Study & Evaluation Scheme

of

Diploma in Engineering
(COMPUTER SCIENCE AND ENGINEERING)

[Applicable w.e.f. Academic Session 2024-25]

Approved by Academic Council

FUTURE UNIVERSITY

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

Study & Evaluation Scheme
of
Diploma in Engineering (COMPUTER SCIENCE AND ENGINEERING)

SUMMARY

Programme	:	Diploma in Engineering (COMPUTER SCIENCE AND 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

Computer Science and 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.	12	4			5	1			22
4.	16			3		3			22
5.	17					1	2		20
6.	13		4			1		2	20

Total Credit- 132

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Polytechnic (Diploma in Engineering), Semester I

							Evaluation Scheme					
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**

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Polytechnic (Diploma in Engineering), Semester II

							Evaluation Scheme					
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-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**

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Polytechnic (Diploma in Engineering), Semester III

							Evaluation Scheme					
SN	SubjectName	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.	Applied Mathematics-III	T	Minor Stream	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.	Internet and Web Technology	T	Major (Core)	2	1	-	20	10	30	70	100	3
5.	Data Structure Using C	T	Major (Core)	3	1	-	20	10	30	70	100	4
6.	Digital Electronics	T	Major (Core)	2	1	-	20	10	30	70	100	3
7.	Internet and Web Technology LAB	P	Major (Core)	-	-	2	-	20	20	30	50	1
8.	Data Structure Using C, LAB	P	Major (Core)	-	-	2	-	20	20	30	50	1
9.	General Proficiency	-	Value Added	-	-	2	-	50	50	-	50	1
	Total			**15**	**4**	**6**	**120**	**150**	**270**	**480**	**750**	**22**

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Polytechnic (Diploma in Engineering), Semester IV

							Evaluation Scheme					
SN	**SubjectName**	**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.	Data Base Management System	**T**	Major (Core)	2	1	-	20	10	**30**	**70**	**100**	**3**
2.	Object Orientation Programming Using Java	**T**	Major (Core)	3	1	-	20	10	**30**	**70**	**100**	**4**
3.	Operating System	**T**	Major (Core)	3	1	-	20	10	**30**	**70**	**100**	**4**
4.	AI For Engineering	**T**	Major (Core)	3	-	-	20	10	**30**	**70**	**100**	**3**
5.	Energy Conservation	**T**	Ability Enhancement	3	-	-	20	10	**30**	**70**	**100**	**3**
6.	Universal Human Values	**T**	Value Added	2	-	-	20	10	**30**	**70**	**100**	**2**
7.	Object Orientation Programming Using Java LAB	**P**	Major (Core)	-	-	2	-	20	**20**	**30**	**50**	**1**
8.	Data Base Management System LAB	**P**	Major (Core)	-	-	2	-	20	**20**	**30**	**50**	**1**
9.	General Proficiency	**-**	Value Added	-	-	2	-	50	**50**	**-**	**50**	**1**
	Total			**16**	**3**	**6**	**120**	**150**	**270**	**480**	**750**	**22**

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Polytechnic (Diploma in Engineering), Semester V

							Evaluation Scheme					
SN	**SubjectName**	**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.	Industrial Training	**T**	Summer Training	-	-	-	-	50	**50**	**-**	**50**	**2**
2.	Software Engineering	**T**	Major (Core)	2	-	-	20	10	**30**	**70**	**100**	**2**
3.	Web Development Using PHP	**T**	Major (Core)	2	-	-	20	10	**30**	**70**	**100**	**2**
4.	Computer Architecture and Hardware Maintenance	**T**	Major (Core)	2	1	-	20	10	**30**	**70**	**100**	**3**
5.	Internet of Things	**T**	Major (Core)	2	-	-	20	10	**30**	**70**	**100**	**2**
6.	Data Communication and Computer Network	**T**	Major (Core)	2	-	-	20	10	**30**	**70**	**100**	**2**
7.	Computer Programming Using Python	**T**	Major (Core)	2	-	-	20	10	**30**	**70**	**100**	**2**
8.	Computer Programming Using Python LAB	**P**	Major (Core)	-	-	2	-	20	**20**	**30**	**50**	**1**
9.	Web Development Using PHP LAB	**P**	Major (Core)	-	-	2	-	20	**20**	**30**	**50**	**1**
10.	Minor Project Work	**P**	Major (Core)	-		4	-	50	**50**	**-**	**50**	**2**
11.	General Proficiency	**-**	Value Added	-	-	2	-	50	**50**	**-**	**50**	**1**
	Total			**12**	**1**	**10**	**120**	**250**	**370**	**480**	**850**	**20**

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Polytechnic (Diploma in Engineering), Semester VI

							Evaluation Scheme					
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.	Development of Android Application	T	Major (Core)	2	1	-	20	10	**30**	**70**	**100**	**3**
2.	Cloud Computing	T	Major (Core)	2	1	-	20	10	**30**	**70**	**100**	**3**
3.	Industrial Management and Entrepreneurship Development	T	Major (Core)	3	-	-	20	10	**30**	**70**	**100**	**3**
4.	Advance Java*	T	Major (Core)	2	1	-	20	10	**30**	**70**	**100**	**3**
5.	E-Commerce and Digital Marketing	T	Multidisciplinary	2	-	-	20	10	**30**	**70**	**100**	**2**
6.	Environmental Studies	T	Multidisciplinary	2	-	-	20	10	**30**	**70**	**100**	**2**
7.	Development of Android Application LAB	P	Major (Core)	-	-	2	-	20	**20**	**30**	**50**	**1**
8.	Project Work	P	Project	-	-	4	-	50	**50**	**200**	**250**	**2**
9.	General Proficiency	-	Value Added	-	-	2	-	50	**50**	-	**50**	**1**
	Total			**13**	**3**	**8**	**120**	**180**	**300**	**650**	**950**	**20**

Note: - (*) Elective Subject

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 ofmultiple 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*,* $\log_e x$ *by definition. Differentiation of sum, product and quotientof 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 definitionof 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 theoremfor any index (expansion without proof); applications of Binomial theorem.

UNIT-V : Complex Numbers: ***(12 Periods)***

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
3	-	2

COURSE OBJECTIVES

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

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.

ENGINEERING WORKSHOP PRACTICE

L	*T*	*P*
-	-	4

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

L	*T*	*P*
3	1	-

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 - $\int_0^{\frac{\pi}{2}} \sin^n x\,dx$, $\int_0^{\frac{\pi}{2}} \cos^n x\,dx$, $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x\,dx$ *for solving problems ,where m and n are positive integers.*

Applications of integration for (i). Simple 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

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 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
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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.

APPLIED MATHEMATICS-III

L T P

3 1 0

COURSE OBJECTIVES

Contents of this course provide understanding of some elementary and advanced mathematics algorithms and their applications of solving engineering problems. Content of this course will enable students to use some advanced techniques like Beta-Gamma function, Fourier series, Laplace transform and probability distributions in solving complex engineering problems.

LEARNING OUTCOMES

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

- Understand matrix operations and uses of matrix in different problems.
- Apply elementary row and column operations in finding inverse of a matrix.
- Find Eigen values, Eigen vectors of matrix and their different properties.
- Understand degree/order of differential equations and their solution techniques.
- Use differential equations in engineering problems of different areas.
- Find Fourier series expansion of a function.
- Apply Laplace transform and their applications in solving engineering problems.
- Understand concept of probability distribution and their applications.

DETAILED CONTENTS

UNIT-1, MATRICES	PERIODS
Algebra of Matrices:- Addition, Multiplication of Matrices, Null Matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermition, Orthagonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix. Definition and Computation of inverse of a matrix. Elementary Row/Column Transformation: - Meaning and use in computing inverse and rank of a matrix. **Linear Dependence: -** Linear dependence/independence of vectors, Definition and computation of rank of matrix. Computing rank through determinants, Elementary row transformation and through the concept of a set of independent vectors, Consistency of equations.	**10**
UNIT-2, Differential Calculus	**PERIODS**
Function of two variables, identification of surfaces in space, conicoids. **Partial Differentiation:-** Directional derivative, Gradient, Use of gradient f, Partial derivatives, Chain rule, Higher order derivatives, Euler's theorem for homogeneous functions, Jacobians. **Vector Calculus: -** Vector function, Introduction to double and triple differential and integration of vector functions, gradient, divergence and curl, differential derivatives.	**08**
UNIT-3, Differential Equation	**PERIODS**
Formation, Order, Types, Solution: - Formation of differential equations through physical, geometrical, mechanical and electrical considerations, Order, Degree of differential equation, Linear, nonlinear equation.	**08**
UNIT-4, Integral Calculus	**PERIODS**
Beta and Gamma Functions: - Definition, Use, Relation between the two, their use in evaluating integrals. **Fourier Series: -** Fourier series of f(x),-n<x<n, Odd and even function, Half range series.	**08**

Laplace Transform:-Definition, Basic theorem and properties, Unit step and Periodic functions, inverse Laplace Transform, Solution of ordinary differential equations	
UNIT-5, Probability and Statistics	**PERIODS**
Probability: - Introduction, Addition and Multiplication theorem and simple problem.	**06**

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3. Applied Mathematics-III by Chauhan and Chauhan, Krishna Publications, Meerut.
4. Applied Mathematics-II by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut.
5. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

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**

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.

INTERNET AND WEB TECHNOLOGY

L T P

2 1 1

COURSE OBJECTIVES

The diploma holders in Computer Science and Engineering needs to understand about Internet, Web Space and how to develop static website.They should be able to develop basic static websites by using different front-end Technologies.

LEARNING OUTCOMES

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

- Understand working of Internet/ Websites, Client Server Model and Internet Tools.
- Understand and develop HTML Web pages.
- provide logics on the web pages by using JavaScript
- use Bootstrap to develop responsive website
- control the Look and feel of web pages by using CSS
- use jQuery for developing the Web Pages
- Develop Static webpage/web portal.

DETAILED CONTENTS

UNIT-1, Introduction	PERIODS
Internet, WWW, Browser, Search engine Client Server Model, URL, Web Pages, Website and Web Services, Types of Websites (Static, Dynamic and Responsive), Developer options of Browser (View page source, Developer Tools, Inspect Element etc) ,Need of cyber security & IT Laws.	**08**
UNIT-2, HTML	**PERIODS**
HTML Document, Basic Structure of HTML, Syntax, HTML Tags and Attributes, Types of HTML Tags, Rules of nesting, Basic Tags (HTML Tag. Head Tag, Title Tag, Body Tags). Div and Span tags. Html Headings, Formatting elements. Comments, Horizontal Lines Creating Lists: Ordered List, Unordered Lists, Definition Lists. Images, Text Links, Image Links, opening a page in New Window or Tab, Linking to an area of same page, Introduction to Table Tags, Advantages and limitations of tables, Frames &I Frame, HTML Forms, and XHTML.	**08**
UNIT-3, Cascading Style Sheets	**PERIODS**
Introduction, Benefits of CSS, CSS Syntax, CSS Implementation (inline, internal and external), CSS Selectors (ID Selectors, Class Selectors, Grouping Selectors, Universals electors, CSS Pseudo-classes), CSS properties (background-color, background-image, border-style, height, width, color, text-align, font-family, font-style, font-size, font weight), Box Model in CSS(margin, border, padding)	**08**
UNIT-4, Java Scripts	**PERIODS**
Java Script Introduction , variables , data types , operators, control flow (if-else, for loop , while loop , do-while loop) , Declaring Functions , Calling functions with parameters, Adding JavaScript to Web Documents, JavaScript Objects , Document Object Models, HTML Events and calling Java Script functions on Events.	**08**

UNIT-5, XML & JSON	PERIODS
Introduction and use of XML, Difference between XML and HTML, XML Elements, Attribute, Name space, Syntax Rules, XML DTD and XML Schema, RSS FEED, JSON Introduction and uses, JSON v/s XML, JSON Syntax.	**08**

LIST OF PRACTICALS

- Install, configure and start using developer tools /Code Editor/Browser
- Creating Web Pages using different HTML tags
- Control the look and feel of Web Page Styling by using CSS.
- Write JavaScript functions and control the different components of Web page by predefined JavaScript objects.
- Validation of Form fields using Java Script.
- Use jQuery library to apply different features on web pages.
- Use Bootstrap library and icons to develop a responsive websites

RECOMMENDED BOOKS

1. Head First HTML and CSS: A Learner's Guide to Creating Standards-Based Web Pages , O Reilly Publications by Elisabeth Robson Eric Freeman
2. Head First JavaScript Programming, O Reilly Publications by Eric FREEMAN
3. Head First jQuery, O Reilly by Ryan Benedetti, Ronan Cranley.
4. Web Technologies, Black Book, Kogent Learning Solutions Inc 5. Developing Web Applications, 2ed, Wiley Publications, M.T.Savaliya.
5. Mastering Bootstrap 4, by Benjamin Jacob's and Jason Marah, Packet Publishing
6. E-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR, Chandigarh.

DATA STRUCTURES USING C

L T P

3 1 1

COURSE OBJECTIVES

Data structures are the techniques of designing the basic algorithms for real-life projects. Understanding of data structures is essential and this facilitates the understanding of the language. The practice and assimilation of data structure techniques is essential for programming. The knowledge of 'C' language and data structures will be reinforced by practical exercises during the course of study. The course will help students to develop the capability of selecting a particular data structure.

LEARNING OUTCOMES

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

- Identify the problem and formulate an algorithm for it.
- Identify the best data structures to solve the problem
- Store data, process data using appropriate data structures
- Sort the data in ascending or descending order.
- Implement trees and various traversing techniques.
- Implement various searching and sorting algorithms and to compare them for checking efficiency.

DETAILED CONTENTS

UNIT-1, Fundamental Notations	**PERIODS**
Introduction to C Programming, Concept of data types, variables and constants, Concept of pointer variables and constants, Categories of Data structure. Concept Of Sorting and Searching	**08**
UNIT-2, Arrays	**PERIODS**
Concept of Arrays, Types Of Array, One -dimensional Array, Multi -dimensional Array, Storage representation of multi-dimensional arrays. Operations on arrays with Algorithms (searching, traversing, inserting, deleting)	**08**
UNIT-3, Linked Lists	**PERIODS**
Introduction to linked list, Representation of linked lists in Memory, Operations on linked list (Insertion, deletion and traversals), Application of linked lists, Doubly linked lists, Operations on doubly linked lists (Insertion, deletion and traversals).	**08**
UNIT-4, Stacks, Queues and Recursion	**PERIODS**
Introduction to stacks, Representation of stacks, Implementation of stacks, Applications of stacks, , Queues and Recursion, Implementation of queues, Circular Queues, De-queues, Application of Queues, Recursion	**08**
UNIT-5, Introduction To Non-Linear Data Structure	**PERIODS**

Tress: - Concept of Trees, Representation of Binary tree in memory, Traversing Binary Trees (Pre order, Post order and In order), Searching, inserting and deleting binary search trees, Introduction to Heap, Application of Trees. Graph: - Introduction to Graph, Basic Operation, Depth First Search, Breadth First Search.	**08**

LIST OF PRACTICALS

Write programs in C to implement:-

1. Addition of two matrices using functions
2. Multiplication of two matrices
3. Push and pop operation in stack
4. Inserting and deleting elements in queue
5. Inserting and deleting elements in circular queue
6. Insertion and deletion of elements in linked list
7. Insertion and deletion of elements in doubly linked list
8. Factorial of a given number with recursion and without recursion
9. Fibonacci series with recursion and without recursion
10. Program for pre-order, post order and in order traversal of binary tree.
11. The selection sort technique
12. The bubble sort technique
13. The quick sort technique
14. The merge sort technique
15. The binary search procedures to search an element in a given list
16. The linear search procedures to search an element in a given list

RECOMMENDED BOOKS

1. Data Structure using C by Robert Kruse; Prentice Hall of India
2. Data Structure through C by Yashwant Kanekar; BPB Publications
3. Data structures – Schaum's Outline Series by Lipschutz; McGraw Hill Education Pvt Ltd , New Delhi
4. Data Structure using C by ISRD Group ; Tata McGraw Hills Education Pvt Ltd , New Delhi
5. .Expert Data Structures with C by R.B. Patel ; Khanna Publishers, New Delhi.
6. Data Structures and Algorithm Using C by RS Salaria; Khanna Book Publishing Co. (P) Ltd. New Delhi
7. Data Structure through C in depth by SK Srivastava, Deepali Srivastava; BPB Publications
8. Data Structure through "C" Language by Sameeran Chattopadhyay, MatanginiChottopadhyay; BPB Publications
9. Data Structure through "C" Language by DOEACC; BPB Publications
10. Data Structure using "C" Lab Workbook by Shukla; BPB Publications
11. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

DIGITAL ELECTRONICS

L T P

2 1 0

COURSE OBJECTIVES

This course has been designed to make the students know about the fundamental principles of digital electronics and gain familiarity with the available IC chips. This subject aims to give a background in the broad field of digital systems design and microprocessors.

LEARNING OUTCOMES

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

- Explain the importance of digitization.
- Verify and interpret truth tables for all logic gates.
- Realize all logic functions with NAND and NOR gates
- Design and demonstrate adder and subtractor circuits
- Verify and interpret truth tables of multiplexer, demultiplexer, encoder and decoder ICs
- Design and realize different sequential circuit (Flip flops, counters and shift registers)
- Verify performance of different A/D and D/A converters.
- Explain the features and applications of different memories.

DETAILED CONTENTS

UNIT-1, Introduction	**PERIODS**
Distinction between analog and digital signal, Applications and advantages of digital signals	**06**
UNIT-2, Number System	**PERIODS**
Binary, octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa, Binary addition and subtraction including binary points. 1's and 2's complement method of addition/subtraction.	**08**
UNIT-3, Logic Gates and Families	**PERIODS**
Concept of negative and positive logic ,Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates, SSI, MSI, LSI, VLSI (Definition) ,Propagation delay, Noise Margin, Fan in, Fan out, Power dissipation, Comparison between TTL, CMOS, ECL, MOS on basis of diff parameter, Introduction to Bipolar logic, MOS, ECL, TTL and CMOS logic families, Basic logic gate using NMOS, PMOS, CMOS	**10**
UNIT-4, Heat Treatment	**PERIODS**
Purpose of heat treatment, solid solutions and its types. Formation and decomposition of Austenite, Martensitic Transformation-simplified Transformation Cooling Curves. Various heat treatment processes- Hardening, tempering, annealing, normalizing, Case hardening and surface Hardening, Hardenability of steels, Selection of case carburizing and induction of hardening steels. Types of heat treatment furnaces (only basis idea).	**06**
UNIT-5, Logic Simplification	**PERIODS**

Postulates of Boolean algebra, De Morgan's Theorems. Implementation of Boolean (logic) equation with gates , Karnaugh map (up to 4 variables) and simple application in developing combinational logic circuits	**06**

LIST OF PRACTICALS

1. Verification and interpretation of truth tables for AND, OR, NOT NAND, NOR and Exclusive OR (EXOR) and Exclusive NOR (EXNOR) gates
2. Realization of logic functions with the help of NAND or NOR gates
3. - Design of a half adder using XOR and NAND gates and verification of its operation - Construction of a full adder circuit using XOR and NAND gates and verify its operation
4. Verification of truth table for positive edge triggered, negative edge triggered, level triggered IC flip-flops (At least one IC each of D latch, D flip-flop, JK flip-flops).
1. 5 Verification of truth table for encoder and decoder ICs, Mux and DeMux
5. To design a 4 bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flops and verification of their operation.
6. To design a 4 bit ring counter and verify its operation.
7. Use of Asynchronous Counter ICs (7490 or 7493)

RECOMMENDED BOOKS

1. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
2. Digital Electronics by RP Jain, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi
4. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New DelhiE-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

DATABASE MANAGEMENT SYSTEM

L T P

2 1 1

COURSE OBJECTIVES

The diploma holders in Computer Science and Engineering need to understand about Relational Data base to manage the data at backend for different applications. They should be able to develop basic table and write query to fetch the required data.

LEARNING OUTCOMES

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

- understand the concept of Database system and Client Server Architecture
- Understand and develop the concepts of Data Modeling, Security and Integrity.
- convert and compare the designs and differentiate between the keys
- understand and execute different SQL queries and PL / SQL programs
- convert database in the form of table
- Normalize the database using normal forms.
- understand the concept of query processing and Transaction processing

DETAILED CONTENTS

UNIT-1, Database System Concept & Data Modeling	PERIODS
Basic concepts, Advantages of a DBMS over file processing system, Data Abstraction, Database Languages, Data Independence. , Components of a DBMS and overall structure of a DBMS. , Three views of Data (External View, Conceptual View, Internal View), Three level architecture of DBMS, Data Independence , Client Server Architecture.	**08**
UNIT-2, Data Model	**PERIODS**
Define data model, Data Models : Network Model Hierarchical Model, E-R Model, Advantage & Disadvantages of each Data Model ER Model: Entity sets and relationship sets- Attributes - Keys in entity and relationship sets: (a) Super Key (b) Candidate Key (c) Primary Key (e) Unique Key - Mapping constraints, Participation Constraint, E-R diagram, Notations. Strong Entity Set and Weak Entity Set	**08**
UNIT-3, Relation Model	**PERIODS**
Definition of Relations, Schema, Sub schema. Relational Model Constraints (Domain, Tuple Uniqueness, Key Constraints, Integrity Constraints, Entity constraints). Relations algebra (Basic operation: Union intersection difference and Cartesian product), Additional Relational Algebraic Operations (Projection, Selection rows, Division, rename and join), Converting ER Model to Relational Model.	**08**
UNIT-4, Relational Database Design	**PERIODS**
Purpose of Normalization, Data redundancy and updating anomalies, Functional Dependencies and Decomposition, Process of Normalization using 1NF, 2NF, 3NF, multivalve dependencies and BCNF , Forth Normal Form, Fifth Normal Form	**08**
UNIT-5, MYSQL/SQL	**PERIODS**

Data definition language, Data manipulation language, SQL, Object naming conventions, Object naming guidelines, Data types, Tables (Creating, Inserting, Updating and deleting tables and using constraints), Views, Indexes. SQL Command :- DESCRIBE, SELECT, WHERE CLAUSE, DISTINCT CLAUSE, ORDER BY,HAVING, LOGICAL OPERATIONS, SQL OPERATORS, JOIN	**08**

LIST OF PRACTICALS

STRUCTURED QUERY LANGUAGE

1. Creating Database

- Creating a database
- Creating a table
- Specifying relational data types
- Specifying constraints
- Creating indexes

2. Table and Record Handling

- INSERT statement
- Using SELECT and INSERT together
- DELETE, UPDATE, TRUNCATE Statement.
- DROP, ALTER statement

3. Retrieving Data from a Database

RECOMMENDED BOOKS

1. An Introduction to Database System - C. J. Date
2. Database System Concepts - A. Silberschatz, S. Sudarshan& H. F. Korth
3. Database Concepts and Systems - LvanBayroos/SPD
4. Fundamental of Database System - R. Elmashri& S. B. Navathee-books/etools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.

OBJECT ORIENTED PROGRAMMING USING JAVA

L T P

3 1 1

COURSE OBJECTIVES

Object orientation is a new approach to understand the complexities of the real world. In contrast to the earlier approaches like procedural etc, object orientation helps to formulate the problems in a better way giving high reliability, adaptability and extensibility to the applications. The students are already familiar with this concept of programming in C which is the basic for JAVA. This course offers the modern programming language JAVA that will help the students to implement the various concept of object orientation practically. The students will be able to program in the object oriented technology with the usage of JAVA.

LEARNING OUTCOMES

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

- Install Java IDE, Compiler, Java virtual machines
- Debug and compile the program written in Java.
- Explain and implement class programs.
- Explain and execute the language construct concepts.
- Explain and execute member functions.
- Explain the concepts of OOPS
- Describe and implement inheritance concepts.
- Explain and implement Polymorphism using Java program.
- Explain and implement the abstract class and interface.
- implement the exception handling in projects
- develop and understand multithreaded programs

DETAILED CONTENTS

UNIT-1, Introduction and Features	PERIODS
Fundamentals of object oriented programming – procedure oriented programming Vs. object oriented programming (OOP), Object oriented programming concepts – Classes, object, object reference, abstraction, encapsulation, inheritance, polymorphism, Introduction of eclipse (IDE) for developing programs in Java.	**08**
UNIT-2, Language Constructs	**PERIODS**
Variables, types and type declarations, data types : Integer, floating point type, character, Boolean, all Operators, iteration and jump statement, if then else clause; conditional expressions, input using scanner class and output statement, loops, switch case, arrays, methods.	**08**
UNIT-3, Classes and Objects	**PERIODS**
Class fundamentals, constructors, declaring objects (Object & Object Reference), creating and accessing variables and methods, static and non static variables/methods defining packages, Creating and accessing a package, Importing packages, Understanding CLASSPATH, auto boxing , String , String Buffer.	**08**
UNIT-4, Inheritance and Polymorphism	**PERIODS**
Definition of inheritance, protected data, private data, public data, constructor chaining, order of	**08**

invocation, types of inheritance, single inheritance, multilevel inheritance, hierarchical inheritance, hybrid inheritance , access control (Private Vs Public Vs Protected Vs Default). Definition of Polymorphism, Method and constructor overloading, method overriding, up-casting and down casting.	
UNIT-5, Exception Handling	**PERIODS**
Definition of exception handling, implementation of keywords like try, catches, finally, throw& throws, built in exceptions, creating own exception sub classes importance of exception handling in practical implementation of live projects.	**08**

LIST OF PRACTICALS

1. WAP to create a simple class to find out the area and perimeter of rectangle and box using super and this keyword.
2. WAP to design a class account using the inheritance and static that show all function of bank (withdrawal, deposit).
3. WAP to design a class using abstract methods and classes.
4. WAP to design a string class that perform string method (equal, reverse the string, change case).
5. Consider we have a Class of Cars under which Santro Xing, Alto and Wagon R represents individual Objects. In this context each Car Object will have its own, Model, Year of Manufacture, Color, Top Speed, etc. which form Properties of the Car class and the associated actions i.e., object functions like Create(), Sold(), display() form the Methods of Car Class.
6. In a software company Software Engineers, Sr. Software Engineers, Module Lead, Technical Lead, Project Lead, Project Manager, Program Manager, Directors all are the employees of the company but their work, perks, roles, responsibilities differs. Create the Employee base class would provide the common behaviors of all types of employee and also some behaviors properties that all employee must have for that company.

RECOMMENDED BOOKS

1. Programming with Java: A Primer; E. Balagurusamy.
2. Head First Java, O-REILLY, Kathy Sierra & Bert Bates.
3. OCA Java SE Programmer I Certification Guide, Wiley Publisher, Mala Gupta
4. PROGRAMMER'S GUIDE TO JAVA SE 8 , Pearson , Khalid E Mughal
5. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR

Websites for Reference: http://www.spoken-tutorial.org, http://swayam.gov.in

OPERATING SYSTEMS

L T P

3 1 0

COURSE OBJECTIVES

The course provides the students with an understanding of human computer interface existing in computer system and the basic concepts of operating system and its working. The students will also get hands-on experience and good working knowledge to work in windows and Linux environments. The aim is to gain proficiency in using various operating systems after undergoing this course. While imparting instructions, the teachers are expected to lay more emphasis on concepts and principles of operating systems, its features and practical utility.

LEARNING OUTCOMES

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

- Describe various types and services of operating system
- Identify the concept of process, various states in the process and their scheduling.
- Classify different types of schedulers and scheduling algorithms.
- Identify the significance of inter-process communication and synchronization.
- Describe deadlock and the various ways to recover from deadlock
- Identify memory management techniques
- Describe virtual memory and its underlying concepts.
- Describe the features and brief history of Linux
- Use General purpose commands and filters of Linux
- Use of shell scripts in Linux

DETAILED CONTENTS

UNIT-1, Overview of Operating Systems	**PERIODS**
Definition of Operating Systems, Types of Operating Systems, Operating System Services, and User operating system interface, System Calls, Types of System Calls, System Programs, Operating System Structure, Virtual Machine, Benefits of Virtual Machine. Introduction: Linux Operating System, Windows Operating System.	**08**
UNIT-2, Process Management (Principles and Brief Concept)	**PERIODS**
Process concept, Process State, Process Control Block, Scheduling Queues, Scheduler, Job Scheduler, Process Scheduler, Context Switch, Operations on Processes, Inter process Communication, Shared Memory Systems, Message Passing Systems, CPU Scheduler, Scheduling Criteria, Scheduling Algorithms, Preemptive and Non Preemptive, First come first serve (FCFS), Shortest Job first (SJF), Round Robin (RR), Multiprocessor scheduling, Process Synchronization.	**08**
UNIT-3, Deadlocks (Principles and Brief Concept)	**PERIODS**
Deadlock, Conditions for Dead lock, Methods for handling deadlocks, Dead Prevention, Deadlock Avoidance, Deadlock detection, Recovery from deadlock.	**08**
UNIT-4, Memory Management Function (Principles and Brief Concept)	**PERIODS**

Definition – Logical and Physical address Space, Swapping, Memory allocation, Contiguous Memory allocation, Fixed and variable partition, Internal and External fragmentation and Compacting, Paging – Principle of operation, Page allocation, Hardware support for paging, Protection and sharing, Disadvantages of paging, Segmentation, Virtual Memory.	**08**
UNIT-5, File Management (Principles and Brief Concept)	**PERIODS**
Types of File System; Simple file system, Basic file system, Logical file system, Physical file system, Various Methods of Allocating Disk Space.	**08**

LIST OF PRACTICALS

1. Demonstration of all the controls provided in windows control panel.
2. Exercise on Basics of windows.
3. Installation of Linux Operating System
4. Usage of directory management commands of Linux: ls, cd, pwd, mkdir, rmdir
5. Usage of File Management commands of Linux: cat, chmod,cp, mv, rm, pg, more, find
6. Use the general purpose commands of Linux: wc, od, lp, cal , date, who, whoami
7. Using the simple filters: pr, head, tail, cut, paste, nl, sort.
8. Communication Commands: news, write, talk, mseg, mail, and wall.

RECOMMENDED BOOKS

1. Operating System Concepts by Silberschatz, Galvin; Wiley Publication.
2. Operating Systems by Stallings; Tata McGraw Hill.
3. Operating Systems- A Concept Based Approach by DhamDhare; Tata McGraw Hill Education Pvt Ltd, New Delhi.
4. Operating Systems by Achyut S Godbole and AtulKahate; Tata McGraw Hill Education Pvt Ltd, New Delhi.
5. Unleashed Linux by Tech Media Publishers, New Delhi.
6. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

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.

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**

& 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.

UNIVERSAL HUMAN VALUES

L T P

2 0 0

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**

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.

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.

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 organized 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%

SOFTWARE ENGINEERING

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COURSE OBJECTIVES

The system analysis and design is the backbone of Application software development. After studying the subject the students will be able to develop and design the system according to given requirements. It involves various steps in analysis and design of the system. It includes the knowledge of preparing project systematically. It is important to know about various aspects of the system analysis and design so that the students will be able to understand the responsibilities while designing and implementing the project.

LEARNING OUTCOMES

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

- Understanding the problem and corresponding requirement for development of software.
- Describe the various phases of the system development life cycle.
- Identify the expected benefits and scope of the projects.
- Prepare and develop data flow diagrams and decision tables.
- Perform a feasibility study of the system.
- Write detailed design specifications for programmes and database.
- Select methods for evaluating the effectiveness and efficiency of a system.
- Apply different testing techniques on simple programme.

DETAILED CONTENTS

UNIT-1, Introduction to Software Engineering	**PERIODS**
System Concepts: Types of systems: (open, closed, static and dynamic systems). Introduction, Programs v/s Software Products Emergence of Software Engineering- Early Computer Programming, High-level Language Programming, Control flow based Design, Data Structure Oriented Design, Object Oriented Design	**08**
UNIT-2, Software Life Cycle Models	**PERIODS**
Requirement of Life Cycle Model, Classic Waterfall Model, Prototyping Model, Evolutionary Model, Spiral Model, introduction to agile methodology. Comparison of different Life Cycle Models	**08**
UNIT-3, Requirement Analysis and Specification	**PERIODS**
Requirement gathering and Analysis, Software Requirement Specifications(SRS), Characteristics of good SRS	**08**
UNIT-4, Software Design and Implementation	**PERIODS**
Characteristics and features of good Software Design Cohesion and Coupling, Software design Approaches- Function Oriented Design (Data flow diagrams, Data dictionary, Decision Trees and tables), Object Oriented Design, Structured Coding Techniques, Coding Styles, and documentation).	**08**
UNIT-5, Software Testing	**PERIODS**

Concept of Testing, Testing type cycle (V-Model), Verification v/s Validations, Unit Testing, Black Box Testing, White Box Testing, Integration testing, System testing, Configuration management, Overview of test cases	**08**

LIST OF PRACTICALS

- Develop a SRS on a given topic/project/problem.
- Develop DFD Model (level 0 and level 1 DFD) of the problem.
- Develop sequence diagram.
- Develop class diagrams.
- Use testing tools such as J-meter, Canoo Web Test.
- Use a project management tool such as Microsoft project or Gantt project etc (Team week, Target process, Gantt project)
- Write test cases for any known application.
- Take any system and study its system specification and report the various bugs.

RECOMMENDED BOOKS

1. Software Engineering by Rajib Mall, PHI Publishers, New Delhi.
2. An Integrated Approach to Software Engineering by Pankaj Jalote, Narosa Publishing House Pvt Ltd, Darya Ganj, New Delhi 110002.
3. Software Engineering, Sangeeta Sabharwal, New Age International, Delhi.
4. Software Engineering by KK Aggarwal and Yogesh Singh.
5. Software Engineering – A Practitioner's Approach by RS Pressman, Tata McGraw Hill Publishers, New Delhi.

WEB DEVELOPMENT USING PHP

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2 1 1

COURSE OBJECTIVES

This course will enable the students to understand and develop competency amongst the students to design professional database backed dynamic and feature based web sites. The course covers the use of programming with PHP and the concepts of database with MySQL. Students will be introduced to popular web application frameworks for building scalable web applications. The main objective for this course is to motivate student's interest in learning Web-app development by giving them an insight into its possibilities through practical applications. In addition, the course also provides a sufficiently broad but practical introduction to Server-side web technologies.

LEARNING OUTCOMES

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

- perform various logical operations in PHP
- create simple programmes to validate forms in PHP
- perform database connectivity using PHP
- apply the basic concepts, principles and practices of Web-site development using serverside technologies (PHP &MySQL)
- install Word Press
- create and manage Blogs, Websites using Word Press

DETAILED CONTENTS

UNIT-1, PHP Introduction	PERIODS
Introduction to PHP: How PHP Works , The php.ini File, Basic PHP Syntax, PHP variables, statements, operators, decision making, loops, arrays, strings, PHP OOPs concept, PHP forms (form handling , validation) , get and post methods, functions. Introduction to cookies, storage of cookies at client side, Using information of cookies. Creating single or multiple server side sessions. Timeout in sessions.	**08**
UNIT-2, PHP and MySQL	**PERIODS**
Introduction to MySQL, connecting to MySQL, database, creation, insertion, deletion and retrieval of MySQL data using PHP.	**08**
UNIT-3, AJAX Introduction	**PERIODS**
AJAX Introduction, XMLHttp, Request object, server response, AJAX events, Validation, Interaction with API.	**08**
UNIT-4, .Word Press (CMS)	**PERIODS**
Word Press Basics: Introduction to content management systems based on PHP, Introduction to Word Press, How Word Press Works, and Installation of Word Press. **Customizing Site Appearance and Themes:** Developing a Color Scheme, Designing Headers, CSS Horizontal Menus, Dynamic Menu Highlighting, Navigation Links, Next and Previous Links, Styling for Print, Designing Your Post Meta Data Section, Separating Categories in your Post Meta Data Section, Customizing the Read More, Formatting Date and Time, Finding CSS Styles, Creating Individual Pages, Uploading Files	**08**

using Word Press Themes, Templates, Template Tags, Template Hierarchy, Validating a Website, Know Your Sources, Word Press Site Maintenance	
UNIT-5, .Blogging	**PERIODS**
Introduction to Blogging, Creating Blogs, Using Images, Wrapping Text Around Images, Comments, Post Formats, Linking to Posts, Pages, and Categories, Using Smilies, Links Manager, Word Press Feeds, Using Password Protection,	**08**

LIST OF PRACTICALS

1. Design PHP based web pages using correct PHP, CSS, and XHTML syntax, structure.
2. Create Web forms and pages that properly use HTTP GET and POST protocol as appropriate.
3. Design SQL languages within MySQL and PHP to access and manipulate databases.
4. Install and configure both PHP and MySQL.
1. 5 Create PHP codes that utilize the commonly used API library functions built in to PHP.
5. Design and create a complete web site that demonstrates good PHP/MySQL client/server design using Ajax.
6. To store a cookie using PHP on client side.
7. To save the user session on server side.
8. Design website using Word Press.
9. Creation of basic Blogging website.

RECOMMENDED BOOKS

1. Head First PHP &MySQL , O'Reilly Media, Inc , Michael Morrison, Lynn Beighley
2. Sams Teach Yourself PHP, MySQL, and Apache All in One" by Julie C. Meloni, Publisher: SAMS ,ISBN 0-672-32976-X
3. Web enabled development application by Ivan Byross: Commercial; TMH
4. PHP: The Complete Reference , by Steven HolznerMcgraw Higher Ed
5. PHP and MySQL Web Development , by Luke Welling , Pearson Education india
6. WordPress 3.5 Complete ,Packt Publishing , by karolkrol , Aaron hodge Silver
7. WordPress Web Application Development ,Packt Publishing
8. Professional WordPress: Design and Development, by Brad Williams, David Damstra, and Hal Stern, Wrox Publication
9. Building Web Apps with WordPress: WordPress as an Application Framework , by Brian Messenlehner and Jason Coleman , O'Reilly Media
10. E-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.

COMPUTER ARCHITECTURE AND HARDWARE MAINTENANCE

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2 1 0

COURSE OBJECTIVES

The subject provides the students with the knowledge of detailed organization of currently available personal computers in order to understand their functioning .The students will also get familiar with Architecture of multi processor systems.

LEARNING OUTCOMES

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

- Use CPU, register and stack.
- Compare micro programmed and hardwired control.
- Compare RISC and CISC architecture.
- Understand memory hierarchy and memory types.
- Explain the function of BIOS.
- Illustrate multi processor systems.
- Set-up, diagnose problems troubleshoot & Maintained the computer components.

DETAILED CONTENTS

UNIT-1, Hardware Organization of computer system	**PERIODS**
CPU Organization: general register organization, stack organization, instruction formats (three address two addresses, one address, zero address and RISC instruction). Addressing modes: Immediate, register, direct, in direct, relative, indexed.CPU Design: Micro programmed vs hard wired control. Reduced instruction set computers: CISC characteristics, RISC characteristics, and their comparison.	**08**
UNIT-2, Memory Organization	**PERIODS**
Memory Hierarchy, RAM and ROM chips, Memory address map, Memory connections to CPU, Auxiliary Memory: Magnetic disks and magnetic tapes, Associative memory , Cache memory, Virtual memory , Memory management hardware, Read and Write operation	**08**
UNIT-3, Arithmetic Operations	**PERIODS**
Introduction, Addition, Subtraction, Multiplication and Division algorithm.	**08**
UNIT-4, I/O Organization	**PERIODS**
Basis Input output system (BIOS), Function of BIOS, Testing and initialization, Configuring the system, Modes of Data Transfer, Programmed I/O: Synchronous, asynchronous and interrupt initiated. , DMA data transfer.	**08**
UNIT-5, 8085 Microprocessor	**PERIODS**

8085 Microprocessor: Introduction, Architecture, Pin diagram, Comparison with 8086.	**08**

LIST OF PRACTICAL

1. Install the Android Studio and Setup the Development Environment
2. Write a program to demonstrate activity (Application Life Cycle)
3. Write a program to demonstrate different types of layouts
4. Write a program to demonstrate list view
5. Write a program to demonstrate photo gallery
6. Write a program to demonstrate Date picker and time picker
7. Develop a simple application with context menu and option menu.
8. Develop a sample Android application having navigation items similar to Gmail Application.
9. Write a program to create a text file in a external memory.
10. Write a program to store and fetch data from SQL life database.

RECOMMENDED BOOKS

1. Beginning Android 4 Application Development by Wei-Meng Lee; Wiley India.
2. Android Apps for Absolute Beginners by Jackson; Apress.
3. Head First Android Development: A Brain-Friendly Guide, by David Griffiths and Dawn Griffiths, O`Relilly.
4. Android Programming for Beginners, by John Horton, Packet Publishing.

INTERNET OF THINGS

L T P

2 0 0

COURSE OBJECTIVES

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT. IoT cuts across different application domain like agriculture, space, healthcare, manufacturing, construction, water, and mining. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to learn the fundamentals of this emerging technology. This introductory syllabus will enable learners to leverage their business and/or technical knowledge across IoT-related functions in the workplace.

LEARNING OUTCOMES

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

- Understand the concepts of Internet of Things.
- Understand what constitutes an IoT design solution.
- Identify the sensors and other devices needed for different IoT solutions.
- Understand the component parts of an IoT network and its connections.
- Build small IoT applications.

DETAILED CONTENTS

UNIT-1, Introduction to Internet Of Things (IoT)	PERIODS
Introduction to IoT, Defining IoT, Things in IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, IoT Protocols, IoT communication Models, IoT communication API's, IoT enabling Technologies.	**08**
UNIT-2, IoT Devices	**PERIODS**
How electronic devices fit with the Internet of Things, and why they are important: Breadboard and its internal connections, LED and its connections, Tri-color LED, Resistor Introduction to the many 'end devices', sensors and actuators, differentiate between different sensor types.	**08**
UNIT-3, IoT Networks	**PERIODS**
Introduction to the components of basic IoT networks, the types of network connections and how data travels through them, and the role of Internet Protocols. Understanding of microcontrollers/Arduino and communication protocols.	**08**
UNIT-4, Ardunino device	**PERIODS**
Purpose of heat treatment, solid solutions and its types. Formation and decomposition of Austenite, Martensitic Transformation-simplified Transformation Cooling Curves. Various heat treatment processes- Hardening, tempering, annealing, normalizing, Case hardening and surface Hardening, Hardenability of steels, Selection of case carburizing and induction of hardening steels. Types of heat treatment furnaces (only basis idea).	**08**

UNIT-5, IoT and M2M	PERIODS
Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software defined networking, network function virtualization, IoT and WoT.	**08**

LIST OF PRACTICALS

1. Installation of Arduino IDE
2. Interfacing Light Emitting Diode (LED) - Blinking LED
3. Interfacing Button and LED – LED blinking when button is pressed.
4. Interfacing Light Dependent Resistor (LDR) and LED, displaying automatic night lamp
5. Interfacing Temperature Sensor (LM35) and/or humidity sensor (e.g. DHT11)
6. Interfacing Liquid Crystal Display (LCD) – display data generated by sensor on LCD
7. Interfacing Air Quality Sensor-pollution (e.g. MQ135) - display data on LCD: switch on LED when data sensed is higher than specified value
8. . Interfacing Bluetooth module (e.g. HC05) - receiving data from mobile phone on Arduino and display on LCD
9. . Interfacing Relay module to demonstrate Bluetooth based home automation application. (Using Bluetooth and relay).

RECOMMENDED BOOKS

1. The Internet of Things: Connecting Objects to the Web,Wiley PublisherHakimaChaouchi
2. Internet of Things: A Hands On Approach, University Press,VijayMadisetti, ArshdeepBahga.
3. Internet Of Things (IOT) Experiments,BPB Publications YashavantKanetkar
4. Arduino Projects for Engineers, BPB Publications, Neerparaj Rai
5. Internet of Things – Hands on Approach, By ArshdeepBahga and Vijay Madisetti Universities Press, ISBN: 9788173719547
6. The Internet of Things, Pearson, By Michael Miller ISBN: 9789332552456E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

DATA COMMUNICATION AND COMPUTER NETWORKS

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2 0 0

COURSE OBJECTIVES

The future of computer technology is in Data Communication and Computer Networks. Global connectivity can be achieved through computer networks. A diploma holder in Computer Science and Engineering should therefore understand the function of networks and get exposure to different existing and upcoming communication technologies. Knowledge about hardware and software requirements of networks is essential.

LEARNING OUTCOMES

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

- know about signal types, transmission media
- know about different communication methodologies
- setup computer networks
- setup basic wireless network
- diagnose & solve network problems
- diagnose & solve network problems remotely
- provide security to networks
- manage & handle wan
- prevent external network attacks
- Identify network troubleshooting methods.

DETAILED CONTENTS

UNIT-1, Introduction to Data Communication	**PERIODS**
Basics of the Communications, Direction of the Data flow (simplex, half-duplex, full-duplex), Network Topologies, signals and transmission (analog and digital), Transmission media (guided and unguided), Concept of digital signals, Bit rate, Bit length, Transmission impairment (attenuation, distortion, noise).	**08**
UNIT-2, Communication Methodologies	**PERIODS**
Need for modulation in communication system, Concepts AM, FM, PM, FSK, TSK, PCM (No Mathematical model), Concept of bandwidth and channel capacity of different communication systems such as radio, microwave etc., Multiplexing techniques (TDM, FDM, WDM, CDMA).	**08**
UNIT-3, Networks Basics	**PERIODS**
Concept of network , Models of network computing ,Networking models , Peer-to –peer Network, Client-Server Network , LAN, MAN and WAN , Network Services ,Switching Techniques	**08**
UNIT-4, Networking Models	**PERIODS**
OSI model: Definition, Layered Architecture Functions of various layers, TCP/IP Model: Definition, Functions of various layers, Comparison between OSI and TCP/IP model.	**08**
UNIT-5, TCP/IP Addressing	**PERIODS**
Concept of physical and logical addressing, IPV4 addresses – Address space, Notations, IPV6 addresses – Address space, Notations, Comparison between IPV4 and IPV6.	**08**

LIST OF PRACTICALS

1. Recognize the physical topology and cabling (coaxial, OFC, UTP, STP) of a network.
2. Recognition and use of various types of connectors RJ-45, RJ-11, BNC and SCST.
3. Making of cross cable and straight cable.
4. Install and configure a network interface card in a workstation.
5. Sharing of Hardware resources in the network.

RECOMMENDED BOOKS

1. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi.
2. Data Communications and Networking by Frozen, (Edition 2nd and 4th), Tata McGraw Hill Education Pvt Ltd, New Delhi.
3. Data and Computer Communication by William Stallings, Pearson Education, New Delhi.
4. Computer Network and Communications By V.K. Jain and Narija Bajaj, Cyber Tech Publications, New Delhi.

COMPUTER PROGRAMMING USING PYTHON

L T P

2 0 1

COURSE OBJECTIVES

This course introduces to the students the Python language. Upon completion of this course, the student will be able to write non trivial Python programs dealing with a wide variety of subject matter domains. Topics include language components, the IDLE/IDE environment, control flow constructs, strings, I/O, collections, classes, modules, and regular expressions.

LEARNING OUTCOMES

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

- execute Python code in a variety of environments
- use correct Python syntax in Python programs
- use the correct Python control flow construct
- write Python programs using various collection data types
- write home grown Python functions
- use standard Python modules such as os, sys, math, and time
- trap various errors via the Python Exception Handling model
- use the IO model in Python to read and write disk files
- create their own classes and use existing Python classes.
- understand and use the Object Oriented paradigm in Python programs
- use the Python Regular Expression capabilities for data verification

DETAILED CONTENTS

UNIT-1, Introduction	**PERIODS**
Brief History of Python, Python Versions , Installing Python , Environment Variables , Executing Python from the Command Line ,IDLE ,Editing Python Files, Python Documentation , Getting Help , Dynamic Types , Python Reserved Words , Naming Conventions.	**08**
UNIT-2, Basic Python Syntax	**PERIODS**
Basic Syntax ,Comments ,String Values ,String Methods ,The format Method ,String Operators , Numeric Data Types , Conversion Functions , Simple Output , Simple Input , The % Method , The print Function.	**08**
UNIT-3, Language Components	**PERIODS**
Indenting Requirements, if Statement, Relational and Logical Operators, Bit Wise Operators, The while Loop, break and continue, for Loop. **Collections:** Introduction, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections, Summary. **Functions:** Introduction, Defining Your Own Functions, Parameters, Function Documentation , Keyword and Optional Parameters ,Passing Collections to a Function ,Variable Number of Arguments, Scope , Functions - "First Class Citizens" ,Passing Functions to a Function , map , filter , Mapping Functions in a Dictionary , Lambda , Inner Functions , Closures.	**08**
UNIT-4, Classes in Python	**PERIODS**
Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, File Organization, Special Methods, Class Variables, Inheritance, Polymorphism.	**08**

UNIT-5, Exceptions Handling	PERIODS
Errors, Runtime Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions, Raise, assert.	08

LIST OF PRACTICALS

1. Getting started with Python and IDLE in interactive and batch modes
2. What do the following string methods do?
   Lower • count • replace
3. Write instructions to perform each of the steps below
   a. Create a string containing at least five words and store it in a variable.
   b. Print out the string.
   c. Convert the string to a list of words using the string split method.
   d. Sort the list into reverse alphabetical order using some of the list methods (you might need to use dir (list) or help (list) to find appropriate methods).
   e. Print out the sorted, reversed list of words.
4. Write a program that determines whether the number is prime.
   What is your favorite number? 24
   24 is not prime
   What is your favorite number? 31
   31 is prime
5. Find all numbers which are multiple of 17, but not the multiple of 5, between 2000 and 2500?
6. Swap two integer numbers using a temporary variable. Repeat the exercise using the code format: a, b = b, a. Verify your results in both the cases.
7. Find the largest of n numbers, using a user defined function largest ().
8. Write a function myReverse () which receives a string as an input and returns the reverse of the string.
9. Check if a given string is palindrome or not.

RECOMMENDED BOOKS

1. Learning Python by Mark Lutz; Pratham Books, Bangalore
2. Foundations of Python Network Programming by John Goerzen and BrandeuRhodes; Apress-eBook distributed by Springer Science and Business Media, New York
3. Dive into Python by Mark Pilgrim; Pratham Books, Bangalore
4. Think Python by Allen B. Downey; O'Reily Media
5. Python Programming For Beginners: A Must Read Introduction to Python Programming by Robert Richards; Pratham Books, Bangalore
6. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh..

DEVELOPMENT OF ANDROID APPLICATIONS

L T P

2 1 1

COURSE OBJECTIVES

Knowing the details of Mobile and their working principle are need of the every common man. Mobile Application development is the very hot business domain. Majority of the corporate have a separate division for the development of mobile applications. It is essential that diploma students must know the way to apply advanced data communicating methods and networking protocols for wireless and mobile devices.

LEARNING OUTCOMES

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

- Illustrate the usage of different components of Android OS in detail
- Develop a mobile application using different components of Android
- Choose appropriate controls to design the GUI to meet desired needs
- Consume JSON data and call web services from Android mobile app.
- Write a program in Android to store data in databases
- Develop Mobile applications using Android.

DETAILED CONTENTS

UNIT-1, Introduction to ANDROID	**PERIODS**
What is Android? Dalvik Virtual Machine & .apk file extension, Fundamentals: Basic Building blocks - Activities, Services, Broadcast Receivers & Content providers, UI Components - Views & notifications, Components for communication -Intents & Intent Filters, Android API levels (versions & version names)	**08**
UNIT-2, Environment Setup and Basic Project Structure	**PERIODS**
Setting up development environment Android, Manifest.xml, Gradle, Uses-permission & uses-sdk, Resources & R.java, Assets, Layouts & Drawable Resources, First sample Application, Launching emulator, Editing emulator settings, Emulator shortcuts, Logcat usage, Introduction to DDMS, Hello World App, Creating your first project The manifest file Layout resource, Running your app on Emulator, Debugging the Android App.	**08**
UNIT-3, Android Fundaments and User Interface Design	**PERIODS**
Activities and Activity lifecycle, Permission System **Basic UI Components:** Text View, Button, Radio Button , Edit Text, Image View for image, Check Box , Progress Bar, Event Handling in Android **Layouts:** Liner Layout, Relative Layout, Frame Layout, Coordinate Layout, [dip, dp, sip, sp] versus px **Intents:** Intents introduction and importance, Types of Intents (Explicit Intents, Implicit intents)	**08**
UNIT-4, Advanced UI Components	**PERIODS**
Introduction to Menus, Types of Menus (Option menu, Context menu), Uses of Shared Preferences. Time and Date, List View, Grid View, Card View, recycler view Adaptors (Base Adaptor, Array Adaptor) & View Holder, Dialogs, Toast, Popup, Fragments, Material Design(Introduction , Navigation, Floating Button , Tool bar).	**08**

UNIT-5, Threads in Android	PERIODS
Threads running on UI thread (run on UI Thread), Worker thread, Handlers & runnable, AsynTask, calling web services and consuming JSON data from Web Services.	08

LIST OF PRACTICAL

1. Install the Android Studio and Setup the Development Environment
2. Write a program to demonstrate activity (Application Life Cycle)
3. Write a program to demonstrate different types of layouts
4. Write a program to implement simple calculator using text view, edit view, option button and button 5. Write a program to develop app having multiple activities and user should be able switch between the activities by using intents.
5. Write a program to demonstrate list view
6. Write a program to demonstrate photo gallery
7. Write a program to demonstrate Date picker and time picker
8. Develop a simple application with context menu and option menu.
9. Write a program to demonstrate the functionality of Shared Preferences.
10. Develop a sample Android application having navigation items similar to Gmail Application.
11. Write a program to demonstrate a service.
12. Write a program to demonstrate the application of intent class.
13. Write a program to create a text file in a external memory.
14. Write a program to store and fetch data from SQL life database.

RECOMMENDED BOOKS

1. Beginning Android 4 Application Development by Wei-Meng Lee; Wiley India.
2. Android Apps for Absolute Beginners by Jackson; Apress.
3. Head First Android Development: A Brain-Friendly Guide, by David Griffiths and Dawn Griffiths, O`Relilly.
4. Android Programming for Beginners, by John Horton, Packet Publishing.

CLOUD COMPUTING

L T P

2 1 0

COURSE OBJECTIVES

This course offers a good understanding of cloud computing concepts and challenges faced in implementation of cloud computing.

LEARNING OUTCOMES

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

- Explain core concepts of cloud computing paradigm.
- Explain various Service Models
- Explain various Deployment Models.
- Describe SLA management in Cloud Computing
- Explain and apply the concept of virtualization.
- Describe the scheduling of tasks in cloud.
- Illustrate the fundamental concepts of cloud storage.
- Describe various security issues in the cloud.
- Make use of cloud.

DETAILED CONTENTS

UNIT-1, Introduction	**PERIODS**
Evolution of Cloud Computing, Cloud Computing Overview, Characteristics, Applications, Benefits, Challenges.	**08**
UNIT-2, Service and Deployment Models	**PERIODS**
Cloud Computing Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service; Cloud Computing Deployment Models: Private Cloud; Public Cloud, Community Cloud, Hybrid Cloud, Major Cloud Service providers.	**08**
UNIT-3, Service Level Agreement (SLA) Management	**PERIODS**
Overview of SLA, Types of SLA, SLA Life Cycle, SLA Management Process. Overview of Virtualization, Types of Virtualization, Benefits of Virtualization, Hypervisors.	**08**
UNIT-4, Cloud Storage and Security	**PERIODS**
Overview; Storage as a Service, Benefits and Challenges, Storage Area Networks (SANs). Infrastructure Security, Data Security & Privacy Issues, Legal Issues in Cloud Computing.	**08**
UNIT-5, Scheduling in Cloud	**PERIODS**

Overview of Scheduling problem, Different types of scheduling, Scheduling for independent and dependent tasks, Static vs. Dynamic scheduling.	**08**

LIST OF PRACTICALS

1. Introduction to Cloud Vendors: Amazon, Microsoft, IBM.
2. Setting up Virtualization using Virtual box/VMware Hypervisor.
3. Introduction to Own Cloud.
4. Installation and configuration of Own Cloud software for SaaS.
5. Accessing Microsoft AZURE cloud-services.
6. Cloud Simulation Software Introduction: Clouds.

RECOMMENDED BOOKS

1. Rajkumar Buyya, James Broberg, Andrzej Goscinski (Editors): Cloud Computing: Principles and Paradigms, Wiley, 2011
2. Kumar Saurabh, Cloud Computing, Wiley, 2012.
3. Barrie Sosinsky: Cloud Computing Bible, Wiley, 2011.
4. Judith Hurwitz, Robin Bloor, Marcia Kaufman,Fern Halper: Cloud Computing for Dummies, Wiley, 2010
5. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

INDUSTRIAL MANAGEMENT AND ENTREPRENERSHIP DEVELOPMENT

L T P

3 0 0

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

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.

ADVANCED JAVA

L T P

2 1 0

COURSE OBJECTIVES

The diploma holders in Computer Science and Engineering need to understand how server side programming can be done using Java/J2EE Technology They should be able to connect the middle layer to backend and frontend by server side programming Hence this subject is introduced in the curriculum.

LEARNING OUTCOMES

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

- Understand Server Side Architecture of Web Applications
- Connect to Database and do the CRUD Database operations using JDBC
- Develop Web Application by using Servlets and JSP
- Manage Session in the web application
- Understand Ajax Concept and uses

DETAILED CONTENTS

UNIT-1, Introduction Server Side Platform	**PERIODS**
Introduction to Web Applications, Dynamic websites, Three Layer Architecture of Web Application , Client Server Architecture , IP Address, Port, URL. Web Server, Introduction to Tomcat Web Server (Installation and its Services), and Introduction to J2EE.	**08**
UNIT-2, Database Programming using JDBC	**PERIODS**
Introduction to JDBC, JDBC Drivers & Architecture, JDBC API CURD operation Using JDBC API: Database Connection, JDBC Statement, Prepared Statements (Advantages and Disadvantages), Using Result Sets.	**08**
UNIT-3, Java Servlets	**PERIODS**
Servlet introduction, working of Servlet, advantage of servlet, servlet terminology, Servlet Container, Life cycle of a servlet, introduction to servlet API, Servlet interface, Generics Servlet class, Http servlet class, Request Dispatcher (include() and forward).	**08**
UNIT-4, Handling Sessions in Servlets	**PERIODS**
Introduction to Session, Session Tracking mechanism: URL rewriting, Hidden form fields, Cookies and Http Session (Working, Advantages and Disadvantages of all session tracking mechanism)).	**08**
UNIT-5, JSP	**PERIODS**
Introduction to JSP - Architecture, JSP- Life cycle, JSP-syntax, JSP-Directive, JSPActions, JSP-Implicit objects, JSP - Client request, JSP - Server response, JSP integration with database, JSP Session.	**08**

LIST OF PRACTICALS

1. Exercises related to make JDBC connections and CRUD operations on database by using JDBC APIs.
2. Installation and configuration of Web Server Tomcat.
3. Exercises related to Java Servlets.
4. Exercises related to JSP.
5. Exercises related to AJAX.
6. Exercises related to Session and Cookies.

RECOMMENDED BOOKS

1. Head First Servlets And JSP, Bert Bates, O' Reilly
2. Java Server Programming Java EE 7 (J2EE 1.7), Black Book, Cogent Learning Solutions Inc.
3. Jdbc, Servlets, And Jsp Black Book, Santos Kumar KDT Editorial Services , Wiley
4. J2EE: The Complete Reference, Jim Keogh, McGraw Hill Education
5. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

E-COMMERCE AND DIGITAL MARKETING

L T P

2 0 0

COURSE OBJECTIVES

The course is designed to help you master the essential disciplines in digital marketing, including search engine optimization (SEO), social media, conversion optimization, web analytics, content marketing, email and mobile marketing. Digital marketing is one of the world's fastest growing disciplines.

LEARNING OUTCOMES

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

- Understand concepts of E-Commerce.
- Identify core concepts of digital marketing and the role of digital marketing in business.
- Develop marketing strategies based on product, price, place and promotion objectives.
- understand how they can use digital marketing to increase sales and grow their business
- Analyze marketing problems and provide solutions based on a critical examination of marketing information.
- Understand the opportunities for deploying emerging digital marketing media and techniques. • implement online campaigns for your business and marketing problems within the organization by learning AdWords Campaign Management

DETAILED CONTENTS

UNIT-1, Introduction	PERIODS
Electronics Commerce, advantages and disadvantages. E-Commerce Business model B2B, B2C, C2C, E-Governance. Four C's (Convergence, collaborative, computer content management and call center), Supply Chain Management.	06
UNIT-2, E-Commerce Payment	**PERIODS**
Payment Gateway, Modes of Electronic Payment, Threats & protections for ecommerce payment system Payment Gateway, Modes of Electronic Payment, Threats & protections for ecommerce payment system.	06
UNIT-3, Principles of Digital Marketing	**PERIODS**
Defining Digital Marketing , Setting Digital Marketing Objectives, Set of activities of digital marketing: Search Engine Optimization, SEO, Search Engine Marketing – Google Ad Words, Social Media Marketing: Face book, LinkedIn, YouTube, Display Advertising – Contextual, Behavioral, Targeted, Content Marketing & Blogging, Lead Generation : Marketing Offer – Attractive / Relevant Offer, Landing Page – Offer's details with form, Conversion Page – Thank you page, Email Marketing, Video Marketing, Responsive Design, Google Analytics	08
UNIT-4, Search Engine Optimization	**PERIODS**
What is SEO?, Why SEO?, How Search Engine works?, Essential SEO guidelines for website owner, designer, blogger and content writer : Keyword Research - Creating Content Hierarchy, Brainstorming – Think and discuss them, Google Suggest, Related Searches, Google Keyword Planner, Keyword Tools, Google Trends – Finding Search Trends, Most Search Terms, How to translate keywords?, Organizing the keywords, Writing Headlines (Page Titles) with examples, Writing Summary (META Descriptions) with examples, SEO for Images, Structuring the Content-SEO-friendly Domain Name, SEO-friendly URL Structure, Plan your Site's Hierarchy, Internal Linking – Site Navigation, How Google reads our pages?, Localized SEO, Website Speed Testing, HTML Improvements using Google Search Console, Links from YouTube Videos, Users'	10

Engagement , Links to Related Stories , Enable Social Sharing , Embedding videos , Enabling site search feature	
UNIT-5, Social Media Marketing	**PERIODS**
Social Media Marketing Strategy : Setting up Goals- Finding out where your targeted people connect, Popular Social Media Networks, KnowEm – Check Social Media Username Availability, Knowing your Audience - Google Alerts – Monitoring your brands, competitions, and industry trends using, TweetDeck – a monitoring tool similar to Google Alerts for Twitter, Hashtags – Best Practices & Tools, Facebook / Instagram / LinkedIn- Setting up a Facebook Business Page, Facebook Graph Search – SEO for Facebook, Facebook Fans vs Talking about this, Promoting your Page, Boost Post, Facebook/Instagram Advertising using Facebook Ads Manager, Remarketing/Retargeting using Facebook Custom Audiences, LinkedIn Advertising: Text Ads | Sponsored Content, Measuring Success- Fans, Likes, Comments & Share, Track performance using Google Analytics, UTMs – URL Builder, Bounce Rate, Time Spent on Site and Conversions!, Tracking Offline Conversions, Tracking your emails, Viral Videos Examples, Instagram, Facebook and Pinterest – Best Practices, Tips and Tools	**10**

LIST OF PRACTICALS

1. Create SEO Friendly Web Pages
2. Submit Website in various search Engines
3. Content Writing
4. Build a Network of Partner Websites to Get Influence on the SERP and Jump up to 30+ Positions
5. Develop a Facebook Customized Page Tab
6. Create and Write a blog.
7. Create Google Map on Places for Business
8. Understanding Plagiarism Checker tools
9. Understanding various SEO Tools like woorank, seositecheckup, seoquake, similarweb, siteliner, etc. 16. Creating XML Sitemap and robot.txt files

RECOMMENDED BOOKS

1. Digital Marketing by Vandana Ahuja, published by Oxford Publication

2. Fundamentals of Digital Marketing by Puneet Bhatia, published by Pearson.

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

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**

(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.