Curriculum for

Diploma Programme in

ELECTRONICS & COMMUNICATION ENGINEERING (BATCH 2018)

For the State of Haryana

Prepared by:

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Bays 7-12, Sector 4
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FIRST YEAR: ELECTRONICS & COMMUNICATION ENGG.

Sr. No.	SUBJECTS	STUDY SCHEME HOURS / WEEK			CREDIT	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1*	English	2	-	2	6	40	25	65	60	3	50	3	110	175
1.2*	Applied Mathematics	3	1	-	7	40	-	40	60	3	-	-	60	100
1.3*	Applied Physics	2	1	2	7	40	25	65	60	3	50	3	110	175
1.4**	Computer Fundamentals	3	-	-	6	40	-	40	60	3	-	3	60	100
1.5***	Fundamental of Electrical and Electronics Engg.	2	-	2	6	40	25	65	60	3	50	3	110	175
1.6*	Environmental Studies	2	-	1	5	40	25	65	60	3	50	3	110	175
1.7*	Engg. Graphics	-	-	3	3	40	25	65	60	3	25 (viva)	3	85	150
1.8*	Information Technology	-	-	2	2	-	50	50	-	-	50	3	50	100
1.9*	Internet of Things & Artificial Intelligence	-	-	2	2	-	50	50	-	-	100	3	100	150
1.10*	General Workshop Practice	-	-	3	3	-	50	50	-	-	50	3	50	100
#	Student Centered Activities(SCA)	-	-	2	2	-	25	25	-	-	-	-	-	25
Total		**14**	**02**	**19**	**49**	**280**	**300**	**580**	**420**	**-**	**425**	**-**	**845**	**1425**

*Common with other diploma programmes

** Common with diploma in Computer Engineering, Instrumentation and Control Engineering, Medical Electronics

*** Common with diploma in Computer Engineering, Electrical Engg, Electrical and Electronics Engg., Electronics and Communication Engg., Instrumentation and Control Engg, Medical Electronics

SCA will comprise of co-curricular activities like extension lectures, games, hobby clubs, seminars, declamation contests, educational field visits, N.C.C., N.S.S., Cultural Activities and Disaster management etc.

THIRD SEMESTER: ELECTRONICS AND COMMUNICATION ENGINEERING-2018

Sr. No.	SUBJECTS	STUDY SCHEME Hours/Week		Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
3.1	Electronic Instruments and Measurement	3	2	4	25	25	50	100	3	50	3	150	**200**
3.2	Principles of Communication Engineering	3	2	4	25	25	50	100	3	50	3	150	**200**
3.3	**Digital Electronics	3	3	4	25	25	50	100	3	50	3	150	**200**
3.4	Electronic Devices and Circuits	3	2	4	25	25	50	100	3	50	3	150	**200**
3.5	Network Filters and Transmission Lines	3	2	4	25	25	50	100	3	50	3	150	**200**
3.6	*Computer Programming using C	3	3	4	25	25	50	100	3	50	3	150	**200**
Soft Skills -I		-	3	-	-	25	25	-	-	-	-	-	**25**
	Total	**18**	**17**	**24**	**150**	**175**	**325**	**600**	**-**	**300**	**-**	**900**	**1225**

** Common with Computer Engineering

* Only Theory portion is common with Computer Engineering

FOURTH SEMESTER: ELECTRONICS AND COMMUNICATION ENGINEERING -2018

Sr. No.	SUBJECTS	STUDY SCHEME Hours/Week		Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
4.1	Instrumentation	3	3	4	25	25	50	100	3	50	3	150	**200**
4.2	Communication System	3	3	4	25	25	50	100	3	50	3	150	**200**
4.3	Power Electronics	3	3	4	25	25	50	100	3	50	3	150	**200**
4.4	*Microprocessor and Peripheral Devices	3	3	4	25	25	50	100	3	50	3	150	**200**
4.5	Troubleshooting of Electronic Equipment	-	3	1	-	50	50	-	-	50+	3	50	**100**
4.6	Medical Electronics	3	3	4	25	25	50	100	3	50	3	150	**200**
Soft Skills -II		-	2		-	25	25	-	-	-	-	-	**25**
	Total	**15**	**20**	**21**	**125**	**200**	**325**	**500**	**-**	**300**	**-**	**800**	**1125**

+ **Includes 25 marks for Viva-Voce**

* **Common with Diploma Programme in Computer Engineering**

Industrial Training

After examination of 4th Semester, the students shall go for training in a relevant industry/field organization for a minimum period of 8 weeks and will prepare a diary. It shall be evaluated during 5th semester by his/her teacher Incharge for 100 marks. The students shall also prepare a report at the end of training and shall present it in a seminar, which will be evaluated for another 100 marks. This evaluation will be done by HOD and lecturer in charge – training in the presence of one representative from Industry/Sector Skill Council/Training and Placement Officer/Subject Expert from other institution.

FIFTH SEMESTER (ELECTRONICS AND COMMUNICATION ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Hours/Week		Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
Industrial Training		-	-	5	-	100	100	-	-	100	-	100	**200**
5.1	Audio Video Systems	3	3	4	25	25	50	100	3	50	3	150	**200**
5.2	Digital Communication	3	3	4	25	25	50	100	3	50	3	150	**200**
5.3	Optical Fiber Communication	3	3	4	25	25	50	100	3	50	3	150	**200**
5.4	Computer Networks	4	-	4	25	-	25	100	3	-	-	100	**125**
5.5	Microcontrollers	4	3	5	25	25	50	100	3	50	3	150	**200**
5.6	Electronics Design and Simulation Techniques	-	3	1	-	50	50	-	-	50	3	50	**100**
Soft Skills -III		-	3	-	-	25	25	-	-	-	-	-	**25**
	Total	**17**	**18**	**27**	**125**	**275**	**400**	**500**	**-**	**350**	**-**	**850**	**1250**

SIXTH SEMESTER (ELECTRONICS AND COMMUNICATION ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Hours/Week		Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
6.1	Microwave and Radar Engineering	4	3	5	25	25	50	100	3	50	3	150	**200**
6.2	Wireless and Mobile Communication	4	3	5	25	25	50	100	3	50	3	150	**200**
6.3	*Entrepreneurship Development and Management	3	-	3	25	-	25	100	3	-	-	100	**125**
6.4	+Elective	4	-	4	25	-	25	100	3	-	-	100	**125**
6.5	Project Work	-	12	6	-	50	50	-	-	100	3	100	**150**
	Soft Skills-IV	-	2	-	-	25	25	-	-	-	-	-	**25**
	Total	**15**	**20**	**23**	**100**	**125**	**225**	**400**	**-**	**200**	**-**	**600**	**825**

***** Common with other diploma programmes

\+ **Elective-To choose one from the following:**

6.4.1 Embedded Systems 6.4.2 Industrial Automation

FIRST YEAR

(Annual System)

1.1 ENGLISH

L	T	P
2	-	2

RATIONALE

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.

LEARNING OUTCOMES

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

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- Understand the importance of good communication
- Describe process of communication.
- Explain, Compare and re-write the types of communication
- Identify and match the parts of speech
- Rewrite sentences correctly
- Modify sentences and relate them with real life situations.
- Reproduce and match words and sentences in a paragraph.
- Re-write the sentences according to given situation.
- Relate and use various words using proper vocabulary and grammar.
- Write the various types of paragraphs, notices and composition on picture with appropriate format.

DETAILED CONTENTS

1. Basics of Communication (06 Hrs)

1.1. Definition and process of communication

1.2. Types of communication – Verbal (Listening, Speaking, Reading and Writing) and Non-verbal

2. Functional Grammar (22 Hrs)

2.1. Noun and Pronoun

2.2. Punctuation

2.3. Preposition

2.4. Conjunction

2.5. Tenses (verb (Main verb and Auxiliary verb)

3. Reading Skills (12 Hrs)

3.1. Unseen passage for comprehension. Based upon the passage, flowing aspects may be covered

- Questions from the passage
- One-word substitution
- Prefixes and Suffixes
- Antonyms and Synonyms etc.

4. Writing skills (30 Hrs)

4.1. Correspondence – Business and official
4.2. Notice, including Press Releases
4.3. Memos
4.4. Circular
4.5. Basics of Report Writing
4.6. Resume Writing
4.7. Writing E-mail
4.8. Paragraph writing
4.9. Picture composition

LIST OF PRACTICALS

1. Listening Exercises
2. Self and Peer Introduction
3. Debate
4. Situational Conversations: Offering - Responding to offers; Requesting – Responding to requests; Congratulating; Expressing sympathy and condolence; Apologizing and Forgiving; Complaining; Warning; Asking and giving information; Getting and giving permission; Asking for and giving opinions; Talking about likes and dislikes
5. Just a minute sessions – Extempore
6. Group Discussion
7. Newspaper reading
8. Mock Interviews: Telephonic and Personal

INSTRUCTIONAL STRATEGY

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

MEANS OF ASSESSMENT

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

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/HSBTE/NITTTR.

Section	Percentage of syllabus to be covered	Units to be covered	Type of assessment	Weightage of Marks	Pass Percentage
A	20%	Unit 1.1, 2.1, 4.1	1st Internal	40%	40% (Combined in internal & final assessment) with minimum 25% marks in final assessment)
B	20%	Unit 2.2, 4.2, 4.3	2nd Internal		
C	60%	Unit 1.2, 2.3 to 2.5 , 3, 4.4 to 4.9	FINAL	60%	

1.2 APPLIED MATHEMATICS

L	T	P
3	1	-

RATIONALE

Contents of this course provide fundamental base for understanding engineering problems and their solution algorithms. Contents of this course will enable students to use basic tools like logarithm, binomial theorem, partial fractions, matrices, t-ratios and co-ordinates for solving complex engineering problems with exact solutions in a way which involve less computational task. By understanding the logarithm, they will be able to make long calculations in short time and it is also a pre-requisite for understanding Calculus. Statistics is important for understanding of tolerances, quality assurance and quality control and it is also essential for data analysis.

LEARNING OUTCOMES

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

- Apply complex number in engineering problems.
- Apply permutation and combination to count without actual counting.
- Apply permutation and combination to understand binomial theorem.
- Calculate the approximate value of roots of certain expressions in engineering problems by application of binomial theorem.
- Resolve rational functions to partial fractions for the use in Integral Calculus.
- Use matrices to provide solution to engineering problems.
- Solve different problems using trigonometry.
- Understand the geometric shapes used in engineering problems by Co-ordinate Geometry.
- Explore the idea of location, graph, and linear relationships between two variables.
- Compute slope, the equation of tangent and normal to a curve at a point using differentiation.
- Find maximum and minimum values of a function by application of differential calculus..
- Calculate simple integration by using concepts of integration.
- Find the velocity from acceleration and displacement from velocity using integration.
- Evaluate area under curves by using definite integrals
- Calculate the area under a curve and axes.
- Calculate the approximate area under a curve by applying numerical integration using Trapezoidal and Simpson’s rules.
- Solve engineering and industrial problems using differential equations.
- Apply differential Equations and numerical methods for higher learning of mathematics and engineering applications.

DETAILED CONTENTS

1. Algebra (30 Hrs)

- Law of Indices, Formula of Factorisation and expansion i.e. $(a+b)^2$, (a^3+b^3) etc.
- Partial fraction:- Definition of Polynomial fraction proper & improper fractions and definition of partial fractions. To resolve proper fraction into partial fraction with denominator containing non-repeated linear factors, only.
- Complex numbers: definition of complex number, real and imaginary parts of a complex number, Polar and Cartesian Form and their inter conversion, Conjugate of a complex number, modulus and amplitude, addition subtraction, multiplication and division of complex number.
- Logarithms and its basic properties
- Determinants and Matrices – Evaluation of determinants (up to 3 order) by laplace method. Solution of equations (up to 3 unknowns) by Cramer's Rule. Definition of Matrices and types, addition subtraction and multiplication of Matrices (up to 2 order).
- Permutation, combination formula, Values of ${}^nP_r$ and ${}^nC_r$.
- Binomial theorem for positive integral index , General term, simple problems

2. Trigonometry (14 Hrs)

- Concept of angle: measurement of angle in degrees, grades, radians and their conversions.
- T-Ratios of standard angle (0^0,30^0,45^0etc) and fundamental Identities, Allied angles (without proof) Sum, Difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa)
- Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.

3. Co-ordinate Geometry (12 Hrs)

- Point: Distance Formula, Mid Point Formula, Centroid of triangle and area of triangle.
- Straight line: Slope of a line, equation of straight line in various standards forms (without proof); (slope intercept form, intercept form, one-point form, two-point form, normal form, general form), angle between two straight lines.
- Circle: General equation of a circle and identification of centre and radius of circle. To find the equation of a circle, given:
    * Centre and radius
    * Coordinates of end points of a diameter

4. Differential Calculus (40 Hrs)

- Definition of function; Concept of limits (Introduction only) and problems related to four standard limits only.

- Differentiation of standard function (Only formulas), Differentiation of Algebraic function, Trigonometric functions, Exponential function, Logarithmic function

- Differentiation of sum, product and quotient of functions.
- Successive differentiation (up to 2nd order)
- Application of differential calculus in:
  (a) Rate measures
  (b) Maxima and minima

5. Integral Calculus (28 Hrs)

- Integration as inverse operation of differentiation with simple examples.
- Simple standard integrals, Integrations by parts and related Simple problems
- Evaluation of definite integrals with given limits.

  Evaluation of $\int_0^{\pi/2} \sin^n x\, dx$, $\int_0^{\pi/2} \cos^n x\, dx$, $\int_0^{\pi/2} \sin^m x \cos^n x\, dx$

  using formulae without proof (m and n being positive integers only) using pre-existing mathematical models.
- Applications of integration: for evaluation of area under a curve and axes (Simple problems where the limits are given).
- Numerical integration by Trapezoidal Rule and Simpson's $1/3^{rd}$ Rule using pre-existing mathematical models

6. Differential Equations (04 Hrs)

Definition, order, degree and linearity, of an ordinary differential equation. Solution of I^{st} order and I^{st} degree differential equation by variable separable method (Simple problems)

7. Statistics (12 Hrs)

- Measures of Central Tendency: Mean, Median, Mode
- Measures of Dispersion: Mean deviation from mean, Standard deviation
- Correlation coefficient and Coefficient of rank correlation (Simple problems)

INSTRUCTIONAL STATREGY

Activity based teaching and learning process using Mathematics lab consisting of physical models and computer based tools/software emphasising Practice => Theory => Practice.
Basic elements of algebra, trigonometry and co-ordinate geometry can be taught in the light of their applications in the field of engineering and technology. By laying more emphasis on applied part, teacher can also help in providing a good continuing education base to the students. Students need to be taught the skills needed to use software tools built by experts through multiple problem solving based on the topics related to Algebra, Trigonometry and Coordinate

Geometry that the industry requires. Examples to be used should be related to engineering. Students should be able to relate to the actual use of these examples and the way mathematical calculations will help them in doing their job.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics Vol. I & II by S Kohli, IPH, Jalandhar
3. Applied Mathematics, Vol. I & II by SS Sabharwal & Dr Sunita Jain, Eagle Parkashan, Jalandhar
4. Engineering Mathematics, Vol I, II & III by V Sundaram et al, Vikas Publishing House (P) Ltd., New Delhi
5. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
6. Applied Mathematics I, by Archana Sharma, Lords Publications, Jalandhar.
7. Engineering Mathematics by Srimanta Pal and Subodh C. Bhunia; Oxford University Press, New Delhi
8. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

Section	Percentage of syllabus to be covered	Units to be covered	Type of assessment	Weightage of Marks	Pass Percentage
A	20%	Unit 1	1st Internal	40%	40%(Combined in internal & final assessment)with minimum 25% marks in final assessment)
B	20%	Unit 2,3	2nd Internal		
C	60%	Unit 4,5,6,7	FINAL	60%	

1.3 APPLIED PHYSICS

L	T	P
2	1	2

RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go on in the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects will behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the 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 appreciate learning of these concepts and principles. In all contents, SI units should be followed. Working in different sets of units can be taught through relevant software.

LEARNING OUTCOMES

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

- Identify physical quantities, parameters and select their units for use in engineering solutions.
- Find units and dimensions of different physical quantities.
- Represent physical quantities as scalar and vectors.
- Use basic laws of motions,
- Analyse and design banking of roads and apply conservation of momentum principle to explain recoil of gun etc.
- Define work, energy and power and their units. Solve problems about work and power
    - State the principle of conservation of energy.
    - Identify forms of energy, conversion from one form to another.
    - Compare and contrast the physical properties associated with linear motion and rotational motion and give examples of conservation of angular momentum.
    - Describe the surface tension phenomenon and its units, applications, effects of temperature on surface tension.
    - Describe the viscosity of liquids.
    - Define stress and strain, modulus of elasticity.
    - State Hooke's law.
    - Measure temperature in various processes on different scales.
    - Distinguish between conduction, convection and radiation.
    - Use equipments like Vernier calliper, screw gauge, Spherometer.
- Differentiate between Transverse and Longitudinal, Periodic and Simple Harmonic Motion.

- Explain the terms: frequency, amplitude, wavelength, wave velocity, frequency and relation between them.
- Explain various engineering and industrial applications of ultrasonics.
- Apply acoustics principles to various types of buildings to get best sound effect.
- Explain the laws of reflection and refraction of light.
- Explain total internal reflection as applied to optical fibers.
- Define capacitance and its unit and solve simple problems using C=Q/V
- Explain the role of free electrons in insulators, conductors and semiconductors.
- Application of semiconductors as diode, rectifiers, concept of transistors
- Explain electric current as flow of charge, the concept of resistance, heating effect of current.
- State and apply Ohm's law.
- Calculate the equivalent resistance of a variety of resistor combinations.
- Apply the concept of light amplification in designing of various LASER based instruments and optical sources.
- Apply the use of optical fibre in medical field and optical fibre communication.

DETAILED CONTENTS

1. Units and Dimensions (11Hrs)

1.1 Definition of Physics, Physical quantities (Fundamental and derived),
1.2 Units: fundamental and derived units,
1.3 Systems of units: CGS, FPS, MKS, SI
1.4 Definition of Dimensions;
1.5 Dimensional formulae and SI units of physical quantities (distance, displacement, area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, pressure, surface tension, stress, strain)
1.6 Principle of homogeneity of dimensions
1.7 Dimensional equations, Applications of dimensional equations; checking of correctness of equation, Conversion of system of unit (force, work)

2. Force and Motion (14 Hrs)

2.1 Scalar and vector quantities –(Definition and examples),
2.2 Addition of Vectors, Triangle & Parallelogram Law (Statement only),
2.3 Scalar and Vector Product (statement and formula only)
2.4 Definition of Distance, displacement, speed, velocity, acceleration
2.5 Force and its units, concept of Resolution of force
2.6 Newton’s Law of motion (Statement and examples),
2.7 Linear Momentum, conservation of momentum (Statement only), Impulse
2.8 Circular motion: definition of angular displacement, angular velocity, angular acceleration, frequency, time period; Relation between linear and angular

velocity.

2.9 Centripetal and centrifugal forces(definition and formula only)

2.10 Application of centripetal force in Banking of roads (derivation for angle of banking)

3. Work, Power and Energy (08 Hrs)

3.1 Work (Definition, Symbol, Formula and SI units)

3.2 Energy (Definition and its SI units), Examples of transformation of energy.

3.3 Kinetic Energy (Formula, examples and its derivation)

3.4 Potential Energy (Formula, examples and its derivation)

3.5 Law of conservation of mechanical energy for freely falling bodies (With . Derivation)

3.6 Power (definition, formula and units)

3.7 Simple Numerical problems based on formula of Power

4. Rotational Motion (05 Hrs)

4.1 Rotational motion with examples

4.2 Definition of torque and angular momentum and their examples

4.3 Conservation of angular momentum (quantitative) and its examples

4.4 Moment of inertia and its physical significance, radius of gyration (definition, derivation and formula).

5. Properties of Matter (10 Hrs)

5.1 Definition of Elasticity, Deforming force, Restoring force, example of Elastic and plastic body,

5.2 Definition of Stress and strain with their types,

5.3 Hooke's law, Modulus of Elasticity (Young's, Bulk modulus and shear)

5.4 Pressure (definition, formula, unit), Pascals Law

5.5 Surface tension: definition, its units, applications of surface tension, effect of temperature on Surface tension

5.6 Viscosity: definition, units, effect of temperature on viscosity

5.7 Fluid motion, stream line and turbulent flow.

6. Heat and temperature (05 Hrs)

6.1 Definition of heat and temperature (on the basis of kinetic theory),

6.2 Difference between heat and temperature

6.3 Principles of measurement of temperature.

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

6.5 Properties of heat radiation

6.6 Different scales of temperature and their relationship

7. Wave motion and its applications (09 Hrs)

7.1 Wave motion, transverse and longitudinal wave motion with examples, Terms used in wave motion like displacement, amplitude, time period, frequency, wavelength, wave velocity; relationship among wave velocity, frequency and wave length .

7.2 Simple Harmonic Motion (SHM): definition, examples

7.3 Cantilever (definition, formula of time period (without derivation).

7.4 Free, forced and resonant vibrations with examples

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

7.6 Ultrasonics: Introduction and their engineering applications (cold welding, drilling, SONAR)

8. Optics (05 Hrs)

8.1. Reflection and refraction with laws, refractive index, lens formula (no derivation), power of lens (related numerical problems).

8.2. Total internal reflection and its applications, Critical angle and conditions for total internal reflection

8.3. Microscope, Telescope (definition)

8.4. Uses of microscope and telescope.

9. Electrostatics (09 Hrs)

9.1. Electric charge, unit of charge, conservation of charge.

9.2. Coulombs law of electrostatics,

9.3. Electric field, Electric lines of force (definition and properties), Electric field intensity due to a point charge.

9.4. Definition of Electric flux, Gauss law (Statement and derivation)

9.5. Capacitor and Capacitance (with formula and units), Series and parallel combination of capacitors (simple numerical problems)

10. Current Electricity (08 Hrs)

10.1 Electric Current and its Unit, Direct and alternating current,

10.2 Resistance, Specific Resistance and Conductance (definition and units)

10.3 Series and Parallel combination of Resistances.

10.4 Ohm's law (statement and formula),

10.5 Heating effect of current, Electric power and its units

10.6 Kirchhoff's laws (statement and formula)

11 Electromagnetism (05 Hrs)

11.1. Introduction to magnetism, Types of magnetic materials. Dia, para and ferromagnetic materials with examples.

11.2. Magnetic field, magnetic intensity, magnetic lines of force, magnetic flux and their units

11.3. Electromagnetic induction (definition)

12. Semiconductor physics (08 Hrs)

12.1. Definition of Energy level, Energy bands,

12.2. Types of materials (insulator, semi conductor, conductor) with examples,

12.3. Intrinsic and extrinsic semiconductors, p-n junction diode and its V-I characteristics

12.4. Diode as rectifier – half wave and full wave rectifier (centre tap only)

12.5. Semiconductor transistor; pnp and npn (Introduction only), symbol.

13. Modern Physics (08 Hrs)

13.1. Lasers: full form, principle, spontaneous emission, stimulated emission, population inversion, engineering and medical applications of lasers.

13.2. Fibre optics: Introduction to optical fibers (definition, parts), applications of optical fibers in different fields.

13.3. Introduction to nanotechnology (definition of nanomaterials with examples) and its applications.

LIST OF PRACTICALS (To perform minimum fourteen experiments)

1. To find diameter of solid cylinder using a vernier calliper
2. To find internal diameter and depth of a beaker using a vernier calliper and hence find its volume.
3. To find the diameter of wire using screw gauge
4. To find thickness of paper using screw gauge.
5. To determine the thickness of glass strip using a spherometer
6. To determine radius of curvature of a given spherical surface by a spherometer.
7. To verify parallelogram law of forces
8. To determine the atmospheric pressure at a place using Fortin's Barometer
9. To determine force constant of spring using Hooke's law
10. Measuring room temperature with the help of thermometer and its conversion in different scale.
11. To find the time period of a simple pendulum
12. To determine and verify the time period of Cantilever
13. To verify ohm's laws by plotting a graph between voltage and current.
14. To verify laws of resistances in series combination.
15. To verify laws of resistance in parallel combination.

16. To find resistance of galvanometer by half deflection method
17. To verify laws of reflection of light using mirror.
18. To verify laws of refraction using glass slab.
19. To find the focal length of a concave lens, using a convex lens
20. To study colour coding scheme of resistance.

INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. Students need to be exposed to use of different sets of units and conversion from one unit type to another. Software may be used to solve problems involving conversion of units. The teacher should explain about field applications before teaching the basics of mechanics, work, power and energy, rotational motion, properties of matter etc. to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, exercises and viva-voce

RECOMMENDED BOOKS

1. Text Book of Physics for Class XI (Part-I, Part-II); N.C.E.R.T., Delhi
2. Applied Physics, Vol. I and Vol. II by Dr. HH Lal; TTTI Publications, Tata McGraw Hill, Delhi
3. Concepts in Physics by HC Verma, Vol. I & Vol.II, Bharti Bhawan Ltd. New Delhi
4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
5. e-books/e-tools/relevant software to be used as recommended by AICTE/ HSBTE/ NITTTR.
6. Practical Physics, by C. L. Arora, S Chand Publication

Websites for Reference:

http://swayam.gov.in

Section	Percentage of syllabus to be covered	Units to be covered	Type of assessment	Weightage of Marks	Pass Percentage
A	20%	Unit 1,2	1st Internal	40%	40%(Combined in internal & final assessment)with minimum 25% marks in final assessment)
B	20%	Unit 3,4,5	2nd Internal		
C	60%	Unit 6,7,8,9, 10,11, 12, 13	FINAL	60%	

1.4 COMPUTER FUNDAMENTALS

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RATIONALE

The diploma holder needs to understand computer fundamentals and information technology. They should be able to operate basic software related to computer. Hence this subject is introduced in the curriculum.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Describe various component of computer system
- Draw the block diagram of computer system showing various units
- Outline various application of IT
- Differentiate between assembly and high level language
- List the features of the MS Word, MS-Excel & MS-PowerPoint
- Demonstrate the use of PowerPoint for seminar presentation
- Identify various web browser
- Use internet and create mail ID, send and receive Email

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DETAILED CONTENTS

1. Fundamentals of Computer (21 hrs)

1.1 Draw the block diagram of a Computer.
1.2. Explain the interaction between the CPU, Memory Input/ Output devices.
1.3. Describe the function of CPU and major functional parts of CPU.
1.4. Describe the function of memory.
1.5 Describe the function of input/output devices.
1.6 State the relevance of speed and word length for CPU Performance.
1.7 Recognize the current family of CPUs used in Computers
1.8 State the use of storage devices used in a Computer.
1.9 List types of memory used in a Computer.
1.10 State the importance of cache memory.
1.11 Generations of computers.
1.12 Classification of computers –based on size, processor.
1.13 Know importance of binary number system for use in Digital Computers.

2. DOS & Windows Operating Systems (40 hrs)

2.1 Describe the need for an operating system
2.2 List the various operating system used presently
2.3 DOS Prompt, Types of Commands, Internal & External Commands
2.4 Directories and files , wild cards, autoexec.bat, config.says,
2.5 List the features of Window desktop

2.6 List the components of Window
2.7 State the function of each component of Window
2.8 Explain the method of starting a program using start button
2.9 Understand maximize, minimize, restore down and close button
2.10 State the meaning of a file
2.11 State the meaning of a folder
2.12 Explain the method of viewing the contents of hard disk drive using explore option
2.13 Explain the method of finding a file using search option
2.14 Explain formatting a floppy disk using explore option
2.15 Describe installing new software using control panel
2.16 Describe uninstalling software using control panel
2.17 Explain installing a new hardware using control panel
2.18 Explain uninstalling a hardware using control panel
2.19 Narrate finding out drive space using system tool option of accessories group
2.20 Explain the procedure of disk defragmentation using system tool
2.21 Narrate installing a Printer using control panel
2.22 Explain the procedure for changing resolution, colour, appearances, and screensaver option of the display
2.23 Narrate the process of charging the system date and time

3. Fundamentals of Internet (28 hrs)

3.1 Explain meaning of a computer network
3.2 Describe the concept of a local area network
3.3 Explain the concept of wide area network
3.4 Compare internet & intranet
3.5 Describe the relevance of an internet service provider
3.6 Explain the role of the modem in accessing the internet
3.7 Explain the installation procedure of a modem using control panel
3.8 Explain the purpose of web browser software
3.9 Explain the structure of a Universal Resources Locator(URL)
3.10 Describe the purpose of World Wide Web, FTP, telnet and E-mail
3.11 Explain the process of sending and receiving e-mail
3.12 Understand different connection methods
3.13 Describe address format and IP address
3.14 Describe DNS
3.15 Describe the role of search engines with examples
3.16 Differences between search engines and directory.
3.17 Know about social network sites
3.18 Understand internet security

4. Understand Programming Methodology (16 hrs)

4.1. State the different steps involved in problem solving
4.2 State the steps involved in algorithm development
4.3 Differentiate algorithm and flowchart
4.4 Develop algorithms for simple problems
4.5 Draw the symbols used in flowcharts
4.6 Draw flowcharts for simple problems

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, connectors etc. and proficient in making use of MS Office/Open Office in addition to working on internet. The student should be made capable of working on computers independently

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation and viva-voce

RECOMMENDED BOOKS

1. Fundamentals of Computer by E Balagurusamy,Tata McGraw Hill EducationPvt. Ltd, New Delhi
2. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
3. Computer Fundamentals by RS Salaria; Khanna Book Publishing Co. (P) Ltd., New Delhi
4. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
5. Computers Today by SK Basandara, Galgotia publication Pvt ltd. Daryaganj, New Delhi.
6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. Computer Fundamentals and Programming in C by ReemaThareja; Oxford University Press, New Delhi
8. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
9. Computer Fundamentals and Information Technology by Preeti Shrivastav, Ishan publication
10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar.
11. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

Section	Percentage of syllabus to be covered	Units to be covered	Type of assessment	Weightage of Marks	Pass Percentage
A	20%	Unit 1	1st Internal	40%	40%(Combined in internal & final assessment)with minimum 25% marks in final assessment)
B	20%	Unit 2.1 to 2.11	2nd Internal		
C	60%	Unit 2.12 to 2.23, 3,4	FINAL	60%	

1.5 FUNDAMENTAL OF ELECTRICAL & ELECTRONICS ENGG

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RATIONALE

A diploma holder may be involved in various jobs ranging from preventive maintenance of electrical installation to fault location. In addition, he/she may be working in testing laboratories where he/she uses measuring instruments. To carry out these and similar jobs effectively, knowledge of basic concepts, principles and their applications is very essential. This course will enable the students to understand the basic concepts and principles of DC and AC fundamental, ac circuits, batteries, electromagnetic induction, voltage and current sources etc. This subject gives the knowledge of fundamental concepts and principles of basic electronics and aims at providing the students with basic understanding of various types of materials such as conductors, semiconductors and insulators, extrinsic and intrinsic semi-conductors, p-n junction, need of rectifiers, significance and use of filters in rectifiers, basic structure and working principle of LEDs, LCD; working of Transistors in various configurations; fundamental knowledge of FETs and MOSFETs etc. and their applications. The teacher should give emphasis on understanding of concepts by explaining the various terms used in the subject. Practical exercises have been included in order to reinforce various concepts

LEARNING OUTCOMES

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

- Identify and able to take readings on various electrical equipments(voltmeter, ammeter, CRO, wattmeter, multi-meter)
- Determination of voltage-current relationship in a DC circuit under specific physical conditions
- Measure resistance of an ammeter and a voltmeter
- Verify DC circuits (Thevenin and Norton’s Theorem), Superposition nodal analysis, Maximum Power Transfer Theorem
- Verify Kirchhoff's Current and Voltage Laws in a dc circuit
- Find the ratio of inductance of a coil having air-core and iron-core respectively and to observe the effect of introduction of a magnetic core on coil inductance
- Measure power and power factor in a single phase R-.L-.C. Circuit and calculation of active and reactive powers in the circuit. After undergoing the subject, the students will be able to take readings on various electronics equipments(multimeter, CRO, signal generator, LCR meter)
- Plot the VI characteristics of pn junction diode and Zener diode
- Measure voltage gain, input and output impedance in a single state CE amplifier circuit.
- Fabricate half wave, full wave and bridge rectifier and observe waveforms of each
- Plot the waveforms of the rectifier circuit with different filters
- Plot input and output characteristics of transistor in CB and CE mode

- Plot the characteristics of FET based amplifier
- Measure voltage gain, input and output impedance in a single state CE amplifier circuit. take readings on various electronics equipments(multi meter, CRO, signal generator, LCR meter)

DETAILED CONTENTS

1. Overview of DC Circuits (05 hrs)

   1.1 Simple problems on series and parallel combination of resistors and capacitors with their wattage consideration,

   1.2 Application of Kirchhoff's current law and Kirchhoff's voltage law to simple circuits. Star – Delta connections and their conversion.

2. DC Circuit Theorems (05 hrs)

   Thevenin's theorem, Norton's theorem, application of network theorems in solving D.C. circuit problems. Superposition nodal analysis, Mesh analysis, Maximum Power Transfer Theorem.

3. Voltage and Current Sources (04 hrs)

   3.1 Concept of voltage source, symbol and graphical representation characteristics of ideal and practical sources.

   3.2 Concept of current sources, symbol, characteristics and graphical representation of ideal and practical current sources.

4. Semiconductor Physics (06 hrs)

   4.1 Review of basic atomic structure and energy levels, concept of insulators, conductors and semi conductors, atomic structure of Germanium (Ge) and Silicon (Si), covalent bonds

   4.2 Concept of intrinsic and extrinsic semi conductor, process of doping.

   4.3 Energy level diagram of conductors, insulators and semi conductors; minority and majority charge carriers.

   4.4 P and N type semiconductors and their conductivity, effect of temperature on conductivity of intrinsic semi conductors.

5. Semiconductor Diode (08 hrs)

   5.1 PN junction diode, mechanism of current flow in PN junction, forward and reverse biased PN junction, potential barrier, drift and diffusion currents, depletion layer, concept of junction capacitance in forward and reverse biased condition.

   5.2 V-I characteristics, static and dynamic resistance and their value calculation from the characteristics.

   5.3 Application of diode as half-wave, full wave and bridge rectifiers. Peak Inverse Voltage, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter, LC and π filters.

5.4 Types of diodes, characteristics and applications of Zener diodes. Zener and avalanche breakdown

6. Electro Magnetic Induction (06 hrs)
   6.1 Concept of electro-magnetic field produced by flow of electric current, magnetic circuit, concept of magneto-motive force (MMF), flux, reluctance, permeability, analogy between electric and magnetic circuit.
   6.2 Faraday's laws of electro-magnetic induction, principles of self and mutual induction, self and mutually induced e.m.f, simple numerical problems.
   6.3 Concept of current growth, decay and time constant in an inductive (RL) circuit.
   6.4 Energy stored in an inductor, series and parallel combination of inductors.

7. Batteries (05 hrs)
   7.1 Basic idea of primary and secondary cells
   7.2 Construction, working principle and applications of Lead-Acid, Nickel-Cadmium and Silver-Oxide batteries
   7.3 Charging methods used for lead-acid battery (accumulator)
   7.4 Care and maintenance of lead-acid battery
   7.5 Series and parallel connections of batteries
   7.6 General idea of solar cells, solar panels and their applications
   7.7 Introduction to maintenance free batteries

8. AC Fundamentals (05 hrs)
   8.1 Concept of alternating quantities
   8.2 Difference between ac and dc
   8.3 Concepts of: cycle, frequency, time period, amplitude, instantaneous value, average value, r.m.s. value, maximum value, form factor and peak factor.
   8.4 Representation of sinusoidal quantities by phasor diagrams.
   8.5 Equation of sinusoidal wave form for an alternating quantity and its derivation
   8.6 Effect of alternating voltage applied to a pure resistance, pure inductance and pure capacitance.

9. AC Circuits (06 hrs)
   9.1 Concept of inductive and capacitive reactance
   9.2 Alternating voltage applied to resistance and inductance in series.
   9.3 Alternating voltage applied to resistance and capacitance in series.
   9.4 Introduction to series and parallel resonance and its conditions
   9.5 Power in pure resistance, inductance and capacitance, power in combined RLC circuits. Power factor, active and reactive power and their significance, definition and significance of power factor.
   9.6 Definition of conductance, susceptance, admittance, impedance and their units

10. Introduction to Bipolar-Transistors (06 hrs)

10.1 Concept of a bipolar transistor, its structure, PNP and NPN transistors, their symbols and mechanism of current flow; Current relations in a transistor; concept of leakage current;

10.2 CB, CE, CC configurations of a transistor; Input and output characteristics in CB and CE configurations; input and output dynamic resistance in CB and CE configurations; Current amplification factors. Comparison of CB, CE and CC Configurations;

10.3 Transistor as an amplifier in CE Configuration; concept of DC load line and calculation of current gain and voltage gain using DC load line.

11. Transistor Biasing Circuits (04 hrs)

Concept of transistor biasing and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits.

12. Field Effect Transistors (05 hrs)

Construction, operation and characteristics of FETs and their applications.

12.1 Construction, operation and characteristics of a MOSFET in depletion and enhancement modes and its applications.

12.2 CMOS - advantages and applications

12.3 Comparison of JFET, MOSFET and BJT.

13. Introduction to Electrical Machines (05 hrs)

13.1 Transformers : Principal of operation, construction detail of single phase transformer, turns ratio , efficiency, loses in a transformer.

13.2 DC machine : principal of operation, construction of DC motor and generator, Characteristics of different types of DC machines , Starter .

13.3 AC machines : Principal and working of synchronous machines, single phase induction motor

LIST OF PRACTICALS

1. Operation and use of measuring instruments viz voltmeter, ammeter, CRO, Wattmeter, multi-meter and other accessories
2. Measurement of resistance of an ammeter and a voltmeter
3. Verification of following Theorems:-
   a. Thevenin’s theorem,
   b. Norton’s theorem,
4. Observation of change in resistance of a bulb in hot and cold conditions, using voltmeter and ammeter.
5. Verification of Krichhoff's Current and Voltage Laws in a dc circuit
6. To find the ratio of inductance of a coil having air-core and iron-core respectively and

to observe the effect of introduction of a magnetic core on coil inductance

7. Charging and testing of a lead - acid storage battery.
8. Measurement of power and power factor in a single phase R-.L-.C. circuit and calculation of active and reactive powers in the circuit.
9. Plotting of V-I characteristics of a PN junction diode & Zener diode
10. Observe the output of waveform using
    a. Half-wave rectifier circuit using one diode
    b. Full-wave rectifier circuit using two diodes
    c. Bridge-rectifier circuit using four diodes
11. Plotting of the wave shape of full wave rectifier with
    a. Shunt capacitor filter
    b. Series inductor filter
12. Plotting of input and output characteristics and calculation of parameters of transistors in CE configuration.
13. Plotting of input and output characteristics and calculation of parameters of transistors in CB configuration.
14. Plotting of V-I characteristics of a FET.
15. To determine the efficiency of single phase Transformer

RECOMMENDED BOOKS

1. Electrical Technology by BL Theraja, S Chand and Co, New Delhi
2. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Sons, New Delhi
3. Experiments in Basic Electrical Engineering by SK Bhattacharya, KM Rastogi; New Age
   International (P) Ltd.; Publishers New Delhi
4. Principles of Electrical Engineering by BR Gupta, S Chand and Co, New Delhi
5. Basic Electrical Engineering by JB Gupta; SK Kataria and Sons, New Delhi
6. Basic Electrical Engineering by D.R Arora, Ishan Publications
7. Basic Electronics and Linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill Publishing Co, New Delhi.
8. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
9. Electronic Components and Materials by SM Dhir, Tata McGraw Hill Publishing Co, New Delhi
10. Electronic Devices and Circuits by Bhupinder Jit Kaur; Modern Publishers, Jalandhar
11. Electronics – I by DR Arora, North Publications, Jalandhar

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A	20%	Unit 1to 3	1st Internal	40%	40%(Combined in internal & final assessment)with minimum 25% marks in final assessment)
B	20%	Unit 4 ,5	2nd Internal		
C	60%	Unit 6 to 13	FINAL	60%	

1.6 ENVIRONMENTAL STUDIES

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RATIONALE

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 abetment 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

1. Introduction (4 Hrs)
    - Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non renewable.

2. Air Pollution (12 Hrs)
    - Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.

3. Water Pollution (16 Hrs)
    - Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of dissolved O_2, BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.

4. Soil Pollution (14 Hrs)
    - 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

5. Noise pollution (8 Hrs)
    - Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.

6. Environmental Legislation (10 Hrs)
    - Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air (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).

7. Impact of Energy Usage on Environment (6 Hrs)
    - Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly Material, Recycling of Material, Concept of Green Buildings.

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 alkalinity in drinking water
7. Determination of acidity in drinking water
8. Determination of organic/inorganic solid in drinking water
9. Determination of pH of soil
10. Determination of N&P (Nitrogen & Phosphorus) of soil
11. To measure the noise level in classroom and industry.
12. To segregate the various types of solid waste in a locality.
13. To study the waste management plan of different solid waste
14. To study the effect of melting of floating ice in water due to global warming

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 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 Erach Bharucha; University Press (India) Private Ltd., Hyderabad.
7. Environmental Engineering and Management by Suresh K Dhamija; S K Kataria and Sons, New Delhi.

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C	60%	Unit 4,5,6,7	FINAL	60%	

1.7 ENGINEERING GRAPHICS

L	T	P
-	-	3

RATIONALE

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, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

Note:

i) First angle projection is to be followed
ii) Minimum of 30 sheets to be prepared
iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students
iv) For better understanding, students should be encouraged to use engineering graph book, and computer based software like Auto CAD for free hand and orthographic projection practice.

LEARNING OUTCOMES

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

- Identify and use of different grades of pencils and other drafting instruments which are 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 drawings of 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 not visible in normal view
- Generate isometric (3D) drawing from different 2D (orthographic) views/sketches
- Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances
- Use AutoCAD or other drafting software for making fast engineering drawings and even animating the assembly drawings.

DETAILED CONTENTS

1. Introduction to Engineering Drawing (4 sheets)

    1.1 Definition of Engineering Drawing, Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards, engineering graph book, different grades of pencils to be used.
    1.2 Different types of lines in engineering drawing as per BIS specifications
    1.3 Practice of vertical, horizontal and inclined lines
    1.4 Principles of dimensioning: Types, elements, placing, different methods of dimensioning
    1.5 Practice of geometrical figures such as –triangles, rectangles, circles, ellipses and parabola, hexagonal, pentagon with the help of drawing instruments.
    1.6 Definition and classification of lettering, single stroke vertical and inclined lettering at 75^0 (alphabet and numerals)
    1.7 Freehand letter writing and sketches of various kind of objects in graph Sketch book/graph paper.

2 Scales (2 sheets)

    2.1 Scales-their needs and importance(theoretical instructions), types of scales, definition of Representative Fraction(R.F.) and length of scale.
    2.2 Construction of Plain and diagonal scale.

3 Orthographic Projection (5 sheets)

    3.1 Theory of orthographic projections (Elaborate theoretical instructions)
    3.2 Projections of points in different quadrants
    3.3 Projection of line (1^{st} angle and 3^{rd} angle)
        3.3.1 Line parallel to both planes
        3.3.2 Line perpendicular to any one of the principal plane
        3.3.3 Line inclined to any one of the principal plane and parallel to other
    3.4 Projection of Solid-Cube, Cuboid, Cone, Prism, pyramid
    3.5 Three views of orthographic projections of different objects (At least one sheet in 3^{rd} angle)

4 Sectioning and Identification of surfaces (2 sheets)

    4. 1 Identifications of surfaces, Importance and salient features of sectioning of objects.
    4. 2 Description of full section, half section.

5 Isometric Views (2 sheets)

5.1 Fundamental of isometric projections and isometric scale

5.2 Isometric views of different objects

6 Graphics using CAD (5 sheets)

6.1 Meaning, requirement of computer graphics, CAD, screen structure and toolbars in AutoCAD, coordinate system, Drawing Limits, Units.

6.2 Practice of LINE command, coordinates-Absolute, incremental, polar. POLYLINE, CIRCLE(3P,2P, TTR), ARC, ELLIPSE

6.3 Using above geometrical commands for making figure e.g. triangle, rectangle, hexagon, pentagon, parabola.

6.4 Editing commands-Scale, erase, copy, stretch, lengthen and explode.

6.5 Use of SNAP, GRID and ORTHO mode for selection of points quickly. Use of these modes while picking points in LINE, CIRCLE, PLINE, ARC, ELLIPSE etc commands.

6.6 Drawing projections of lines and solids.

6.7 Drawing orthographic projections of different objects (at least 2 sheets)

6.8 AutoCAD for the isometric views sheets. Making single computer sheet showing all the three views and an isometric (in single split screen view) of any object showing understanding of use of AutoCAD in making isometric views – at least 1 sheet

7 Common Symbols and conventions used in Engineering (1 sheet)

7.1 Civil Engineering sanitary fitting symbols

7.2 Electrical fitting symbols for domestic interior installations

7.3 Safety symbols used in engineering works

8 Development of surfaces (cylinder, cuboid, cone) (1 sheet)

8.1 Parallel line, radial line method

(The teacher may explain both methods but will use one method in sheet in classroom and other method on sketchbook)

9 Detailed and assembly drawing (3 sheets)

9.1 Principle and utility of detailed and assembly drawings

9.2 Wooden joints i.e. corner mortise and tenon joint, Tee Halving joint, Mitre faced corner joint, Tee bridle joint , crossed wooden joint, cogged joint, dovetail joint, through Mortise and tenon joint, furniture drawing – freehand and with the help of drawing instruments

9.3 Making Wooden Joint sheets in AutoCAD, rendering & showing assembly animation at least 1 sheet

10 Screw threads and threaded fasteners (5 sheets)

10.1 Type of threads-external and internal threads, right and left hand threads (actual conventional representation), Single and multiple start thread.

10.2 Different forms of screw threads –V threads (B.S.W. threads, B.A thread, American National and Metric thread), Square threads (Square, Acme, buttress and Knuckle thread)

10.3 Different views of hexagonal and square nuts. Square and hexagonal headed bolt.

10. 4 Foundations bolts-Rag bolt, Lewis bolt, Curved bolt and eye bolt.

10. 5 Freehand sketches of various types of screws and studs.

11 Keys and Cotters (3 sheets)

11. 1 Various types of keys and cotters - their practical application, drawings of various keys and cotters showing keys and cotters in position.

11. 2 Various types of Joints

-Spigot and Socket Joints

-Gib and cotter joint

-Knuckle joint

12 Couplings (2 sheets)

12.1 Introduction to coupling, their use and types

12.2 Muff coupling

12.3 Flange coupling (protected)

12.4 Flexible Coupling

MEANS OF ASSESSMENT

- Drawing sheets
- Assignments and quiz/class tests

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.
6. CAD/CAM by J.S.Narang, Dhanpat Rai & Sons Publishers, New Delhi.
7. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.
8. Engineering Drawing with AutoCAD 2000 by T. Jeyapooran, Vikas Publishing House, Delhi
9. AutoCAD for Engineering Drawing Made Easy by P. Nageswara Rao; Tata McGraw Hill;, New Delhi.

Websites for Reference:

http://swayam.gov.in

Section	Percentage of syllabus to be covered	Units to be covered	Type of assessment	Weightage of Marks	Pass Percentage
A	20%	Unit 1 ,2	1st Internal	40%	40% (Combined in internal & final assessment) with minimum 25% marks in final assessment)
B	20%	Unit 3,4,5	2nd Internal		
C	60%	Unit 6, 7, 8, 9, 10, 11, 12	FINAL	60%	

1.8 INFORMATION TECHNOLOGY

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RATIONALE

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.,. 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. There will not be any theory examination.

LEARNING 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, 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.

TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Basic Concepts of IT and Its Application

   Information Technology concept and scope, applications of IT. in office, Air and Railway Ticket reservation, Banks financial transactions, E-Commerce and E- Governance applications etc., Ethics of IT, concept of online frauds, threats of IT crimes.

2. Computer Hardware:

   Block diagram of a computer, components of computer system, CPU, Memory, Input devices; keyboard, Scanner, mouse etc; Output devices; VDU, LCD, Printers etc. Primary and Secondary Memory: RAM, ROM, magnetic disks – tracks and sectors, optical disk (CD, DVD & Blue Ray Disk.), USB/Flash Drive.

3. Software Concepts:

   System software, Application software, Virtualization software and Utility software, Introduction of Operating System, Installation of Window / linux, Features of OPEN OFFICE/MS_OFFICE(MS word, Excel, PowerPoint) .

4. Internet Concepts:

   Basics of Networking – LAN, WAN, Wi-Fi technologies and sharing of printers and other resources, Concept of IP addresses, DNS, introduction of internet, applications of internet like: e-mail and browsing, concept of search engine and safe searching. Various browsers like Internet explorer/Microsoft Edge, Mozilla Firefox, use of cookies and history, WWW (World Wide Web), hyperlinks, introduction to Anti-virus.

LIST OF PRACTICAL EXERCISES

1. Given a PC, name its various components and peripherals. List their functions .
2. Installing various components of computer system and installing system software and application software
3 Installation of I/O devices, printers and installation of operating system viz. Windows/BOSS/ LINUX
4. Features of Windows as an operating system
   - Start
   - Shut down and restore
   - Creating and operating on the icons
   - Opening, closing and sizing the windows and working with windows interfacing elements (option buttons, checkbox, scroll etc.)
   - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file and folders
   - Changing settings like, date, time, colour (back ground and fore ground etc.)

- Using short cuts
- Using on line help

5. Word Processing (MS Office/Open Office)
   a) File Management:
      - Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, giving password protection for a file
   b) Page set up:
      - Setting margins, tab setting, ruler, indenting
   c) Editing a document:
      - Entering text, cut, copy, paste using tool- bars
   d) Formatting a document:
      - Using different fonts, changing font size and colour, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
      - Aligning of text in a document, justification of document, inserting bullets and numbering
      - Formatting paragraph, inserting page breaks and column breaks, line spacing
      - Use of headers, footers: Inserting footnote, end note, use of comments, autotext
      - Inserting date, time, special symbols, importing graphic images, drawing tools
   e) Tables and Borders:
      - Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
      - Print preview, zoom, page set up, printing options
      - Using find, replace options
   f) Using Tools like:
      - Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelops and lables
      - Using shapes and drawing toolbar,
      - Working with more than one window .

6. Spread Sheet Processing (MS Office/Open Office)

   a) Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, save worksheet, switching between different spread sheets
   b) Menu commands:
      Create, format charts, organise, manage data, solving problem by analyzing data. Programming with Excel Work Sheet, getting information while working
   c) Work books:
      Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations

Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet, conditional formatting

d) Creating a chart:

Working with chart types, changing data in chart, formatting a chart, use chart to analyze data

Using a list to organize data, sorting and filtering data in list

e) Retrieve data with query:

Create a pivot table, customizing a pivot table. Statistical analysis of data

f) Exchange data with other application:

Embedding objects, linking to other applications, import, export document.

7. PowerPoint Presentation (MS Office/Open Office)

a) Introduction to PowerPoint
   - How to start PowerPoint
   - Working environment: concept of toolbars, slide layout & templates.
   - Opening a new/existing presentation
   - Different views for viewing slides in a presentation: normal, slide sorter.

b) Addition, deletion and saving of slides

c) Insertion of multimedia elements
   - Adding text boxes
   - Adding/importing pictures
   - Adding movies and sound
   - Adding tables and charts etc.
   - Adding organizational chart
   - Editing objects
   - Working with Clip Art

d) Formatting slides
   - Using slide master
   - Text formatting
   - Changing slide layout
   - Changing slide colour scheme
   - Changing background
   - Applying design template

e) How to view the slide show?
   - Viewing the presentation using slide navigator
   - Slide transition
   - Animation effects, timing, order etc.

f) Use of Pack and Go Options.

8. Internet and its Applications

a) Establishing an internet connection.

b) Browsing and down loading of information from internet.
c) Sending and receiving e-mail
   - Creating a message
   - Creating an address book
   - Attaching a file with e-mail message
   - Receiving a message
   - Deleting a message
d) Assigning IP Addresses to computers and use of domain names.

9. Functioning of Antivirus

   a) Installation and updation of an antivirus.
   b) How to scan and remove the virus.

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 in addition to working on internet. The student should be made capable of working on computers independently.

RECOMMENDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
3. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New Delhi.
4. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
5. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
6. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

1.9 INTERNET OF THINGS AND ARTIFICIAL INTELLIGENCE

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LEARNING OUTCOMES

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

- Understand the concepts of Internet of Things
- Build small IoT applications
- Understand and analysing sensor generated data using analytic techniques in Excel

DETAILED CONTENTS

1. Introduction to Internet of Things (IoT) (8 hrs)
   - Applications, architecture, protocols
   - Characteristics of IoT
   - Physical Design/Logical Design of IoT
   - Functional blocks of IoT, Communication Models.

2. Basics of C language using Arduino IDE (14 hrs)
   - Understating basics of Arduino IDE
   - Variables, datatype, loops, control statement, function

3 Practical using Arduino-interfacing sensors (28 hrs)

   i. Interfacing Light Emitting Diode(LED)- Blinking LED
   ii. Interfacing Button and LED – LED blinking when button is pressed
   iii. Interfacing Light Dependent Resistor (LDR) and LED, displaying automatic night lamp
   iv. Interfacing Temperature Sensor(LM35) and/or humidity sensor (e.g. DHT11)
   v. Interfacing Liquid Crystal Display(LCD) – display data generated by sensor on LCD
   vi. Interfacing Air Quality Sensor-pollution (e.g. MQ135) - display data on LCD , switch on LED when data sensed is higher than specified value.
   vii. Interfacing Bluetooth module (e.g. HC05)- receiving data from mobile phone on Arduino and display on LCD
   viii. Interfacing Relay module to demonstrate Bluetooth based home automation application. (using Bluetooth and relay).

4 Introduction to Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL). (20 hrs)
   - Role of AI in IoT and its applications
   - Managing and Analysing data generated by IoT devices – Big Data
   - Machine learning (ML) Techniques e.g. classification, linear regression, etc.
   - Numerical based on above techniques.
   - Understanding excel for analysing data

INSTRUCTIONAL STRATEGY

Since this subject is practical oriented, the teacher should demonstrate functioning of various sensors and demonstrate building of IoT applications. Solution to various regression and classification problems should also be built.

LIST OF REFERENCE BOOKS:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands On Approach, University Press
2. Yashavant Kanetkar, Shrirang Korde, "21 Internet Of Things (IOT) Experiments"
3. Neerparaj Rai , "Arduino Projects For Engineers"
4. Chandra S.S.V, "Artificial Intelligence and Machine Learning"

LIST OF COMPONENTS

1. One kit for 3-4 students : Arduino Uno, sensors(Bluetooth module(HC05), MQ135, DHT11, breadboard , LCD, 2-relay module etc)
2. Consumables : LED, button, connecting wires, LDR, LM35, battery, etc

1.10 GENERAL WORKSHOP PRACTICE

(Common for Mechatronics Engineering, Medical Electronics, Electrical Engineering, Electronics and Communication Engineering, Electrical & Electronics Engineering, , Instrumentation & Control Engineering, Computer Engineering, Food Technology, Chemical Engineering, Chemical Engineering (Pulp & Paper), Ceramic Engineering)

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SCHEDULING

The students will visit the different workshops in two major rounds in a year. In 1st round, they will learn basic skills of each workshop and in 2nd round, they will refine their skills further**.**

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

LEARNING OUTCOMES

After completing the course, the students will be able to:

- Identify tools and equipment used and their respective functions.
- Identify different types of materials and their basic properties.
- Use and take measurements with the help of basic measuring tools/equipment.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare simple jobs independently and inspect the same.
- Inspect visually to identify various types of defects in different type of materials.
- Follow safety procedures and precautionary measures.
- Use safety equipment and Personal Protection Equipment(PPE).
- Maintain good housekeeping practices.

DETAILED CONTENTS (PRACTICAL EXERCISES)

1st ROUND

Workshop Safety Induction Session:

First turn of each shop shall be dedicated to safety practices and the contribution of safety to quality. The safety aspects should be categorised into 3 categories

- PSS (Process Safety System)
- SSS (Safety Shutdown System)

- ESD (Emergency Shutdown) or Emergency Depressurisation System.

The following practices should be included:

- Use of PPE (Personal Protection Equipment)
- Use of Safety Equipment like fire extinguishers etc.)
- Paramedic teaching suite, First –Aid
- Reports to be prepared for the damages
- At the end of this session, the student must sign "Student Safety Declaration form".

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1. Welding Shop – I
2. Fitting Shop – I
3. Sheet Metal Shop – I
4. Electric Shop – I
5. Electronic Shop – I

1. WELDING SHOP - I

1.1 Introduction and importance of welding process as compared to other material joining processes. Specifications and type of ARC welding machines, parts identification, classification, selection and coding of electrodes, welding parameters, welding joints and welding positions. Common weldable Materials, safety precautions, use of PPEs, welding screens, Hazards and remedies during welding, Elementary symbolic representations, demo of types of welding defects.

1.2 Jobs to be prepared

Job I Practice of striking arc (Minimum 4 continuous beads on 100 mm long M.S. flat).

Job II Practice of depositing beads on plate at different current levels. (Minimum 4 beads on M.S. plate at four setting of current level and differentiating their characteristics).

Types of joints and their edge preparations:

Job III Preparation of lap joint using arc welding process.

Job IV Preparation of butt joint using arc welding process. (100 mm long).

Job V Preparation of T Joint using arc or gas welding (100mm x 6 mm M.S. Flat).

2. FITTING SHOP – I

2.1 Introduction and Practical Importance of fitting jobs

2.2 Basic deburring processes.

2.3 Introduction to fitting shop tools, marking and measuring devices/equipment.

2.4 Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.)

2.5 Identification of various steel sections (flat, angle, channel, bar etc.).

2.6 Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing). Demonstration of wrong fitting practices causing damage to filed surfaces (outsized, out angled etc.) and tool/blade breakages.

2.7 Jobs to be prepared:

Job I Marking of job, use of marking tools and various types of files, use of tri square, surface plate, filing and use of measuring instruments. (zero error and least count of Vernier calliper, Micrometer and Vernier height gauge).

Job II Filing a rectangular/square piece to maintain dimensions within an accuracy of ±0.5 mm.

Job III Making a cut-out from a square piece of MS flat using hand hacksaw and chipping.

3. SHEET METAL SHOP – I

3.1. Introduction and practical importance of sheet metal jobs, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.

3.2 Introduction and demonstration of hand tools used in sheet metal shop.

3.3 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine, Turning Machine, Wiring Machine, Setting Down Machine, Forming Machine, Brake etc.

3.4 Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc.

3.5 Study of various types of nuts, bolts, rivets, screws etc.

Job I Shearing practice on a sheet using hand shears.

Job II Prepare a seam joint of G.I. Sheet

Job III Practice on making Single riveted lap joint/Double riveted lap Joint.

Job IV Development of sheet for preparation of cubical container (300x150x25 mm)

4. ELECTRIC SHOP – I

4.1 Study, demonstration and identification of common electrical materials with standard ratings and specifications such as wires, cables, switches, MCB & ELCB, fuses, cleats, clamps and allied items, tools and accessories.

4.2 Study of electrical safety measures and protective devices.

Job I Identification of phase, Neutral and Earth wires for connection to domestic electrical appliances and their connections to three pin plugs. Difference between series and parallel wiring.

Job II Carrying out house wiring circuits using fuse, switches, sockets, ceiling rose etc. in batten or P.V.C. casing-caping. Demo of conduit wiring through junctions

Job III To prepare a three level Godown wiring circuit with PVC conduit wiring system.

4.3 Introduction to the construction of lead acid battery, its working and its specification parameters(maH, sp gravity), precautions while handling battery, Introduction to battery charger and its functioning. Types of charging

Job IV Installation of battery and connecting two or three batteries in series and parallel and its effect. Charging a battery and testing with hydrometer and cell tester

4.4 Introduction to solar energised lighting or water heater system and their defects.

Job V Installation of Solar cells, costing according to capacity

5. ELECTRONIC SHOP – I

Safety precautions to be observed in the Electronics Shop:
Identification and familiarization with the following tools used in electronic shop such as Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Screw Driver (Star Screw Driver), L- Keys, Soldering Iron, soldering wire, flux . Their demonstration and uses.
Identification, familiarization and uses of commonly used components; active and passive components; colour code and types of resistor and potentiometers, Diode, Transistor, LED, LDR, SCR, TRIAC,DIAC, Thermistor etc.
Identification, familiarization, demonstration and use of the following electronic instruments:

a) Analog multimeter
b) Digital multimeter

Identification, familiarization, demonstration and use of the following electronic instruments:
a) Simple CRO, function of every knob on the front panel
b) Power supply, fixed voltage and variable voltage, single output as well as dual output.
c) Function generator

Job I Practice in the use of above mentioned tools and instruments. For this a small experimental set up may be done

2ND ROUND

LEARNING OUTCOMES

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

- Follow safety procedures and measures.
- Maintain good housekeeping practices.

- Select materials, sequence of operations, select tools to make a given job based on interpretation of drawing as per given specification with close tolerances using at least the resources of three shops.
- Prepare a job using resources of shops and compare the job with the specifications given.
- Specify and read/understand specifications of different types of tools, equipment and machines used in various shops.
- Inspect visually to identify various types of defects in different type of materials.
- Analyze a given job and identify various operations required to make it.

DETAILED CONTENTS (PRACTICAL EXERCISES)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus.

1. Electric Shop – II
2. Electronic Shop – II
3. Computer Shop

1. ELECTRIC SHOP- II

1.1 Introduction to single phase and three phase supply and wiring system. Importance of three phase supply (RYB)& its sequence and wiring system.

Job I Connecting Generator and 3 phase wiring through Change over Switch.

1.2 Estimating and costing of power consumption

Job II Connecting single phase energy meter with supply and load. Reading and working out power consumption and cost of energy.

1.3 Study of internal wiring diagram of common electrical appliances such as auto electric iron, electric kettle, ceiling/table fan, desert cooler etc. Demonstration of dismantling, servicing and reassembling of table/ceiling fan, air-cooler, auto electric iron, heater etc.

Job III Dismantling, servicing and reassembling of any of the above electrical appliances, finding faults with series testing lamp and multimeter.

1.4 Testing and reversing direction of rotation of single phase and three phase motors.

Job IV Acceptance Testing of single phase/three phase motors by using voltmeter, ammeter and tachometer.

Job V Reversing direction of rotation of single phase and three phase motors.

1.5 Identification and familiarisation with the following tools:

Tweezers, Screw Drivers (Different sizes), Insulated pliers, Cutters, Sniper, Philips Screw driver (star screw driver), L-Keys, Soldering Iron and their demonstration and uses.

Job VI Practice on joining using soldering flux and removing components/wires by desoldering

2. ELECTRONIC SHOP - II

Various types of protective devices such as : wire fuse, cartridge fuse etc. ,

Demonstrate the joining (or connecting) methods/mounting and dismantling method, as well as uses of the items mentioned below:

a) Various types of plugs, sockets, connectors suitable for general purpose audio video use. Connectors, Banana plugs, sockets and similar male and female connectors and terminal strips.

b) Various types of switches such as: normal/miniature toggle, slide, push button piano key, rotary, SPST, SPDT, DPST, DPDT, band selector, multi-way Master Mains Switch.

Job-I Cut, bend, tin component, leads, inserts. Solder components e.g. resistor, capacitor, diodes, transistors on a PCB

Job-II Wiring of a small circuit on a PCB/tag strip involving laying, sleeving and use of identifier tags

Job-III De-soldering practice with de-soldering pump and with de-soldering wick.

Job-IV Cut, strip, join and insulate two lengths of wires/cables (repeat with different types of cables/ wires)

3. COMPUTER SHOP

EXERCISE– I

3.1 Keyboard

- Types of Keyboards
- Interfacing (PS2, USB port, DIN connector)
- Working
- Repairing

3.2 Mouse

- Types of Mouse
- Interfacing (serial, PS2, USB)
- Working

EXERCISE – II

3.3 Printers

- Types (Dot matrix, Inkjet, Laserjet)

- Interfacing (parallel port, USB port, Networking)
- Working
- Maintenance (cartridge change etc)
- Installation of printers
- Troubleshooting (Driver compatibility, Paper jam, printing problems due to uncleaned drum in laserjet printers, belt related problems in inkjet printer, jets choking problem in inkjet printer, color alignment problem).
- Tracing network printer and sharing it.

EXERCISE – III

3.4 Scanner

- Types
- Interfacing
- Scanning a document

3.5 Monitor

- Types and Interfacing
- Fault finding and repairing

EXERCISE – IV

3.6 CPU

- Motherboard connection (dimensions, processor, chipset, BIOS, EFI (Extended Firmware Interfacing), UFI (Unified Firmware Interfacing).
- SMPS-AT
  - Working
  - Voltage levels
  - Fault finding and repair

EXERCISE - V

3.7 Optical Devices

- CD-R, DVD, CD-W
- Working
- Copying
- CD/DVD drives
- Pen drive (copying data, formatting scanning)

3.8 Microphones and Speakers

- Types and Interfacing

EXERCISE – VI

3.9 Projectors

- Types
- Settings

- Interfacing

3.10 Hard disks

- Different makes of Hard disks
- Retrieval of Hard disk data

3.11 Graphic Card connection

3.12 Sound Card Connection

EXERCISE – VII

3.13 Different types of network interface cards, cables such as data cables, printer cables, network cables, power cables etc.

3.14 Networking tools such as cutter, connector (RJ45)

3.15 Network Cable

- Straight Cable
- Cross Cable
- Roll Cable

EXERCISE – VIII

3.16 Types of cables

- UTP Cables: CAT3, CAT5, CAT6, CAT7
- Fibre optic cable
- Structured cabling

MEANS OF ASSESSMENT

- Workshop jobs
- Report writing, presentation and viva voce

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi
7. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi
8. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

THIRD SEMESTER

3.1 ELECTRONIC INSTRUMENTS AND MEASUREMENT

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RATIONALE

In the real world of work, the technician is required to handle wide variety of instruments while testing, trouble shooting, calibration etc. The study of this subject will help students to gain the knowledge of working principles and operation of different instruments. During practical sessions, he will acquire the requisite skills.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Describe and demonstrate the specifications (accuracy, precision, sensitivity, resolution, range, errors, loading effects) of measuring instruments.
- Demonstrate the working principle of measuring instruments like multi-meter, CRO, DSO
- Measure the loading effect of a multi-meter
- Describe the limitation of multi-meter for high frequency measurement
- Measure frequency, voltage, time period and phase using CRO and DSO
- Measure rise time and fall time using CRO and DSO
- Demonstrate the working of RF signal generator, pulse generator
- Measure distortion of RF signal generator using Distortion factor Meter
- Measure of Q using Q-meter
- Measure of remittance, capacitance, inductance and usig different bridges
- Use of logic pulser, logic analyzer and signature analyzer

DETAILED CONTENTS

1. Basics of Measurements (04 Periods)

- Measurement, method of measurement, types of instruments
- Specifications of instruments: Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors, loading effect, importance and applications of standards and calibration

2. Voltage, Current and Resistance Measurement (08 Periods)

- Principles of measurement of DC voltage, DC current, AC voltage, AC current,
- Principles of operation and construction of permanent magnet moving coil (PMMC) instruments and Moving iron type instruments,

3. Cathode Ray Oscilloscope (12 Periods)

- Construction and working of Cathode Ray Tube(CRT)
- Block diagram description of a basic CRO and triggered sweep oscilloscope, front panel controls
- Specifications of CRO and their explanation
- Measurement of current, voltage, frequency, time period and phase using CRO
- Digital storage oscilloscope (DSO) : block diagram and working principle

4 Impedance Bridge Q Meters (08 periods)

- Wheat stone bridge
- AC bridges: Maxwell's induction bridge, Hay's bridge, De-Sauty's bridge, Schering bridge and Anderson bridge
- Bock diagram description of laboratory type RLC bridge, specifications of RLC bridge.
- Block diagram and workig principle of Q meter.

5 Signal Generators and Analytical Instruments (08 Periods)

- Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator
- Distortion factor meter
- Instrumentation amplifier: its characteristics, need and working

6. Digital Instruments (08 Periods)

- Comparison of analog and digital instruments
- Working principle of ramp, dual slope and integration type digital voltmeter
- Block diagram and working of a digital multi-meter
- Specifications of digital multi-meter and their applications
- Limitations of digital multi-meters.
- Working principle of logic probe, logic pulser, logic analyzer and signature analyzer.

LIST OF PRACTICALS

1. **Measurement of voltage, resistance, frequency using digital multimeter**
2. Measurement of voltage, frequency, time period and phase using CRO
3. Measurement of voltage, frequency, time and phase using DSO
4. Measurement of Q of a coil
5. Measurement of resistance and inductance of coil using RLC Bridge
6. Measurement of impedance using Maxwell Induction Bridge
7. To find the value of unknown resistance using Wheat Stone Bridge
8. Measurement of distortion using Distortion Factor Meter
9. Use of logic pulser and logic pobe

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Sons, New Delhi
2. Electronics Measurement and Instrumentation by Oliver, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Electronics Instrumentation by Cooper, Prentice Hall of India, New Delhi
4. Electronics Instrumentation and measurment by Sanjeev Kumar and Yash Pal; North Publications
5. Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi
6. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No	**Time Allotted (Periods)**	**Marks Allocation (%)**
1.	04	08
2.	08	18
3.	12	24
4.	08	18
5.	08	16
6.	08	16
Total	**48**	**100**

3.2 PRINCIPLES OF COMMUNICATION ENGINEERING

L	T	P
3	-	2

RATIONALE

The study of principles of communication systems leads to further specialized study of audio and video systems, line communications and microwave communication systems. Thus the diploma-holder in Electronics and Communication Engineering shall find employment in areas of R and D, production, servicing and maintenance of various communication systems. The students should understand the advantage and limitations of various analog and digital modulation systems on a comparative a scale and relate to them while studying practical communication systems.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Explain the concept and need of modulation and demodulation
- Measure the modulation index of the Amplitude Modulated wave
- Measure the frequency deviation of FM wave for different modulating signals
- Use different types of modulators and demodulators
- Obtain modulating signal from an AM Detector Circuit
- Obtain modulating signal from a FM Detector
- Use different types of Pulse Modulation Techniques (PAM, PPM, PWM)

DETAILED CONTENTS

1. Introduction (03 Periods)

   - Need for modulation, frequency translation and demodulation in communication systems
   - Basic scheme of a modern communication system.

2. Amplitude modulation (06 Periods)

   - Derivation of expression for an amplitude modulated wave. Carrier and side band components. Modulation index. Spectrum and BW of AM Wave. Relative power distribution in carrier and side bands.
   - Elementary idea of DSB-SC, SSB-SC, ISB and VSB modulations, their comparison, and areas of applications

3. Frequency modulation (06 Periods)

   - Expression for frequency modulated wave and its frequency spectrum (without Proof and analysis of Bassel function) Modulation index, maximum frequency deviation and deviation ratio, BW of FM signals, Carson's rule.

   - Effect of noise on FM carrier. Noise triangle, Role of limiter, Need for pre-emphasis and de-emphasis, capture effect.

   - Comparison of FM and AM in communication systems

4. Phase modulation (05 Periods)

- Derivation of expression for phase modulated wave, modulation index, comparison with frequency modulation.

5. Principles of AM Modulators (05 Periods)
Circuit Diagram and working operation of:

a) Collector and Base Modulator
b) Square Low Modulator
c) Balanced Modulator

6. Principles of FM Modulators (06 Periods)

- Working principles and applications of reactance modulator, varactor diode modulator, VCO and Armstrong phase modulator.
- Stabilization of carrier using AFC (Block diagram approach).

7. Demodulation of AM Waves (05 Periods)

- Principles of demodulation of AM wave using diode detector circuit; concept of Clipping and formula for RC time constant for minimum distortion (no derivation)

8. Demodulation of FM Waves (06 Periods)

- Basic principles of FM detection using slope detector
- Principle of working of the following FM demodulators
  i. Foster-Seeley discriminator
  ii. Ratio detector
  iii. Block diagram of Phase locked Loop (PLL) FM demodulators (No Derivation)

9. Pulse Modulation (06 Periods)

- Statement of sampling theorem and elementary idea of sampling frequency for pulse modulation
- Basic concepts of time division multiplexing (TDM) and frequency division multiplexing (FDM)

- Pulse Amplitude Modulation (PAM), Pulse Position Modulation (PPM), Pulse Width Modulation (PWM).

LIST OF PRACTICALS

1. a) To observe an AM wave on CRO produced by a standard signal generator using internal and external modulation
   b) To measure the modulation index of the wave obtained in above practical

2. a) To obtain an AM wave from a square law modulator circuit and observe waveforms
   b) To measure the modulation index of the obtained wave form.

3. To obtain an FM wave and measure the frequency deviation for different modulating signals.

4. To obtain modulating signal from an AM detector circuit and observe the pattern for different RC time constants and obtain its optimum value for least distortion.

5. To obtain modulating signal from FM detector.

6. To observe the sampled signal and compare it with the analog input signal. Note the effect of varying the sampling pulse width and frequency on the sampled output.

7. To observe and note the pulse amplitude modulated signal (PAM) and compare them with the corresponding analog input signal

8. To observe PPM and PWM signal and compare it with the analog input signal

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making

- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

(1) Electronics Communication System by Kennedy, Tata McGraw Hill Education Pvt Ltd, New Delhi
(2) Principles of Communication Engineering by Taub, Tata McGraw Hill Education Pvt Ltd,
(3) Electronics Communication by KS Jamwal, Dhanpat Rai and Co, New Delhi
(4) Radio Engineering by GK Mittal, Khanna Publishers, New Delhi
(5) Principles of Communication Engineering by Sanjeev Kumar, Ishan Publications, Ambala
(6) Communication Engineering by A Kumar
(7) Principles of Communication Engineering by Manoj Kumar, Satya Prakashan, New Delhi
(8) Principles of Communication Engineering by Anokh Singh, S. Chand and Co., New Delhi
(9) Principles of Communication Engineering by Roody , Coolen, Pearson Publisher
(10) e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (Periods)**	**Marks Allocation (%)**
1.	03	06
2.	06	12
3.	06	12
4.	05	10
5.	05	10
6.	06	14
7.	05	10
8.	06	14
9	06	12
Total	**48**	**100**

3.3 DIGITAL ELECTRONICS

L T P
3 - 3

RATIONALE

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 the subject, student 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 half adder and full adder circuit
- Demonstrate and design 4-bit adder, 2's complement subtractor
- Verify and interpret truth tables for all flip flops.
- Verify and interpret truth tables of multiplexer, demultiplexer, encoder and decoder ICs
- Design and realize different asynchronous and synchronous counters
- Design 4-bit SISO, PISO, SIPO, PIPO shift registers
- Explain the features and applications of different memories.
- Verify performance of different A/D and D/A converters.

DETAILED CONTENTS

1. Introduction (02 Periods)

   a) Distinction between analog and digital signal.
   b) Applications and advantages of digital signals.

2. Number System (03 Periods)

   a) Binary, octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa.
   b) Binary addition and subtraction including binary points. 1's and 2's complement method of addition/subtraction.

3. Codes and Parity (03 Periods)

   a) Concept of code, weighted and non-weighted codes, examples of 8421, BCD, excess-3 and Gray code.

   b) Concept of parity, single and double parity and error detection

4. Logic Gates and Families (05 Periods)

   a) Concept of negative and positive logic
   b) Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates.
   (c) Introduction to TTL and CMOS logic families

5. Logic Simplification (04 Periods)

   a) Postulates of Boolean algebra, De Morgan's Theorems. Implementation of Boolean (logic) equation with gates

b) Karnaugh map (upto 4 variables) and simple application in developing combinational logic circuits

6. Arithmetic circuits (02 Periods)

a) Half adder and Full adder circuit, design and implementation.
b) 4 bit adder circuit

7. Decoders, Multiplexeres, Multiplexeres and Encoder (04 Periods)

a) Four bit decoder circuits for 7 segment display and decoder/driver ICs.
b) Basic functions and block diagram of MUX and DEMUX with different ICs
c) Basic functions and block diagram of Encoder

8. Latches and flip flops (04 Periods)

a) Concept and types of latch with their working and applications
b) Operation using waveforms and truth tables of RS, T, D, Master/Slave JK flip flops.
c) Difference between a latch and a flip flop

9. Counters (06 Periods)

a) Introduction to Asynchronous and Synchronous counters
b) Binary counters
c) Divide by N ripple counters, Decade counter, Ring counter

10. Shift Register (06 Periods)

Introduction and basic concepts including shift left and shift right.

a) Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.
b) Universal shift register

11. A/D and D/A Converters (06 Periods)

- Working principle of A/D and D/A converters
- Brief idea about different techniques of A/D conversion and study of :
    - Stair step Ramp A/D converter
    - Dual Slope A/D converter
    - Successive Approximation A/D Converter
- Detail study of :
    - Binary Weighted D/A converter
    - R/2R ladder D/A converter
- Applications of A/D and D/A converter.

12. Semiconductor Memories (03 periods)

Memory organization, classification of semiconductor memories (RAM, ROM, PROM, EPROM, EEPROM), static and dynamic RAM, introduction to 74181 ALU IC

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. Realisation of logic functions with the help of NAND or NOR gates

3. - To design 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).
5 Verification of truth table for encoder and decoder ICs, Mux and DeMux
6. To design a 4 bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flops and verification of their operation.
7. To design a 4 bit ring counter and verify its operation.
8. Use of Asynchronous Counter ICs (7490 or 7493)

Note: Above experiments may preferably be done on Bread Boards.

INSTRUCTIONAL STRATEGY

The digital systems in microprocessors have significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge in microprocessors (programming as well as interfacing), A/D, D/A Converters and other topics. Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. Programming exercises other than the tested in circulation may be given to the students.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
3. Digital Electronics by Soumitra Kumar Mandal, Tata McGraw Hill Education Pvt Ltd,
4. Digital Electronics by V K Sangar , Raj Publishers, Jalandhar
5. Digital Electronics by Tokheim, Tata McGraw Hill Education Pvt Ltd,
6. Digital Fundamentals by Thomas Floyds, Universal Book Stall
7. Digital Electronics by RP Jain, Tata McGraw Hill Education Pvt Ltd, New Delhi
8. Digital Electronics by KS Jamwal, Dhanpat Rai and Co., New Delhi
9. Digital Electronics by Yashpal and Sanjeev Kumar; North Publication, Ambala City
10. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi
11. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
12. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi
13. Fundamentals of Digital Electronics by Naresh Gupta, Jain Brothers, New Delhi
14. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	02	04
2.	03	05
3.	03	05
4.	05	10
5.	04	10
6.	02	05
7.	04	10
8.	04	10
9	06	12
10.	06	12
11.	06	12
12	03	05
Total	**48**	**100**

3.4 ELECTRONIC DEVICES AND CIRCUITS

L	T	P
3	-	2

RATIONALE

Having attained basic knowledge of electronic devices like diodes, transistors, and elementary circuits, in second semester, this course will enable the students to learn about the use of transistors in analog circuits like power amplifier, multistage amplifier, oscillators, wave shaping circuits and in multivibrators etc. It also gives information about timer, operational amplifier, voltage regulator, ICs and their applications for effective functioning in the field of electronic service industry.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Demonstrate the concept of multistage amplifiers and plot the frequency response of the same
- Measure the bandwidth of multistage amplifier
- Describe the operation of large signal amplifiers.
- Demonstrate the concept of negative and positive feedback.
- Measure the gain of emitter follower and push pull amplifiers
- Plot the frequency response of oscillators(Hartley, Colpitt, Wein Bridge)
- Explain the concept of feedback amplifiers
- Plot the frequency response of tuned voltage amplifiers
- Design various wave-shaping circuits (concepts of clipping and clamping)
- Describe the concept of multi-vibrators and operational amplifiers
- Demonstrate the working of operational amplifier as inverter, integrator, differentiator, adder and subtractor.
- Describe the concept of regulated DC supplies.

DETAILED CONTENTS

1. Multistage Amplifiers (05 Periods)

- Need for multistage amplifier
- Gain of multistage amplifier
- Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth

2. Large Signal Amplifier (06 Periods)

- Difference between voltage and power amplifiers
- Importance of impedance matching in amplifiers
- Class A, Class B, Class AB, and Class C amplifiers, collector efficiency and Distortion in class A,B,C
- Single ended power amplifiers, Graphical method of calculation (without derivation) of out put power; heat dissipation curve and importance of heat sinks. Push-pull amplifier, and complementary symmetry push-pull amplifier

3. Feedback in Amplifiers (08 Periods)

- Basic principles and types of feedback
- Derivation of expression for gain of an amplifier employing feedback
- Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier
- RC coupled amplifier with emitter bypass capacitor
- Emitter follower amplifier and its application

4. Sinusoidal Oscillators (06 Periods)

- Use of positive feedback
- Barkhausen criterion for oscillations
- Different oscillator circuits-tuned collector, Hartley, Colpitts, phase shift, Wien's bridge, and crystal oscillator. Their working principles (no mathematical derivation but only simple numerical problems)

5. Tuned Voltage Amplifiers (04 Periods)

- Series and parallel resonant circuits and bandwidth of resonant circuits.
- Single and double tuned voltage amplifiers and their frequency response characteristics

6. Multivibrator Circuits (07 Periods)

- Working principle of transistor as switch
- Concept of multi-vibrator: astable, monostable, and bistable and their applications
- Block diagram of IC555 and its working and applications
- IC555 as monostable and astable multi-vibrator and bistable multivibrator

7. Operational Amplifiers (07 Periods)

- Characteristics of an ideal operational amplifier and its block diagram
- IC-741 and its pin configuration
- Definition of differential voltage gain, CMRR, PSRR, slew rate and input offset current
- Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator, and integrator

8. Regulated DC Power Supplies (05 Periods)

- Concept of DC power supply. Line and load regulation
- Concept of fixed voltage, IC regulators (like 7805, 7905), and variable voltage regulator like (IC 723)

LIST OF PRACTICALS

(1) Plot the frequency response of two stage RC coupled amplifier and calculate the bandwidth and compare it with single stage amplifier
(2) To measure the gain of push-pull amplifier at 1KHz
(3) To measure the voltage gain of emitter follower circuit and plot its frequency response
(4) Plot the frequency response curve of Hartley and Colpitt's Oscillator
(5) Plot the frequency response curve of phase shift and Wein bridge Oscillator
(6) Use of IC 555 as monostable multivibrator and observe the output for different values of RC
(7) Use of IC 555 as astable multivibrator and observe the output at different duty cycles

(8) To use IC 741 (op-amplifier) as
i) Inverter, ii) Adder, iii) Subtractor iv) Integrator

(9) To realize positive and negative fixed voltage DC power supply using three terminal voltage regulator IC (7805, 7812, 7905)

Class Project: Fabricate any simple operational amplifier circuit (Inverter, Adder, Subtractor etc.) and test it.

INSTRUCTIONAL STRATEGY

This subject being of fundamental importance for diploma holders in electronics engineering and related fields, emphasis on conceptual understanding may be given by taking the help of charts, simulation packages etc. Sufficient exercises may given to the students in single stage and multi-stage amplifier circuits in addition to simple exercises in fabricating and testing of various simple d.c circuits. The students may be encouraged to perform some additional practical exercises apart from the list provided.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

(1) Basic Electronics and Linear Circuits by NN Bhargava; Tata McGraw Hill, New Delhi
(2) Electronic Principles by Sahdev; Dhanpat Rai and Sons, New Delhi.
(3) Electronics Devices and Circuits by D.R. Arora, North Publication
(4) Electronics Devices and Circuits by Bhupinderjit Kaur; Modern Publishers, Jalandhar
(5) Electronic Devices and Circuits by BL Theraja; S Chand and Co Ltd. New Delhi
(6) Operational Amplifiers and Linear Integrated Circuits by Ramakant A. Gaykwad
(7) Electronics Devices and Circuits-II by Rajesh Kumar, Eagle Prakashan, Jalandhar
(8) e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:
http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Periods)	Marks Allocation
1.	05	10
2.	06	12
3.	08	16
4.	06	12
5.	04	08
6.	07	16
7.	07	16
8.	05	10
Total	**48**	**100**

3.5 NETWORK FILTERS AND TRANSMISSION LINES

L	T	P
3	-	2

RATIONALE

The study of networks, filters and transmission lines leads to understanding of line communication, audio and video communication, and microwave communication. Particularly the study of networks takes off from principles of A.C. theory and introduces the student to parameters and characteristics of various networks, including filters. Also the study of transmission lines becomes important as its analogy is used in study of transmission of plane electromagnetic waves in bounded media.

LEARNING OUTCOMES

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

- Describe the concept of symmetrical, asymmetrical, balanced, unbalanced, T, PI, ladder, lattice, L and Bridge T networks
- Demonstrate the operation of filters and attenuators.
- Demonstrate the operation of attenuators.
- Design and measure the attenuation of a symmetrical T/ π type attenuator
- Determine the characteristic impedance experimentally and Plot the attenuation characteristic of prototype low pass filter and prototype high pass filter
- Plot the Impedance characteristic and attenuation characteristics of prototype band-pass filter and m-derived filters
- Measure standing wave ratio and characteristic impedance of the line
- Draw the attenuation characteristics of a crystal filter
- Explain the concept of DC transmission

DETAILED CONTENTS

1. Networks (12 Periods)

- Two port (four terminals) network: Basic concepts of the following terms:
  - Symmetrical and asymmetrical networks: Balanced and unbalanced network; T-network, π network, Ladder network; Lattice network; L-network and Bridge T-network

- Symmetrical Network:
  - Concept and significance of the terms characteristic impedance, propagation constant, attenuation constant, phase shift constant and insertion loss.
  - T-network and π Network (No Derivation)

- Asymmetrical Network
  - Concept and significance of iterative impedance, image impedance,
  - The half section (L-section); symmetrical T and π sections into half sections (No Derivation)

2. Attenuators (08 Periods)

- Units of attenuation (Decibels and Nepers): General characteristics of attenuators
- Analysis and design of simple attenuator of following types; Symmetrical T and π type, L type.

3. Filters (14 Periods)

- Brief idea of the use of filter networks in different communication systems, concept of low pass, high pass, band pass and band stop filters.
- Prototype Filter Section:
  - Impedance characteristics vs frequency characteristics of a low and high pass filter and their significance
  - Attenuation Vs frequency; Phase shift Vs frequency, characteristics impedance vs frequency of T and π filters and their significance
  - Simple design problems of prototype low pass section.
- M-Derived Filter Sections
  Limitation of prototype filters, need of m-derived filters
- Crystal Filters
  Crystal and its equivalent circuits, special properties of piezoelectric filters and their use
- Active Filters
  Basic concept of active filters and their comparison with passive filters.

4. Transmission Lines (14 Periods)

- Transmission Lines, their types and applications.
- Distributed constants, T and π representation of transmission line section.
- Concept of infinite line
- Condition for minimum distortion and minimum attenuation of signal on-the-line and introduction to loading methods.
- Concept of reflection and standing waves, definition of reflection coefficient, SWR & VSWR and their relation (no derivation).
- Concept of transmission lines at high frequencies.
- Introduction to stubs. (single, open and short stubs).
- HVDC (High Voltage DC transmission) – Concept and Advantage, Disadvantage and areas of application.

LIST OF PRACTICALS

1. To measure the characteristic impedance of symmetrical T and π networks
2. To measure the image impedance of a given asymmetrical T and π networks

3. For a prototype low pass filter:

   a) Determine the characteristic impedance experimentally
   b) Plot the attenuation characteristic

4. To design and measure the attenuation of a symmetrical T/ π type attenuator

5. For a prototype high pass filter:

   - Determine the characteristic impedance experimentally
   - To plot the attenuation characteristic

6. a) To plot the Impedance characteristic of a prototype band-pass filter
   b) To plot the attenuation characteristic of a prototype band pass filter

7. a) To plot the impedance characteristic of m- derived low pass filter
   b) To plot the attenuation characteristics of m-derived high pass filter

8. To observe the information of standing waves on a transmission line and measurement of SWR and characteristic impedance of the line

9. Draw the attenuation characteristics of a crystal filter

INSTRUCTIONAL STRATEGY

Stress should be laid on problems in networks/ filler and transmission lines. Practical must be carried out after completion of topic to gain a good know how on the subject students should be given home assignments on various topics, stress on making own circuit models to calculate input/output impedance, characteristic impedance, losses etc. should be carried out by the students.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Network Lines and Fields by John D Ryder; Prentice Hall of India, New Delhi
2. Network Filters and Transmission Lines by AK Chakarvorty; Dhanpat Rai and Co. Publication, New Delhi
3. Network Analysis by Van Valkenburg: Prentice Hall of India, New Delhi
4. Network Analysis by Soni and Gupta; Dhanpat Rai and Co. Publication, New Delhi
5. Network Theory and Filter Design by Vasudev K. Aatre
6. Network Filters and Transmission line by Umesh Sinha
7. Network Filters and Transmission Line by Yash Pal; Ishan Publications, Ambala City

8. Electrical and Electronics Measuring instrumentation, A.K Sawhney; Dhanpat Rai and Co. Publication, New Delhi
9. Network Analysis by G.K. Mithal
10. Network Filters and Transmission line by Nardeep Goyal, Rajneesh Kumari; Tech. Max Publication, Pune.
11. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1	12	25
2	8	15
3	14	30
4	14	30
Total	**48**	**100**

3.6 COMPUTER PROGRAMMING USING C

L	T	P
3	-	3

RATIONALE

Computers play a vital role in present day life, more so, in the professional life of technician engineers. People working in the field of computer industry, use computers in solving problems more easily and effectively. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposition to various applications of computers. The knowledge of C language will be reinforced by the practical exercises.

LEARNING OUTCOMES

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

- Identify a problem and formulate an algorithm for it.
- Identify various control structures and implement them.
- Identify various types of variables.
- Use pointer in an array and structure.
- Explain the concepts of C programming language
- Implement the language constructs concepts
- Install C software on the system and debug the programme
- Explain and execute member functions of C in the programme
- Implement array concept in C programme
- Execute pointers

DETAILED CONTENTS

1. Algorithm and Programming Development (06 Periods)
   - 1.1 Steps in development of a program
   - 1.2 Flow charts, Algorithm development
   - 1.3 Programme Debugging

2. Program Structure (12 Periods)
   - 2.1 I/O statements, assign statements
   - 2.2 Constants, variables and data types
   - 2.3 Operators and Expressions
   - 2.4 Standards and Formatted IOS
   - 2.5 Data Type Casting

3. Control Structures (12 Periods)

- 3.1 Introduction
- 3.2 Decision making with IF – statement
- 3.3 IF – Else and Nested IF
- 3.4 While and do-while, for loop
- 3.5 Break. Continue, goto and switch statements

4. Pointers (10 Periods)

- 4.1 Introduction to Pointers
- 4.2. Address operator and pointers
- 4.3 Declaring and Initializing pointers,
- 4.4 Single pointer,

5. Functions (12 Periods)

- 5.1 Introduction to functions
- 5.2 Global and Local Variables
- 5.3 Function Declaration
- 5.4 Standard functions
- 5.5 Parameters and Parameter Passing
- 5.6 Call - by value/reference

6. Arrays (08 Periods)

- 6.1 Introduction to Arrays
- 6.2 Array Declaration, Length of array
- 6.3 Single and Multidimensional Array.
- 6.4 Arrays of characters
- 6.5 Passing an array to function
- 6.6 Pointers to an array

LIST OF PRACTICALS

1. Programming exercises on executing and editing a C program.
2. Programming exercises on defining variables and assigning values to variables.
3. Programming exercises on arithmetic and relational operators.
4. Programming exercises on arithmetic expressions and their evaluation.
5. Programming exercises on formatting input/output using printf and scanf and their return type values.
6. Programming exercises using if statement.
7. Programming exercises using if – Else.
8. Programming exercises on switch statement.
9. Programming exercises on do – while, statement.
10. Programming exercises on for – statement.
11. Programs on one-dimensional array.

12. Programs on two-dimensional array.
13. (i) Programs for putting two strings together.
    (ii) Programs for comparing two strings.
14. Simple programs using structures.
15. Simple programs using pointers.
16. Simple programs using union.

INSTRUCTIONAL STRATEGY

The subject is totally practical based. Students should be given clear idea about the basic concepts of programming. In practical session student should be asked to draw flow chart write algorithm and then write program for the algorithm and run on computer. It is required that students should maintain records (files with printouts).

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Let us C by Yashwant Kanetkar
2. Programming in ANSI C by E Balaguruswami, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Problem Solving and Programming in C by RS Salaria, Khanna Book Publishing Co(P) Ltd. New Delhi
4. Programming in C by Reema Thareja; Oxford University Press, New Delhi
5. Computer Programming and Application by Mridula Bassi; North Publications, Ambala City.
6. Programming in C by Gottfried, Schaum Series, , Tata McGraw Hill Education Pvt Ltd , New Delhi
7. Exploring C by Yashwant Kanetkar; BPB Publications, New Delhi
8. Programming in C by R Subburaj, Vikas Publishing House Pvt. Ltd., Jangpura, New Delhi
9. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi
10. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	12
2	12	20
3	16	20
4	10	16
5	12	20
6	08	12
Total	**64**	**100**

SOFT SKILLS – I

L	T	P
-	-	3

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

LEARNING OUTCOMES

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

- Identify components of effective verbal communication
- Prepare a report
- Learn the techniques of enhancing memory
- Set goals for overall personality development
- Understand the concept of quality and its implementation in an organisation.

DETAILED CONTENTS

- Soft Skills - Concept and Importance
- Communication Skills- Improving verbal communication
- Report Writing
- Method to enhance memory and concentration
- Component of overall personality- Dressing sense/etiquettes/body language etc.

In addition, the students must participate in the following activities to be organized in the institute.

- Sports
- NCC/NSS
- Camp – Blood donation
- Cultural Event

Note: Extension Lectures by experts may be organized. There will be no examination for this subject.

FOURTH SEMESTER

4.1 INSTRUMENTATION

L	P
3	3

RATIONALE

This subject deals with the various instruments, their construction and working which control the various parameters and operations in any industry. Electrical supervisor employed for maintenance of electrical equipment/ machinery is required to diagnose faults, rectify them and test the total system for good performance. Thus there is a need of introducing diploma holders to the basics of Instrumentation. Basics of instrumentation has been dealt with in this subject.

LEARNING OUTCOMES

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

- Explain importance of measurement
- Use various transducers
- Measure displacement and Strain
- Measure force and torque
- Measure pressure
- Measure flow
- Measure temperature
- Measurement non electrical quantities

DETAILED CONTENTS

1. Measurements (4 Periods)

   Importance of measurement, basic measuring systems, advantages and limitations of each measuring systems and display devices

2. Transducers (6 Periods)

   Theory, construction and use of various transducers (resistance, inductance, capacitance, electromagnetic, piezo electric type)

3. Measurement of Displacement and Strain (10 Periods)

   Displacement Measuring Devices: wire wound potentiometer, LVDT, strain gauges and their different types such as inductance type, resistive type, wire and foil type etc. Gauge factor, gauge materials and their selections. Use of electrical strain gauges, strain gauge bridges and amplifiers.

4. Force and Torque Measurement (10 Periods)

   Different types of force measuring devices and their principles, load measurements by using elastic transducers and electrical strain gauges. Load cells, measurements of torque by brake, dynamometer, electrical strain gauges, speed measurements; different methods

5. Pressure Measurement (6 Periods)

   Bourdon pressure gauges, electrical pressure pick ups and their principle, construction and applications. Use of pressure cells.

6. Flow Measurement (4 Periods)

Basic principles of magnetic and ultrasonic flow meters

7. Measurement of Temperature (6 Periods)

Bimetallic thermometer, thermoelectric thermometers, resistance thermometers, thermocouple, thermisters and pyrometer. Temperature recorders

8. Measurement of other non electrical quantities such as humidity, pH, level and vibrations (2 Periods)

PRACTICAL EXERCISES

1. To measure temperature using a thermo-couple/PTO/temperature sensor.
2. Study and use of digital temperature controller
3. Use of themistor in ON/OFF transducer
4. Study of variable capacitive transducer/proximity Switches
5. Draw the characteristics of a potentiometer
6. To measure linear displacement using LVDT, Ultrasonic
7. To study the use of electrical strain gauge
8. To study weighing machine using load cell
9. To measure pH/ TPS/DO_2 value of given solution.

INSTRUCTIONAL STRATEGY

The teacher should explain the scope of various measuring devices and their practical applications in the field. The transducers and measuring devices must be shown to the students and they should be trained in the reaction, operation, maintenance and calibrations. Frequent visits to nearby process industries will be of immense help to the students.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work and viva-voce

RECOMMENDED BOOKS

1. Electronic Measurement and Instrumentation by Dr Rajendra Prasad
2. Electronic Measurement and Instrumentation by JB Gupta, SK Kataria and Sons, New Delhi
3. Electrical and Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Co., New Delhi
4. Electronic Instrumentation and Measurement Techniques by WD Cooper, AD Helfrick Prentice Hall of India Pvt. Ltd. New Delhi
5. Industrial Instrumentation by Umesh Rathore, SK Kataria and Sons, New Delhi
6. Instrumentation by Sapra & Chadha, Ishan Publication
7. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

SUGGESTED DISTRIBUTION OF MARKS

Sr. No	Topic	Time Allotted (Periods)	Marks Allocation (%)
1	Measurements	04	06
2	Transducers	06	12
3	Measurement of Displacement and Strain	10	20
4	Force and Torque Measurement	10	20
5	Pressure Measurement	06	12
6	Flow Measurement	04	09
7	Measurement of Temperature	06	12
8	Measurement of other non electrical quantities	02	09
	Total	**48**	**100**

4.2 COMMUNICATION SYSTEMS

L	T	P
3	-	3

RATIONALE

This course provides the basics of electronic communication systems including transmitters, receivers, antennas and various modes of propagation of signals. In addition to components and systems of fiber optic communication, the students will learn the basics of satellite communication. This course will provide the students with perspectives of different communication systems.

LEARNING OUTCOMES

After completion of the subject, the learner will be able to:

- Classify the transmitters on the basis of modulation, service, frequency and power
- Demonstrate the working of each stage of AM and FM transmitters
- Identify the waveforms at different stages of a Radio Receiver
- Tune AM broadcast radio receiver
- Measure the performance characteristics of a radio receiver(sensitivity, selectivity, fidelity, S/N ratio, image rejection ratio).
- Determine the appropriate value of Intermediate Frequency IF.
- Identify the waveforms at different stages of a FM receiver
- Identify the various types of antennas used in different frequency ranges
- Plot the radiation pattern of directional and omni-directional antenna
- Explain various modes of propagation of waves i.e. Ground Wave, Sky Wave, Space Wave and Duct Propagation.
- Explain satellite communication link and terms related to satellite orbit.
- Plot the variation of field strength of a radiated wave, with distance from a transmitting antenna

DETAILED CONTENTS

1. AM/FM Transmitters (06 Periods)

   - Classification of transmitters on the basis of modulation, service, frequency and power
   - Block diagram of AM transmitters and working of each stage
   - Block diagram and working principles of reactance FET and armstrong FM transmitters

2. AM/FM Radio Receivers (12 Periods)

   - Principle and working with block diagram of super heterodyne AM receiver. Function of each block and typical waveforms at input and output of each block
   - Performance characteristics of a radio receiver: sensitivity, selectivity, fidelity, S/N ratio, image rejection ratio and their measurement procedure. ISI standards on radio receivers (brief idea)
   - Selection criteria for intermediate frequency (IF). Concepts of simple and delayed AGC
   - Block diagram of an FM receiver, function of each block and waveforms at input and output of different blocks. Need for limiting and de-emphasis in FM reception
   - Block diagram of communication receivers, differences with respect to broadcast receivers.

3. Antennas: (12 Periods)

- Electromagnetic spectrum and its various ranges: VLF, LF, MF, HF, VHF, UHF, Microwave.
- Physical concept of radiation of electromagnetic energy from a dipole. Concept of polarization of EM Waves.
- Definition and physical concepts of the terms used with antennas like point source, gain directivity, aperture, effective area, radiation pattern, beam width and radiation resistance, loss resistance.
- Types of antennas-brief description, characteristics and typical applications of half wave dipole, medium wave (mast) antenna, folded dipole, patch, loop, Ferrite rod, Yagi antenna
- Structure, Characteristics and typical applications of dish antenna.

4. Propagation: (09 Periods)

- Basic idea about different modes of wave propagation and typical areas of application. Ground wave propagation and its characteristics, summer field equation for field strength.

- Space wave communication – line of sight propagation, standard atmosphere, concept of effective earth radius range of space wave propagation standard atmosphere

- Duct propagation, sky wave propagation - ionosphere and its layers. Explanation of terms - virtual height, critical frequency, skip distance, maximum usable frequency, multiple hop propagation.

5. Satellite Communications*:* (10 Periods)

- Basic idea, passive and active satellites, Meaning of the terms; orbit, apogee, perigee

- Geo-stationary satellite and its need. Block diagram and explanation of a satellite communication link.
- Introduction to VSAT and its features.

LIST OF PRACTICALS

1. To observe the waveforms at different stages of a AM transmitter
2. To observe the waveforms at different stages of a Radio Receiver
3. To align AM broadcast radio receiver
4. To identify and study the various types of antennas used in different frequency ranges.
5. To plot the radiation pattern of a directional and omni directional antenna
6. To plot the variation of field strength of a radiated wave, with distance from a transmitting antenna..
7 To study and rectify different faults in a broadcast radio receiver.

NOTE: Visits to appropriate sites of digital/data communication networks, satellite communication, telemetry centres (like remote sensing) should be made with a view to understand their working. A comprehensive report must be prepared by all students on these visits, especially indicating the dates and locations of their visits.

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Communication Systems by George Kennedy, Tata McGraw Hill Education Pvt Ltd, New Delhi.
2. Communication Systems by A.K. Gautam; SK Kataria and Sons, New Delhi.
3. Electronic Communication Systems by K.S. Jamwal; Dhanpat Rai and Sons, New Delhi.
4. Electronic Communication System by Roddy and Coolen; Prentice Hall of India, New Delhi.
5. Handbook of Experiments in Electronics and Communication Engineering by S. Poornachandra Rao, and B Sasikala, Vikas Publishing House Pvt Ltd, Jangpura, New Delhi
6. Radio Engineering by G.K Mittal; Khanna Publications, Delhi
7. Communication System by Deepika Chadha; Ishan Publications, Ambala City
8. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	12
2	12	25
3	12	25
4	09	20
5	09	18
Total	**48**	**100**

4.3 POWER ELECTRONICS

L	T	P
3	-	3

RATIONALE

Diploma holders in Electronics and related fields are required to handle a wide variety of power electronic equipment used in process control industry. This subject will provide the student basic understanding of the principles of their working. The practical training will further reinforce the knowledge and skill of the students.

LEARNING OUTCOMES

After completion of the subject, the learner will be able to:

- Describe the construction, working principles of SCR, two transistor analogy of SCR, SCR specifications, methods of SCR triggering.
- Plot and explain V-I characteristics of SCR, TRIAC, UJT, DIAC
- Draw and demonstrate different wave forms of UJT relaxation oscillator
- Draw and demonstrate the wave shape of voltage at relevant point of single-phase controlled rectifiers(half wave, full wave) and effect of change of firing angle.
- Draw and demonstrate wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit
- Install UPS system and routine maintenance of batteries
- Demonstrate the concept and working of choppers, inverters, dual converters, and cyclo-conveters.
- Explain basic ideas about electric drives(AC and DC)

DETAILED CONTENTS

1. Introduction to thyristors and other Power Electronics Devices (14 Periods)

- Role of Power electronics
- Construction, working principles of SCR, two transistor analogy of SCR, V-I characteristics of SCR.
- SCR specifications & ratings.

$$\frac{di}{dt} \& \frac{\mathrm{dv}}{dt} \text{ protection of SCR}$$

- Different methods of SCR triggering.
- Different commutation circuits for SCR.
- Construction & working principle of DIAC, TRIAC and their V-I characteristics.
- Construction, working principle of UJT, V-I characteristics of UJT. UJT as relaxation oscillator.
- Basic idea about the selection of Heat sink for thyristors.
- Application such as light intensity control, speed control of universal motors, fan regulator, battery charger.

2. Controlled Rectifiers (06 Periods)

- Single phase half wave controlled rectifier with load (R, R-L)
- Single phase half controlled full wave rectifier (R, R-L)
- Single phase fully controlled full wave bridge rectifier.
- Single phase full wave centre tap rectifier.

3. Inverters, Choppers, Dual Converters and Cyclo converters. (12 Periods)

- Principle of operation of basic inverter circuits, concepts of duty cycle, series & parallel, inverters & their applications.
- Choppers: Introduction, types of choppers (Class A, Class B, Class C and Class D). Step up and step down choppers.
- Dual Converters and cyclo converters: Introduction, types & basic working principle of dual converters and cyclo converters & their applications.

4. Thyristorised Control of Electric drives (10 Periods)

a) DC drive control
   - Half wave drives.
   - Full wave drives
   - Chopper drives (Speed control of DC motor using choppers)

b) AC drive control
   - Phase control
   - Constant V/F operation
   - Cycloconverter/Inverter drives.

5. Uninterrupted Power supplies (06 Periods)

- UPS, on-line, off line & its specifications
- Concept of high voltage DC transmission
- Classification of batteries

LIST OF PRACTICALS

1) To plot VI characteristic of an SCR.
2) To plot VI characteristics of TRIAC.
3) To plot VI characteristics of UJT.
4) To plot VI characteristics of DIAC.
5) To study UJT relaxation oscillator and observe different wave forms
6) To observe wave shapes at relevant points of single-phase half wave controlled rectifier and effect of change of firing angle.
7) To observe wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit for .
8) To observe output wave shape in a circuit for single phase full wave controlled rectifier.
9) To study installation of UPS system and routine maintenance of batteries.

INSTRUCTIONAL STRATEGY

Power Electronics being very important for industrial controls requires a thorough know how about industrial devices. Teacher should take to the class various SCRs and other semiconductor devices to demonstrate these to the students. The teacher may encourage students to perform practical simultaneously for better understanding of the subject and verification of theoretical concepts. So industrial visit in between the course is a must.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1) Power Electronics by P.C. Sen; Tata McGraw Hill Education Pvt Ltd., New Delhi
2) Power Electronics by P.S. Bhimbhra; Khanna Publishers, New Delhi
3) Power Electronics – Pricilpes and Applications by Vithayathi; Tata Mc Graw Hill Education Pvt Ltd. New Delhi
4) Power Electronics by M.S. Berde; Khanna Publishers, New Delhi.
5) Power Electronics by MH Rashid
6) Industrial Electronics and Control by SK Bhattacharya and S. Chatterji; New Age Publications. New Delhi
7) Power Electronics by S Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
8) Power Electronics by Sugandhi and Sugandhi
9) Power Electronics – Principles and Applications by J Michael Jacob; Vikas Publishing House, New Delhi
10) Power Electronics by Puri and Chopra; North Publications, Ambala City
11) e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	14	30
2	06	15
3	12	25
4	10	20
5	06	10
Total	**48**	**100**

4.4 MICROPROCESSORS AND PERIPHERAL DEVICES

L T P

3 - 3

RATIONALE

The study of microprocessors in terms of architecture, software and interfacing techniques leads to the understanding of working of CPU in a microcomputer. The development in microprocessors of 32 bit architecture brings the students face-to-face with mainframe enabling them to get employment in R&D, assembly, repair and maintenance of hardware of microprocessors and computers. Microprocessors find application in process control industry. They also form a part of the electronic switching system between source and destination in long distance telecommunications. Thus the microprocessor is an area of specialization. Students of electronics and related engineering branches often use microprocessors to introduce programmable control in their projects, in industrial training.

LEARNING OUTCOMES

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

- Describe all the internal parts and pins of 8085
- Write and Edit assembly language program using mnemonics
- Write, execute and debug assembly language programs for simple applications
- Interface various peripheral devices with microprocessor.
- Use various data transfer techniques in micro computers
- Describe the internal parts and pins of 8086

DETAILED CONTENTS

1. Evolution of Microprocessor (03 Periods)

   Typical organization of a microcomputer system and functions of its various blocks. Microprocessor, its evolution, function and impact on modern society

2. Architecture of a Microprocessor (With reference to 8085 microprocessor) (09 periods)

   Concept of Bus, bus organization of 8085, Functional block diagram of 8085 and function of each block, Pin details of 8085 and related signals, Demultiplexing of address/data bus generation of read/write control signals, Steps to execute a stored programme

3. Instruction Timing and Cycles (06 periods)

   Instruction cycle, machine cycle and T-states, Fetch and execute cycle.

4. Programming (with respect to 8085 microprocessor) (12 periods)

   Brief idea of machine and assembly languages, Machines and Mnemonic codes. Instruction format and Addressing mode. Identification of instructions as to which addressing mode they belong. Concept of Instruction set. Explanation of the instructions of the following groups of instruction set. Data transfer

group, Arithmetic Group, Logic Group, Stack, I/O and Machine Control Group. Programming exercises in assembly language. (Examples can be taken from the list of experiments).

5. Memories and I/O interfacing (08 periods)

Concept of memory mapping, partitioning of total memory space. Address decoding, concept of peripheral mapped I/O and memory mapped I/O. Interfacing of memory mapped I/O devices.

6. Interrupts (03 periods)

Concept of interrupt, Maskable and non-maskable, Edge triggered and level triggered interrupts, Software interrupt, Restart interrupts and its use, Various hardware interrupts of 8085, Servicing interrupts, extending interrupt system

7. Data Transfer Techniques (03 periods)

Concept of programmed I/O operations, sync data transfer, async data transfer (hand shaking), Interrupt driven data transfer, DMA, Serial output data, Serial input data

8. Peripheral devices (02 periods)

8255 PPI, 8253 PIT and 8257 DMA controller

9 Architecture of 8086 Microprocessor (02 periods)

- Block diagram
- Minimum and Maximum mode
- Pin and Signals

LIST OF PRACTICALS

1. Familiarization of different keys of 8085 microprocessor kit and its memory map
2. Steps to enter, modify data/program and to execute a programme on 8085 kit
3. Writing and execution of ALP for addition and sub station of two 8 bit numbers
4. Writing and execution of ALP for multiplication and division of two 8 bit numbers
5. Writing and execution of ALP for arranging 10 numbers in ascending/descending order
6. Writing and execution of ALP for 0 to 9 BCD counters (up/down counter according to choice stored in memory)
7. Interfacing exercise on 8255 like LED display control
8. Interfacing exercise on 8253 programmable interval timer
9. Interfacing exercise on 8279 programmable KB/display interface like to display the hex code of key pressed on display
10. Use of 8085 emulator for hardware testing

INSTRUCTIONAL STRATEGY

The digital systems in microprocessors have significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge in microprocessors (programming as well as

interfacing). Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. Programming exercises other than the given in the list may be given to the students.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises
- Viva-voce

RECOMMENDED BOOKS

1. Microprocessor Architecture, Programming and Applications with 8080/8085 by Ramesh S Gaonker, Willey Eastern Ltd. New Delhi
2. Introduction to Microprocessor by Mathur ,Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Microprocessor and Microcontrollers by Dr BP Singh, Galgotia Publications, New Delhi
4. Microprocessor and Applications by Badri Ram: Tata McGraw Hill Education Pvt Ltd , New Delhi
5. Microprocessor and Microcomputers by Refiquzzaman, Prentice Hall of India Ltd., New Delhi.
6. Microprocessor programming & applications.by sudhir Goyal, North Publication.
7. Digital Logic and Computer Design by Mano, M Morris; Prentice Hall of India, New Delhi
8. Digital Electronics by Rajaraman; Prentice Hall of India Ltd., New Delhi
9. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	**03**	**05**
2.	**09**	**20**
3	**06**	**10**
4	**12**	**25**
5.	**08**	**15**
6.	**03**	**05**
7.	**03**	**05**
8.	**02**	**07**
9	**02**	**08**
Total	**48**	**100**

4.5 TROUBLESHOOTING OF ELECTRONIC EQUIPMENT

L	T	P
-	-	3

RATIONALE

The course provides the students with necessary knowledge and competency to diagnose the faults for trouble shooting and for systematic repair and maintenance of electronic equipment and testing of components.

NOTE: Students are to be given the awareness about the following topics during the Laboratory Work. There will not be any theory examination.

LEARNING OUTCOMES

After completion of the subject, the students should be able to:

- find out basic faults in test equipments like power supply, multimeter, function generator, CRO and one equipment from each group.
- pinpoint faulty block/component in circuits by observing standard voltages/wave shapes at different test points
- use digital IC tester and digital tools used for trouble shooting.

TOPICS TO BE DISCUSSED

1. Fundamental Trouble Shooting Procedures

   i) Fault location
   ii) Fault finding aids
      - Service manuals
      - Test and measuring instruments
      - Special tools

   iii) Trouble Shooting Techniques
      - Functional Areas Approach
      - Split half method
      - Divergent, convergent and feedback path circuit analysis
      - Measurement techniques

LIST OF PRACTICALS

1. Demonstration and practice of fault finding and repair of:
   (a) C.R.O
   (b) Function Generator
   (c) Power supplies
   (d) Digital multimeter

2. Demonstration, practice of fault finding and repair of any one equipment from group-I i.e. Communication

3. Demonstration, practice of fault finding and repair of any one equipment from group-II i.e.Consumer

4. Demonstration, practice of fault finding and repair of any one equipment from group- III i.e. Audio/Video systems

5 Demonstration, practice of fault finding and repair of any one equipment from group IV i.e. Computer

Choice of one equipment from each group is compulsory**.**

Group-I Communication	**Group-II Consumer**	**Group-III Audio-video**	**Group-IV Computer**
Telephone Handsets.	Inverters/UPS Emergency Lights	TV, CRT, LCD/HD	Monitor
Cordless Phones	Stabilizers	VCD, DVD Players	Printer (Laser)
Fax Machine	EPABX	CCTV	Printer (Inkjet)
Modem	Hub/Switches	Audio Systems	Scanner
Walkie / Talkie	Electronic Toys		Keyboard, Mouse
			Video Games

6 Testing of Integrated Circuits (ICs)

7 Use of digital tools for troubleshooting digital equipments

INSTRUCTIONAL STRATEGY

Emphasis must be laid on skill development in assembly and disassembly of equipments and to rectify faults practically.

MEANS OF ASSESSMENT

- Actual Laboratory and Practical Work,
- Model/prototype making
- Assembly and disassembly exercises
- Viva-Voce

RECOMMENDED BOOKS

1. Modern Electronic Equipment Trouble shooting, Repair and Maintenance by RS Khandpur, Tata McGraw Hill Education Pvt Ltd, New Delhi.

Troubleshooting and maintenance of Electronics Equipment by Manoj Kumar, Satya Parkashan

4.6 MEDICAL ELECTRONICS

L	T	P
3	-	3

RATIONALE

A large number of electronic equipment s are being used in hospitals for patient care and diagnosis or carry out advanced surgeries. This subject will enable the students to learn the basic principles of different instruments used in medical science.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Describe various medical electronics equipment and their uses
- Use electrodes for various purposes
- Identify different Medical transducers and use them
- Prepare block diagrams of biomedical recorders i.e. ECG, EEG and EMG machines
- Maintain various electronics patient monitoring systems
- Measure current leakage with the help of safety analyzer

DETAILED CONTENTS

1. Overview of Medical Electronics, classification of medical Equipments, application and specifications of diagnostic, therapeutic and clinical laboratory equipment, method of operation of these instruments, typical waveforms & signal characteristics (06 Periods)

2. Electrodes (08 Periods)

   Origin of Bioelectric signals, Bio electrodes, Electrode tissue interface, contact impedance, Types of Electrodes, Biological Amplifiers, Electrodes used for ECG , EEG, EMG.

3. Bio Transducers & Biosensors (08 Periods)

   Typical signals from physiological parameters, Classification of Bio transducers, pressure transducer, Photoelectric transducer, Transducer for body temperature measurement, pulse sensor, respiration sensor.

4. Bio Medical Recorders (08 Periods)

   Block diagram description and application of following instruments
   - Electrocardiograph (ECG) Machine
   - Electroencephalograph (EEG) Machine
   - Electromyography (EMG) Machine
   - Phonocardiogram (PCG)
   - Vector cardiogram (VCG)
   - Digital Stethoscope

5. Patient Monitoring Systems (08 Periods)

   - Heart rate measurement
   - Pulse rate measurement
   - Respiration rate measurement
   - Blood pressure measurement
   - Need of defibrillator and Cardiac Pace maker
   - Bedside patient monitoring System

6. Modern Imaging System (06 Periods)

- X-Ray Machine
- Magnetic Resonance Imaging System
- Ultrasonic Imaging System

7. Patient Safety (04 Periods)

- Electric shock hazards
- Leakage currents
- Electrical safety analyser
- Safety standards.

Note: Students must be taken for a visit to hospital for exposure of various medical electronics related equipments like ventilator, boyles apparatus, pulse ox meters, defibrillators, bedside monitor and x-ray equipment etc.

INSTRUCTIONAL STRATEGY

The teacher has to play a proactive role in arranging visits to hospitals and well equipped laboratories to reinforce theory. The apparatus and equipment available should be shown to students so that they can understand where and how the various biomedical instruments are used. Various charts and models be used for demonstration. Exposure to Spectrometer and UV Spectrometer must be given to students in addition to arranging visits to biomedical industries.

LIST OF PRACTICALS

1. To operate and familiarization with:
   a) B.P. Apparatus
   b) ECG Machine
2. To operate and familiarization with:
   a) Ventilator
   b) Incubator
3. To measure the concentration of blood sugar with Glucometer (fasting, P.P., Random)
4. To measure
   a) Respiration rate and interface to PC
   b) Pulse rate
5. To Measure The EMG Signals and interface with PC
6. Body Temperature measurement and recording in excel form in pc.
7. To study the Body positions and interfacing of body position sensor and data recording
8. Installation of small medical equipment in laboratories of Hospital precautions to be taken.
9. Study of large medical equipment in Hospital / Nursing home.
10. Operation and use of Electro-physiotherapy
11. Maintenance schedule for different equipment and their records in a hospital

12. Getting body parameters from Bluetooth to android App and PC
13. Creating body Area network using Zigbee devices
14. Logging of various body parameters in SD card as excel format.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Handbook of Biomedical Instrumentation by RS Khandpur;Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Biomedical Instrumentation by Cromwell
3. Modern Electronics Equipment by RS Khandpur; TMH, New Delhi
4. Introduction to Biomedical Electronics by Edward J. Perkstein; Howard Bj, USA
5. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1	**06**	**12**
2	**08**	**18**
3	**08**	**18**
4	**08**	**16**
5	**08**	**16**
6	**06**	**12**
7	**04**	**8**
Total	**48**	**100**

SOFT SKILLS – II

L	T	P
-	-	2

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

LEARNING OUTCOMES

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

- Develop Communication Skills
- Work in a team
- Learn to resolve conflict by appropriate method
- Identify leadership traits and learn self motivation
- Follow ethics

DETAILED CONTENTS

- Concept of team building, behavior in a team
- Developing Interpersonal Relations- empathy, sympathy
- Communication skills-improving non-verbal communication
- Conflict Management
- Motivation
- Leadership
- Professional Ethics and Values
- Health, Hygiene, Cleanliness and Safety

In addition, the students must participate in the following activities to be organized in the institute

- Sports
- NCC/NSS
- Camp – Environment awareness
- Cultural Event

Note : Extension Lectures by experts may be organized. There will be no examination for this subject.

INDUSTRIAL TRAINING

Industrial training 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.

For this purpose, students at the end of fourth semester need to be sent for industrial training for a minimum of 6 weeks upto 8 weeks duration to be organized during the semester break starting after IV 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. A teacher may guide a group of 4-5 students. A minimum of one visit per week by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An internal assessment of 100 and external assessment of 100 marks have been provided in the study and evaluation scheme of V 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. The formative and summative evaluation may comprise of weightage to performance in testing, general behavior, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry. The components of evaluation will include the following.

a) Punctuality and regularity 15%
b) Initiative in learning new things 15%
c) Relationship with workers 15%
d) Industrial training report 55%

FIFTH SEMESTER

5.1 AUDIO VIDEO SYSTEMS

L	T	P
3	-	3

RATIONALE

The objective of teaching this subject is to give students an in depth knowledge of various electronic audio and video devices and systems. Further this subject will introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices. This in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

LEARNING OUTCOMES

After completion of the subject, the learner will be able to:

- Explain the working of loudspeakers and microphones.
- Describe the basics of digital audio signals.
- Describe the working of colour television system (PAL).
- Use the basic principles of digital video and its compression techniques.
- Illustrate basic techniques of digital television transmission and reception.
- Compare the working of LCD and LED

DETAILED CONTENTS

1. Audio Systems (10 Periods)

   1.1. Microphones and Loudspeakers
   - a) Carbon, moving coil, cordless microphone
   - b) Direct radiating and horn loudspeaker
   - c) Multi-speaker system
   - d) Optical Sound recording

2. Digital Audio Fundamentals (06 Periods)

   Audio as Data and Signal, Digital Audio Processes Outlined, Time Compression and Expansion.

3. Television (12 Periods)

   3.1. Basics of Television
   - Elements of TV communication system
   - Scanning and its need
   - Need of synchronizing and blanking pulses, VSB
   - Composite Video Signal

   3.2 Colour Television
   - Primary, secondary colours
   - Concept of Mixing, Colour Triangle
   - Camera tube
   - PAL TV Receiver
   - NTSC, PAL, SECAM (brief comparison)

4. Digital Video, Compression Techniques and Standards (06 Periods)

   Digital Video, The RGB and YUV Representation of Video Signals, The Need for Compression, How compression works, Compression formats for video - MPEG-x format, H.26x format

5. Digital Television-Transmission and Reception (10 Periods)

Digital satellite television, Direct-To-Home(DTH) satellite television, Digital Terrestrial Television(DTT), Introduction to :Video on demand, CCTV, CATV with optical fibre.

6. Introduction to Liquid Crystal and LED Screen Televisions (04 Periods)

Basic block diagram of LCD and LED Television and their comparison.

LIST OF PRACTICALS

1. To plot the directional response of a Microphone
2. To plot the directional response of a Loud Speaker
3. To study public address system and its components.
4. To test color TV using pattern generator.
5. To perform fault identification in Colour TV.
6. Installation of Dish Antenna for best reception.
7 Installation of CCTV system.

MEANS OF ASSESSMENT

Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making

RECOMMENDED BOOKS

1. Modern Television Practice by R. R. Gulai; New Age International Publishers.
2. Audio Video Systems by R. G. Gupta; McGraw Hill Education System.
3. Television and Video Engineering by A. M. Dhake McGraw Hill Education System
4. Essential Guide to Digital Video by John Watkinson; Snell Wilcox Inc Publication
5. Guide to Compression by John Watkinson; Snell Wilcox Inc Publication
6. Audio Video Systems Principles Practices and Troubleshooting by Bali & Bali; Khanna Publishing Company
7. Consumer Electronics by S. P. Bali; Pearson Education, New Delhi
8. Consumer Electronics by Yagyik and Jain,Ishan Publication, Ambala
9. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	20
2	06	12
3	12	24
4	06	12
5	10	20
6	04	12
Total	**48**	**100**

5.2 DIGITAL COMMUNICATION

L	T	P
3	-	3

RATIONALE

This course deals with the advanced digital and data communication techniques beyond the conventional communication. It involves the use of modems in synchronous and asynchronous data transmission. It encompasses the modern communication network and integrated services like ISDN and Radio paging along with cellular mobile telephones, FAX, electronic exchanges etc. so vital for present day communication.

LEARNING OUTCOMES

After completion of the subject, the learner should be able to:

- Describe and identify block diagram of digital and data communication link
- Transmit Hamming code on a serial link and reconvert at the receiving end
- Plot and interpret wave forms at input and output of PSK and FSK modulators
- Transmit parallel data on a serial link using USART
- Transmit data using MODEM
- Describe Space and time switching systems.
- Describe and identify concepts of PCM and DPCM
- Plot and interpret waveforms at input and output of PCM, DPCM, DM, ADM modulators.

DETAILED CONTENTS

1. Introduction: (03 Periods)

   Basic block diagram of digital and data communication systems. Their comparison with analog communication systems.

2. Sampling theorem and its basic concept. (10 Periods)

   Use of Sampling Theorem:
   - Introduction to PAM, PPM, PWM
   - Quantization and error of Quantization
   - PCM, DPCM, their advantage and disadvantage
   - DELTA and ADAPTIVE DELTA Modulation concept of COMPANDING
   - Frequency hopping spread spectrum technique

3. Digital Modulation Techniques: (10 Periods)

   - Basic block diagram and principle of working of the following:
   - Amplitude shift keying (ASK): Interrupted continuous wave (ICW), two tone modulation
   - Frequency Shift keying (FSK)
   - Phase shift keying (PSK), Quadrature Phase Shift Keying(QPSK)

4. Characteristics/working of data transmission circuits; bandwidth requirements, data transmission speeds, noise, cross talk, echo suppressors, distortion, equalizers (10 Periods)

5. Modems: (10 Periods)

Need and function of modems, Mode of modems operation (low speed, medium speed and high speed modems). Modem interconnection, Modem data transmission speed, Modem modulation method.

1. Space and time switching: Working principle of STS and TST switches. (05 Periods)

LIST OF PRACTICALS

1. Observe wave forms at input and output of pulse code modulator with CRO.
2. Transmission of data using MODEM.
3. Observe wave forms at input and output of QPSK modulators
4. Observe wave forms at input and output of PSK modulators
5. Observe the working of space and time switching circuit.

NOTE:

Visits to various telephone exchanges (including mobile and rural exchanges), Carrier telephony should be made with a view to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

INSTRUCTIONAL STRATEGY

This subject provides information to the students regarding the various techniques used in Digitals and Data Communication. Emphasize should be made in the laboratory on the conduct of experiments. For the better awareness, visit must be arranged to the industries like telephone exchange, various cellular industries etc.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, and viva-voce

RECOMMENDED BOOKS

1. Electronic Communication Systems by George Kennedy Tata McGraw Hill Education Pvt. Ltd, New Delhi
2. Communication system by A.K. Gautam S.K. Kataria Sons, Delhi
3. Electronics communication by K.S. Jamwal, Dhanpat Rai and Sons, Delhi
4. Digital Communication, Preeti Shirvastva, Ishan Publication

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

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	03	06
2	10	22
3	10	20
4	10	20
5	10	20
6	05	12
Total	**48**	**100**

5.3 OPTICAL FIBER COMMUNICATION

L	T	P
3	-	3

RATIONALE

Progressing from communication over copper wire to today's fibre optic communication, we have increased our ability to transmit more information, more quickly and over longer distances. This has expanded our boundaries and is finding a good slot in communication system. Optical fiber has replaced existing transmission media due to its advantages. As a result the technicians are supposed to have knowledge of optical communication. This subject will provide basic concepts and requisite knowledge and skill required.

LEARNING OUTCOME

After completion of the subject, the learner should be able to:

- Set up a fiber analog link and optic digital link
- Measure bending losses in optical fibers
- Measure the splice or connector loss
- Measure and calculate numerical aperture of optical fiber
- Explain and demonstrate characteristics of optical source and optical detector
- Connect a fiber with connector at both ends
- Identify and demonstrate use of various components and tools used in optical fiber communication

DETAILED CONTENTS

1. Introduction (10 Periods)

   - Historical perspective, basic communication systems, optical frequency range, advantages of optical fiber communication, application of fiber optic communication
   - Electromagnetic spectrum used, Advantages and disadvantages of optical communication.
   - Principle of light penetration, reflection, critical angle.

2. Optical Fibers and Cables (08 Periods)

   - Constructional details of various optical fibers, multimode and mono-mode fibers, step index and graded index fibers, acceptance angle and types of optical fiber cables.
   - Optical Fibers cable connectors and splicing techniques (Mechanical, fusion)

3. Losses in Optical Fiber Cable: (08 Periods)

   a) Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending loses.
   b) Dispersion: Types and its effect on data rate.
   c) Testing of losses using OTDR(Optical Time Domain Reflectometer).

4. Optical Sources (10 Periods)

   Characteristics of light sources (LED and LASER) used in optical communication, principle of operation of LED, different types of LED structures used and their brief description, Injection laser diode, principle of operation, different injection laser diodes, comparison of LED and ILD.

5. Opticalll Optical Detectors (06 Periods)

Characteristics of photo detectors used in optical communication; PIN diode and avalanche photo diode (APD), Noise in detectors

6. Optical Amplifiers (06 Periods

Types of optical amplifiers, semiconductor & fiber optical amplifiers, principle of operation of SOA, types of SOA. EDFA, Raman amplifiers. Comparison of SOA, EDFA and Raman Amplifiers.

LIST OF PRACTICALS

1. To set up fiber analog link
2. To set up optic digital link
3. To measure bending losses in optical fibers
4. To observe and measure the splice or connector loss
5. To measure and calculate numerical aperture of optical fiber
6. To observe characteristics of optical source
7. To observe characteristics of optical detector
8. To splice the available optical fiber
9. To connect a fiber with connector at both ends
10. To identify and use various components and tools used in optical fiber communication

INSTRUCTIONAL STRATEGY

This subject gives the complete knowledge of optical fibre communication techniques. The teacher should make the students aware about the historical development, optical sources and optical fibre system in addition to applications of optical fibre in communication system. Since this subject deals with theory and practical, the theory should be reinforced by visit to sites and industries like HFCL having optical fiber installations in addition to practical work in the laboratory.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

2. Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi
3. Optical fiber Communication by J. Gower , Prentice Hall of India, New Delhi
4. Optical fiber Communication by Gerd Keiser, McGraw Hill International Editions
5. Optical Communications – Components and Systems by JH Franz and VK Jain, Narosa Publishing House, New Delhi
6. Optical Fiber Communication by Yashpal & Sanjeev Kumar, North Publications, Ambala
7. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	20
2	08	15
3	08	15
4	10	22
5	06	14
6	06	14
Total	**48**	**100**

5.4 COMPUTER NETWORKS

L	T	P
4	-	-

RATIONALE

The future of computer technology is in computer networks. Global connectivity can be achieved through computer networks. A diploma holder in electronics and communication engineering should therefore understand the function of networks. Knowledge about hardware and software requirements of networks is essential.

LEARNING OUTCOMES

After completion of the course, the learner should be able to

- Recognize physical topology and cabling (coaxial, OFC, UTP, STP) of a network.
- Recognize various types of connectors RJ-45, RJ-11,BNC and SCST.
- Demonstrate various types of networking models and protocol suites.
- Install and configure a network interface card in a workstation.
- Identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation.
- Configure routers.
- Demonstrate sub netting of IP address.
- Identify connectivity troubleshooting using PING, IPCONFIG, IFCONFIG.
- Explain concept of wireless networking.

DETAILED CONTENTS

1. Networks Basics (10 Periods)
   - What is network
   - Peer-to –peer Network
   - Server Client Network
   - LAN, MAN and WAN
   - Network Services
   - Topologies
   - Switching Techniques

2. OSI Model (10 Periods)
   - Standards
   - OSI Reference Model
   - OSI Physical layer concepts
   - OSI Data-link layer concepts
   - OSI Networks layer concepts
   - OSI Transport layer concepts
   - OSI Session layer concepts
   - OSI presentation layer concepts
   - OSI Application layer concepts

3. Introduction to TCP/IP (10 Periods)
   - Concept of physical and logical addressing
   - Different classes of IP addressing, special IP address
   - Sub netting and super netting
   - Loop back concept
   - IPV4 and IPV6 packet Format
   - Configuring IPV4 and IPV6

4. Cables and Connectors (10 Periods)

- Types of Cables(Coaxial, Twisted Pair), Shielded and Unshielded Pair of Cables (Straight wire Cable, CrossOver Cables) with colour coding.
- Ethernet Specification and Standardization: 10 Mbps (Traditional Ethernet), 100 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet),Leased lines.
- Use of RJ45, RJ11, BNC,SCST.

5. Network Connectivity (10 Periods)

- Network connectivity Devices
- NICs
- Hubs
- Repeaters
- Switches
- Routers and Routing Protocols.
- Configuring of Routers.
- VOIP and Net-to-Phone Telephony

6. Network Administration / Security (10 Periods)

- Client/Server Technology
- Server Management
- RAID management and mirroring
- Cryptography
- Ethical Hacking

7. Wireless Networking (04 Periods)

Basics of Wireless: Wireless MAN, Networking, Wireless LAN, Wi-Fi, WiMax (Broad-band Wireless) and Li-Fi.

INSTRUCTIONAL STRATEGY

This subject deals with both theory and practicals. The students should be made to practically establish LAN with various hardware and software and their integration.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making

- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi
2. Computer Networks, Preeti Shirvastva, Ishan Publication
3. Data Communications and Networking by Forouzan, (Edition 2nd and 4th),Tata McGraw Hill Education Pvt Ltd , New Delhi
4. Data and Computer Communication by William Stallings, Pearson Education, New Delhi
5. Local Area Networks by Peter Hudson
6. Network+ Lab manual by Tami Evanson; BPB Publications
7. Networking Essentials ; BPB Publications New Delhi

8. Computer Network and Communications By V.K. Jain and Nirija Bajaj, Cyber Tech Publications, New Delhi.
9. Computer Network by J.S. Katre; Tech-Max Publication, Pune
10. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	10	14
2.	10	16
3.	10	14
4.	10	16
5.	10	16
6.	10	16
7.	4	08
Total	**64**	**100**

5.5 MICROCONTROLLERS

L T P
4 - 3

RATIONALE

The study of microcontrollers in terms of architecture, software and interfacing techniques leads to the understanding of working of microcontrollers and applications of microcontroller in Electronic Industries. The microcontroller is an area of specialization. Microcontroller is the heart of the programmable devices. Students of electronics and related engineering branches often use microcontroller to introduce programmable control in their projects, automation and fault finding in industry.

LEARNING OUTCOMES

After completion of the subject, the learner should be able to:

- Understand the working of microcontrollers,
- Programmed the microcontrollers
- Interface the sensors with microcontroller
- Fault finding of microcontroller based appliances and projects

DETAILED CONTENTS

1. Microcontroller series (MCS) – 51 Overview (16 Periods)
   - 1.1 Architecture of 8051Microcontroller
   - 1.2 Pin details
   - 1.3 I/O Port structure
   - 1.4 Memory Organization
   - 1.5 Special Function Registers (SFRs)
   - 1.6 External Memory

2. Instruction Set (20 Periods)
   - 2.1 Instruction Set of 8051
   - 2.2 Addressing Modes,
   - 2.3 Types of Instructions
   - 2.4 Timer operation
   - 2.5 Serial Port operation
   - 2.6 Interrupts

3. Assembly/C programming for Micro controller (12 Periods)
   - 3.1 Assembler directives
   - 3.2 Assembler operation
   - 3.3 Compiler operations
   - 3.4 De bugger

4. Design and Interface (12 Periods)
   - 4.1 Keypad interface
   - 4.2 7- segment interface

4.3 LCD, A/D, D/A and RTC interface with programming.

5. Introduction of PIC Micro controllers (04 Periods)

LIST OF PRACTICALS

1. Familiarization with Micro-controller Kit and its different sections
2. Familiarization with Assembly Language Programming (PC Based)
3. Programming to interface switches and LEDs
4. Programming and interface of Seven Segment and LCD.
5. Programming and interfacing of Graphical LCD .
6. Programming to interface Hex 4x4 matrix Keypad
7. Programming for A/D converter, result on LCD.
8. Programming for D/A converter, result on LCD.
9. Programming for serial data transmission from PC to Kit or Vice versa.
10. Programming and interfacing of RELAY and Buzzer

INSTRUCTIONAL STRTEGY

Instruction should be given to students by showing them actual microcontrollers in the class room so that they can develop the concept. Exercise on programming should be done by taking simple examples like interfacing of switch, LED and relay.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, model making, and viva-voce

RECOMMENDED BOOKS:-

1. Fundamentals of Microprocessor and Microcontroller by B. Ram , Dhanpat Rai Publications.
2. Microcotroller : Architecture, Programming & Applications by Ayala, Kenneth J., Penram
3. Microcotroller and Embedded Systems using Assembly And C by Muhammad Ali Mazidi, Rolin Mckinlay, Janice Gilispie Mazidi: Pearson
4. PIC Microcontroller and Embedded Systems : Using assembly and C by Muhammad Ali Mazidi, Rolin Mckinlay, Danny Causey; Pearson
5. Microcotroller, Sanjeev Gupta, Ishan Publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%age)
1	16	25
2	20	30
3	12	20
4	12	20
5	04	05
Total	**64**	**100**

5.6 ELECTRONICS DESIGN AND SIMULATION TECHNIQUES

L	T	P
-	-	3

RATIONALE

The purpose of this subject is to give practice to the students in elementary design and fabrication of the PCB. The topics of assembly, soldering, testing, and documentation have been included to give overall picture of the process of manufacturing of electronic equipment.

LEARNING OUTCOMES

After completion of the course, the learner will be able to:

- Demonstrate skills in assembly of components, soldering, and desoldering techniques.
- Prepare a PCB, mount the components and assemble in a cabinet.
- Design electronic circuit and layout using software ORCAD/ PSpice /EAGLE/ DIP TRACE/EDA/Multisim.
- Demonstrate drilling, photo plating, explain concept of SMDs (Surface Mount Devices).
- Assemble circuits on PCB.
- Design a project using basic techniques.

PRACTICAL EXERCISES

1. Electronic Design

   - Selection and use of commonly used active and passive components
   - Testing of active and passive components
   - Develop skills in assembly of components, soldering, and soldering techniques
   - Procedure for Cabinet Making

2. Fabrication Techniques

   - Printed Circuit Boards (PCBs):
     - PCB board materials, their characteristics and plating, corrosion and its prevention.
     - Photo processing, screen printing, etching, high speed drilling, buffing, surface treatment and protection from harsh environments, plated through holes, double sided and multilayer PCBs.
     - Assembly of circuits on PCB, soldering techniques, Role of tinning, flow and wave soldering, solderability, composition of solder, Edge connector.

3. Lab View/Multisim/Proteus/ORCAD/'Winspice based circuit simulation
   Simulation of different circuits of following types:
   a) Analog Circuits
   b) Digital Circuits
   c) Power Electronic Circuits.

4. PCB Layout Design
   Practice in designing PCB layout using software like EDA/Diptrace/Eagle/ORCAD

Every student must design and prepare a PCB, mount the components and assemble in a cabinet.

LIST OF PROJECTS (to be designed individually)

Some of the projects are listed below which is just a guideline for selecting the mini project. Students can also select any other project with the advice of his teacher.

1. Regulated power supply
2. Timers using 555 and other oscillators
3. Touch plate switches – transistorized or 555 based
4. Door bell/cordless bell
5. Clapping switch and IR switch
6. Blinkers
7. Sirens and hooters
8. Electronic dice
9. Battery charger, mobile charger
10. Fire/smoke/intruder alarm
11. Liquid level controller
12. Counters
13. Combination locks
14. Electronics musical instruments
15. Electronic Ballasts
16. Emergency light
17. Fan regulator

INSTRUCTIONAL STRATEGY

More emphasis may be laid on practical project work. Small industrial problems may be taken as assignments. Practical training regarding fabrication techniques using CAD may be carried out.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Printed Circuit Board by Bosshart; McGraw Hill Education Pvt Ltd., New Delhi
2. Printed Circuit Board by RS Khandpur, Tata McGraw Hill Education Pvt Ltd., New Delhi
3. Electronics Techniques by Rajesh Kumar, NITTTR, Chandigarh
4. Modular CAD for PCBs using EAGLE Software by Rajesh Kumar, NITTTR, Chandigarh
5. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SOFT SKILLS – III

L	T	P
-	-	3

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

LEARNING OUTCOMES

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

- Develop communication skills.
- Learn how to speak without fear and get rid of hesitation
- Use effective presentation techniques
- Understand entrepreneurial traits
- Exhibit attitudinal changes

DETAILED CONTENTS

- Communication Skills – Handling fear and phobia
- Resume Writing
- Applying for job through email/job portal
- Interview preparation : Mock Interview, Group Discussions and Extempore
- Presentation Techniques
- Developing attitude towards safety. Disaster management.

In addition, the students must participate in the following activities to be organized in the institute

- Sports
- NCC/NSS
- Camp – Entrepreneurial awareness
- Cultural Event

Note : Extension Lectures by experts may be organized. There will be no examination for this subject.

SIXTH SEMESTER

6.1 MICROWAVE AND RADAR ENGINEERING

L	T	P
4	-	3

RATIONALE

This subject includes an exposure to microwaves engineering, radar systems, fibre optics and satellite communication. In microwaves industry, job opportunities are available in the area of assembly, production, installation, repair and maintenance of microwave transmitters and receivers. The knowledge of radar systems allows opportunities with civil and defence organizations dealing with aircraft and shipping. Fibre optics is the latest thrust area in communication with vast opportunities in the private sector.

LEARNING OUTCOMES

After completion of the course, the learner should be able to:

- Identify, explain and demonstrate construction, characteristics, operating principles and typical applications of Multi cavity Klystron, Reflex Klystron, Magnetron, Travelling Wave Tube, GUNN diode, IMPATT diode
- Measure electronics and mechanical tuning range of a reflex klystron
- Measure VSWR of a given load
- Measure the Klystron frequency by slotted section method
- Measure the directivity and coupling of a directional coupler
- Plot radiation pattern of a horn antenna in horizontal and vertical planes
- Demonstrate the properties of magic tee
- Identify the block diagram and explain the operating principles of CW(Doppler), FMCW, MTI radar
- Interpret radar display PPI
- Describe the working principles of microwave communication link

DETAILED CONTENTS

1. Introduction to Microwaves (06 Periods)

   Introduction to microwaves and its applications, Classification on the basis of its frequency bands (HF, VHF, UHF, L, S, C, X, Ku, Ka, Sub mm)

2. Microwave Devices (12 Periods)

   Construction, characteristics, operating principles and typical applications of the following devices (No mathematical treatment)
   - Multi cavity klystron
   - Reflex klystron
   - Multi-cavity magnetron
   - Traveling wave tube
   - Gunn diode and
   - Impatt diode

3. Wave guides (10 Periods)

   Rectangular and circular wave guides and their applications. Mode of wave guide; Propagation constant of a rectangular wave guide, cut off wavelength, guide wavelength and their relationship with free space wavelength (no mathematical derivation). Impossibility of TEM mode in a wave guide.

4. Microwave Components (10 Periods)

   Constructional features, characteristics and application of tees, bends, matched termination, twists, detector, mount, slotted section, directional coupler, fixed and variable attenuator, isolator, circulator and duplex, coaxial to wave guide adapter, horn antenna.

5. Microwave Communication systems (10 Periods)

   a) Block diagram and working principles of microwave communication link.
   b) Troposcatter Communication-basic idea

6. Radar Systems (16 Periods)

   - Introduction to radar, its various applications, radar range equation (no derivation) and its applications.
   - Block diagram and operating principles of basic pulse radar. Concepts of ambiguous range, radar area of cross-section and its dependence on frequency.
   - Block diagram and operating principles of CW (Doppler) and FMCW radars, and their applications.
   - Block diagram and operating principles of MTI radar.
   - Radar display- PPI

LIST OF PRACTICALS

1. To measure electronics and mechanical tuning range of a reflex klystron
2. To measure VSWR of a given load.
3. To measure the Klystron frequency by slotted section method
4. To measure the directivity and coupling of a directional coupler.
5. To plot radiation pattern of a horn antenna in horizontal and vertical planes.
6. To verify the properties of magic tee.

NOTE:

Visit to the appropriate sites of microwave station/tower and communication stations should be made to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

INSTRUCTIONAL STRATEGY

Microwave and radar engineering is very important subject and requires both theoretical as well as practical exposure. The teaching should be supplemented by visits to the microwave stations and using suitable audio visual aids.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Microwave Devices and Components by Sylio; Prentice Hall of India, New Delhi
2. Electronics Communication by Roddy and Coolen; Pearson Publishers.
3. Electronics Communication System by KS Jamwal; Dhanpat Rai and Sons, Delhi
4 Microwave Engineering by Das; Tata McGraw Hill Education Pvt Ltd , New Delh
5 Microwave & Radar Engineering by Navneet Kaur; Ishan Publications, Ambala City
5 e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	06	08
2.	12	18
3.	10	16
4.	10	16
5.	10	17
6.	16	25
Total	**64**	**100**

6.2 WIRELESS AND MOBILE COMMUNICATION

L	T	P
4	-	3

RATIONALE

The wireless/mobile communication technology though complex but is spreading at a very fast rate. People use more of mobile phones in comparison to land line phones. It is expected that within very short period, almost every body will be using mobile communication. Technology is also changing very fast. Therefore, the students should know the functioning of wireless/mobile system/equipment to keep themselves abreast of this latest application of communication.

LEARNING OUTCOMES

After completion of the course, the learner should be able to:

- Identify and explain the features, specification and working of cellular mobile
- Measure and analyse signal strength at various points from a transmitting antenna with mobile phone.
- Describe and analyse different Multiple Access Techniques for Wireless Communication (FDMA, TDMA and CDMA)
- Describe different Mobile Communication Systems(GSM and CDMA)
- Demonstrate call processing on a GSM and CDMA trainer Kit
- Troubleshoot GSM mobile phone.

DETAILED CONTENTS

1. Wireless Communication (08 Periods)

   1.1 Basics

   1.2 Advantages of wireless communication

   1.3 Electromagnetic waves.

   1.4 Frequency Spectrum used.

   1.5 Cellular Network Systems.

   1.6 Propagation considerations

   a) Range
   b) Atmospheric Effect
   c) Geographic Effect
   d) Fading
   e) Doppler Effect
   f) Multipath Effect

2. Cellular Concept (08 Periods)

   2.1. Introduction to 1G and 2G

   2.2 Cell area

   2.3. Cell Site Structure

   2.4. Capacity of cell

2.5. Frequency Reuse (Concept)

2.6 Interference (Co-channel, Adjacent channel)

2.7 Power Control for reducing Interference

2.8 Fundamentals of cellular network planning

a) Coverage planning

b) Capacity planning

c) Cell splitting and sectoring

3 Multiple Access Techniques for Wireless Communication (10 Periods)

3.1 Introduction to Multiple Access.

3.2. Frequency Division Multiple Access (FDMA)

3.3. Time Division Multiple Access (TDMA)

3.4 Distinction between TDMA FDD and TDMA TDD

3.5 Code Division Multiple Access (CDMA), WCDMA

4. Mobile Communication Systems (10 Periods)

4.1. Introduction of Global Systems for Mobile Communication (GSM) and its architecture, Introduction of CDMA System, comparison of CDMA and GSM Systems

4.2. Introduction of GPRS, EDGE, Bluetooth and Wi-fi.

5. Introduction to 3G & 4G (06 Periods)

5.1. Introduction to Architecture and Features of UMTS
5.2. HSPA (High Speed Packet Access).
5.3. Features and Architecture of LTE (Long Term Evolution).

6. Troubleshooting GSM Mobile Phone (06 periods)

6.1. Assembling and dissembling of GSM phone
6.2. Study parts of Mobile Phone
6.3. Testing of various parts

LIST OF PRACTICALS

1. Study the features, specification and working of cellular mobile
2. To study the cell processing using CDMA trainer kit.
3. Observing call processing of GSM trainer kit.
4. Demonstration of Base Trans Receiver(BTS) with nearby cellular tower.
5. Demonstration of data transfer using Bluetooth.
6. To set up aWi-fi network.
7. To study faults on a GSM mobile trainer.
8. Visit to Mobile Switching Centre.

INSTRUCTIONAL STRATEGY

Wireless and Mobile Communication is having significant impact in Electronics Market. For the proper awareness of this subject, it is must to provide the students the detailed functioning of wireless/mobile system/equipment. For this, visits must be arranged to BTS/MSC (Mobile Switching Centre) providers. The theory classes need to be application based in addition to industrial visits to mobile companies

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making
- Actual laboratory and practical work, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

1. Wireless Communications, Principles and Practice, by Thedore S.Rappaport.
2. Wireless Communications by Singal, Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Wireless Communications by Misra, Tata McGraw Hill Education Pvt Ltd , New Delhi
4. Introduction to Wireless and Mobile Systems, by Dharma Prakash Agarwal, Qing-An zeng.
5. Wireless Communications and Networking, by William Stallings.
6. Mobile and Personal Communication Systems and Services, by Raj Pandya, Prentice Hall of India, New Delhi
7. Mobile Communication by John Schiller, Prentice Hall of India, New Delhi
8. Wireless Communications by Pahalwan, Pearson Publishers
9. Wireless and Mobile Communication VK Sangar, Ishan Publication, Ambala.
10. E-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS*:*

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	10	16
2.	10	16
3.	12	20
4.	14	22
5.	09	12
6	09	14
Total	**64**	**100**

6.3 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

L	T	P
3	-	-

RATIONALE

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 organisation.
- 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 organisation.
- 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 CONTENTS

SECTION – A ENTREPRENEURSHIP

1. Introduction (10 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 organisations
- Schemes of assistance by entrepreneurial support agencies at National, State, District – level, organisation: 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

2. Market Survey and Opportunity Identification/Ideation (08 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

3. Project report Preparation (06 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

SECTION –B MANAGEMENT

4. Introduction to Management (04 Periods)

- Definitions and importance of management
- Functions of management: Importance and process of planning, organising, staffing, directing and controlling
- Principles of management (Henri Fayol, F.W. Taylor)
- Concept and structure of an organisation
- Types of industrial organisations and their advantages

- Line organisation, staff organisation
- Line and staff organisation
- Functional Organisation

5. Leadership and Motivation (03 Periods)

a) Leadership

- Definition and Need
- Qualities and functions of a leader
- Manager Vs leader
- Types of leadership
- Case studies of great leaders

b) Motivation

- Definition and characteristics
- Importance of self motivation
- Factors affecting motivation
- Theories of motivation (Maslow, Herzberg, Douglas, McGregor)

6. Management Scope in Different Areas (06 Periods)

a) Human Resource Management

- Introduction and objective
- Introduction to Man power planning, recruitment and selection
- Introduction to performance appraisal methods

b) Material and Store Management

- Introduction functions, and objectives
- ABC Analysis and EOQ

c) Marketing and sales

- Introduction, importance, and its functions
- Physical distribution
- Introduction to promotion mix
- Sales promotion

d) Financial Management

- Introductions, importance and its functions
- knowledge of income tax, sales tax, excise duty, custom duty, VAT, GST

7. Work Culture (04 Periods)

7.1. Introduction and importance of Healthy Work Culture in organization
7.2. Components of Culture
7.3. Importance of attitude, values and behaviour
Behavioural Science – Individual and group behavior.
7.4. Professional ethics – Concept and need of Professional Ethics and human values.

8. Basic of Accounting and Finance (04 Periods)

a) Basic of Accounting:

- Meaning and definition of accounting
- Double entry system of book keeping
- Trading account, PLA account and balance sheet of a company

b) Objectives of Financial Management

- Profit Maximization v/s Wealth Maximization

9. Miscellaneous Topics (03 Periods)

a) Total Quality Management (TQM)

- Statistical process control
- Total employees Involvement
- Just in time (JIT)

b) Intellectual Property Right (IPR)

- Introduction, definition and its importance
- Infringement related to patents, copy right, trade mark

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

MEANS OF ASSESSMENT

Assignments and quiz/class tests, mid-term and end-term written tests, model/prototype making

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/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	20
2	08	16
3	06	14
4	04	10
5	03	06
6	06	14
7	04	08
8	04	08
9	03	06
Total	48	100

ELECTIVE
6.4.1 EMBEDDED SYSTEMS

L	T	P
4	-	-

RATIONALE

Embedded systems and Micro-controllers have also assumed a great significance in the electronic and consumer goods industry and are a very vital field. The subject aims expose students to the embedded systems besides giving them adequate knowledge of Micro controllers.

LEARNING OUTCOMES

A diploma holder in the field of Electronics employed for maintenance of electronic equipment/ gadgets can

- Describe embedded system
- Explain embedded operating systems
- Program PIC microcontroller and AVR microcontroller
- Interface sensors with microcontroller
- Repair microcontroller based appliances.

DETAILED CONTENTS

1. Introduction (08 Periods)
   Embedded system, history of embedded systems, embedded system architecture, Functional structure of embedded system
2. Embedded operating systems (12 Periods)
   Real-time operating system, factors affecting embedded systems, applications of embedded systems, embedded systems characteristics and features, Reliability of embedded systems, embedded systems versus general purpose systems, selection criteria of microcontroller.
3. Introduction of PIC microcontroller, block diagram, function of each block. (08 Periods)
4. Introduction of AVR microcontroller, block diagram, function of each block.(08 Periods)
5. Programming concepts of microcontrollers. Basic introduction of Software used in microcontrollers. How to transfer C or ASM code in microcontrollers. (18 Periods)
6. Comparison between 8051, PIC and AVR, Steps involved in development of a project, interfacing of LED, 7-segment display, buzzer, relay and sensors. (10 Periods)

LIST OF PRACTICALS

1. Design PIC based Security System
2. Design AVR based Temperature indicator cum controller.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests

RECOMMENDED BOOKS:

1. Microcotroller:Architecture, Programming & Applications by Ayala, Kenneth J., Penram
2. Microcotroller and Embedded Systems using Assembly and C by Muhammad Ali Mazidi, Rolin Mckinlay, Janice Gilispie Mazidi, Pearson
3. Embedded Systems - Architecture, Programming, Design, by Kamal, R. Tata McGraw Hill, New Delhi.
4. Embedded System Design: A Unified Hardware/Software Introduction, by Vahid, F. and Givargis, T. Student Edition, John Wiley & Sons, New York.
5. PIC Microcontroller and Embedded Systems : Using assembly and C by Muhammad Ali Mazidi, Rolin Mckinlay, Danny Causey, Pearson
6. The AVR microcontroller (with CD-ROM) by Dhananjay Gadre, Tata McGraw Hill Education Private Limited.
7. Books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%age)
1	08	16
2	12	20
3	08	12
4	08	12
5	18	24
6	10	16
Total	**64**	**100**

6.4.2. INDUSTRIAL AUTOMATION

L	T	P
4	-	-

RATIONALE

A diploma holder when employed in automated industrial process controls or in automated power station will be required to know the basics of Programmable Logic Controllers, their working and their programming. In industry, many manufacturing processes demand a sequence of operation, which are to be performed repetitively. Early automation systems were mechanical in design, timing and sequencing being effected by gears and cams. Slowly these design concepts were replaced by electrical drives which were controlled by relays and now by programmable logic controllers (PLCs). A PLC is a solid state device, designed to operate in noisy industrial environments and can perform all logic functions. PLCs are widely used in all industries for efficient control operations. A diploma holder in industry is called upon to design, modify and troubleshoot such control circuits. Looking at the industrial applications of PLCs in the modern industry, this subject finds its usefulness in the present curriculum.

LEARNING OUTCOMES

After completion of the course, the learner will be able to:

- Explain and demonstrate the different modules of a Programmable Logic Controller
- Program a PLC using a hand-held programmer and computer interface
- Implement ladder programming concepts
- Implement basic logic operations using ladder programming
- Demonstrate Logic control systems with time response as applied to clamping operation
- Explain sequence control system
- Drive for speed and direction control of motor.

DETAILED CONTENTS

1. Introduction to PLC (10 Periods)

   Concept of PLC, Building blocks of PLC, Functions of various blocks, limitations of relays. Advantages of PLCs over electromagnetic relays. Different programming languages, PLC manufacturer etc.

2. Working of PLC (12 Periods)

   - Basic operation and principles of PLC
   - Scan Cycle
   - Memory structures, I/O structure
   - Programming terminal, power supply

3. Instruction Set (18 Periods)

   - Basic instructions like latch, master control self holding relays.
   - Timer instruction like retentive timers, resetting of timers.
   - Counter instructions like up counter, down counter, resetting of counters.
   - Arithmetic Instructions (ADD,SUB,DIV,MUL etc.)
   - MOV instruction
   - RTC(Real Time Clock Function)
   - Watch Dog Timer

- Comparison instructions like equal, not equal, greater, greater than equal, less than, less than equal
- Programming based on basic instructions, timer, counter, and comparison instructions using ladder program.

4. DCS Concepts (10 Periods)

Concept of DCS, DCS I/O hardware, Remote Terminal Unit

5. SCADA (10 Periods)

Block Diagram of SCADA, Difference between Open Architecture and Dedicated System. Difference between DCS and SCADA

6 Electrical Drives: AC Drive for Speed and Direction control (04 Periods)

INSTRUCTIONAL STRATEGY

Introduce the subject and make the students familiar with applications of PLCs and Microcontrollers. The inputs shall start with theoretical inputs to architecture, instruction set, assembly language programming, Small projects may be identified, designed and implemented. PLC ladder diagram and programming should be supplemented with visits to industry. More emphasis may be given to practical work.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests

RECOMMENDED BOOKS

1) Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA
2) Introduction to PLCs by Gary Dunning. McGraw Hill
3) Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh
4) Programmable Logic Controller and Microcontrollers by Gurpreet Kaur and SK Sahdev by Uneek Publications, Jalandhar
5) Module on "Allen Bradlag PLC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh
6) Module on "PLC Applications based on SLC 5/03" By Rajesh Kumar, NITTTR Chandigarh
7) Instrument engineers Handbook - Process Control, Modern Control Techniques for Process Industries by G Liptak
8) e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1.	10	16
2.	12	20
3.	18	30
4.	10	16
5.	10	12
6	04	06
Total	**64**	**100**

6.5 PROJECT WORK

L	T	P
-	-	12

RATIONALE

Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period.

LEARNING OUTCOMES

After undergoing the project work, students will be able to:

- Apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project.

In addition, the project work is intended to place the learner for project oriented practical training in actual work situation for the stipulated period with a view to:

- Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study
- Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.
- Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.
- Assemble/fabricate and test an electronics gadget.

General Guidelines

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work **should not be considered** as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

Some of the project activities are given below:

- Projects related to designing small electronic equipment / instruments.
- Projects related to increasing productivity in electronic manufacturing areas.
- Projects related to quality assurance.
- Projects connected with repair and maintenance of plant and equipment.
- Projects related to design of PCBs.
- Projects related to suggesting substitutes of electronics components being used.
- Projects related to design of small oscillators and amplifier circuits.
- Projects related to design, fabrication, testing and application of simple digital circuits and components.
- Projects related to microprocessor/microcontroller based circuits/ instruments.

Some of the projects based on above areas are listed below for the benefit of students:

1. Microprocessor/Microcontroller based rolling display/bell and calendar
2. Microprocessor based stepper motor control.
3. Speed control of DC Machines by Microprocessor/Microcontrollers
4. Temperature monitoring using Microprocessor/Microcontroller based systems.
5. Microprocessor/Microcontroller based liquid level indicator and control
6. Fabrication and assembling of digital clock.
7. Fabrication of PCB circuits using ORCAD/ EAGLE Software.
8. Fabrication of ON line/OFF line UPS of different ratings and inverters
9. Design, fabrication and testing of different types of experimental boards
10. Repair of oscilloscope, function generator
11. Design and developing web sites of organizations
12. Installation of computer network (LANS).
13. Microprocessor/Microcontroller based solar tracking system
14. GSM based car or home security system
15. Bank token display using microcontroller
16. Printer sharing unit
17. Microprocessor/Microcontroller Based A/D converter
18. Microprocessor/Microcontroller Based D/A converter
19. Simulation of half wave and full wave rectifiers using Simulation Software
20. Simulation of class A, Class B, Class AB and Class C amplifiers
21. Simulation of different wave forms like sine, square, triangular waves etc.
22. GPS based vehicle tracking system
23. Calculate BER(Bit Error Rate) of various modulation techniques
24. Design ALU using CPLD/FPGA
25. Design Display System using CPLD/FPGA
26. Electronic Weighing Machines
27. Setting up home security system using biometrics and video recording
28. Making an overhead tank water level controller using a pump and control system
29. PLC based water level controller/sequential motor starter/bottling plant/traffic light control.

NOTE:

The list is only the guideline for selecting a project; however a student is at liberty to select any other related project of his choice independently under guidance of his teacher.

A suggestive criterion for assessing student performance by the external (person from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance Criteria	Max.** Marks	Rating Scale				
			Excellent	Very Good	Good	Fair	Poor
1.	Selection of project assignment	10%	10	8	6	4	2
2.	Planning and execution of considerations	10%	10	8	6	4	2
3.	Quality of performance	20%	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20%	20	16	12	8	4
5.	Sense of responsibility	10%	10	8	6	4	2
6.	Self expression/ communication skills	5%	5	4	3	2	1
7.	Interpersonal skills/human relations	5%	5	4	3	2	1
8.	Report writing skills	10%	10	8	6	4	2
9	Viva voce	10%	10	8	6	4	2
Total marks		**100**	**100**	**80**	**60**	**40**	**20**

The overall grading of the practical training shall be made as per following table.
In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance to improve and re-evaluate before being disqualified and declared "not eligible to receive diploma". It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

	Range of maximum marks	**Overall grade**
i)	More than 80	**Excellent**
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	Less than 40	Poor

Important Notes

1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.

2. The criteria for evaluation of the students have been worked out for 200 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.

3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.

4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition.

SOFT SKILLS – IV

L	T	P
-	-	2

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

LEARNING OUTCOMES

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

- Communicate effectively.
- Apply techniques of effective time management
- Develop habits to overcome stress
- Face problems with confidence
- Exhibit attributes required to appear for an interview
- Learn about current and future career opportunities
- Exhibit entrepreneurial skills
- Use QC/QT tools

DETAILED CONTENTS

- Communication Skills - Presentation
- Time management
- Stress Management
- Problem solving
- Career opportunities-Current and future
- Entrepreneurial Skills
- Quality and Quality tools used in industry

In addition, the students must participate in the following activities to be organized in the institute

- Sports
- NCC/NSS
- Cultural Event

Note: Extension Lectures by experts may be organized. There will be no examination for this subject.