turbulent flow - explained through Reynold's experiment , Critical velocity and velocity distributions in a pipe for laminar flow, Head loss in pipe lines due to friction, sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction (No derivation of formula), Simple numerical problems related to flow through pipes and siphons. Hydraulic gradient line and total energy line. Simple numerical problems. Pipes in series and parallel, Water hammer phenomenon and its effects (only definition and description), Definition of an open channel, uniform flow and non-uniform flow , Discharge through channels using i) Chezy's formula (no derivation) ii) Manning's formula (no derivation) , Most economical channel sections (no derivation, only simple numerical problems) i) Rectangular ii) Trapezoidal , Head loss in open channel due to friction , Concept of specific energy and specific force- hydraulic jump.	**10**

DETAILED CONTENTS

LIST OF PRACTICALS

1. 1.To verify Bernoulli's Theorem
2. To find out Venturimeter coefficient
3. To determine coefficient of velocity (Cv), Coefficient of discharge (Cd) Coefficient of contraction (Cc) of an orifice and verify the relation between them
4. To perform Reynold's experiment
5. 5. To verify loss of head in pipe flow due to a. Sudden enlargement b. Sudden contraction   c. Sudden bend

1.

RECOMMENDED BOOKS

1. Fluid Mechanics and Hyraulics by Jagdish Lal; Delhi Metropolitan Book Co. Pvt Ltd.
2. Hydraulics and Fluid Mechanics by Modi, PN, and Seth, SM; Delhi Standard Publishers Distributors.
3. Hydraulics and Hydraulics Machines by Khurmi RS ; S Chand and Co., Delhi
4. Laboratory Manual for Fluid Mechanics by Poonia MP and Jakhar OP; Standard Publishers Distributors, Delhi
5. Fluid Mechanics by Birinder Singh; Kaption Publishing, New Delhi.
6. Fluid Mechanics by Sarao A.S; Tech.

DIPLOMA IN ENGINEERING

COMMUNICATION SKILLS – II

L T P

3 0 0

COURSE OBJECTIVES

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

COURSE OUTCOMES

After undergoing the subject, the students will be able to:

• Frame correct sentences with illustrations
• Comprehend the language correctly
• Interpret the language correctly
• Use given material in new situations.
• Correspond effectively using various types of writings like letters, memos etc.
• Communicate effectively in English with appropriate body language making use of correct and appropriate vocabulary and grammar in an organized set up and social context.

DETAILED CONTENTS

UNIT-1, Functional Grammar	PERIODS
1.1 Prepositions 1.2 Framing Questions 1.3 Conjunctions 1.4 Tenses	**8**
UNIT-2, Reading	**PERIODS**
2.1 Unseen Passage for Comprehension (Vocabulary enhancement - Prefixes, Suffixes, one word substitution, Synonym and Antonym) based upon the Passage should be covered under this topic.	**8**
UNIT-3, Writing Skill	**PERIODS**
3.1 Correspondence Business Letters- Floating Quotations, Placing Orders, Complaint Letters.	**8**
UNIT-4, Official Letters Writing Skill	**PERIODS**
4.1 Official Letters Letters to Government and other Offices Memos, Circular, Office Orders	**8**
UNIT-5, Report Writing	**PERIODS**
5.1 Agenda & Minutes of Meeting Report Writing	**8**

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LIST OF PRACTICALS
Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations.
Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project-oriented manner were the learning happens as a byproduct.

RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2 Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.
3 High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

FSEC301	AI FOR EVERYONE	L T P 2 0 0	2 credits

Course Objectives:

CO1	**Introduce** fundamental concepts of Artificial Intelligence (AI) and its real-world applications.
CO2	**Familiarize** students with basic AI techniques such as machine learning, natural language processing, and computer vision.
CO3	**Enhance** understanding of ethical considerations and societal impacts of AI.
CO4	**Develop** problem-solving skills using AI tools and frameworks.
CO5	**Encourage** critical thinking about the future of AI in various domains such as healthcare, education, business, and security.

Unit-I

Introduction to AI (Concept + Hands-on): What is AI? Understanding AI vs. Machine Learning vs. Deep Learning, AI in daily life: Smart assistants, AI in social media, AI in e-commerce, Prompt Engineering, Real Life Applications of AI. Tools: Explore AI-based tools (Google AI, ChatGPT , MetaAI,Gemini).

Unit-II

Introduction to Machine Learning and Deep Learning: Introduction to learning theory, Methods and Models.Supervised vs. Unsupervised Learning (Examples from real life), Reinforcement Learning, Introduction to ANN and Deep Learning.
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Unit-III

Computer Vision & Image Processing: Introduction to Image processing and Computer Vision ?, Hardware used, Face Recognition, Object Detection, and AI-powered Cameras, How AI understands text & speech, AI in Chatbots, Sentiment Analysis, and AI-based Translation Practical

Unit-IV

AI in Automation & Robotics: AI-powered automation in businesses, How AI is used in robotics and smart homes, Ethical AI & Responsible AI, Bias in AI and fairness in decision-making, How to use AI responsibly.

Unit-V
Mini AI Projects (Without Coding): Hands-on Project Options: AI for Image Classification: Train an AI model to recognize objects Create an AI Chatbot: Use Dialog flow or Chatbot.com AI in Business: Automate tasks using AI-based productivity tools.
* **Students will present their AI Project (Simple AI-based tool using existing platforms) Complete an AI-based quiz & get a certification.**

Text books and References:
1. **Stuart Russell & Peter Norvig** – *Artificial Intelligence: A Modern Approach* (Pearson, 4th Edition)
2. **John Paul Mueller & Luca Massaron** – *Artificial Intelligence For Dummies* (Wiley)"A beginner-friendly guide to AI concepts, applications, and future trends."
3. **Thomas H. Davenport & Nitin Mittal** – *All in on AI: How Smart Companies Win Big with Artificial Intelligence* (Harvard Business Review Press), Explains AI strategies in business and industry.

COURSE OUTCOMES:

CO1	**Understand** the fundamental principles and applications of AI in different industries.
CO2	**Explain** key AI techniques, including supervised and unsupervised learning, deep learning, and neural networks.
CO3	**Analyze** ethical challenges and biases in AI systems and their impact on society.
CO4	**Apply** AI-driven solutions in fields like healthcare, finance, and automation.
CO5	**Critically evaluate** the benefits and risks associated with AI technologies.

CONCRETE TECHNOLOGY

L T P

2 1 1

COURSE OBJECTIVES

Diploma holders in Civil Engineering are supposed to supervise concreting operations involving proportioning, mixing, transporting, placing, compacting, finishing and curing of concrete. To perform above functions, it is essential to impart knowledge and skills regarding ingredients of concrete and their properties; properties of concrete in plastic and hardened stage, water cement ratio and workability; proportioning for ordinary concrete; concreting operations and joints in concrete.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- evaluate physical properties of cement concrete as per IS codes
- conduct various tests on aggregate in laboratory to evaluate their characteristics
- interpret the grading charts of different aggregates and evaluate fineness modulus of aggregates
- evaluate workability and strength of concrete
- recognize bleeding, segregation, harshness defects in fresh concrete

DETAILED CONTENTS

UNIT-1, Introduction	PERIODS
Definition of concrete, properties of concrete, uses of concrete in comparison to other building materials. Advantages and disadvantages of concrete. **Ingredients of Concrete** Cement: physical properties of cement; different types of cement as per IS Codes , Aggregates: Classification of aggregates according to size and shape , Characteristics of aggregates: Particle size and shape, surface texture, specific gravity of aggregate; bulk density, water absorption, surface moisture, bulking of sand, deleterious materials soundness , Grading of aggregates: coarse aggregate, fine aggregate and All-in- - one aggregate; fineness modulus; interpretation of grading Water: Water Quality requirements as per IS:456-2000	**08**
UNIT-2,Water Cement Ratio	**PERIODS**
Hydration of cement principle of water-cement ratio, Duff Abram's Water cement ratio law: Limitations of water-cement ratio law and its effects on strength of concert. **Properties of Concrete** Properties in plastic state: Workability, Segregation, Bleeding and Harshness , Factors affecting workability, Measurement of workability: slump test, compacting factor and Vee Bee consist meter; Recommended slumps for placement in various conditions as per IS:456-2000/SP-, Properties in hardened state: Strength, Durability, Impermeability, Dimensional changes;	**08**
UNIT-3, Concrete Mix Design	**PERIODS**
Objectives and parameters of mix design, introduction to various grades as per IS:456-2000; proportioning for nominal mix design as prescribed by IS 456- 2000 , Adjustment on site for: Bulking of fine aggregate, water absorption of aggregate, workability , Difference between nominal and controlled concrete , Introduction to IS-10262-2009-Code for controlled mix design. , Mix design problems of concrete for desired mix strength or grade	**08**
Concreting under special conditions, difficulties and precautions before, during and after concreting , Cold weather concreting, Under water concreting , Hot weather concreting , Ready mix concrete ,	**PERIODS**

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Fibre reinforced concrete , Polymer Concrete , Fly ash concrete ,Silica fume concrete , Self compacting concrete	
UNIT4, Concreting Operations	**PERIODS**
Storing of Cement , Storing of cement in a warehouse , Storing of cement at site , Effect of storage on strength of cement , Determination of warehouse capacity for storage of Cement , Storing of Aggregate: Storing of aggregate at site , Batching (to be shown during site visit) , Batching of Cement ,Batching of aggregate by: , Volume, using gauge box (farma) selection of proper gauge box , Weight spring balances and batching machines ,Measurement of water Mixing ,Hand mixing , Machine mixing - types of mixers, capacities of mixers, choosing appropriate size of mixers, operation of mixers , Maintenance and care of mixers , Batching and mixing plants , Transportation of concrete: Transportation of concrete using: wheel barrows, transit mixers, chutes, belt conveyors, Dumpers and trucks, tremie, mono rail system, pumps, tower crane and hoists. Type of form works and scaffoldings, Checking of form work, shuttering and precautions to be taken during placement ,Compaction , Hand compaction , Machine compaction - types of vibrators, internal screed vibrators and form vibrators , Selection of suitable vibrators for different situations 8.8 Finishing concrete slabs - screeding, floating and trowelling , Curing , Objective of curing, methods of curing like ponding, membrane curing, steam curing, chemical curing , Duration for curing and removal of form work , Jointing: Location of construction joints, treatment of construction joints, expansion joints in buildings - their importance and location , Defects in concrete: Identification of defects,	**08**
Importance and methods of non-destructive tests (introduction only)	

LIST OF PRACTICALS

1. To determine the physical properties of cement such as fineness, consistency, setting time, soundness and compressive strength of cement as per IS Codes
2. To determine flakiness and elongation index of coarse aggregate
3. To determine silt content in fine aggregate
4. Determination of specific gravity and water absorption of aggregates
5. Determination of bulk density and voids of aggregates
6. Determination of particle size distribution of fine, coarse and all-in-one aggregate by sieve analysis (grading of aggregate)
7. To determine bulking of fine aggregates

RECOMMENDED BOOKS

1.Concrete Technology by Krishnamurthy, KT Rao, A Kasundra and Khandekar, AA; Dhanpat Rai and Sons, Delhi
2. Text Book of Concrete Technology by Gupta BL and Gupta Amit; Standard Publishers Distributors, Delhi.
3. Concrete Tecnology by Handoo, BL, Puri, LD and Mahajan Sanjay; Satya Prakashan, New Delhi
4. Laboratory Manual on Concrete Technology by Sood, Hemant, Mittal LN and Kulkarni PD; CBS Publishers, New Delhi
5. Concrete Technology by Birinder Singh; Kaption Publications, Ludhiana,
6. Module on Special Concretes by Dr. Hemant Sood; NITTTR Chandigarh
7. Video programme on different experiments in 'Concrete Technology' developed by NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

ENVIRONMENTAL STUDIES

L T P

2 0 0

COURSE OBJECTIVE

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the ecosystem and controlling pollution by various control measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. Energy conservation is the need of hour. He should know the concept of energy management and its conservation.

LEARNING OUTCOMES

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

- *Comprehend the importance of ecosystem and sustainable.*
- *Demonstrate interdisciplinary nature of environmental issues*
- *Identify different types of environmental pollution and control measures.*
- *Take corrective measures for the abatement of pollution.*
- *Explain environmental legislation acts.*
- *Define energy management, energy conservation and energy efficiency*
- *Demonstrate positive attitude towards judicious use of energy and environmental protection*
- *Practice energy efficient techniques in day-to-day life and industrial processes.*
- *Adopt cleaner productive technologies*
- *Identify the role of non-conventional energy resources in environmental protection.*
- *Analyze the impact of human activities on the environment.*

DETAILED CONTENTS

UNIT-1, Introduction	PERIODS
Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non renewable.	05
UNIT-2, Air Pollution	**PERIODS**
Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.	05
UNIT-3, Water Pollution	**PERIODS**
Impurities in water Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of dissolved O2, BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.	10
UNIT-4, Soil & Noise Pollution	**PERIODS**
Sources of soil pollution, Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste, Effect of Solid waste, Disposal of Solid Waste- Solid Waste Management. Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.	10
UNIT-5, Environmental Legislation	**PERIODS**
Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air	10

DIPLOMA IN ENGINEERING

(Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board and National Green Tribunal (NGT), Environmental Impact Assessment (EIA).

LIST OF PRACTICALS

1. Determination of pH of drinking water
2. Determination of TDS in drinking water
3. Determination of TSS in drinking water
4. Determination of hardness in drinking water
5. Determination of oil & grease in drinking water
6. Determination of pH of soil
7. To measure the noise level in classroom and industry.
8. To segregate the various types of solid waste in a locality.
9. To study the waste management plan of different solid waste
10. To study the effect of melting of floating ice in water due to global warming

RECOMMENDED BOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications , New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
5. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Environmental Studies by ErachBharucha; University Press (India) Private Ltd., Hyderabad.
7. 7. Environmental Engineering and Management by Suresh K Dhamija; S K Katariaand Sons,
8. New Delhi.
9. E-books/e-tools/relevantsoftware to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

BUILDING CONSTRUCTION

L T P

3 1 1

COURSE OBJECTIVES

Diploma holders in Civil Engineering are supposed to effectively supervise construction of buildings. Effective supervision is essential to obtain/provide a fault free service from contractors to users. To perform above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, staircases, floors etc., and their constructional details as well as preventive, remedial and corrective methods of common construction faults. Therefore, the subject of Building Construction is very important for Civil Engineering diploma holders.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- *define the different components and classification of building*
- *select a foundation for particular type of building*
- *explain different types of walls, scaffolding, shoring, underpinning and their constructional methodology*
- *carry out the construction of brick wall.*
- *supervise rubble and ashlar types of stone masonry construction*
- *demonstrate the construction details of lintels and arches at appropriate level in building • select different types of doors, windows, floors and stairs cases in building*
- *recognize different parts of roof trusses and drainage system of roofs*
- *identify and select application procedure for different types of surfaces finishes in building i.e. plastering, pointing, painting, white washing and distempering*
- *evaluate the possible reason of dampness at various level in building and remedial means*

DETAILED CONTENTS

UNIT-1, Introduction, Foundations	PERIODS
Concept of foundation and its purpose 2.2 Types of foundation-shallow and deep , Shallow foundation - constructional details of: Spread foundations for walls, min. depth criteria, thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation for masonry pillars and concrete columns, Raft foundation, combined footing grillage foundation.,, Introduction to deep foundation and their types , Earthwork , Layout/setting out for surface excavation, cutting and filling , Excavation of foundation, trenches, shoring, timbering .	**08**
UNIT-2, Walls	**PERIODS**
Purpose of walls , Classification of walls - load bearing, non-load bearing, dwarf wall, retaining, breast walls and partition walls , Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls , Partition walls: Constructional details, suitability and uses of brick and wooden partition walls ,Scaffolding, construction details and suitability of mason's brick layers and tubular scaffolding, shoring, underpinning	**08**
UNIT-3, Masonry	**PERIODS**
Brick Masonry: Definition of terms like header, stretcher, queen closer, king closer, frog and quoin, course, bond, facing, backing, hearting, jambs, reveals, soffit, plinth, pillars and pilasters, Bond – meaning and necessity; English, flemish bond and other types of bonds , Construction of	**08**

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brick walls –methods of laying bricks in walls, precautions observed in the construction of walls, methods of bonding new brick work with old (toothing, raking, back and block bonding), Expansion and contraction joints ,Mortars: types, selection of mortar and its preparation, Glossary of terms – natural bed, bedding planes, string course, corbel, cornice, block in course grouting, moulding, templates, corner stone, bond stone, throating, through stone, parapet, coping, pilasters and buttres,Types of stone masonry: rubble masonry - random and coursed; Ashlar masonry, principles to be observed in construction of stone masonry walls	
UNIT-4 Arches and Lintels	**PERIODS**
Meaning and use of arches and lintels: , Glossary of terms used in arches and lintels - abutment, pier, arch ring, intrados, soffit, extrados, voussoirs, springer, springing line, crown, key stone, skew back, span, rise, depth of an arch, haunch, spandril, jambs, bearing, thickness of lintel, effective span , Arches: ,Types of Arches - Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving , Stone arches and their construction , Brick arches and their construction , Lintels ,Purpose of lintel , Materials used for lintels , Cast-in-situ and pre-cast lintels , Lintel along with sun-shade or chhajja	**08**
UNIT-5 , Doors, Windows and Ventilators	**PERIODS**
Glossary of terms with neat sketches , Classification based on materials i.e. wood, metal and plastic and their suitability for different situations. Different type of doors- panel door, flush door, glazed door, rolling shutter, steel door, sliding door, plastic and aluminium doors, Window – Panel window, glazed windows (fixed and openable) ventilators, sky light window, Louveres shutters, plastic and aluminium windows. , Door and window frames – materials and sections, fixtures and fasteners, hold fasts	**08**

PRACTICAL EXERCISES

1. Demonstration of tools and plants used in building construction

2. To prepare Layout of a building: two rooms building with front verandah

3. To construct brick bonds (English bond only) in one, one and half and two brick thick:

(a) Walls for L, T and cross junction

(b) Columns

4. Demonstration of following items of work at construction site by:

a) Timbering of excavated trenching

b) Laying damp proof courses

c) Construction of masonry walls

d) Laying of tile flooring on an already prepared lime concrete base

e) Plastering and pointing exercise

f) Constructing RCC work

g) Pre-construction and post construction termite treatment of building and woodwork

h) Interlocking tiles

RECOMMENDED BOOKS DED BOOKS
1. Building Construction by Rangwala, SC; Charotar Book Stall, Anand

DIPLOMA IN ENGINEERING

2. A Text Book of Building Construction by Kulkarni, GJ; Ahmedabad Book Depot
3. A Text Book of Building Construction by Arora, SP and Bindra, SP; Dhanpat Rai and Sons, New Delhi
1. . 4. Building Construction by Sushil Kumar; Standard Publishers Distributors, Delhi
2. 5 SP – 62 Hand Book of BIS
3. 6 B.I.S. – 6313 Part 1, 2, 3 7 National Building Code
4. 8. Handbook of Civil Engineering by PN Khanna
5. 9. Video films on Damp proofing, water proofing, surface finishes
6. 10. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

INDUSTRIAL TRAINING

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It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of 4 weeks duration to be organised during the semester break starting after second year i.e. after 4th semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An external assessment of 50 marks has been provided in the study and evaluation scheme of 5th Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

Teachers and students are requested to see the footnote below the study and evaluation scheme of 4th semester for further details.

The teacher along with field supervisors will conduct performance assessment of students. The components of evaluation will include the following:

a) Punctuality and regularity 15%
b) Initiative in learning new things 15%
c) Presentation and VIVA 15%.
d) Industrial training report 55%

DIPLOMA IN ENGINEERING

HIGHWAY ENGINEERING

L T P

2 1 1

COURSE OBJECTIVES

Construction of roads is one of the major areas in which diploma holders in Civil Engineering may get very good opportunities for employment. The diploma holders are responsible for construction and maintenance of highways and airports. Basic concepts of road geo-metrics, surveys and plans, elements of traffic engineering, road materials, construction of rigid and flexible pavements, special features of hill roads, road drainage system and various aspects of maintenance find place in above course

LEARNING OUTCOMESA

After undergoing the subject, students will be able to:

- classify the roads as per IRC types and geometrics
- explain various components of a flexible/rigid pavement
- select various highway materials and test them for different quality parameters
- supervise construction of a highway in plain areas and hilly areas
- supervise repair and maintenance of roads
- supervise preparation of bituminous mix in the hot mix plants

DETAILED CONTENTS

UNIT-1, Introduction	**PERIODS**
1.1 Importance of Highway engineering 1.2 Functions of IRC, CRRI, MoRT & H, NHAI 1.3 Classification of roads 1.4 Mass Transportation system 1.5 Concept of Smart highway **.** **Road Geometrics** Glossary of terms used in road geo-metrics and their importance: Right- ofway, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation levels, camber and gradient ,Average running speed, stopping and overtaking sight distance, Necessity of curves, horizontal and vertical curves including transition curves. Super elevation and methods of providing super elevation, Sketch of typical L-section and X-section in cutting and filling on straight alignment and at a curve **(Note: No design/numerical problem to be taken)**	**08**
UNIT-2, Highway Alignment	**PERIODS**
Basic considerations governing alignment for a road in plain and hilly area, Highway location, marking of alignment on ground, setting out alignment of road, setting out bench marks, control pegs for embankment and cutting,	**08**
UNIT-3, Road Materials	**PERIODS**
Different types of road materials in use; soil, aggregate and binders , Introduction to California Bearing Ratio, method of finding CBR value and its significance. Aggregate : Source and types, important properties, strength, durability , Binders: Common binders; bitumen, properties as per BIS	**08**

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specifications, penetration, softening point, ductility and viscosity test of bitumen, procedures and significance, cut back and emulsion and their uses, Bitumen modifiers (CRMB, PMB) , Use of recycled materials in pavements.

UNIT-4, Road Pavements	PERIODS
Road pavement: Flexible and rigid pavement, their merits and demerits, typical cross-sections, functions of various components, Sub-grade preparation Borrow pits, making profiles of embankment, construction of embankment, compaction, preparation of subgrade, methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for subgrade preparation., Stabilization of subgrade. Types of stabilization mechanical stabilization, lime stabilization, cement stabilization, fly ash stabilization etc.(introduction only) . Base Course Granular base course: (a) Water Bound Macadam (WBM) (b) Wet Mix Macadam (WMM) Bitumen Courses: (a) Bituminous Macadam (b) Dense Bituminous Macadam (DBM)	08
UNIT-5, Road Drainage, , Road Maintenance	PERIODS
Necessity of road drainage work, cross drainage, Surface and subsurface drains and storm water drains. Location, spacing and typical details of side drains, side ditches for surface drainage. Intercepting drains, pipe drains in hill roads, details of drains in cutting embankment, typical cross sections, Common types of road failures of flexible pavements: Pot hole, cracks, rutting, alligator, cracking, upheaval - their causes and remedies (brief description), Maintenance of bituminous road such as crack sealing, patch-work and resurfacing. Maintenance of concrete roads-filling cracks, repairing joints, maintenance of shoulders beam.	08

LIST OF PRACTICALS

1. *Visit to highway construction site for demonstration of operation of: Tipper, tractors (wheel and crawler), scraper, bulldozer, dumpers Determination of penetration value of bitumen*
2. *Determination of softening point of bitumen*
3. *Determination of ductility of bitumen*
4. *Determination of impact value of the road aggregate*
5. *Determination of abrasion value (Los Angeles') of road aggregate*
6. *Determination of crushing strength of aggregate*
7. *Determination of the California bearing ratio (CBR) for the sub-grade soil*
8. *Demonstration of working of hot mix plant through a field visit.*

RECOMMENDED BOOKS
1. Highway Engineering by Khanna, SK and Justo, CEG; Nem Chand and Bros., Roorkee
2. A Text Book on Highway Engineering and Airport by Sehgal, SB; and Bhanot, KL; S Chand and Co, Delhi
3. A Course on Highway Engineering by Bindra, SP; Dhanpat Rai and Sons, New Delhi
4. Laboratory Manual in Highway Engineering by Duggal AK, Puri VP; New Age Publishers (P) Ltd, Delhi
5. Laboratory Manual in Highway Engineering, by NITTTR, Chandigarh
6. Maintenance of Highway – a Reader by Duggal AK; NITTTR, Chandigarh
7. Types of Highway Construction by Duggal AK; NITTTR Chandigarh
8. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

FCS406	**AI for Engineering**	**L T P** **3 0 0**	**3 credits**

CourseObjectives:

CO1	To understand the concepts of Artificial Intelligence (AI).
CO2	To understand strength of and weakness of searching algorithms.
CO3	To learn and compare the searching techniques for AI applications.
CO4	To acquaint with the various knowledge representation & experts' systems.
CO5	To understand basic probability notations in artificial Intelligence/ Game theory.

Unit-I

Introduction: History & overview of Artificial Intelligence, Different Definitions, Problem Solving Strategies,Applications, Physical Symbol System Hypothesis, production systems, Characteristics of production, Agentsand Environments,Concept of rationality,Nature of environments,Structure of agents.

Unit-II

Searching Techniques: Search Strategies-Informed-Uninformed Search, depth first search, breadth firstsearch,Heuristic Search Strategies, Evolutionary algorithms Local Search Algorithms, Backtracking Search – Game Playing – OptimalDecisions in Games – Alpha – Beta Pruning.

Unit-III

KNOWLEDGE REPRESENTATION: Syntax and semanticsof First Order Logic,Prolog Programming,Forward ChainingBackwardChaining Resolution,KnowledgeBased Agents, Example, Propositional Logic,Reasoning Patterns in Propositional Logic, Inference in First Order Logic Knowledge Base Reasoning Systems for Categories.

Unit-IV

Game Playing: Constraint Satisfaction Problems(CSP), constraint propagation, backtracking search for CSP, local search forCSP, structure of CSP , Minimax& Alpha-Beta Pruning Algorithm, Imperfect Real-time decisions.

Unit-V

APPLICATIONS: AI applications, Language Models, Information Retrieval, Information Extraction, Natural Language Processing, Machine Translation, Speech Recognition, Robot, Hardware, Perception, Planning & Moving.

Fuzzy logic,Probabilistic Reasoning Structured knowledge, graphs, frames and related structures.

TextbooksandReferences:

1. Artificial Intelligence by Luger (Pearson Education).

2. Artificial Intelligence, A Modern Approach. Stuart Russell and Peter Norvig.
3. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-GrawHill.
4. Introduction to AI & Expert System: Dan W.Patterson, PHI.

COURSEOUTCOMES:

CO1	To understand the fundamentals of Artificial Intelligence.
CO2	To design smart system using different search strategies of Artificial Intelligence.
CO3	To analyze various basic probability notations, game theory.
CO4	Implement Artificial Intelligence solutions using logical reasoning.
CO5	To apply various algorithms for Artificial Intelligence application development.

SURVEYING – I

L T P

2 1 1

COURSE OBJECTIVES

The important functions of a diploma civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works While framing the curriculum for the subject of surveying, stress has been given to the development of the skill in each type of survey like chain surveying, compass surveying leveling, that the Civil Engineering diploma holder will normally be called upon to perform and plane table surveying, Field work should be a selected one so that student can check his work and have an idea of the results the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

• Measure a long line with chain or tape

• Prepare maps for closed traverse and open traverse with survey instruments

• Measure bearing of line

• Perform leveling with digital level

• Find difference of level between two points with dumpy level, auto level and digital level

• Perform temporary adjustments of leveling instruments

DETAILED CONTENTS

UNIT-1, Introduction	**PERIODS**
Basic principles of surveying , Concept and purpose of surveying, measurements-linear and angular, units of measurements , Instruments used for taking these measurements, classification based on surveying instruments.	**08**
UNIT-2, Chain surveying	**PERIODS**
Purpose and principles of Chain Surveying , Introduction, advantages and disadvantages, Direct and indirect ranging, offsets and recording of field notes, Obstacles in Chain Surveying , Errors in Chain Surveying and their correction.	**08**
UNIT-3, Compass surveying	**PERIODS**
Purpose of compass surveying. Use of prismatic compass: Setting and taking observations , Concept of following with simple numerical problems: a) Meridian - Magnetic and true, Arbitrary b) Bearing - Magnetic, True and Arbitrary	**08**

DIPLOMA IN ENGINEERING

c) Whole circle bearing and reduced bearing d) Fore and back bearing e) Magnetic dip and declination Local attraction - causes, detection, errors and corrections, problems on local attraction, magnetic declination and calculation of included angles in a compass traverse (Simple Numerical Problems).	
UNIT-4, Levelling	**PERIODS**
Purpose of levelling, concept of a level surface, horizontal surface, vertical surface, datum, reduced level and bench marks , Identification of various parts of Dumpy level and use of Dumpy level, Engineer' level, Auto level: advantages and disadvantages, use of auto level. Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis , Levelling staff: single piece, folding, invar precision staff, telescopic ,Temporary adjustment and permanent adjustment of dumpy level by two peg method. Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels , Level book and reduction of levels by Height of collimation method and , Rise and fall method , Arithmetic checks, problem on reduction of levels, fly levelling, check leveling and profile levelling (L-section and X-section), errors in levelling, permissible limits, reciprocal leveling. Numerical problems.	**08**
UNIT-5, Plane Table Surveying, Methods of plane table surveying	**PERIODS**
Purpose of plane table surveying, equipment used in plane table survey: Setting of a plane table: (a) Centering (b) Levelling (c) Orientation a) Radiation, (b) Intersection (c) Traversing (d) Resection Concept of Two point and Three point problems (Concept only) Errors in plane table survey and precautions to control them. Testing and adjustment of plane table and alidade,	**08**

PRACTICAL EXERCISES

I. Chain surveying

i) a) Ranging a line

b) Chaining a line and recording in the field book

c) Taking offsets - perpendicular and oblique (with a tape only)

d) Setting out right angle with a tape

ii) Chaining of a line involving reciprocal ranging

iii) Chaining a line involving obstacles to ranging

iv) Chain Survey of a small area.

III. Compass Surveying

i) a) Study of prismatic compass

b) Setting the compass and taking observations

DIPLOMA IN ENGINEERING

c) Measuring angles between the lines meeting at a point

III. Levelling

i) a) Study of dumpy level and levelling staff

b) Temporary adjustments of various levels

c) Taking staff readings on different stations from the single setting and finding differences of level between them

ii) a) To find out difference of level between two distant points by shifting the instrument

iii) Longitudinal and cross sectioning of a road/railway/canal

iv) Setting a gradient by dumpy and auto-level IV. Plane Table Surveying

RECOMMENDED BOOKS

1. A Text Book of Surveying by Kochar, CL; Katson Publishing House, Ludhiana,

2. Surveying and Leveling by Kanetkar,TP and Kulkarni, SV; AVG Parkashan, Poona

3. Surveying –I by Mahajan, Sanjay; Tech. Publication, Delhi

4. Surveying and Leveling by Punmia, BC; Standard Publishers Distributors, Delhi.

5. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

REINFORCED CEMENT CONCRETE STRUCTURES

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2 1 0

COURSE OBJECTIVES

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise RC Construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials (bars of different diameters. This subject thus deals with elementary design principles as per IS:456-2000

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

• *Explain methods of RCC design i.e.*

- *Working stress methods*

- *Limit state methods*

• *Design singly, doubly reinforced rectangular and T&L beams as per IS Code*

• *Design one way and two way slab*

• *Design axially loaded column and their isolated footing*

DETAILED CONTENTS

UNIT-1, Introduction	PERIODS
Concept of Reinforced Cement Concrete (RCC), Reinforcement Materials: - Suitability of steel as reinforcing material - Properties of mild steel, HYSD steel and TMT bars . Loading on structures as per IS: 875	**08**
UNIT-2, Introduction to following methods of RCC design	**PERIODS**
Working stress method: Definition and basic assumptions ,Limit state method: Definition and basic assumptions , Problems of singly, doubly and T beam analysis by working stress method.	**08**
UNIT-3, Shear and Development Length & Concept of Limit State Method	**PERIODS**
Shear as per IS: 456-2000 by working stress method Shear strength of concrete without shear reinforcement Maximum shear stress Shear reinforcement Definitions and assumptions made in limit state of collapse (flexure) , Partial factor of safety for materials ,Partial factor of safetyfor loads , Design loads 'Stress block, parameters	**08**
UNIT-4, Singly Reinforced beam, , Doubly Reinforced Beams	**PERIODS**
Theory and design of singly reinforced beam by Limit State Method, Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method	**08**

DIPLOMA IN ENGINEERING

UNIT -5 Behavior of T beam, inverted T beam, isolated T beam and 'L', One Way Slab and Two Way Slab	PERIODS
Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method. Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State Method including sketches showing reinforcement details (plan and two sections).	**08**

Important Note: Use of BIS: 456-2000 is permitted in the examinations

RECOMMENDED BOOKS

1. Design of Reinforced Concrete Structures by Alok Srivastava
2. Reinforced Concrete Structure Vol I by Punmia, BC; Standard Publishers, Delhi
3. Design and Testing of Reinforced Structures by Ramamurtham, S; Dhanpat Rai and Sons, Delhi
4. RCC Design and Drawing by Singh, Birinder; Kaption Publishing House, New Delhi
5. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

ENERGY CONSERVATION

L T P

3 0 0

COURSE OBJECTIVE

The requirement of energy has increased manifolds in last two decades due to rapid urbanization and growth in industrial/service sector. It has become challenging task to meet ever increasing energy demands with limited conventional fuels and natural resources. Due to fast depletion of fossil fuels and a tremendous gap between supply and demand of energy, it is essential to adopt energy conservation techniques in almost every field like industries, commercial and residential sectors etc. Energy conservation has attained priority as it is regarded as additional energy resource. Energy saved is energy produced. This course covers the concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in general industry and details out energy audit methodology and energy audit instruments.

LEARNING OUTCOMES

After undergoing this subject, the students will be able to:
- *Define principles and objectives of energy management and energy audit.*
- *Understand Energy Conservation Act 2001 and its features.*
- *Understand various forms & elements of energy.*
- *Identify electrical and thermal utilities. Understand their basic principle of operation and assess performance of various equipments.*
- *Identify areas of energy conservation and adopt conservation methods in various systems.*
- *Evaluate the techno economic feasibility of the energy conservation technique adopted.*

DETAILED CONTENTS

UNIT-1, Basics energy	PERIODS
Classification of energy- primary and secondary energy, commercial and noncommercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators. Global fuel reserve, Energy scenario in India and state of U.P. Sector-wise energy consumption (Domestic, industrial, agricultural and other sectors), Impact of energy usage on climate.	**06**
UNIT-2, Energy Conservation and EC Act 2001	**PERIODS**
Introduction to energy management, energy conservation, energy efficiency and its need, Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation. Standards and Labeling: Concept of star rating and its importance, Types of product available for star rating.	**06**
UNIT-3, Electrical Supply System and Motors	**PERIODS**
Types of electrical supply system, Single line diagram, Losses in electrical power distribution system, Understanding Electricity Bill: Transformers Tariff structure, Components of power, (kW, kVA and kVAR) and power factor, improvement of power factor, Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC) Transformers: Introduction, Losses in transformer, transformer Loading, Tips for energy savings in transformers, Electric Motors Types of motors, Losses in induction motors Features and characteristics of energy efficient motors, Estimation of motor loading, Variation in efficiency and power factor with loading, Tips for energy savings in motors.	**12**
UNIT-4, Energy Efficiency in Thermal Utilities & General Energy Saving Tips	**PERIODS**

DIPLOMA IN ENGINEERING

& Energy Audit	
Thermal Basics: Thermal energy, Energy content in fuels, Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE), Energy Conservation in boilers and furnaces : Introduction and types of boilers, Energy performance assessment of boilers, Concept of stoichiometric air and excess air for combustion, Energy conservation in boilers and furnaces, Do's and Don'ts for efficient use of boilers and furnaces, Cooling Towers: Basic concept of cooling towers, Tips for energy savings in cooling towers, Efficient Steam Utilization	**11**
UNIT-5, Energy Conservation Building Code & waste heat recovery and Co-generation	**PERIODS**
ECBC and its salient features, Tips for energy savings in buildings: New Buildings, Existing Buildings. Concept, classification and benefits of waste heat recovery, Concept, and types of co-generation system.	**5**

PRACTICAL EXERCISE

1. To conduct load survey and power consumption calculations of small building.
2. To check efficacy of different lamps by measuring power consumption and lumens using lux meter.
3. To measure energy efficiency ratio (EER) of an air conditioner.
4. To measure effect of valve throttling and variable frequency drive (VFD) on energy
5. Consumption by centrifugal pump.
6. 5. To measure and calculate energy saving by arresting air leakages in compressor.
7. 6. To measure the effect of blower speed on energy consumed by it.

RECOMMENDED BOOKS

1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015.
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015.
3. 3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015.
4. Handbook on Energy Audit & Environmental Management by Y P Abbi &Shashank Jain published by TERI. Latest Edition.

DIPLOMA IN ENGINEERING

REINFORCED CEMENT CONCRETE (RCC) DRAWING

L T P

1 1 0

COURSE OBJECTIVES

Diploma holders in Civil Engineering are required to supervise the construction of RC structures. Thus one should be able to read and interpret drawings of RC structures. The competence to read and interpret structural drawings is best learnt by being able to draw these drawings. Hence there is a need to have a subject devoted to preparation of structural drawings.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- *Draw the reinforcement details for various structural elements from the given data*
- *Calculate reinforcement details from the given drawings*
- *Draw bar bending schedule from drawing*
- *Read and interpret R.C.C. drawings*

DETAILED CONTENTS

UNIT-1, . RC Drawing:	PERIODS
Reinforcement details from the given data for the following structural elements with bar bending schedules (i) General instruction and rules (ii) , Drawing 1- lap, joint, development drawing: length, rings, hook etc. (iii) (ii) Drawing No. 2: RC Slabs - One way slab, Two way slab and Cantilever Slab. (iv) (iii) Drawing No.3: Beams - Singly and doubly reinforced rectangular beams and Cantilever beam (All beams with vertical stirrups), T Beam, Tapered Beam. (v) (iv) Drawing No.4: Columns and Footings – Square, Rectangular and Circular Columns with lateral ties and their isolated sloped column footings, column and beam junction (vi) (v) Drawing No. 5: Portal Frame – Three bay two storey RC portal frame with blow up of column beam junctions. (vii) (vi) Drawing of cantilever retaining wall showing details of all the members and reinforcement. (viii) (vii) Drawing of Intze type water tank showing details of all the members and reinforcement. (ix) (viii) Drawing No. 6 : Draw at least one sheet using AutoCAD software	**20**

RECOMMENDED BOOKS1

1. Civil Engineering Drawing by Layal JS; Satya Parkashan, New Delhi
2. Civil Engineering Drawing by Kumar NS; IPH, New Delhi
3. RCC Design and Drawing by Singh, Birinder; Kaption Publishing House, New Delhi.
4. Steel Structures Design and Drawing by Singh, Birinder; Kaption Publishing House, New Delhi
5. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

WATER AND WASTE WATER ENGINEERING

L T P

2 1 0

COURSE OBJECTIVES

One of the basic necessities of life is water which is not easily available to a lot of people. Providing potable water at the first place then collection and disposal of waste solids and liquids are important activities of civil engineering field. This subject provides basic knowledge and skills in the field of water supply system and waste disposal system. Classroom instructions should be supplemented by field visits to show functional details of water supply and waste disposal systems. It will also be advantageous to invite professionals from field to deliver extension lectures on specialized operations.

LEARNING OUTCOMES

Calculate the water requirement for a particular population

- *Check and improve the quality of water by giving required treatment to water*
- *Calculate the size of different pipes to carry water*
- *Lay the network of pipes for water supply as well as sewerage in a building*
- *Draw the location of different appurtenances*
- *Carry out the disposal of sewage*
- *Supervise the water supply and waste water schemes*

DETAILED CONTENTS

A. WATER SUPPLY

UNIT-1, Introduction	PERIODS
Necessity and brief description of water supply system. Sources of water – surface/sub-surface sources, **Quantity of Water** Water requirement , Rate of demand and variation in rate of demand , Per capita consumption for domestic, industrial, public and fire fighting uses as per BIS standards (no numerical problems) , Population Forecasting. **Quality of Water** Meaning of pure water and methods of analysis of water ,Physical, Chemical and bacteriological tests and their significance , Standard of potable water as per Indian Standard , Maintenance of purity of water.	**08**
UNIT-2, Water Treatment	**PERIODS**
Sedimentation - purpose, types of sedimentation tanks ,Coagulation/floculation - usual coagulation and their feeding , Filtration - significance, types of filters, their suitability , Necessity of disinfection of water, forms of chlorination, break point chlorine, residual chlorine, application of chlorine. Flow diagram of different treatment units, functions of (i) Areation fountain (ii) mixer (iii) floculator, (iv) classifier, (v) slow and rapid sand filters (vi) chlorination chamber.	**08**
UNIT-3,Conveyance of Water,	**PERIODS**

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Different types of pipes - cast iron, PVC, steel, asbestos cement, concrete and lead pipes. Their suitability and uses, types of joints in different types of pipes. Appurtenances: Sluice, air, reflux valves, relief valves, scour valves, bib cocks, stop cocks, fire hydrants, water meters their working and uses. **Laying of Pipes** Setting out alignment of pipes, Excavation for laying of pipes and precautions to be taken , Handling, lowering and jointing of pipes , Testing of pipe lines , Back filling. **Building Water Supply** Connections to water main (practical aspect only), Water supply fittings (with sketches) and terminology related to plumbing.	**08**
UNIT-4, Sewerage System	**PERIODS**
Types of sewerage systems, materials for sewers, their sizes and joints , Appurtenance: Location, function and construction features. Manholes, drop manholes, tank hole, catch basin, inverted siphon, flushing tanks grease and oil traps, storm regulators, ventilating shafts.	**08**
UNIT-5, Laying and Construction of Sewers	**PERIODS**
Setting out/alignment of sewers , Excavations, checking the gradient with boning rods preparation of bedding, handling and jointing testing and back filling of sewers/pipes. Construction of surface drains and different sections required 11 Sewage Characteristics, Properties of sewage and IS standards for analysis of sewage, Physical, chemical and bacteriological parameters, Natural Methods of Sewerage Disposal , General composition of sewage and disposal methods , Disposal by dilution , Self purification of stream , Disposal by land treatment , Nuisance due to disposal.	**08**

LIST OF PRACTICALS

To determine turbidity of water sample by

1.(i) JTU (ii) NTU

2) To determine dissolved oxygen of given sample

3) To determine pH value of water

4) To perform jar test for coagulation

5) To determine BOD of given sample

6) To determine residual chlorine in water

7) To determine conductivity of water and total dissolved solids

8) To study the installation of following:

a) Water meter

b) Connection of water supply of building with main

c) Pipe valves and bends

d) Water supply and sanitary fittings

9) To study and demonstrate the joining/tPeriodseading of GI Pipes, CI Pipes, SWG pipes, PVC pipes and copper pipes.

DIPLOMA IN ENGINEERING

10) To demonstrate the laying of SWG pipes for sewers

11) Study of water purifying process by visiting a field lab

. 12) Demonstration of plumbing tools.

13) Testing of pipes (GI, CI, PVC, SWG) as per BJI standards.

RECOMMENDED BOOKS

- Elements of Public Health Engineering by Duggal, KN; S. Chand and Co. New Delhi
- Water Supply and Sanitary Engineering by Rangwala, SC; Charotar Book Stall, Anand
- Water Supply Engineering by Kshirsagar, SR; Roorkee Publishing House, Roorkee
- Sewage and Sewage Treatment by Kshirsagar, SR; Roorkee Publishing House, Roorkee
- Water Supply and Sanitary Engineering by Birdie, GS; Dhanpat Rai and Sons, Delhi
- Water Supply Engineering by Garg, Santosh Kumar; Khanna Publishers, Delhi
- Sewage and Waste Water Disposal Engineering by Garg, Santosh Kumar; Khanna Publishers, Delhi
- A Laboratory Manual in Public Health Engineering by Duggal, Ajay K and Sharma, Sanjay; Galgotia Publications, 2006, New Delhi
- e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

BUILDING DRAWING

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3 1 0

COURSE OBJECTIVES

. Drawing is the language of engineers. Engineering is incomplete without a thorough knowledge of drawing. A Civil Engineering diploma holder must be capable of sketching detailed constructional drawing of various components of building for the purpose of communication with the craftsman. Planning of small buildings, developing a line plan, dimensioning, key plan, drainage plan should be a part of curriculum. The diploma engineer must be conversant with reading and interpretation of drawings for execution of work

LEARNING OUTCOMES

- Read and interpret building drawings
- Explain the drawing to craftsman
- Layout foundation plan of different types of foundations
- Prepare drawings of small buildings, developing different sections of building
- Guide and supervise carpenters in various carpentry works related to doors, windows etc.
- Prepare details of brick courses in joints
- Draw the sketches of various joints of carpentry
- Demonstrate circular arch and segmental arches

DETAILED CONTENTS

UNIT-1, Drawing No. 1	PERIODS
Details of spread footing foundations for a load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick apron have to be shown in the drawing.	**08**
UNIT-2, Drawing No. 2	**PERIODS**
Plans of 'T' and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond, Drawing plan, elevation of arches: circular arch, segmental arch. Drawing plan, elevation of a small building by measurement and foundation detail and sectional elevation. ,.	**08**
UNIT-3, Drawing No. 4	**PERIODS**
Elevation, sectional plan and sectional side elevation of flush door, fully glazed door, fully panelled door with wire gauge shutter. Partly panelled and partly glazed door.	**08**
UNIT-4, Drawing No. 6	**PERIODS**
Drawing detailed working plan, elevation and section of a residential building from a given line plan or given data showing details of foundations, roof and parapet, Drawing of flat roof, showing the heat/thermal insulation provisions	**08**
UNIT-5, Drawing No. 7	**PERIODS**
Drawings of following floors Cement concrete floors at ground level and at first floor level. i) Brick floors: a) Diagonal Bond b) Herring Bone Bond ii) Bonded cement concrete flooring/ Marble flooring/ Terrazzo flooring iii) Ceramic/vitrified tile flooring.	**08**

DIPLOMA IN ENGINEERING

.**RECOMMENDED BOOKS**

- Civil Engineering Drawing by RS Malik; Asia Publishing House
- Civil Engineering Drawing by V.B.Sikka ; Katson Publishing, Ludhiana
- Civil Engineering Drawing by NS Kumar ; IPH, New Delhi
- Principles of Building Drawing by MG Shah and CM Kale; MacMillan, Delhi
- Building Construction by Moorthy NRK
- Civil Engg Drawing by Layal
- Drawing and Design of Residential and Commercial Buildings by Zaidi, SKA and Siddiqui, Suhail; Standard Publishers and Distributors, Delhi.
- SP : 20
- National Building Code
- Building Drawing by Mamta Kataria; North Publication, Jalandhar.
- E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

SOIL MECHANICS AND FOUNDATION ENGINEERING

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2 1 0

COURSE OBJECTIVES

Civil Engineering diploma engineers are required to supervise the construction of roads, pavements, dams, embankments, and other Civil Engineering structures. As such the knowledge of basic soil engineering is the pre-requisite for these engineers for effective discharge of their duties. This necessitates the introduction of Soil and Foundation Engineering subject in the curriculum for Diploma Course in Civil Engineering. The subject covers only such topics which will enable the diploma engineers to identify and classify the different types of soils, their selection and proper use in the field for various types of engineering structures. The emphasis will be more on teaching practical aspect rather than theory.

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LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- *Identify and classify various types of soils*
- *Select particular type of foundation according to loading of structure*
- *Carry out compaction of soils as per density*
- *Calculate bearing capacity of soil*
- *Calculate liquid limit and plastic limit of soil*

DETAILED CONTENTS

UNIT-1, Introduction	PERIODS
Constituents of soil and representation by a phase diagram , Definitions of void ratio, porosity, degree of saturation, water content, specific gravity, unit weight, bulk density/bulk unit weight, dry unit weight, saturated unit weight and submerged unit weight of soil grains and correlation between them , Simple numerical problems with the help of phase diagrams. **Physical Properties of Soils** Constituents of soil and representation by a phase diagram , Definitions of void ratio, porosity, degree of saturation, water content, specific gravity, unit weight, bulk density/bulk unit weight, dry unit weight, saturated unit weight and submerged unit weight of soil grains and correlation between them , Simple numerical problems with the help of phase diagrams	**08**
UNIT-2, Classification and Identification of Soil	**PERIODS**
Particle size, shape and their effect on engineering properties of soil, particle size classification of soils,Gradation and its influence on engineering properties, Relative density and its use in describing cohesionless soils ,Behaviour of cohesive soils with change in water content, Atterberg's limit - definitions, use and practical significance including numerical problems , Field identification tests for soils , Soil classification system as per IS 1498; basis, symbols, major divisions and sub divisions, groups, plasticity chart; procedure for classification of a given soil	**08**
UNIT-3, Flow of Water Through Soils	**PERIODS**
Concept of permeability and its importance ,Darcy's law, coefficient of permeability, seepage velocity and factors affecting permeability , Comparison of permeability of different soils as per	**08**

DIPLOMA IN ENGINEERING

Indian Standards , Measurement of permeability in the laboratory , Simple numerical problems. **(Concept only Effective Stress)** Stresses in subsoil, Definition and meaning of total stress, effective stress and neutral stress , Principle of effective stress , Importance of effective stress in engineering problems	
UNIT-4, Deformation of Soils, , Shear Strength of Soil	**PERIODS**
Meaning, conditions/situations of occurrence with emphasis on practical significance of: a) Consolidation and settlement b) Creep c) Plastic flow d) Heaving e) Lateral movement f) Freeze and thaw of soil ,inition and practical significance of compression index, coefficient of consolidation, degree of consolidation, Meaning of total settlement, uniform settlement and differential settlement; rate of settlement and their effects, Settlement due to construction operations and lowering of water table ,Tolerable settlement for different structures as per IS , Simple numerical problems, Concept and Significance of shear strength , Factors contributing to shear strength of cohesive and cohesion less soils, Coulomb's law, Determination of shearing strength by direct shear test, unconfined compression test and vane shear test. Drainage conditions of test and their significance ,Stress and strain curve, peak strength and ultimate strength, their significance , Examples of shear failure in soils , Numerical problems,	**08**
UNIT-5, Compaction, Foundation Engineering	**PERIODS**
Concept of shallow and deep foundation; types of shallow foundations: combined, isolated, strip, mat, and their suitability. Factors affecting the depth of shallow foundations, deep foundations, type of piles and their suitability; pile classification on the basis of material, pile group and pile cap**.** Ground improvement techniques,Pre-loading, vibro compaction, stone columns, soil nailing, grouting, sand drain	**08**

LIST OF PRACTICALS

1. To determine the moisture content of a given sample of soil

2. Auger Boring and Standard Penetration Test

a) Identifying the equipment and accessories

b) Conducting boring and SPT at a given location

c) Collecting soil samples and their identification

d) Preparation of boring log and SPT graphs

e) Interpretation of test results

3. Extraction of Disturbed and Undistrubed Samples

a) Extracting a block sample

b) Extracting a tube sample

c) Extracting a disturbed samples for mechanical analysis.

d) Field identification of samples

4. Field Density Measurement (Sand Replacement and Core Cutter Method)

DIPLOMA IN ENGINEERING

a) Calibration of sand

b) Conducting field density test at a given location c) Determination of water content d) Computation and interpretation of results

5. Liquid Limit and Plastic Limit Determination:

a) Identifying various grooving tools

b) Preparation of sample

c) Conducting the test

d) Observing soil behavior during tests

e) Computation, plotting and interpretation of results

6. Mechanical Analysis

a) Preparation of sample

b) Conducting sieve analysis

c) Computation of results

d) Plotting the grain size distribution curve

e) Interpretation of the curve

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RECOMMENDED BOOKS

1. Soil Mechanics and Foundations by Punmia, BC; Standard Publishers, Delhi
2. Soil Mechanics and Foundations Engineering by Bharat Singh and Shamsher Prakash; Nem Chand and Bros, Roorkee,
3. Soil Sampling and Testing - A Laboratory Manual by Duggal, AK., Ramana, TR.,Krishnamurthy, S; Galgotia Publications, Delhi 4. BIS Codes IS 6403 (latest edition) and IS 1498 (latest edition)
4. Shallow Foundations by NITTTR, Chandigarh
5. Video films on Geo-technical Laboratory Practices by Vinod Kumar; NITTTR, Chandigarh
6. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

SURVEYING – II

L T P

2 1 1

COURSE OBJECTIVES

The important functions of a civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works. While framing the curriculum for the subject of surveying, stress has been given to the development of knowledge and skill in theodolite surveying, tachometry surverying, curves and use of minor and modern instruments have been included in this subject. Field work should be a selected one so that student can check his work and have an idea of the results the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- *Interpolate contours on a given sheet of paper*
- *Align a proposed road*
- *Draw a contour plan of an area*
- *Calculate earth work for a road from a contour map*
- *Prolong a line with theodolite*
- *Conduct closed traversing*

DETAILED CONTENTS

UNIT-1, Contouring	PERIODS
Concept of contours, purpose of contouring, contour interval and horizontal equivalent, factors effecting contour interval, characteristics of contours, methods of contouring: Direct and indirect, use of stadia measurements in contour survey, interpolation of contours; use of contour map, Drawing cross section from a contour map; marking alignment of a road, railway and a canal on a contour map, computation of earth work and reservoir capacity from a contour map	**06**
UNIT-2, Theodolite Surveying	**PERIODS**
Working of a transit vernier theodolite, axes of a theodolite and their relation; temporary adjustments of a transit theodolite; concept of transiting, swinging, face left, face right and changing face; measurement of horizontal and vertical angles. Prolonging a line (forward and backward) measurement of bearing of a line; traversing by included angles and deflection angle method; traversing by stadia measurement, theodolite triangulation, plotting a traverse; concept of coordinate and solution of omitted measurements (one side affected), errors in theodolite survey and precautions taken to minimize them; limits of precision in theodolite traversing. Height of objects – accessible and non-accessible bases	**10**
UNIT-3, Tacho-metric surveying	**PERIODS**
Tachometry, Instruments to be used in tachometry, methods of tachometry, stadia system of tachometry, general principles of stadia tachometry, examples of stadia tachometry and Numerical problems.	**06**
UNIT-4, . Curves	**PERIODS**
Simple Circular Curve Need and definition of a simple circular curve; Elements of simple circular curve - Degree of the curve, radius of the curve, tangent length, point of intersection	**08**

DIPLOMA IN ENGINEERING

(Apex point), tangent point, length of curve, long chord deflection angle, Apex distance and Mid-ordinate. Setting out of simple circular curve: a) By linear measurements only: - Offsets from the tangent - Successive bisection of arcs - Offsets from the chord produced b) By tangential angles using a theodolite ,Transition Curve Need (centrifugal force and super elevation) and definition of transition curve; requirements of transition curve; length of transition curve for roads; by cubic parabola; calculation of offsets for a transition curve; setting out of a transition curve by tangential offsets only, Vertical curve Setting out of a vertical curve	
UNIT-5, Introduction to the use of Modern Surveying equipment and techniques such as	**PERIODS**
a) EDM or Distomat b) Planimeter (Digital Total station c) Introduction to remote sensing and GPS e) Auto leveL d) Digital theodolite e) Total station- installation, calibration concept of coordinate system. f) Analysis of dater, plotting, Remote sensing , GIS & GPS concept and application in various fields	**06**

LIST OF PRACTICALSI.

Contouring

i) Preparing a contour plan by radial line method by the use of a Tangent Clinometer/Tachometer
ii) ii) Preparing a contour plan by method of squares iii) Preparing a contour plan of a Road/Railway track/Canal by taking cross sections.
iii) II. Theodolite
iv) i) Taking out the Theodilite, mounting on the tripod and placing it back in the box ii) Study of a transit vernier theodolite; temporary adjustments of theodolite
v) iii) Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods
vi) iv) Measurement of vertical angles and use of tachometric tables
vii) v) Measurement of magnetic bearing of a line
viii) vi) Running a closed traverse with a theodolite (at least five sides) and its plotting vii) Height of objects with and without accessible bases

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RECOMMENDED BOOKS
1. A Text Book of Surveying by Kocher, CL; Katson Publishing House Ludhiana,
 2. Surveying and Leveling by Kanetkar,TP and Kulkarni, SV; AVG Parkashan, Pune
3. Surveying and Leveling-Vol.2 by Kanetkar, TP and Kulkarni, SV; AVG Prakashan, Pune
4. Surveying and Leveling by Punima, BC; Standard Publishers Distributors, Delhi
5. Surveying-II by Mahajan, Sanjay; Satya Prakashan, Delhi 6. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

INDUSTRIAL MANAGEMENT AND ENTREPRENERSHIP DEVELOPMENT

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COURSE OBJECTIVE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mindset with managerial skills helps the student in the job market. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- Explain the principles of management including its functions in an organization.
- Have insight into different types of organizations and their structures.
- Inculcate leadership qualities to motivate self and others.
- Manage human resources at the shop-floor
- Maintain and be a part of healthy work culture in an organization.
- Use marketing skills for the benefit of the organization.
- Maintain books of accounts and take financial decisions.
- Undertake store management.
- Use modern concepts like TQM, JIT and CRM.

DETAILED OUTCOMES

UNIT-1, Introduction to Entrepreneurship	PERIODS
Concept /Meaning and its need, Qualities and functions of entrepreneur and barriers in entrepreneurship, Sole proprietorship and partnership forms and other forms of business organizations, Schemes of assistance by entrepreneurial support agencies at National, State, District –level, organization: NSIC, NRDC, DC, MSME, SIDBI, NABARD, NIESBUD, HARDICON Ltd., Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks.	08
UNIT-2, Market Survey and Opportunity Identification/Ideation	PERIODS
Scanning of the business environment, Salient features of National and Haryana State industrial policies and resultant business opportunities, Types and conduct of market survey, Assessment of demand and supply in potential areas of growth, Identifying business opportunity, Considerations in product selection, Converting an idea into a business opportunity.	08
UNIT-3, Project report Preparation	PERIODS
Preliminary project report, Detailed project report including technical, economic and market feasibility, Common errors in project report preparations, Exercises on preparation of project report Sample project report.	08
UNIT-4, Introduction to Management	PERIODS

DIPLOMA IN ENGINEERING

Definitions and importance of management, Functions of management: Importance and process of planning, organizing, staffing, directing and controlling, Principles of management (Henri Fayol, F.W. Taylor), Concept and structure of an organization, Types of industrial organizations and their advantages, Line organization, staff organization, Line and staff organization, Functional Organization.	08
UNIT-5, Leadership and Motivation	PERIODS
Leadership: Definition and Need, Qualities and functions of a leader, Manager Vs leader, Types of leadership, Case studies of great leaders, Motivation: Definition and characteristics, Importance of self motivation, Factors affecting motivation, Theories of motivation (Maslow, Herzberg, Douglas, McGregor).	08

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development and Management by J.S.Narang; Dhanpat Rai & Sons, Delhi.
3. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
4. Handbook of Small Scale Industry by PM Bhandari
5. Entrepreneurship Development and Management by MK Garg
6. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

UNIVERSAL HUMAN VALUES

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COURSE OBJECTIVE

This introductory course input is intended

1. *To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.*
2. *To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.*
3. *To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature*

Thus, this course is intended to provide a much needed orientation input in value education to the young enquiring minds.

Course Methodology

1. *The methodology of this course is exploration and thus universally adaptable. It involves a systematic and rational study of the human being vis-a-vis the rest of existence.*
2. *It is free from any dogma or value prescriptions.*
3. *It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.*
4. *This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self evolution.*
5. *This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.*

DETAILED CONTENT

UNIT-1, Course Introduction- Need, Basic Guidelines, Content and Process for Value Education	PERIODS
Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels	**08**
UNIT-2, Understanding Harmony in the Human Being- Harmony in Myself!	**PERIODS**
Understanding human being as a co-existence of the sentient 'I' and the material the Body' Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail ,Programs to ensureSanyam and Swasthya -Practice Exercises and Case Studies will be taken up in Practice Sessions.	**06**
UNIT-3, Understanding Harmony in Family and Society- Harmony in	**PERIODS**

DIPLOMA IN ENGINEERING

Human-Human Relationship	
Understanding Harmony in the family – the basic unit of human interaction, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitvaas comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family! -Practice Exercises and Case Studies will be taken up in Practice Sessions.	**08**
UNIT-4, Understanding Harmony in the Nature and Existence- Whole existence as Co-existence	**PERIODS**
Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence. -Practice Exercises and Case Studies will be taken up in Practice Sessions.	**04**
UNIT-5, Implications of the above Holistic Understanding of Harmony on Professional Ethics	**PERIODS**
Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics, Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers, At the level of society: as mutually enriching institutions and organizations, To inculcate Human Values among Students: The Role of self ,Parents and Teachers. Practice Exercises and Case Studies will be taken up in Practice Sessions.	**08**

Reference Material

The primary resource material for teaching this course consists of

a) The text book (Latest Edition) R.R Gaur, R Asthana, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi.
b) The teacher's manual (Latest Edition) R.R Gaur, R Asthana, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi.

In addition, the following reference books may be found useful for supplementary reading in connection with different parts of the course:

1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991.
4. Ivan Illich, 1974, Energy & Equity, the Trinity Press, Worcester, and HarperCollins, USA.

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5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, and Universe Books.

DIPLOMA IN ENGINEERING

QUANTITY SURVEYING AND VALUATION

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COURSE OBJECTIVES

Diploma holders in Civil Engineering are supposed to prepare material estimates for various Civil Engineering works namely; buildings, irrigation works, public health works and roads etc. In addition, they must have basic knowledge regarding analysis of rates, contracting, and principles of valuation. Therefore, this subject has great importance for diploma holders in Civil Engineering

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- *Explain different units of measurement for different items*
- *Calculating quantities of materials and prepare the material chart*
- *Prepare detailed and abstract of estimates from drawings*
- *Prepare tender document of different civil engineering items by using C.S.R. rates with premium*
- *Use principles of valuation for valuation of a building*

DETAILED CONTENTS

	PERIODS
UNIT-1, Introduction to quantity surveying and its importance. Duties of quantity surveyor , Types of estimates	**PERIODS**
Preliminary estimates - Plinth area estimate - Cubic content estimate Detailed estimates Definition, Type of detailed estimate- Detail estimate you new work, Revised Estimate, Supplementary estimate, Maintenance and Repair estimate - Stages of preparation – details of measurement and calculation of quantities and abstract	**08**
UNIT-2, Measurement, Preparation of Detailed and Abstract Estimates from Drawings by following CSR rates for:	**PERIODS**
Units of measurement for various items of work as per BIS:1200 , Rules for measurements , Different methods of taking out quantities – canter line method and long wall and short wall method, A small residential building with a flat roof comprising of - Two rooms with W.C., bath, kitchen and verandah , Earthwork for unlined channel, WBM road and pre-mix carpeting ,Single span RCC slab culvert , Earthwork for plain and hill roads 4.6 RCC work in beams, slab, column and lintel, foundations , 10 users septic tank	**08**
UNIT-3, Calculation of quantities of materials for, Analysis of Rates	**PERIODS**
Steps involved in the analysis of rates. Requirement of material, labour, sundries, contractor's profit and overheads , Analysis of rates for finished items when data regarding labour, rates of material and labour is given Earthwork in excavation in hard/ordinary soil and filling with a concept of lead and lift along with lead diagram - RCC in roof slab/beam/lintels/columns - Brick masonry in cement mortar -	**08**

DIPLOMA IN ENGINEERING

Cement Plaster - White washing, painting- RCC foundation	
UNIT-4, C.C Flooring, Contractorship	**PERIODS**
Standard schedule of rates, full rates and labour rates, - Meaning of contract - Essentials of a contract - Types of contracts, their advantages, dis-advantages and suitability, system of payment - Single and two cover-bids; tender, tender forms and documents, tender notice, submission of tender and deposit of earnest money, security deposit, retention money, maintenance period - Classification and types of contracting firms/construction companies,	08
UNIT-5, Preparation of Tender Document based on Common Schedule Rates (CSR)	**PERIODS**
- Introduction to CSR and calculation of cost based on premium on CSR - Exercises on writing detailed specifications of different types of building works from excavation to foundations, superstructure and finishing operation - Exercises on preparing tender documents for the following a) Earth work b) Construction of a small house as per given drawing c) RCC works d) Pointing, plastering and flooring e) White-washing, distempering and painting f) Wood work including polishing g) Sanitary and water supply installations h) False ceiling, aluminum (glazed) partitioning i) Tile flooring including base course j) Preparation of comparative statement for item rate contract **Valuation** a) Purpose of valuation, principles of valuation b) Definition of various terms related to valuation like depreciation, sinking fund, salvage and scrap value, market value, fair rent, year's purchase etc. c) Methods of valuation replacement cost method d) Rental return method	**08**

RECOMMENDED BOOKS

1. Estimating, Costing and Valuation (Civil) by Pasrija, HD, Arora, CL and S. Inderjit Singh; New Asian Publishers, Delhi,
2. Estimating and Costing by Rangwala, S.C ;Charotar Book Stall, Anand
3. Estimating and Costing by Dutta, BN
4. Estimating and Costing by Mahajan Sanjay; Satya Parkashan, Delhi 5. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

DESIGN OF STEEL STRUCTURES

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COURSE OBJECTIVES

upon availability This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise steel construction and fabrication. He may also be required to design simple structural elements, make changes in design depending of materials. This subject thus deals with elementary design principles as per BIS code of practice IS: 800.

LEARNING OUTCOMES

- *After undergoing this course, the students will be able to:*
- *Explain structural properties of steel and its designation as per Indian Standards*
- *Select different types of bolted and welded joints*
- *Analyze and design single and double angle section struts and I section compression members*
- *Explain different types of trusses, their different components and usability*
- *Analyze and design of simply supported steel beams*
- *Select various types of plate girders*
- *Supervise fabrication and erection of steel structure like trusses, columns and girders.*

DETAILED CONTENTS

UNIT-1, Structural Steel and Sections	PERIODS
Properties of structural steel, Designation and classification of structural steel sections as per IS handbook and IS: 800: 2007, Tubular Sections.	**04**
UNIT-2, Riveted Connections , Bolt Connections & Welded connections:	**PERIODS**
Types of Rivet, Permissible stresses in rivets, types of riveted joints, specifications as per IS800, Failure of riveted joint, strength and efficiency of riveted joint, Design of Riveted Connection only axially loaded number (No staggered riveting), Types of bolt, permissible stresses in bolt, types of bolted joints, specifications for bolted joints as per IS 800. Failure of a bolted joint. Assumptions in the theory of bolted joints. Strength and efficiency of a bolted joint. Design of bolted joints for axially loaded members (No Staggered bolts). Types of welds and welded joints, advantages and disadvantages of welded joints design of fillet and butt weld for axially loaded members	**10**
UNIT-3, Tension Members	**PERIODS**
Analysis and design of single and double section tension members and their rivetted and welded connections with gusset plate as per IS:800-2007. Introduction to Lug Angle and Tension splice.	**08**
UNIT-4, Compression Members, , Roof Trusses, Column Bases	**PERIODS**
Angle struts, type of section used, effective length, radius of gyration, slenderness ratio and its limits, permissible compressive stress Analysis and design of single and double angle sections compression members subjected to axial load. Introduction to analysis and design of axially loaded column. Introduction to lacing and battening (No numerical problem on lacing and battening), Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering. Connection between purlin and principal rafter (no design, only concept), Types of column bases i.e. slab base, gusseted base. Design of slais base and concrete block. Introduction to gusseted base (no numerical problems on gusseted base). Introduction to beam columns design of simple built up beams (Symmetrical I section with cover plates only)	**10**
UNIT-5, Beams	**PERIODS**

DIPLOMA IN ENGINEERING

Analysis and design of single section simply supported laterally restrained steel beams. Introduction to plate girder and functions of various elements of a plate girder, **,** Fabrication and erection of steel structures like trusses, columns and girders	**08**

Important Note:

 Use of IS: 800 and Steel Tables are permitted in examination

RECOMMENDED BOOKS
- 1.Design of Steel Structures by Duggal SK; Standard Publishers, Delhi
- 2. Steel Structures Design and Drawing by Birinder Singh Kaption Publishing House, Ludhiana
- 3. Design of Steel Structures by Ram Chandra; Standard Publishers ,Delhi
- 4. Design of Steel Structures by S Ramamurthan
- 5. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

STEEL STRUCTURES DRAWINGS

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COURSE OBJECTIVES

Diploma holders in Civil Engineering are required to supervise the construction of steel structures. Thus one should be able to read and interpret structural drawings of steel structures. The competence to read and interpret structural drawings is best learnt by being able to draw these drawings. Hence there is a need to have a subject devoted to preparation of structural drawings.

LEARNING OUTCOMES

After undergoing the subject, students will be able to

- *Read and interpret steel structural drawing*
- *Prepare the detailed drawings of toe joint, ridge joint, details of purlins and roof sheets*
- *Prepare and draw slab base connection, gusseted base connection grillage base connection for single section steel columns*
- *Draw column beam connections*
- *Prepare drawings of plate girder from given design data*

DETAILED CONTENTS

Steel Structures Drawings:

Structural drawing from given data for following steel structural elements.

    (i)   Drawing No. 1: Roof Truss – Drawing of Fink Roof Truss with details of joints, fixing details of purlins and roof sheets.

    (ii)   (ii) Drawing No.2 : Column and Column Bases - Drawing of splicing of steel columns. Drawings of slab base, gusseted base and grillage base for single section steel columns.

    (iii)   (iii) Drawing No.3 : Column Beam Connections (a) Sealed and Framed Beam to Beam Connections (b) Sealed and Framed Beam o Column Connections

    (iv)   (iv) Drawing No. 4 : Plate Girder (Bolted) Plan and Elevation of Plate Girder with details at supports and connection of stiffness, flange angles and cover plate with web highlighting curtailment of plates.

    (v)   (v) Drawing No. 5 : Draw atleast one sheet using CAD software

RECOMMENDED BOOK

1. Civil Engineering Drawing by Layal JS; SatyaParkashan, New Delhi

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2. Civil Engineering Drawings by Chandel RP
3. Civil Engineering Drawing by Kumar; NS; IPH, New Delhi
4. Civil Engineering Drawing by Malik RS and Meo GA; Asian Publishing House, New Delhi
5. Steel Structures Design and Drawing by SinghBirinder; Kaption Publishing House, New Delhi
6. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

IRRIGATION ENGINEERING

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COURSE OBJECTIVES

Diploma holders in Civil Engineering have to supervise the construction, repair and maintenance of canals, head works, river training works, cross drainage works, regulatory and other works . Some of diploma holders are also engaged for preventing water logging and irrigation by tubewells. This subject imparts knowledge regarding hydrology, flow irrigation – storage and distribution system, constructional features of head works, river training works, cross drainage works, causes and prevention of water logging and construction of tube wells.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- explain concept of necessity of irrigation in India
- recognize different crops and their water requirements
- define rainfall and runoff
- measure rainfall and read rain gauges and hydrographs
- monitor construction and maintenance work of canal and canal linings
- monitor installation of tubewells and water harvesting techniques

DETAILED CONTENTS

UNIT-1, Introduction	PERIODS
Definition of irrigation ,Necessity of irrigation, Role of Irrigation in country's economy. History of development of irrigation in India , Major, medium and minor irrigation projects of India **.** **Water Requirement of Crops** Principal crops in India and their water requirements , Crop seasons – Kharif and Rabi, Soil water, soil crop and crop water relationships, Duty, Delta and Base Period, their relationship ,Gross commanded area (GCA), culturable commanded area (CCA), Intensity of Irrigation, Paleo, Kor, Crop Ratio, Crop period, Base period, Duty, Delta. Relation between Duty-Delta and Base period	**08**

UNIT-2, Hydrological Cycle Catchment Area and Run-off	PERIODS
Rainfall , definition rain-gauges – automatic and non-automatic, methods of estimating average rainfall, Advantages of keeping rainfall records, (Arithmatic system); catchment area, runoff, factors affecting runoff, hydrograph, basic concept of unit hydrograph.	**08**
UNIT-3, Methods of Irrigation, Canals	**PERIODS**
Flow irrigation - its advantages and limitations ,Lift Irrigation – Tubewell, submersible and well irrigation advantages and disadvantages , Sprinkler irrigation conditions favourable and essential requirements for sprinkler irrigation, sprinkler system – classification and component parts 4.4 Drip irrigation, suitability of drip irrigation, layout, component parts, advantages, Factors to be considered in Canal Alignment. Functions/Purpose of various components of Canal. Classification of Canals and their functions, sketches of different canal crosssections Various types of canal lining - their related advantages and disadvantages, sketches of different lined canal X-sections, Breaches – Causes, Method to plug canal breaches and their control , Maintenance of lined and unlined canals.	**08**

DIPLOMA IN ENGINEERING

UNIT-4, Tubewell Irrigation	PERIODS
ntroduction, occurrence of ground water, location and command, advantages and disadvantages, comparison with canal irrigation,Tubewells, explanation of terms: water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers. Yield of a well and methods of determining yield of well ,Types of tubewells (cavity type, strainer type and slotted type) and their choice, Method of boring, installation of well assembly, development of well, pump selection and installation and maintenance , Water Harvesting Techniques: Need and requirement of various methods, Run-off from roof top and ground surface, construction of recharge pits and recharge wells and their maintenance.	08
UNIT-5, Dams, Canal Head Works and Regulatory Works	PERIODS
Classification of dams; earthen dams - types, causes of failure; cross-section of homogeneous, zoned and diaphragm type earthen dams, method of construction. Gravity dams – types, cross-sections of a dam, method of construction , Concept of small and micro dams , Concept of spillways and energy dissipators, Choice of location of Canal Head Works, definition, object, general layout, functions of different parts of head works. Difference between weir and barrage, Cross Drainage Works Functions and necessity Cross Drainage Works, Types of Cross Drainage Works: aqueduct, super passage, level crossing, inlet and outlet, Sketches of the above cross drainage works. Definitions of following Hydraulic Structures with Sketches Falls Cross and head regulators, Outlets , Canal Escapes.	08

RECOMMENDED BOOKS

- Irrigation Engineering and Hydraulics Structures by Garg, Santosh Kumar; Khanna Publishers, Delhi,
- Irrigation and Water Power Engineering by Punmia, BC and Pande Brij Bansi Lal; Standard Publishers Distributors, Delhi
- 3 Irrigation Engineering and Hydraulic Structures by Saharsabudhe SR
- 4 BIS Codes
- 5. Central Ground Water Board and Central Water Commission Guidelines and Reference Books.
- 6. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

DIPLOMA IN ENGINEERING

SOFTWARE APPLICATIONS IN CIVIL ENGINEERING

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COURSE OBJECTIVES

Computer applications play a very vital role in present day life, more so, in the professional life of engineer. In order to enable the students use the computers effectively in problem solving, this course offers applications of various computer software in Civil Engineering.

DETAILED CONTENTS

PRACTICAL EXERCISES

1. *Introduction and use of AutoCAD for making*
2. *2D Drawings and develop plan, section and elevation of a residential building*
3. *2 Demonstration of various Civil Engineering softwares like STAAD-Pro/Revit/MS Project Primavera Project Planner, Auto CIVIL or any other equivalent software*

   Note: i) Polytechnics may use any other software available with them for performing these exercises
   ii) If the above softwares are not available in the institution, demonstration of the above said software should be arranged outside the institute.

DIPLOMA IN ENGINEERING

REPAIR   AND   MAINTENANCE   OF BUILDINGS

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COURSE OBJECTIVES

One of the major concerns of a civil engineer is to take care of the building works, already constructed, in order to keep these buildings in utmost workable conditions. Usually, it is being felt that the buildings deteriorate faster for want of care and proper maintenance. The buildings usually have a shabby appearance due to cracks, leakage from the roofs and sanitary/water supply fittings. Thus, the need for teaching the subject in proper perspective has arisen making students aware of importance of maintenance of buildings.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- *State various factors causing deterioration to buildings*
- *Investigate/diagnose various defects in buildings*
- *Explain main causes of defects in buildings*
- *Select the materials for repair and maintenance of buildings*
- *Carry out repairs for various types of building defects*

DETAILED CONTENTS

UNIT-1, Need for Maintenance	PERIODS
Importance and significance of repair and maintenance of buildings , Meaning of maintenance , Objectives of maintenance , Factors influencing the repair and maintenance.	**08**
UNIT-2, Agencies Causing Deterioration (Sources, Causes, Effects)	**PERIODS**
Definition of deterioration/decay ,Factors causing deterioration, their classification .1 Human factors causing deterioration, 2Chemical factors causing deterioration ,3Environmental conditions causing deterioration ,4 Miscellaneous factors ,5Effects of various agencies of deterioration on various building materials i.e. bricks, timber, concrete, paints, metals, plastics, stones	**08**
UNIT-3, Investigation and Diagnosis of Defects	**PERIODS**
Systematic approach/procedure of investigation , Sequence of detailed steps for diagnosis of building defects/problems ,List non-destructive and others tests on structural elements and materials to evaluate the condition of the building and study of three most commonly used tests.	**08**
UNIT-4, Defects and their root causes, Materials for Repair, maintenance and protection	**PERIODS**
Define defects in buildings , Classification of defects , Main causes of building defects in various building elements .1 Foundations, basements and DPC,.2 Walls,.3 Column and Beams,..4 Roof and Terraces,.5 Joinery,.6 Decorative and protective finishes.7 Services ,8 Defects caused by dampness.	**08**
UNIT-5, Remedial Measures for Building Defects	**PERIODS**
Preventive maintenance considerations , Surface preparation techniques for repair , Crack repair methods , Epoxy injection , Grooving and sealing , Stitching, Adding reinforcement and grouting ,Flexible sealing by sealant, Repair of surface defects of concrete 6.4.1 Bug holes 6.4.2 Form tie holes 6.4.3 Honey comb and larger voids 6.5 Repair of corrosion in RCC elements 6.5.1 Steps in repairing 6.5.2 Prevention of corrosion in reinforcement 6.6 Material placement techniques with	**08**

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sketches 6.6.1 Pneumatically applied (The Gunite techniques) 6.6.2 Open top placement 6.6.3 Pouring from the top to repair bottom face 6.6.4 Birds mouth 6.6.5 Dry packing 6.6.6 Form and pump 6.6.7 Preplaced – aggregate concrete 6.6.8 Trowel applied method 6.7 Repair of DPC against Rising Dampness 6.7.1 Physical methods 6.7.2 Electrical methods 6.7.3 Chemical methods 6.8 Repair of walls 6.8.1 Repair of mortar joints against leakage 6.8.2 Efflorescence removal 6.9 Waterproofing of wet areas and roofs 6.9.1 Water proofing of wet areas 6.9.2 Water proofing of flat RCC roofs 6.9.3 Various water proofing systems and their characteristics 6.10 Repair of joints in buildings 6.10.1 Types of sealing joints with different types of sealants 6.10.2 Techniques for repair of joints 6.10.3 Repair of overhead and underground water tanks

INSTRUCTIONAL STRATEGY

This is very important course and efforts should be made to find damaged/defective work spots and students should be asked to think about rectifying/finding solution to the problem. Visits to work site, where repair and maintenance activities are in progress can be very useful to students. The students will also prepare a project report based upon the available water proofing materials, sealant, special concrete for repair and adhesives and other repair material available in the market.

RECOMMENDED BOOKS

1.Building Defects and Maintenance Management by Gahlot P.S. and Sanjay Sharma; CBS Publishers, New Delhi
2. Maintenance Engineering for Civil Engineers by Nayak, BS; Khanna Publishers, Delhi
3. Building Failures - Diagnosis and Avoidance by Ransom; WH Publishing
4. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

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