CURRICULUM FOR

DIPLOMA IN

ELECTRONIC &

INSTRUMENTATION

ENGINEERING

SEM I, II, III, IV,

V & VI

PROGRAMME STRUCTURE

SET II

Semester - I

Course code	Name of Course	L	T	P	C	TH	TM	PR/OR	TW	Total marks
		TEACHING SCHEME				EXAMINATION SCHEME				
						Theory Marks		Practical Marks		
GN101	Communication Skills	-	-	2	2	-	-	50	50	100
GN102	Engg. Maths-I	4	2	-	6	75	25	-	-	100
GN103	Applied Physics-I	4	-	2	6	75	25	-	50	150
GN104	Applied Chemistry	3	-	2	5	75	25	-	50	150
GN204	Engg. Drawing	2	-	4	6	-	-	50	50	100
	Total	**13**	**2**	**10**	**25**	**225**	**75**	**100**	**200**	**600**

Semester - II

Course code	Name of Course	L	T	P	C	TH	TM	PR/OR	TW	Total marks
		TEACHING SCHEME				EXAMINATION SCHEME				
						Theory Marks		Practical Marks		
GN201	Engg. Maths-II	4	2		6	75	25	-	-	100
GN202	Applied Physics-II	4	-	2	6	75	25	-	50	150
GN203	Environmental Studies	3	-	-	3	75	25	-	-	100
GN205	Engg. Materials	4	-	-	4	75	25	-	-	100
GN105	Computer Fund. & App.	-	-	4	4	-	-	50	50	100
GN106	Basic Engg. Skills	-	-	6	6	-	-	50	100	150
	Total	**15**	**2**	**12**	**29**	**300**	**100**	**100**	**200**	**700**

GN 101 COMMUNICATION SKILLS

1. RATIONALE

This course deals with Student's proficiency in English by developing their skills in reading, writing and speaking. They will be able to appreciate the usage of grammar. Acquiring proficiency in English is absolutely essential for effective communication while serving on the job. It also deals with applications of the concepts and principles learnt. Using visuals in written communication and body language in oral communication highly enhances the effectiveness of the communication process. These and some other important aspects are discussed in this course. The practice-feedback-practice cycle is of utmost important for developing the communication competencies/skills.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN-101 Communication Skills	L	T	P	C	TH	TM	TW	PR/OR	
		-	2	2	-	-	50	50	100

Minimum passing % : Practical 40%
Legends:

*L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit; **TH**- End Semester Theory; **TM** – Test Marks:*

PR/OR *- End Semester Practical / Oral Examinations; **TW-** Term Work*

3. DETAILED COURSE CONTENTS

Unit 1 - Fundamental of Communication skills

Definition, components (message, sender, receiver, transmission medium and protocol), types(verbal & no-verbal, technological & non-technological, etc), importance of communication skills, effective communication skills (phatic stage, personal stage and intimate stage), barriers in effective communications(verbal, non-verbal), barriers while speaking, other barriers (individual's viewpoints, emotional block, etc.) methods of and hint to increase communication skills, body language.

Unit 2 – Presentation Skills

Methods and styles of presentations (seminars, speeches, etc), the plan, objectives, audience, structure (sequential, hierarchical, question oriented pyramid, meaty sandwich), tips for good beginning and end, aids to presentation (visual, verbal), delivery style (eyes, voice, expression, appearances, stance, etc), techniques for a good speech (repeat, draw (signs, pictures), jokes, etc).

Unit 3 - Technical Reports, Letter Writing, CVs

Functions of Reports (information, initiate action, recommend new procedures, recording, coordinating project), techniques (basic format, steps, appendices), types of reports (emphasis on progress reports, industrial visit reports, inspection reports, accident reports, survey report, report on seminars, workshop, technical gathering, etc).

Types of letters, format function, qualities of a good letter, examples of job applications, leave applications, complaints, purchase orders, enquiries replies etc.

Brief mention of importance of etiquette in email communication, importance of careful proofing the documents sent.

Curriculum Vitae – definition, sample, tips for a good CV, covering letter

Unit 4 - Soft Skills

Importance of values, attitude and etiquettes in communication, ethics and manners, courtesy, honesty and reliability; personal integrity, flexibility – adaptability, team skills – cooperation; ability to follow regulations; willingness to be accountable; Ability to relate to co workers in a close environment, non verbal communication, leadership skills – self directed, ability to direct and guide others, self-supervising; ability to relate to co workers in a close environment; positive attitude; positive work ethic, written communication Skills- basic spelling and grammar; reading and comprehension, personal hygiene and energy, interpersonal skills – communication skills with public, fellow employees, supervisors, and customers, motivation – willingness to learn; caring about seeing the company succeed; understanding what the world is all about; commitment to continues training and learning; critical thinking skills, grooming – good personal appearance.

Unit 5 - Language Workshop

The Reading, Listening, Writing, Speaking Skills will be tested

1. **Reading Skills:**

   Articles from the newspapers, magazines, journals etc. will be given to the students to read aloud thus checking their pronunciation, clarity and their style of reading.

2. **Listening Skills:**

   Passages, Topics, Stories, Speeches of eminent people will be read or played. The students have to listen and their listening skills will be tested.

3. **Writing Skills:**

   a) Students to write on any given topic

   b) Students to compose their own stories

   c) Students will be given a particulars situation i.e. accident, college gathering etc. and asked to write a report

4. Speaking Skills:

   a) Students to speak on any given topic

   b) Narrate a story written by them.

Group discussions in the classroom. This could include debates, discussion on current issues, role-playing.

4. List of Experiments :

- Oral presentation about technical products for five minutes.
- Seminar Presentation/Report writing and presentation on identified topics from science and technical subjects for short duration.
- Group discussion on science and technical topics.
- Organise mock interviews.
- Organise debates.
- Extempore speech for three minutes on a topic.
- Observe a process and reproduce orally in own words for three to five minutes.
- Arrange video recording of presentations for self-feedback.

5.   SUGGESTED LEARNING RESOURCES

S.No.	Author	Title of Books	Year of Publication
1	Wren and Martin	Practical English Grammar	1992
2	John Sinclair (ed.),	Collins Cobuild English Grammar	William Collins & Sons Cp., London 1990
3	Krishna & Mohan,	Effective English Communication	Tata McGraw Hill, New Delhi 2000
4	Randolf, Quirk & Sidney Greenbaum	University Grammar of English	1993
5	Tiwari, N.P. et al ,	Communication Skills for Technical Students – Book	Somaiya Publications, 1995
6	Tiwari, N.P. et al,	A Communicative Grammar of English	Somaiya Publications, 1989

GN 102 ENGINEERING MATHEMATICS- I

1.   RATIONALE

There are variable and constant concepts in the engineering phenomena and problems, which need to be understood, analyze and predict their behaviour. For instance, motion and acceleration of an object under applied known force, effect of temperature and pressure under constant volume, etc. All these situations require modeling of constants and variables into a relationship known as formula (formulating) and solving problems of engineering by substituting the values of constants and variables. Thus mathematics is used to understand, analyse and find solutions. There are some standard principles and formulae, which should be understood by students and apply as per needs of situations in real life.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
GN-102 Engineering Mathematics	L	T	P	C	TH	TM	TW	PR/OR	
	4	2	-	6	75	25	-	-	100

Minimum passing % : Theory 40%

Legends:

L *-Lecture;* ***T*** *- Tutorial;* ***P*** *- Practical;* ***C*** *- Credit;* ***TH*** *- End Semester Theory;* ***TM*** *– Test Marks:*

PR/OR *- End Semester Practical / Oral Examinations;* ***TW-*** *Term Work*

3.   DETAILED COURSE CONTENTS

Unit 0	**Fundamentals of algebraic mathematical operations**

- Use of scientific calculator
- Recall of algebraic operations & formulae
- Solving of simultaneous equations with two variables

Unit 1	**Co-ordinate Geometry/ Analytic Geometry;**

Purposes/Applications of Co-ordinate Geometry. Coordinate systems. *Straight Line*-Distance between two points. Internal & external division of a line. Area of triangle. Slope of line. Angle between two lines. Various forms of equation of line-parallel to axis, point-slope form, slope intercept form, two point form, intercepts form & normal form. General equation of line. Distance of a point from a line. - Equations of circle,   Equations of tangent & normal to circle.

Unit 2	Trigonometry

Purposes/Applications of Trigonometry. Radian. Radian & degree. Area of sector & length of an arc. Trigonometric ratios of any angle & Trigonometric identities. Trigonometric ratio of allied angles, compound angles, & Multiple angles(only 2A). Sum & product formulae. Sine, Cosine rules. Solution of triangles

Unit 3	Limits & Functions

Functions- constants, variables. Kinds of functions (question not to be asked). Concepts of limits- algebraic, trigonometric, logarithmic & exponential functions (No question on method of substitution and Inverse Trigonometric function)

Unit 4	Differential Calculus

Purposes/Applications of Differential Calculus. Definition of Derivative. Derivatives of standard functions-applications. Derivative of sum, difference, product & quotient of a function. Derivative of composite, implicit & parametric functions with reference to - algebraic, logarithmic, trigonometric, inverse circular functions, exponential functions & logarithmic differentiations. Introduction to Second order derivatives.

Unit 5	Application of derivatives

Geometrical meaning of derivatives. Equation of tangent & normal to curves.   Derivatives as rate, motion, related rates. Maxima & minima.

4.   SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Marks
1	Co-ordinate Geometry	14	20
2	Trigonometry	17	16
3	Limits & Functions	8	12
4	Differential Calculus	15	20
5	Application of derivatives	10	07
		64	75

5. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title of Books	Publication & Year
1.	Deshpande S.P.,	Mathematics for Polytechnics	Griha Prakashan, Pune, 1996 or latest
2.	Grewal B.S;	Engineering Mathematics	Khanna Pub., New Delhi1995 or latest
3.	Prasad, I.B.;	Engineering Mathematics	Khanna Pub., New Delhi1997 or latest
4.	TTTI, Bhopal	Mathematics for Polytechnics Vol. – I & Vol. – II	TTTI, Bhopal Latest
5.	Wartiker P.N.,	Applied Mathematics	Griha Prakashan Pune, 1996 or latest

****

GN 103 APPLIED PHYSICS-I

1. RATIONALE:

Being the basis of all engineering branches, the students must acquire knowledge of basic principles; laws and facts of Physics This knowledge will improve their ability to apply it in solving engineering problems and overall growth of their disciplines.

2. TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN-103 Applied Physics I	L	T	P	C	TH	TM	TW	PR/OR	
	4	-	2	6	75	25	50	-	150

Minimum passing % : Theory 40%   *Duration of Theory Paper: 3 Hrs.*
Legends:
*L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit;   **TH**- End Semester Theory; **TM** – Test Marks:*
***PR/OR** - End Semester Practical / Oral Examinations; **TW**- Term Work*

3. DETAILED COURSE CONTENTS

Unit 1   UNITS & DIMENSIONS
Fundamental and Derived Physical Quantities and their SI units. Dimensions and Dimensional formula, Principle of Homogeneity, use of Dimensional Analysis for checking the correctness of an equation. Definition of least count of Vernier Caliper, Micrometer Screw Gauge.

Unit 2   KINEMATICS
Vectors and Scalars-Definition, Difference between vectors and scalars, types of vectors with example. Definition - Displacements and distance, Velocity and speed, uniform and average velocity, Uniform acceleration and retardation, problems based on kinematic equations for uniform acceleration. $V=u+at$, $S=ut + \frac{1}{2} at^2$, $v^2 = u^2 + 2as$. Velocity- time diagram, Motion under gravity.

Unit 3   PROPERTIES OF MATTER
Definition of Elasticity, Stress, Strain and Elastic limit. Hooke's Law. Definition of Young's modulus, Bulk modulus, Rigidity modulus. Determination of Young's modulus by Searle's method. Behaviour of wire under continuously increasing stress. Definition of Yield Point, Breaking Stress, and Factor Of Safety. Adhesive and Cohesive forces. Angle of contact. Concept and definition of Surface Tension, Surface Tension by Capillary rise method. Application of Surface Tension. Definition and explanation of Viscosity. Statement of Newton's law of viscosity, Terminal Velocity (no derivation) Stokes Law. Determination of Viscosity by Stokes method. Streamlined and Turbulent flow. Definition of Critical Velocity, Reynolds Number.

Unit 4   HEAT

Definition of specific heat and units of specific heat. Modes of transfer of heat transfer, Conduction, Convection and Radiation. Law of thermal conductivity. Definition of co-efficient of thermal conductivity. Determination of coefficient of thermal conductivity of a good conductor
Statement of Charles's law, Boyle's law and Gay Lussac's law. Derivation of general gas equation.

Unit 5   ELECTROSTATICS

Coulomb's Law of Electrostatics, Electric Field, Intensity of Electric Field, Electric Potential and its unit, Potential difference between two points (no derivation), Potential of a sphere, Potential of Earth, Definition and units of Capacitance, Principle of Capacitor, Capacitors in series, Capacitors in Parallel.

Unit 6   MAGNETISM

Magnetic Effect of Electric current (Oersted's Experiment) Magnetic Field, Intensity of Magnetic Field. Coulomb's Law of Magnetism, Magnetic lines of Force, Magnetic Induction, Expression for Magnetic Induction at the centre of a Circular coil carrying current (no derivation), Force acting on straight conductor placed in Magnetic Field (no derivation).

Unit 7 (A)   LAWS OF FORCES & FRICTION (MECHANICAL AND ALLIED GROUPS)

Triangle law of forces, parallelogram law of forces (expression only), graphical & analytical representation of force, resolution of forces, resolving force into rectangular components.
Definition & concept of friction, types of friction, Force of friction, Laws of static friction, Coefficient of friction, angle of friction (expression only), angle of repose(only qualitative aspects)

OR

UNIT 7(B) : SEMICONDUCTORS (ELECTRONICS AND ALLIED GROUPS)

Energy Band structure of electronic material(conductor , semiconductor and insulator)
Definition of semiconductors, types of impurities added to the semiconductors, intrinsic and extrinsic semiconductors.
Types of semiconductors P- type and N- type, Structure of P- type and N- type,
Extrinsic   semiconductor using pure Si and Ge semiconductors.
Types of carriers; N- type and P- type
Process of recombination of carriers.
Formation of P-N junction and depletion region.

4.SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Units and Dimensions	5	5
2	Kinematics	9	12
3	Properties of Matter	13	14
4	Heat & Gas Laws	9	10
5	Electrostatics	12	12

Unit No.	Unit	Teaching Hours / Semester	Marks
6	Magnetism	8	10
7A	Laws of Forces & Friction	8	12
	OR		
7B	Semiconductors	8	12
	Total	**64**	**75**

7A-Mechanical and allied branches   7BFor Electronics and allied branches

5. SUGGESTED LIST OF EXPERIMENTS

Sr. No.	LIST OF EXPERIMENTS
1	Use of Vernier Caliper
2	Use of Micrometer Screw gauge
3	Determination of Surface tension by capillary rise method using Travelling Microscope.
4	Determination of coefficient of viscosity by stroke's method.
5	Determination of acceleration due to gravity ('g') by simple pendulum.
6	Determination of Young's modulus by Searle's method.
7	Determination of Coefficient of thermal conductivity by Searle's method.
8A	Find resultant force using parallelogram of forces
8B	Draw and interpret band structure of Insulator, Semiconductor and conductor, Band structure of P-type & N-type extrinsic semiconductor, Drawing PN junction.

6. SUGGESTED LEARNING RESOURCES

Sr.No.	Author	Title	Publication and Year
1.	Halliday D and Resnickr	Physics Part-I & II	Latest
2.	Das S.K., Sisodiya M.L., Neher P.K., Kachhawa C.M.,	Physics Part-I & II for 10+2 Students	Latest
3.	B.G. Dhande	Applied physics for polytechnics	Latest
4.	Bhandarkar	Applied Physics for polytechnics	Latest
5.	Saxena HC & Singh Prabhakaer	Applied Physics Vol. I & II	Latest

6.	Rao, B.V.N.	Modern Physics	Latest
7.	R.K.Guar and S.L. Gupta.	Engineering Physics	Latest
8.	B.L. Thereja.	Engineering Technology	Latest
9.	Modern Publishers.	ABC of Physics	Latest
10.	V.K Mehta	Elements of electronic engineering	Latest
11	R S Khurmi	Applied Mechanics	Latest

****

GN 104 APPLIED CHEMISTRY

1.   RATIONALE

Applied Chemistry is multi-disciplinary science having wide applications in all the branches of engineering and technology. In simple terms, it is the science of chemical phenomena in various engineering situations. An understanding of the basic concepts of applied chemistry is essential not only for all chemists but also for engineers. Therefore it forms an indispensable base for them. The emphasis is given more on applications of principles of chemistry to engineering situations rather than fundamental principles only. It also develops in the students the habit of scientific enquiry, ability to investigate the cause and effect relationship, ability to interpret and analyze the results under given conditions.

2.   TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN-104 Applied Chemistry	L	T	P	C	TH	TM	TW	PR/OR	150
	3	-	2	5	75	25	50	-	

Minimum passing % : Theory 40%

Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:
PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3.   DETAILED COURSE CONTENTS

Unit 1   Atomic Structure and Chemical Bonding
Fundamental particles and their characteristics, Energy levels - definition, designation of energy levels, Bohr- Bury's laws for distribution of electrons in shells (1st three laws only), concept and shape of orbitals (s and p only), Quantum numbers-designation, definition, values, Aufbau and Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, orbital electronic configuration of elements with atomic number 1 to 20, Lewis and Langmuir concept of stable configuration. Concept of electrovalent, covalent and co-ordinate bond, Formation, properties and examples of electrovalent compounds ($NaCl$, MgO, $CaCl_2$) covalent compounds (Cl_2, O_2, N_2, CO_2)and coordinate compounds (O_3, SO_2).
Unit 2 Electrochemistry
Arrhenius theory of electrolytic dissociation., Degree of Ionisation- definition, factors affecting degree of ionisation , Nature of solute and solvent, concentration of solution, and temperature, Strong and weak electrolytes - definition and examples, Concept of the terms involved in electrolysis –conductor, insulator, electrolyte, non-electrolyte, electrolysis, electrodes, electrolytic cell, cathode, anode and current density, electrochemical series- concept and significance. Mechanism of electrolysis, Ionisation, primary reactions at the cathode, activity series of cations, primary reactions at the anode, activity series of anions, electrolysis of i. Fused $NaCl$ using carbon electrodes, ii. aqueous $NaCl$ using platinum electrodes iii. aqueous $CuSO_4$ using platinum electrodes iv. aqueous $CuSO_4$, using copper electrodes);

UNIT 3   Water and its treatment

Hard and soft water, types of hardness and its causes, disadvantages of hardness of water (i) for industrial use - dyeing, textile, sugar, paper, bakeries, (ii) in boilers for steam generation with special reference to sludge and scale formation (no chemical equations), zeolite and ion exchange process for water softening, desalination by electro dialysis and reverse osmosis, concept of pH

Unit 4   Corrosion and Its Control

Definition, Atmospheric corrosion (direct chemical corrosion) - definition, Oxidation corrosion, the nature of the oxide film, stable, unstable and volatile, mechanism of oxidation corrosion, corrosion due to other gases. Immersed corrosion (electrochemical corrosion) - definition, factors necessary for electrochemical corrosion , Galvanic cell corrosion, concentration cell corrosion- metal ion concentration and differential aeration. Mechanism of electrochemical corrosion- Hydrogen evolution mechanism, Oxygen absorption mechanism, Protection of metals from corrosion; galvanising, tinning, metal spraying , proper designing , using pure metals, using metal alloys, Cathodic protection- sacrificial anode and impressed current .Modifying the environment- De-aeration, De-activation, De-Humidification and alkaline neutralization.

Unit 5   Lubricants
Definition, functions of Lubricants, Types of Lubrication, Fluid Film, Boundary, Extreme Pressure, Classification of Lubricant - solid, semi- solid, liquid synthetic oils. Characteristics of Lubricants, Definition and Its significance -Viscosity. Viscosity Index, Flash and Fire Point, Oiliness, Pour Point, Volatility, Acidity, Emulsification and Saponification Value. Selection of Lubricants for Delicate Instruments, High Pressure and Low Speed Machines, Extreme Pressure and Low Speed Machines, Mechanisms of Lubrications.

4. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (Theory)

Unit No.	Name of the unit	Hours	Marks
1	Atomic Structure and Chemical bonding	10	15
2	Electrochemistry	08	13
3	Water and its treatment	09	15
4	Corrosion and its control	16	25
5	Lubricants	05	07
	Total	**48**	75

5. SUGGESTED LIST OF EXPERIMENTS

Sr. No.	Unit No.	List of Experiments
1.		Double titration of acid and base using phenolphthalein
2.		Double titration of acid and base using methyl orange
3.		Redox titration of potassium permaganate, ferrous sulphate and oxalic acid.
4.		Determination of degree of hardness of water by EDTA method
5.		Determination chloride content of water by Mohr's method
6.		Determination of total alkalinity of water sample
7.		Titration of strong acid and strong base using pH meter
8.		Determination of conductivity of water
9.		Titration of strong acid and strong base using conductometer
10.		Corrosion susceptibility of aluminium to acid or base.

6. SUGGESTED LIST OF ACTIVITIES

S.No.	Title
1.	Quiz on Electronic configuration of atoms.
2.	Demonstration of process of electrolysis
3.	Demonstration of purification of water by domestic/economical method.
4.	Identification and application of lubricants in different equipment/glasswares used in different laboratories
5.	Visit to some metallurgical industries for demonstration of different processes of metallurgy.
6.	Preparation of chart of different alloys of steel and their uses
7.	Seminar on different aspects of fuel, properties and usages
8.	Use of pH paper for testing different samples of water, blood etc.
9.	Demonstration and use of different samples of paints, varnishes, drying oils, pigments, thinners, dryers, fillers, plasticizers and anti-skinning agents.

7. SUGGESTED LEARNING RESOURCES

Sl. No.	Author	Title	Publication and Year
1.	M.M. Uppal	A text book of Engineering Chemistry,	Khanna Publishers
2	V.P. Mehta	A textbook of Engineering Chemistry,	Jain Bros. Delhi
3	S.N. Narkhede	A Textbook of Engineering Chemistry	Nirali Prakashan
4	R.A. Banawat, S.K. Mahajan, S.K.Mehta	Textbook of Applied Chemistry	India Book House
	V.S. Godbole	Applied Chemistry	

5	R.S. Sharma	Textbook of Engineering Chemistry	Khanna Pubnlishers
	P.C. Jain and M. Jain	Engineering Chemistry	
6	J.C. Kuriacose and J. Rajaram	Chemistry in Engineering	Tata McGraw Hill Publishing Co.Ltd., New Delhi
7	Dr.S. Rabindra and Prof.B.K. Mishra	Engineering Chemistry:	Kumar and Kumar Publishers (P) Ltd., Bangalore -40
8	S.S.Kumar	A Text book of Applied Chemistry-I	Tata McGraw Hill, Delhi
9	Sharma	A Text book of Applied Chemistry -I	Technical Bureau of India, Jalandhar
10	S.S.Dhara	A Textbook of Engineering chemistry	S.Chand & Company, New Delhi
11	Dr. G.H. Hugar	Progressive Applied Chemistry – I & II	Eagle Prakashan, Jalandhar

****

GN 204 ENGINEERING DRAWING

1. RATIONALE:

Drawing is a graphical language of engineering field. Engineering technician irrespective of his field of operation in an industry is expected to possess a thorough understanding of drawing, which includes clear spatial visualization of objects and the proficiency in reading and interpreting a wide variety of engineering drawings. It is the skill, which translates an engineering idea into lines and dimensions on a piece of paper. Besides this he is also expected to possess a certain degree of drafting skill- depending upon his job functions-in his day-to-day activities. This course of Engineering Drawing for Diploma courses is aimed at developing basic knowledge and skills of engineering drawing and use of computer in the field of Engineering Drawing.

2. TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN-204	L	T	P	C	TH	TM	TW	PR/OR	
Engineering Drawing	2	-	4	6	-	-	50	50	100

Minimum passing % : Theory 40% and Practical 40%   *Duration of Theory Paper: 3 Hrs.*

Legends:

*L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit;   **TH**- End Semester Theory; **TM** – Test Marks:*

*__PR/OR__ - End Semester Practical / Oral Examinations; **TW-** Term Work*

3. DETAILED COURSE CONTENT

Unit 1   Introduction
• Importance of Engineering drawing as a means of communication. • Introduction to drawing equipment, instruments and their uses. • Planning of drawing sheet as per I.S. 696 - 1972. • Indian standard practices of laying out and folding of drawing • Different types of lines used in engineering drawing. • Importance of scale in Engineering Drawings. • Lettering

Unit 2   Dimensioning techniques and standard conventions

- Methods of dimensioning, Dimensioning terms and notation (use of I.S. code 696 and 2709), General rules for dimensioning, Dimensioning of cylinder, holes, arcs of circle, narrow space, angles, counter sunk hole, screw thread, taper etc.
- Conventional representation of various materials.

Unit 3   Engineering Curves & Shapes

- Construction of an Equilateral and Isosceles triangle,Square,Rhombus,Regular pentagon & Regular hexagon given distance across the corners/ flats and given length of a side using general method of construction
- Types of Engineering curves
- Construction of Engineering curves like
  - Ellipse- by focus & directrix method and arcs of circles method
  - Parabola- by focus & directrix method and rectangule or oblong method
  - Hyperbola- by transverse axis & Focus and directrix method
  - Cycloid- by generating circle rolling on a straight line
  - Involutes of a triangle ,circle & pentagon
  - Draw normal & tangents to the above curves from given point on the curve
- Practice problems of drawing various engineering curves

Unit 4   Orthographic projection

- Definitions of various terms associated with orthographic projections.
- Planes of projections.
- Concept of Quadrants.
- First and third angle method of projection.
- Projection of points
- Projection of lines
  - (i)   Parallel to both Principal planes
  - (ii)   Parallel to one and Perpendicular to other Principal plane.
  - (iii)   Inclined to one plane and parallel to other plane.

- Projection of Triangle, Square, Rhombus, regular Pentagon when inclined to one principal plane & perpendicular to other plane.

- Introduction to the following solids
    Cylinder, cone, cube.

    Right regular solids such as

  - (i) Prism: Triangular & Square
  - (ii) Pyramid: Square & Pentagonal.
    - Projections of above mentioned solids when axis is inclined to one principal plane & Parallel to other principal plane.
    - Conversion of simple pictorial views into orthographic views.

- Practice problems on projection of points, lines and planes.
- *Problems where one end of the line is in one quadrant & other end in other quadrant and traces are to be excluded.*
- *Problems where apparent projection of plane are given, true shape & slope angle are to be drawn are excluded.*

Unit 5   Section of solids

- Concept of sectioning planes
- Auxiliary planes and true shape of section.
- Drawing projections and section of solids like square prism, square pyramid, pentagonal pyramid, cylinder and cone with sectioning plane inclined to one principal plane and Perpendicular to the other principal plane (Axis of solid perpendicular to one principal plane and parallel to the other)

Unit 6   Development of lateral surfaces

- Concept and importance of surface development in the engineering field.

    Methods of development of surfaces-Radial & Parallel line method.

    Development of surfaces for the following right regular solids-

- Cylinder
- Prism
- Cone
- Pyramids
- Development of solids standing on its base & cut by a plane inclined to either VP/HP and   perpendicular to the other is also included.
- *Practice problems on above with top & bottom of the solid is excluded*

Unit 7   Isometric Views

- Limitations of orthographic projections.
- Procedure for preparing isometric projections.
- Difference between Isometric projection & Isometric view.
- Isometric view of geometrical solids and simple machine parts.
- Conversion of orthographic views into isometric views.
- Construction of Isometric view for any real object. Conversion of orthographic views of simple components into isometric views.

4. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS

Unit No.	Unit	Teaching Hours / Semester
1	Introduction	**1**
2	Dimensioning techniques & standard conventions	1
3	Engineering Curves & Shapes	4
3	Orthographic projections	**13**
4	Section of solids	3
5	Development of surfaces	4
6	Isometric projections	2
-	Revision	4
	Total	**32**

5.   SUGGESTED LIST OF ACTIVITIES

Following shall be the list of sheets to be prepared as Engineering drawing lab work

Sheet No.	TITLE	Contents	Hours
1.	TYPES OF LINES, LETTERING, DIMENSIONING.	All types of lines, Single stroke vertical capital letters, Methods of Dimensioning-Aligned & unidirectional System, Conventional representation of materials.	4
2.	GEOMETRICAL CONSTRUCTIONS	Construction of Equilateral and Isosceles triangle, Square, Rhombus, Regular pentagon & hexagon	4
3.	ENGINEERING CURVES	Construction of ellipse, parabola, hyperbola by given methods. Involutes, cycloid. Draw normal and Tangent to curves.	8
4.	PROJECTION OF POINTS & LINES	Drawing projection of points in all 4 quadrants. Drawing of projections of lines in following positions (i) Parallel to both Principal planes (ii)Parallel to one and Perpendicular to other Principal plane. (iii) Inclined to one plane and parallel to other plane.	6
5	PROJECTION OF PLANES	Drawing the projection of Triangle square, Rhombus, regular Pentagon when inclined to one principal plane & perpendicular to other plane.	6
6	PROJECTIONS OF SOLIDS	Drawing projection of following solids Cylinder, cone, cube. Right regular solids such as Prism: Triangular & Square,Pyramid: Square & Pentagonal,when axis is inclined to one principal plane & parallel to other principal plane.	8
7	ORTHOGRAPHIC PROJECTIONS	Simple problems on conversion of pictorial into orthographic views.(atleast 2 problems each in 1st angle and 3rd angle)	4
8	SECTIONS OF SOLIDS	Drawing projections and section of solids like square prism, square pyramid, pentagonal pyramid, cylinder and cone with sectioning plane inclined to one principal plane and Perpendicular to the other principal plane (Axis of solid perpendicular to one principal plane and parallel to the other)	8
9.	DEVELOPMENT OF LATERAL SURFACES	Draw the Development of surfaces for the following right regular solids- Cylinder, Cone, Prism & pyramids (square, triangular, pentagonal).	8
10	ISOMETRIC VIEWS	Conversion of orthographic views of simple components into isometric views.	8

6. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title	Publisher
1.	BIS, India	IS. 696. (Latest revision).	BIS, India
2.	N.D. Bhatt	Engineering Drawing	Charoter Publisher,Anand
3.	R. K. Dhawan	Engineering Drawing & Machine Drawing	Kumar
4.	R.B. Gupta	Engineering Drawing	Satya Prakashan, Delhi
5.	P.S. Gill	Geometrical Drawing	Ketson & Sons
6.	P.S. Gill	Machine Drawing	Ketson & Sons
8.	TTTI, Bhopal	Work Book in Mechanical Drafting	TTTI, Bhopal
9.	T. Jeyapoovan	Engineering Drawing & Graphics Using AutoCAD 2000	Vikas Publishing House Pvt. Ltd, New Delhi.
10	N.D. Bhatt	Machine Drawing	Charoter Publisher,Anand

****

SEMESTER II

GN-105 - COMPUTER FUNDAMENTALS & APPLICATIONS

1. RATIONALE

The course on Computer Fundamentals & Applications will enable the students to understand the basic concepts related to computer fundamentals, Data Representation & Number Systems, Computer Languages, operating system, Computer Software and Internet Technology and will be able to apply the same in different areas of electronics engineering. Laboratory practice will help in developing the requisite skills.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN-105	L	T	P	C	TH	TM	TW	PR/OR	
Computer Fundamentals & Applications	-	-	4	4	-	-	50	50	100

Minimum passing % : Theory 40%

Legends:
*L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit; **TH**- End Semester Theory; **TM** – Test Marks:*
***PR/OR** - End Semester Practical / Oral Examinations; **TW-** Term Work*

3. DETAILED COURSE CONTENTS

UNIT 1   Computer Fundamentals

1.Introduction to Computer

2. History, Evaluation, Classification and Generations of computers

3.Organisation of the Computer System

4. Hardware

    Input device, Memory or Storage Devices, Processing Unit, Output device, Scanner

    Printers.

5. Communication technology and evolution of communication mediums

6. Software

> System software

> Application Software

> Shareware

> Freeware

> Open Source

7. Concept of Computer Viruses

> Definition

> Types

> Preventive Measures

UNIT 2   Operating System

1. Introduction to operating system

  Definition Functions , Types, Examples, Comparisons of Various Operating Systems

2. Windows Operating System-

GUI(Graphical user Interface), desktop, Start Menu, Task Bar, Status Bar, Scroll Bar, Title Bar, Toolbar, Menu Bar. File Organization: Creating, Saving, Deleting, Renaming, Cutting, Pasting, copying, moving, Searching Files and Folders. Applications: My Computer, Recycle Bin, Windows Explorer, Control Panel.

UNIT 3   Application Software

1. MS Word

- Introduction
  - Starting MS Word
  - Creating, saving and opening a document
  - Editing commands-Cut, Copy, Paste, Paste Special
  - Text Formatting, Bullets and Numbering, Borders and shading etc.
  - Tabs, Style, Views
  - Insert Table, Picture, OLE Objects, etc.
  - Checking Spelling and Grammar, Thesaurus
  - Page Layout & Printing
  - Mail Merge.

2. MS Excel

  - Create, Save and open a worksheet
  - Entering data – text, numbers and formulae in a worksheet, Hyperlink
  - Navigating within a Worksheet and also between different Worksheets of a Workbook
  - Inserting and deleting cells, rows and columns in a worksheet
  - Select, copy, paste and delete cell data within the worksheet

o Using various formulae and inbuilt functions like Trigonometric, Statistical, Logical, Data Sorting
o Update worksheets using special tools like spell check and auto correct.
o Setup the page and margins of worksheets for printing
o Enhance worksheets using charts & graphs

3. MS Power Point

o Introduction and starting the program
o Starting a presentation
o Adding new slide
o Saving and Opening presentation
o Text formatting options
o Copy, Move and delete slides and text
o Applying designs
o Using Animations
o Slide Transitions, Hyperlink
o Insert clip art
o Viewing the presentation

UNIT 4   The Internet

Networks, Advantages of networking, Types of networks.

o History and Functions of the Internet
o Working with Internet
o Web Browsers, World Wide Web, Uniform Resources Locator and Domain, Names, Issues related to web security.
o Uses of Internet
o Search for information, Email, Chatting, Instant messenger services, News Group, Teleconferencing, Video-Conferencing, E-Commerce and M-Commerce.

Email

o Manage an E-mail Account
E-mail Address, Configure E-mail Account, log to an E-mail, Receive E-mail, Sending mails, sending files an attachments and Address Book

o Downloading Files

4. SUGGESTED LIST OF EXPERIMENTS

S. No.	Unit No.	List of Experiments
1	**1**	Identify Input and output devices
2	**1**	Calculate capacity of different storage device
3	**2**	Identify OS and different application software s loaded on that OS

4	3	Load Windows operating system. Configure and load relevant device drivers
5	4	Practice on Windows 95/98/2000 ; o Starting Windows, Exploring the desktop, Arranging windows, My Computer, The start button, Creating Shortcuts, Practice on moving and sizing of windows o Study of file organization: creating, copying, moving, renaming and deleting o Practice on Windows Accessories- Notepad, Word Pad and Paint o Editing document & formatting text, Previewing and printing document/Image file o Practice on Windows Explorer **o** Recycle bin **o** Shutting down windows
6	4	Practice on MS-Word ; o Create and format document o Edit and Modify text- changing font size type and style o AutoText, AutoComplete, AutoCorrect, grammar and spellchecker, Find and replace of text o Open save and print a document o Insert, modify table o Insert graphics o Mail merge
7	5	Practice on Microsoft Excel o Create, save & format worksheet o Open and save worksheet file o Edit & modify data o Use formula and functions o Split windows and freeze pans o Data sort and security features o Create, edit, modify and print worksheet. o Create and edit charts
8	5	Practice on PowerPoint o Create, edit, insert, move, slides o Open and save presentation o Insert picture, audio slide layout, action button o Apply custom animation o Present slide show
9	6	Practice on: o Identification of type of Account. o Connecting to internet o Dial up access o Web browsing o Searching websites o Information searching o Email services **o** Creating email accounts & Receiving and sending mails

5. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title of Books	Publication & Year
1	Norton Peter	Introduction to Computers (special Indian edition)	Tata McGraw Hills New Delhi, 6th Edition, 2005 ISBN: 0070593744
2	Kahate Atul	Information Technology	Tata McGraw Hills New Delhi, ISBN-13:9780070593718
3	Williams Stalling	Using Information technology: A Practical Introduction to Computers and Communication	Tata McGraw Hills New Delhi,
4	Curtin	Information Technology: The Breaking Wave (book only)	Tata McGraw Hills New Delhi, ISBN:0074635581
5	Ravichandran, D	Introduction to Computers and Communication	Tata McGraw Hills New Delhi, ISBN: 0070435650
7	Douglas E.	The Internet Book	Prentice Hall of India, New Delhi, 3rd Edition, ISBN: 812032286X
8	Basanbhara S.K.	Computer Today	Nita Mehta Publications, 2003 ISBN: 8186340742

GN 106 BASIC ENGINEERING SKILLS

1. **Rationale:**

   A technician is expected to work on the shop floor. It therefore becomes essential for him to have a through exposure to safety aspects, fire fighting, first aid as he is the guide for the skilled and unskilled personnel working under him. From technical knowledge and skills point of view he is also expected to have knowledge on proper ways of using various hand tools, measuring devices etc. in addition to other engineering skills.

   The course on Basic Engineering skills is aimed at providing him the knowledge and skills in all those areas through shop instructions, demonstrations and skill development exercises. This course is also aimed at providing the student the exposure to engineering equipment which will help him to assimilate the teaching which takes place at higher semesters.

2. **Teaching And Examination Scheme**

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
(GN106) Basic Engineering Skills	L	T	P	C	TH	TM	PR/OR	TW	150
	0	0	6	6	-	-	50	100	

   Legends: L-Lectures; P-Practical; C-Credits; TH-End Semester Theory; TM-Test Marks;

   PR/OR-End Semester Practica/Oral Examinations TW- Term Work

3. **Detailed Course Contents**

Unit 1: General Safety, Housekeeping, Fire Fighting & First Aid   Introduction to General Safety aspects of engineering workshop, meaning and importance of housekeeping, possible fire hazards, fire triangle, types of fire extinguishers – selection and use, basic knowledge of first aid with specific inputs on cuts, burns, electric shocks, artificial respiration, handling emergencies.
Unit 2: Fitting Workshop Practice   Introduction to the trade, Introduction to various hand Tools, Measuring and Marking Tools, cutting tools, Holding tools, Striking tools, Types of files and filing methods. Drill bits and drilling Processes, using portable and pillar drilling machine. Operations performed in fitting shop such as measuring, marking, chipping, filing, grinding, sawing, drilling tapping and deing. Use of spirit level and plumb bob.
Unit 3: Carpentry Workshop Practice   Introduction to the trade, types of wood and its characteristics, forms of wood, defects in timber and its identification, wood working hand tools, wood working processes. Different types of joints and their usage. Introduction to wood working machines- lathe , circular saw, band saw, wood planner, universal wood working machine.
Unit 4: Electrical Workshop Practice

Brief introduction to power distribution, different hand tools used in electrical trade, different measuring instruments. Making of cable joints. Measurement of current, voltage, frequency and Power Consumption. Connecting and starting of Induction Motor. Changing of Direction of rotation of induction motor. Introduction to commonly used electrical Fittings (Domestic & Industrial). Reading of simple electrical drawings.

Unit 5: Basic Electronics Workshop Practice
Introduction to basic electronic components, Introduction to use of Multimeter in measuring voltage, current, resistance, capacitance. Checking of connectivity. Introduction to soldering process. Soldering Irons- Types and wattage. Reading of basic electronic circuits.

Note: during first 20 minutes of the practical session, Instructor shall provide theoretical knowledge as prescribed in the curriculum. (Shop Talk)

Unit No.	Topic	Hours/ Semester
1.	General Safety, Housekeeping, Fire Fighting & First Aid	06
2.	Fitting Workshop Practice	36
3.	Carpentry Workshop Practice	18
4.	Electrical Workshop Practice	18
5.	Basic Electronics Workshop Practice	18
	Total	**96**

GN201 ENGINEERING MATHEMATICS- II

1. RATIONALE :

Mathematics is the backbone of all areas of engineering and technology and hence technician / engineers need to study relevant theories and principles of mathematics to enable them to understand and grasp the concept of advance courses of the curriculum. With above in mind, the necessary content for the engineering mathematics is derived to understand advance use of mathematics in solving engineering problems.

2. TEACHING AND EXAMINATION SCHEME :

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN-201 Engineering Mathematics-II	L	T	P	C	TH	TM	TW	PR/OR	100
	4	2	-	6	75	25	-	-	

Minimum passing % : Theory 40%   *Duration of Theory Paper: 3 Hrs.*

Legends:
*L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit; **TH**- End Semester Theory; **TM** – Test Marks:*
***PR/OR** - End Semester Practical / Oral Examinations; **TW**- Term Work*

3. DETAILED COURSE CONTENT :

Unit 1   Determinants
Determinants of the second order and third order, solutions of equations in two or three variables using Cramer's Rule

Unit 2   Binomial Theorem - Binomial Theorem for a rational index, general term of binomial expansion, middle term (s).

Unit 3   Mensuration - Volume and surface area of - Prism, pyramid, frustrum of a sphere, frustrum of pyramid, frustrum of cone, Area and volume by Simpsons Rule

Unit 4   Matrices
Definition and Notations,

Elements of Matrix, Types of matrices, Special matrices - Square, Diagonal, Row, Column, Scalar Unit, Zero or null, upper and lower triangular matrices, Symmetric, Skew symmetric matrices . Addition, Subtraction and multiplication of matrices, Inverse of matrix using Adjoint method only Application of matrices in solving simultaneous equations in 2 or 3 variable.

Unit 5 Integral Calculus
Definition, fundamental properties. Methods of Integration - Integration by substitution, Integration by parts, Integration by partial fractions.. Definition of Definite Integral Properties of definite integrals, Application of integration, area under a plane curve, volume of revolution.(simple sums only)

Unit 6 Differential Equations

Definition, order and degree of a differential equation, solutions of differential equations of first order and first degree-variable separable type only. Second order differential equation of type $d^2y/dx^2 = f(x)$ only, Application of differential equation in engineering problems

Unit 7   Statistics (Mechanical and Allied Engg. Branches)
. Measures of central tendency for grouped and ungrouped data - Mean, Median and Mode . Measures of dispersion for grouped and ungrouped data -range , mean deviation, standard deviation, variance and co-efficient of variation

OR

Unit 7   Complex Numbers. (Electronics engg and Allied branches)

Definitions, Argand diagrams , polar form of a complex number, Addition, Subtraction, Multiplication & Division of a complex number. Exponential and circular function, Demoivres theorem, roots of a complex number- Cube roots of unity, n th roots of unity, , hyperbolic functions

4.   SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY):

Unit No.	Topic	Teaching Hours/ Semester	Marks
1.	Determinants	5	7
2.	Binomial Theorem	7	10
3.	Mensuration	7	10
4.	Matrices	11	08
5.	Integral Calculus	17	20
6.	Differential equations	08	10
7.	Statistics	09	10 $
OR			
7	Complex Numbers	09	10 #
	Total :	64	75

$- for Mechanical and allied branches

 # - For Electronics and allied branches

5. SUGGESTED LEARNING RESOURCES :

S.No.	Author	Title of Books	Publication & Year
1.	Deshpande S.P,	Mathematics for Polytechnics	Griha Prakashan, Pune, 1996 or latest
2.	Grewa, I B.S;	Engineering Mathematics	Khanna Pub., New Delhi1995 or latest
3.	Prasad, I.B.;	Engineering Mathematics	Khanna Pub., New Delhi1997 or latest
4.	Wartiker P.N.,	Applied Mathematics	Griha Prakashan Pune, 1996 or latest

GN 202 APPLIED PHYSICS-II

1. RATIONALE:

Physics is one of the basic building blocks for engineering sciences. Therefore, the students need to describe and explain the basic principles, laws & facts of physics. These skills will enhance their ability to apply it in solving engineering problems related to their respective branches of engineering

2. TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN-202 Applied Physics-II	L	T	P	C	TH	TM	TW	PR/OR	150
	4	-	2	6	75	25	50	-	

Minimum passing % : Theory 40% and Practical 40%   *Duration of Theory Paper: 3 Hrs.*
Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:
PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3.   DETAILED COURSE CONTENTS

Unit 1   FORCE, WORK, POWER, AND ENERGY Definition of Force and its units. Types of Forces with example- Direct, Remote action e.g. Gravitational Force, Magnetic Force, Electric Force. Effect of Forces on body-External, Internal. Work-definition and units, Graphical Representation of workdone, Energy definition and units. Types of Mechanical Energies- K.E. & P.E. Law of Conservation of Energy, Total Energy, Power-definition and units, Power (Force X Velocity)
Unit 2   CURRENT ELECTRICITY Ohms law, General equation of Ohms law, Factors affecting resistance, specific resistance and units. Effect of temperature on resistance, Law of resistance in series and parallel. Internal resistance and EMF of the cell. Potential drop along a uniform wire. Principle of potentiometer. Comparison of EMF of a given cell by single cell method. Camparision of EMF of a given cell by sum and difference method. Use of meter bridge to determine the unknown resistance. Definition of Electric power and energy in d.c. circuit. Concept of Kilowatt hour, calculation of energy bills.

Unit 3   ELECTROMAGNETISM
Electromagnetic Induction, Faraday's Laws of Electromagnetic Induction, Lenz's Law, Self Induction & Mutual Induction.
Unit 4   LOGIC GATES Introduction to Binary Number System, Concept of '0' and '1' in Binary System. Binary equivalent of Decimal numbers from 0 to 10 Logic Gates: 1. 'NOT' Gate , 2. 'OR' Gate 3. 'AND' Gate. NAND , NOR GATE Their Logic Representation & Truth Table
Unit 5   SOUND Definition and examples of Free and Forced Vibrations, Resonance. Determination of velocity of sound using Resonance Tube. Definition of Beats (No derivation),   Beat frequency & application of Beats, Definition of Echo, Reverberation & Reverberation time, Sabine's Formula, Acoustical Planning of an Auditorium. Factors affecting Reverberation Time, Ultrasonic waves, Piezo Electric Effect, Applications of Ultrasonic waves.
Unit 6   CIRCULAR MOTION AND GRAVITATION Defination of Uniform Circular Motion, Angular Displacement, Angular Velocity, Relation between Linear and Angular velocity, Defination and concept of Centripetal and Centrifugal Force.(No derivation), Expression for velocity of a vehicle moving on a curved Horizontal Road, Expression for Angle of Banking & Super Elevation of Road. Newton's Law of Gravitation, Force of Gravity. Acceleration due to Gravity, Expression for Acceleration due to gravity.
Unit 7(A) FUNDAMENTAL CONCEPTS OF SIMPLE MACHINES **   (MECHANICAL AND ALLIED GROUPS)** Definition of efforts, velocity ratio, mechanical advantage & efficiency of machine and their relationship. Laws of machines, examples of simple machine, definition of ideal machine, systems of pulleys (First & Second). Determination of velocity ratio ,Mechanical Advantage & Efficiency. OR **Unit 7 (B) RECTIFIERS** **   (ELECTRONICS AND ALLIED GROUPS)** V-I characteristics of P-N junction. Diode as a rectifier. Half wave rectifiers, working, input and output waveforms, percentage regulation,$((V_{NL} - V_{FL}) / V_{FL}) \times 100$ Full wave rectifier with centre tap transformer, working, input and output waveforms, percentage regulation Bridge rectifier, working, input and output waveforms, percentage regulation

4. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS(THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	FORCE, WORK,POWER & ENERGY	10	12
2	CURRENT ELECTRICITY	16	16
3	ELECTROMAGNETISM	6	8
4	LOGIC GATES & AWARNESS TO NANO SCIENCE	4	6
5	SOUND	8	9
6	CIRCULAR MOTION & GRAVITATION	10	12
7A	FUNDAMENTAL CONCEPTS OF SIMPLE MACHINES	10	12
	OR		
7B	RECTIFIERS	10	12
	Total	**64**	**75**

7A- for Mechanical and allied branches   7B- For Electronics and allied branches

4. LIST OF EXPERIMENTS

1. Determination of Specific resistance of a material wire by Voltmeter and Ammeter.
2. Determination of Internal resistance of a given cell by using Potentiometer.
3. Calibration of Voltmeter by using Potentiometer.
4. Comparison of E.M.F. of two given cells by single cell method using potentiometer.
5. Determination of specific resistance by meter bridge.
6. Verify the law of resistances in series by meter bridge.
7. Verify the laws of resistances in parallel by meter bridge.
8. Determination of velocity of sound by Resonance tube.

5. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title	Publication and Year
1.	Halliday D and Resnickr	Physics Part-I & II	Latest
2.	Das S.K., Sisodiya M.L., Neher P.K., Kachhawa C.M.,	Physics Part-I & II for 10+2 Students	Latest
3.	B.G. Dhande	Applied physics for polytechnics	Latest
4.	Bhandarkar	Applied Physics for polytechnics	Latest
5.	Saxena HC & Singh Prabhakaer	Applied Physics Vol. I & II	Latest
6.	Rao, B.V.N.	Modern Physics	Latest
7.	R.K.Guar and S.L. Gupta.	Engineering Physics	
8.	B.L. Thereja.	Engineering Technology	
9.	Modern Publishers.	ABC of Physics	
10.	V.K Mehta	Elements of Electronic Engineering	

GN203 ENVIRONMENTAL STUDIES

1. RATIONALE

Due to various developmental activities carried out by man, our environment is continuously being abused and getting degraded. The air we breathe, water we drink, food we eat, land we live on, all are getting spoiled day by day. The purity of our environment is of prime importance for survival of human race on the earth. Man should not go for developmental activities at the cost of environment. This subject has been introduced in the Diploma Programme to bring about awareness towards the environmental purity amongst the students.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
GN203 Environmental Studies	L	T	P	C	TH	TM	TW	PR/OR	100
	3	-	-	3	75	25	-	-	

Minimum passing %: Theory 40%   *Duration of Theory Paper: 3 Hrs.*

3. DETAILED COURSE CONTENT

Unit 1 Multidisciplinary Nature Of Environmental Studies.

Definition, scope and importance. Need for public awareness.

Unit 2   Natural Resources

Renewable and nonrenewable resources. Natural resources and associated problems.

- Forest resources: Use and overexploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, droughts, conflicts over water, dams- benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Case studies.
- Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer & pesticide problems, water logging, salinity, case studies.

- Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
- Land resources: Land as a source, land degradation, man induced land slides, soil erosion and desertification.

Role of an individual in conservation natural resources. Equitable use of resources for sustainable life styles.

Unit 3 Ecosystems.

Concept of an ecosystem. Structure and function of an ecosystem. Producers, Consumers and Decomposers. Energy flow in the ecosystem. Ecological succession. Food chains. Food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems: (a) Forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) Aquatic ecosystems (Ponds, streams, lakes, rivers, oceans, and estuaries).

Unit 4. Biodiversity And Its Conservation.

Introduction – Definition: genetic, species and ecosystem diversity.

Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels. India as a mega-diversity nation. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wild life, man-wild life conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Unit 5. Environmental Pollution.

Definition. Causes, effects and control measures of: Air pollution, water pollution, soil pollution, marine pollution, noise pollution, Thermal pollution, Nuclear hazards. Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of individual in prevention of pollution. Pollution case studies. Disaster management: flood, earthquakes, cyclone and landslides.

Unit 6. Social Issues And The Environment.

From unsustainable to sustainable development. Urban problems related to energy. Water conservation rainwater harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns; case studies. Environmental ethics: Issues and possible solutions. Climatic change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust; case studies. Wasteland reclamation. Consumerism and waste products. Environmental protection act. Air (Prevention and control of pollution) Act. Water (Prevention and control of pollution) Act. Wildlife protection Act. Forest conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Unit 7. Human Population And The Environment.
Population growth, variation amongst nations. Population explosion – Family welfare programme. Environment and human health. Human rights. Value education. HIV / AIDS. Women and child welfare. Role of Information technology in environment and human health. Case studies.
Unit 8. Field Work.
Visit local area to document environment assets – river / forest / grassland / hill / mountain. Visit to a local polluted site – urban / rural / industrial / agricultural. Study of common plants, insects, birds. Study of simple ecosystems – ponds, river, hill slopes, etc. (field work equal to 6 lecture hours).

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours	Marks
1)	Multidisciplinary Nature Of Environmental Studies.	01	03
2)	Natural Resources.	10	12
3)	Ecosystems.	06	08
4)	Biodiversity And Its Conservation.	06	09
5)	Environmental Pollution.	08	12
6)	Social Issues And The Environment.	07	12
7)	Human Population And The Environment.	04	09
8)	Field Work.	06	10
		48	75

5. MANDATORY ACTIVITIES

In addition to the class room instruction, visits should be arranged in any 2 of the following areas:

1. Visit to NIO or Science Centre.
2. Visit to Selaulim/ Anjunem Dam.
3. Visit to study ecosystem (Pond, Stream, River, and Forest).
4. Visit to show Hill cuttings, mining areas.
5. Visit to show Rain water harvesting project / Vermicomposting plant / Watershed management project. (Krishi Vigyan Kendra – Old Goa)
6. Visit to water treatment/ waste water treatment plant.

6. SUGGESTED VIDEOS

In addition to the class room instruction, video films on environment may be shown.

7. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title of Books	Publication
1	Erach Bharucha	Textbook of Environmental Studies for Undergraduate courses	University Press
2	P. Meenakshi	Elements of Environmental Science and Engineering	Prentice Hall of India (PHI)
3	S. Deswal & A. Deswal	A Basic Course in Environmental Studies.	Dhanpat Rai & Co.
4	Pandya and Camy	Environmental Engineering	Tata McGraw Hill
5	Asthana D.K. and Asthana Meera	Environmental Problems and Solutions.	S. Chand & Co
6	Centre for Environmental education	Video Film	Thaltej Tekra, Ahme
7	Dr. S.K. Dhameja	Environmental Studies	

GN 205 ENGINEERING MATERIALS

1. RATIONALE:-

Adequate knowledge of different types of engineering materials, their properties & applications are very essential for the engineers. This course content is designed to provide basic insight knowledge regarding engineering material and their applications which will be useful for the students to learn subjects of higher semesters. The range of materials available for engineering applications is quite vast, hence only the basic groups of ferrous non-ferrous, non-ferrous & other engineering materials with their general properties and uses have been stressed upon.

2. TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
G-205	L	T	P	C	TH	TM	TW	PR/OR	
Engineering Materials	4	-	-	4	75	25	-	-	100

Minimum passing % : Theory 40%   *Duration of Theory Paper: 3 Hrs.*
Legends:

*L-Lecture; **T** - Tutorial; **P** - Practical; **C**- Credit;   **TH**- End Semester Theory; **TM** – Test Marks:*

***PR/OR** - End Semester Practical / Oral Examinations; **TW-** Term Work*

3. COURSE CONTENTS

Unit 1 Introduction to Engineering Materials
Classification of Materials
• Metal, Non-metal
• Ferrous Metal & Non-ferrous Metals.
Differences between Metals & non-metals.
Properties of Materials.
• Physical properties – Melting point, freezing point, boiling point, Density, Linear co-efficient of expansion, Thermal conductivity, Electrical resistivity.
• Mechanical properties – Strength, Elasticity, Plasticity ductility,

Malleability, Toughness, Brittleness, Hardness, fatigue, creep.
- Electrical properties – Resistivity, conductivity, Temperature coeff. of resistance, dielectric strength, Thermo electricity, super conductivity.
- Magnetic properties – permeability, coercive force, magnetic stresses.
- Chemical properties - Corrosion resistance, chemical composition, acidity, alkalinity.

Unit 2 Ferrous & Non-Ferrous Metals & its Alloys
- ➢ **Ferrous alloys.**
- o Low carbon steel, medium carbon steel, High carbon steel, their carbon percentage, properties & uses.
- o Cast iron – Grey cast iron, white cast iron, spheroidal grey cast iron, their properties & uses.
- o Alloy steels.
- ▪ Constituents of alloy steels such as phosphorous sulphur, Silicon, Manganese and their effect on properties of materials.
- ▪ Stainless steel, chromium – Nickel steel, Nickel-chromium-molybdenum steel, Nitriding steel, Manganese steel, its properties & uses.
- o Tool steel – composition, HSS, High carbon steel, properties & uses.
- ➢ **Non-ferrous Metals & alloys**

- o Aluminium – Properties & uses.
- o Aluminium alloys – constituents of alloy & their effect on   properties of metal
- o Properties & uses of Duralumin, Y-alloy, Al-si alloy, Al-Zn-Mg alloys.
- o Copper – Properties & uses.
- o Copper alloys – Constituents of alloy & their effect on properties of metal.
- o Properties & uses of Copper – Zinc alloys such as Muntz metal, manganese bronze, copper-Tin alloys such as Bronze, copper aluminium alloys such as aluminium bronzes.
- o Properties & uses of lead & its alloys.

Unit 3 Non – Metallic materials

- o Refractory
- Desirable properties.
- Difference between acid, basic & neutral refractories.
- Properties & uses of Fire clay refractory, silica refractory.
- o Plastic
- Classification table only.
- Properties & uses of Thermosetting & Thermoplastic.

- o Natural & Synthetic abrasive materials.
- Introduction, Properties & uses.
- o Rubber
- Properties & uses of natural, neoprene, synthetic & butyl rubber.

- Vulcanization process.
    - Glass
- Properties & uses of soda glass, Borosilicate glass, fibre glass.
- Glass wool – composition, properties & uses.

    - Introduction to composite materials.Classification diagram only.

Unit 4 Conductor, Semi Conductor, Insulating and Magnetic Materials.

- Classification of Materials as conductor, Semiconductor and Insulating materials.
- Conductor Materials.
    - High conductivity materials
        - Copper, Aluminium, Carbon, Silver, Lead, Brass, Bronz, Tungsten & Gold.
        - Their properties as conducting materials and applications.
    - High resistivity materials
        - hichrome, constantan, manganin
        - Their applications
- Insulating materials
    - Introduction
    - Characteristics of Good Insulating materials
    - Solid Insulating materials
        - Wood, paper, rubber, mica, glass tibre, porcelain, varnish, PVC, Resins.
    - Their characteristics as insulating materials and applications.
    - Liquid insulating materials
    - Mineral oil, its properties as insulating material and applications.
    - Gaseous insulating materials like air, Nitrogen, Sulphur hexafloride   & their applications.
- Semiconductor Materials.
    - Silicon & Germanium. Their specifications as semiconductor material and uses
- Magnetic Materials.
    Classification as:
        * Dia Magnetic
        * Para Magnetic
        * Ferromagnetic
        * Non magnetic
List of these materials and their applications.

Unit 5 Construction Materials

-                Building Stones : Classification of rocks, Characteristics of good building stones, common building stones & their uses.
- Cement: Chemical composition of port land cement, outline of manufacturing process, types of cements, uses.
- Bricks: Bricks – Constituents, properties, classification, special bricks – refractory and flyash bricks; uses.
-              Other materials:
  - Lime   – Sources. Properties, uses.
  - Clay   – Different building products from clay   like tiles, pipes etc.
  - Timber – Common varieties of timber, uses   wood products, veneer, plywood, etc.
  - Sand   – Sources: rivers, crushed aggregates,   characteristics uses.

4. SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Marks
1	Introduction to Engineering Materials	04	09
2	Ferrous & Non-Ferrous Metals & its Alloys	16	18
3	Non – Metallic materials	12	12
4	Conductor, Semi Conductor, Insulating and Magnetic Materials.	16	18
5	Construction Materials	16	18
		64	75

Semester - III

Course code	Name of Course	TEACHING SCHEME				EXAMINATION SCHEME				Total marks
		L	T	P	C	Theory Marks		Practical Marks		
						TH	TM	PR/OR	TW	
CS308	Basic Electronics Engineering	3	-	2	5	75	25	50	25	175
CS304	Basic Electrical Engineering	3	-	2	5	75	25	-	25	125
CS309	Digital Electronics	3	-	2	5	75	25	50(P)	25	175
EN301	Electronics measurement	3	-	2	5	75	25		25	125
EN302	Computer Aided PCB Design	1	-	4	5				50	50
CS306	Programming in 'C'	2	-	4	6			50	50	100
	Total	**15**	**-**	**16**	**31**	**400**		**350**		**750**

CS308 BASIC ELECTRONICS ENGINEERING.

1. **RATIONALE:**
   This course will enable the students to understand the construction, working, characteristics and applications of various types of semiconductor components such as Zener diode, Transistor and FET's.

2. **TEACHING AND EXAMINATION SCHEME:**

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CS308 BASIC ELECTRONICS ENGINEERING.	L	T	P	C	TH	TM	TW	PR/OR	175
	3	-	2	5	75	25	25	50	

Minimum passing % : Theory 40%   **Duration of Theory Paper:** 3 Hrs.
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. **Unit- I –Regulators and Filters   (10 hrs) (20 marks)**

Zener Diode: Construction, operation, characteristics, breakdown mechanism and important specifications. Zener as a regulator, simple calculations.
Filters: Ripple voltage, ripple factor. C filter operation and comparison. (No calculations and numericals)

Unit- II – Transistors   (14 hrs) (20 marks)
BJT – Basic construction, NPN and PNP type, transistor action, current – relationship in a transistor, leakage currents. CE, CB and CC configurations, Transistor input and output characteristics in CE configuration. Alpha, Beta and the relation between them. Comparison between the configurations. Current and voltage ratings of transistor.

Unit- III –Field Effect Transistors   (14 hrs) (20 marks)
JFET: Structure, n and p channel JFET, operation characteristics and comparison with BJT(no numericals), important JFET parameters(rd,µ and gm).
MOSFET: Structure, operation and characteristics of enhancement and depletion type MOSFET, comparison with JFET.

Unit- IV - Unit –VI Logic families and Memories   **(10 hrs) (15 marks)**
Introduction to Logic IC families, parameters-fan in , fan out, propagation delay, power dissipation, noise immunity .
Concept of TTL , C-MOS (for NAND & NOR gate), & their comparison.
Introduction to Memories: Semiconductor memory and its types (RAM /ROM. PROM/EPROM/EE PROM,: definition & application), Static/Dynamic memories. Flash memories.

4. **SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (THEORY)**

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Filters and regulator	10	20
2	Transistor	14	20
3	FET	14	20
4	Logic families and memories	10	15

5. **SUGGESTED LIST OF EXPERIMENTS (Any 8-10)**

Sr. No.	LIST OF EXPERIMENTS
1	Plot the VI characteristics of zener diode
2	Zener diode as a voltage regulator
3	Calculation of ripple factor for full wave rectifier
4	Calculation of ripple factor for C filter using full wave rectifier
5	Obtain input transistor characteristics for CE config.
6	Obtain output transistor characteristics for CE config.
7	Obtain input transistor characteristics for CB config.
8	Obtain output transistor characteristics for CB config
9	To study the transistor as a switch
10	Plot VI characteristics of JFET

6. **SUGGESTED LEARNING RESOURCES**

Sr.No.	Author	Title	Publication and Year
1	Bhargava & others	Basic course in Electronics	Latest
2	Robert L. Boylestad	Electronic Devices and Circuit Theory	Latest
3	V.K. Mehta	Principles of Electronics Engineering	Latest

CS304 BASIC ELECTRICAL ENGINEERING.

1.   RATIONALE:
This course will enable the students to understand the basic concepts and principles of AC Circuits, Transformers and Motors.

2.   TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CS304	L	T	P	C	TH	TM	TW	PR/OR	
BASIC ELECTRICAL ENGINEERING.	3	-	2	5	75	25	25	-	125

Minimum passing % : Theory 40%   **Duration of Theory Paper:** 3 Hrs.
L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. Units :
Unit- I– AC Circuits   (06hrs) (09 marks)
Sinusoidal AC voltage waveform. Definition of various terms related to AC wave, average value, RMS value, form factor, peak factor of AC wave.(no derivation)

Three-phase circuits. Concept of phase sequence, balanced system. Relation between line and phase quantities for star and delta connections. Real, reactive and apparent power in three-phase system. Applications of three phase three wire, four wire and five wire system(no derivation and numerical).

Unit- II – Transformer   (8 hrs) (15 marks)
Principle of operation and basic construction of a single phase transformer (core, winding & insulation only). EMF equation, losses in transformer, efficiency and voltage regulation. Rating of transformer(no numericals).

Unit- III – DC Motors   (10 hrs) (15 marks)
Working principle of DC motors, main parts of DC motor and their functions, classification of DC motors (shunt, series and compound and their applications).
Necessity of starter, methods of reversal of direction of rotation of DC shunt and series motor.

Unit- IV – AC Motors   (12 hrs) (15 marks)
Working of three phase induction motor, main parts, classification (squirrel cage & Slip ring), torque slip characteristics and application (only diagram).
Necessity of starter, Starters used- Direct On Line starter, manually operated star delta starter and auto transformer starter, (w.r.t. circuit diagram, working and application). Method of reversal of direction of rotation.

Working principle and application of
- Single phase induction motor (split phase only)
- Universal motor

Unit- V – Earthing   (06 hrs) (09 marks)
Necessity of earthing, types of earthing- equipment earthing & system earthing (definitions only).
Types of earthing electrodes- Pipe and Plate.
Methods of reducing earth resistance. IE rules relevant to earthing.

Unit- VI – Protective Devices   (06 hrs) (12 marks)
Fuse- Definition, Types of Fuses- Rewirable fuse, HRC fuse & Cartridge fuse. Rating for fuse such as Voltage ratings, Current ratings, Breaking capacity (Rupture capacity) & Minimum fusing current.

MCB- Principle of operation and functions.
ELCB- Current operated type. Principle of operation and functions.

4. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	AC Circuits	06	09
2	Transformers	08	15
3	DC Motors	10	15
4	AC motors	12	15
5	Earthing	06	09
6	Protective Devices	06	12

5. SUGGESTED LIST OF EXPERIMENTS
(Any 8-10)

Sr. No.	LIST OF EXPERIMENTS
1	Measurement of voltage ratio and current ratio of single phase transformer
2	Measure input and output quantities in a single phase transformer
3	Speed control of DC motor
4	Starting of DC shunt motor and reversal of direction of rotation
5	Starting of three phase induction motor using star delta starter
6	Open circuit test of single phase transformer
7	Short circuit test of single phase transformer
8	Study of stepper motors
9	Study of servo motors
10	Study of universal motors
11	Study of rotor resistance starter for starting of Slip ring induction motor.

6. **SUGGESTED LEARNING RESOURCES**

Sr.No.	Author	Title	Publication and Year
1	B.L. Thereja.	Text book of Electrical Technology	Latest
2	V.K. Mehta	Principles of Electronics Engineering	Latest

CS 309 DIGITAL ELECTRONICS

1.   RATIONALE:

This course includes detailed study of digital circuits such as adders, subtractors, flip flops, counters, registers and memories. This course will enable the students to understand the structure of digital computers, peripheral and other digital devices.

2.   TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
CS309 DIGITAL ELECTRONICS	L	T	P	C	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	25	50(P)	175

Minimum passing % : Theory 40%   **Duration of Theory Paper:** 3 Hrs.
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3.   **Unit-I Number Systems**   (7 hrs) (12 marks)

Digital and Analog Signals- Decimal, binary, hexadecimal number system, conversion from one system to another, BCD code, ASCII code, gray code.
2's complement binary addition and subtraction.
Unit-II Combinational circuits.   (14hrs) (21 marks)

Symbol, truth table of basic gates (OR, NOR, AND, NOT, XOR, XNOR)
Laws of Boolean algebra and simplification of Boolean expressions
Demorgans and Duality theorem
K-map techniques (upto 4 variables)
Implemntation of NOT,OR and AND gates using Universal gates (NAND, NOR)
Half adder, Full adder, Half subtractor , Full subtractor.
4-bit paraller binary adder: block diagram and operation.
Block diagram and implementation using basic gates: Multiplexer (4 to 1), Demultiplexer (1 to 4), Encoder (4 to 2), Decoder (2 to 4).
BCD to 7 segment decoder driver (common cathode).
Unit-III Flip Flop.   (8 hrs) (12 marks)
Symbol, truth table, operation and timing diagrams of RS F/F & clocked RS F/F (using NAND gates), D F/F JK F/F,JK master slave F/F(no timing diagram), T F/F.

Unit-IV Registers & Counters. **(8 hrs) (21 marks)**
4 bit shift Register- function and logic block diagram, timing diagrams with negative edge triggered D F/F(Serial in-parallel out, Serial in-serial out, parallel in-parallel out register, parallel in serial out shift register) ,concept of shift right shift left, Ring counter.
Counters (no design). – Asynchronous/ Synchronous 4 bit up counter & Asynchronous/ synchronous 4 bit Down Counter , decade (mod 10) counter (synchronous type) (timing diagrams with negative edge triggered)

Unit V-ADC &DAC **(7 hrs) (9 marks)**
Types of ADC & DAC (no description)
Working of binary ladder DAC.
Successive approximation ADC(only).

4. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Number Systems	7	12
2	Combinational Circuits	14	21
3	Flip flops	8	12
4	Registers and Counters	8	21
5	ADC and DAC	7	9

5. SUGGESTED LIST OF EXPERIMENTS

Sr. No.	LIST OF EXPERIMENTS
1	Verification of logic gates and demorgans theorem.
2	NAND as universal gate
3	NOR as universal gate
4	Half adder and full adder
5	Half subtractor and full subtractor
6	MUX & D-MUX
7	Seven segment decoder common anode & common cathode
8	RS and JK F/F
9	Assemble and test shift register using IC 7495
10	Assemble and test decade counter (any one type)
11	Assemble and test DAC

6. SUGGESTED LEARNING RESOURCES

Sr.No.	Author	Title	Publication and Year
1	Malvino and Leach	Digital principal and applications	Latest
2	R.P. Jain	Modern Digital Electronics	Latest
3	Bartee	Digital Computer Fundamentals	Latest

EN 301 ELECTRONIC MEASUREMENTS

1.   RATIONALE:

This subject shall enable students to select the right instrument for the right application with minimized errors during measurement of various parameters.

2.   TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
ELECTRONIC MEASUREMENTS	L	T	P	C	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	25	-	125

Minimum passing % : Theory 40%   **Duration of Theory Paper:** 3 Hrs.
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

Unit I- Measuring Instruments   **(10 hrs) (18 marks)**
Construction, working of PMMC meter, moving iron meter ,DC ammeter ,DC voltmeter ,extension of ranges , series Ohmmeter.
Analog & Digital multimeter (Block diagram).
AC voltmeter using rectifier.
Extension of ranges, effect of loading.

Unit II-Errors in Measurement Systems.   **(6 hrs) (9 marks)**
Static Characteristics -Accuracy, Precision, Resolution & Dynamic characteristics-speed of response, fidelity, lag ,dynamic error, calculation of Error in measurement,
Errors: types of errors (Gross, Systematic and Random), sources of errors. Limiting errors,
Standards-international, primary, secondary, working & IEEE standards

Unit-III Oscilloscope   **(12 hrs) (18 marks)**
CRT- internal structure & features, deflection (no derivation) block diagram of basic CRO –vertical deflection System. Compensated Attenuator, function of delay line, horizontal deflection system (time base generator, triggered sweep).
CRO probes –direct probes 1:1& 10:1
Applications –measurements of voltage, frequency & phase, Lissagous patterns.
Types of oscilloscopes: Dual Trace CRO, DSO (Block diagrams only).

Unit IV- AC & DC Bridges. (No phasor diagrams)   **(10 hrs) (15 marks)**
DC Bridges for measurements of resistance (R) :Wheatstone's Bridge, Kelvin Bridge,

AC Bridges: conditions for bridge balance,–measurement of Inductance (L): Maxwell's Bridge, measurement of Capacitance (C) : Schering Bridge & measurement of Frequency- Wein Bridge.

Unit V Signal Generators & Analyzers **(10 hrs) (15 marks)**
Block Diagram & Working of signal generator, Function generator (Sine, Triangular, Square &Pulse outputs)
Frequency Synthesizer using Phase Locked Loop.
Digital frequency meter,
Basic wave analyzer, frequency selective wave analyzer, basic spectrum analyzer (block diagrams)

4. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Measuring Instruments	10	18
2	Errors in Measurement Systems	6	9
3	Oscilloscope	12	18
4	AC & DC Bridges	10	15
5	Signal Generators & Analyzers	10	15

5. SUGGESTED LIST OF EXPERIMENTS

Sr. No.	LIST OF EXPERIMENTS
1	Measurement of current voltage and resistance using PMMC meter
2	Measurement of current voltage and resistance using LMI meter
3	Measurement of current voltage and resistance using multi-meter
4	Measurement of voltage current and freq. and time period using CRO
5	Testing of various components using CRO, measurement of phase shift and frequency using Lissajous pattern
6	Measurement of R, L, C & Q using RLC meter and Q meter
7	Testing of Kelvins bridge
8	Testing of Maxwells bridge

6. SUGGESTED LEARNING RESOURCES

Sr.No.	Author	Title	Publication and Year
1	Cooper	Electronic measurement and instrumentation	Latest
2..	Kalsi	Electronic measurement and instrumentation	Latest
3	A K Shawney	Measurements and Instrumentation	Latest

EN 302 COMPUTER AIDED PCB DESIGN

1.   RATIONALE:

PCB design is an important skill required by design as well as maintenance personnel in Industry. Electronic Design Automation tools widely being used in Industry for PCB design . This course will enable the student to design PCB for electronic circuits using CAD software.

2.   TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
COMPUTER AIDED PCB DESIGN	L	T	P	C	TH	TM	TW	PR/OR	
	1	-	4	5	-	-	50	-	50

Minimum passing % :   Duration of Theory Paper:
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

Unit- I – Basic of PCB
Introduction – Classification of PCB – single, double, multilayer and flexible boards – copper clad laminates materials of copper clad laminates – manufacturing process – properties of laminates (electrical & physical) - types of laminates.

Unit- III – Schematic & Layout Design
Schematic diagram – Net list – Design rule check – creating components for library – Imperial – metric Tracks – Pads – Vias – Clearances – Rats nest – silk screen – selection of board size – power plane – grounding

Unit- IV – Design of PCB's
Single sided PCB – Double sided PCB – Multilayer PCB – Auto routing – manual routing – Design rule check – creating of foot print for library creating Gerber file.

Unit- V – PCB Fabrication
Film master preparation - Image transfer - photo printing – Screen Printing – Plating techniques etching techniques – Mechanical Machining operations.

4.SUGGESTED LIST OF EXPERIMENTS

Sr. No.	LIST OF EXERCISES
1	PCB design of Centre tap Rectifier
2	PCB design of Bridge Rectifier
3	PCB design of Transistor Amplifiers
4	PCB design of Operational Amplifiers
5	PCB design of Digital IC based circuits
6	Design of custom library components
7	Creation of Gerber files
8	PCB design of simple mini -project circuits
9	Fabrication of a PCB for a designed PCB layout

5.   SUGGESTED LEARNING RESOURCES

Sr.No.	Author	Title	Publication and Year
1	Latest	Printed Circuit Board-- Design, Fabrication, Assembly & Testing	Latest
2	Walter C.Bosshard	Printed circuit Board – Design & Technology	Latest
3	ISTE Hand book	Printed Circuit Board Fabrication.	

CS 306 PROGRAMMING WITH C

1.   RATIONALE:

This course will enable the student to understand basic programming skills, develop logical skills and requisite skills to program, interface, debug and troubleshoot Electronic and microcontroller based systems.

2.   TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
PROGRAMMING WITH C	L	T	P	C	TH	TM	TW	PR/OR	100
	1	1	4	6	-	-	50	50	

Minimum passing % :   **Duration of Theory Paper:**
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3.   Unit- I –Introduction to C

Important features of C language and structure of C language.

Unit- II –Lexical elements of C language
C character set, constants, variables, variable declarations, data types, labels, delimiters, reserved words and expressions.

Unit- III –Input/ Output in C
Conversion specification, Input functions, Output functions and formatted Input/ Output.

Unit- IV –Operators and Expression in C
Arithmetic operators & Expressions, hierarchy of operators, relational operators, logical operators, assignment operators, increment/decrement operators, bitwise data manipulation, data type conversion

Unit- V –C Control Structures
Unconditional control- the go-to statement, bi-directional conditional control- the if- else structure, multi-directional conditional control- the switch statement, loop control, the for statement, the while statement, the do-while statement, break and continue statement.

Unit- VI –C Functions
C functions, C library functions, user defined functions, advantages of functions, arguments and parameters return statement, function declaration, recursive functions, scope of variables, scope rules for identifiers, storage class specifiers.

Unit- VII – Arrays and Strings in C
Arrays, one dimensional array, array declaration, multi-dimensional array, array initialization, rules to initialize an array, strings, strings/character array, string library functions.

Unit- VIII – Pointers
Concept of pointers, declaration of pointers, pointer initialization, pointer operators, pointer arithmetic.

Unit- IX– Structures
Structure, declaration of a structure, access members of a structure, initializing a structure, array of structures, structure within a structure.

Unit- X – File Handling in C
File definition, file handling in C: declaring a file, opening a file, reading from and writing to files, closing a file

4. SUGGESTED LIST OF EXPERIMENTS

Sr. No.	LIST OF EXPERIMENTS
1	Exercise involving output and input format controls
2	Exercise with operators, expression in C
3	Exercise on control statements
4	Exercise with arrays and strings
5	Exercise on functions and subroutines
6	Exercise with file handling
7	Exercise with structures and pointers
8	Exercise with Graphics

5. SUGGESTED LEARNING RESOURCES

Sr.No.	Author	Title	Publication and Year
1	Yeshwant Kanetkar	Let us C	Latest
2	H. Mullish, H.L. Cooper	The spirit of C	Latest
3	Yeshwant Kanetkar	Understanding pointers in C	Latest
4	B.W. Kernigham, D.M.Ritchie	The C programming language	Latest

Semester IV

Course code	Name of course	TEACHING SCHEME				EXAMINATION SCHEME				
		L	T	P	C	Theory Marks		Practical Marks		
						TH	TM	PR/OR	TW	
EN401	Electronic Circuits	4	-	2	6	75	25	50	25	175
EN402	Analog Communication	3	-	2	5	75	25	-	25	125
EN403	Circuit and Networks	4	-	2	6	75	25	-	25	125
EN404	Electronics Instrumentation	3	-	2	5	75	25	-	25	125
EN405	Analog Electronics	4	-	2	6	75	25	50	25	175
CS501	Entrepreneurship Development	-	-	2	2	-	-	-	50	50
	Total	18		12	30	500		275		775

(EN401) ELECTRONIC CIRCUITS

1. RATIONALE:

Any electronic trade has its basis on some standard circuits. These common circuits are applied in all sections of electronics technology. A good understanding of the basic functions of all these circuits will be a solid platform to enter into more complex and specialized field of Electronics engineering. Emphasis has been given on the characteristics and applications of rectifiers, oscillator, multivibrators and amplifier circuits.

2. TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
					TH	TM	TW	PR/OR	
EN401 ELECTRONIC CIRCUITS	L	T	P	C					175
	4	-	2	6	75	25	25	50	

Minimum passing % : Theory 40% Duration of Theory Paper: 3 Hrs.
Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:
PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

Unit-1   Transistor biasing techniques and amplifiers

(18 hrs)   (21mks)

- Transistor biasing techniques: need and types(fixed & voltage divider biasing), selection of Q point for voltage divider biasing.
- Single stage transistor CE amplifier- working, frequency response.
- General block diagram of multi-stage amplifier, necessity of multistage amplifiers.
- Different coupling methods- working, frequency response, applications and comparison of:-
  a) RC coupled
  b) Direct-coupled
  c) Transformer coupled amplifier

Unit-2   Negative feedback   (18 hrs)   (21mks)

- Concept of feedback, block diagram of feedback systems: types of feedback, merits and limitations of negative feedback: feedback connections-Block diagram of voltage-series, voltage-shunt, current-series, current –shunt.
- Derivation of input impedance, output impedance, voltage gain, stability factor, bandwidth of a voltage series amplifier(block diagram only)
- Feedback with & without bypass capacitor in single stage CE amplifier
- Emitter follower circuit

Unit -3 Power Amplifiers   (10 hrs) (12mks)
  • Power amplifier, single ended power amplifier
  • Classification- A,B, AB; operation ,comparison.
  • Push pull, complimentary symmetry power amplifier(no analysis)

Unit -4 Oscillator & Multivibrator

                                                          (18 hrs) (21mks)

  • Principle of oscillations; Barkhausens criteria.
  • Working of RC oscillators- phase shift and Wien Bridge.
  • Working of LC oscillators- Hartley, colpitts and crystal oscillator
  • Multivibrator-operation of Bistable, Monostable and Astable type circuit
  • Schmitt trigger circuit.

4. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Transistor biasing techniques and amplifiers	18	21
2	Negative feedback	18	21
3	Power Amplifiers	10	12
4	Oscillator & Multivibrator	18	21
	Total	64	75

5. SUGGESTED LIST OF EXPERIMENTS

Sr. No.	LIST OF EXPERIMENTS
1	Assemble & Test a single stage CE amplifier
2	Assemble a multistage direct coupled amplifier and obtain its gain
3	Test the performance of RC coupled amplifier
4	Assemble and test amitter follower
5	Assemble and test performance of class A power amplifier
6	Assemble and test the performance of Hartley and colpitts oscillator
7	Assemble and test phase shift and wein bridge oscillator
8	Assmeble and test performance of Monostable multivibrator
9	Assmeble and test performance of Astable multivibrator
10	Assmeble and test performance of Schmitt trigger circuit

6. SUGGESTED LEARNING RESOURCES

Sr.No	Author	Title	Publication and Year
1	Bhargava & Gupta	Basic Electronics &Linear circuits	Latest
2	Mottershead Allen	Electronic devices and circuits : introduction	Latest
3	Boylestad, Robert and Nashelsky Louis	Electronic Devices and circuit theory	Latest
4	Nair, Somnathan B.	Electronic devices and applications	Latest

(EN402) ANALOG COMMUNICATION

1. **RATIONALE:** This course on analog communication will enable the student to understand the various concepts of analog communication like amplitude modulation and demodulation, angle modulation and demodulation and noise performance of various receivers and apply the same when working with electronics communication systems.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/Week (In Hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
EN402 Analog Communication	L	T	P	C	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	25	-	125

3. Detailed course contents:

Unit	Topics and Sub-topics
1. Introduction to Analog Communication	• Block diagram of communication System Transmitter & receiver. • Concept of modulation: Need for modulation,Amplitude, Frequency and phase modulation, Frequency bands used in communication.
2. Amplitude modulation	• Amplitude Modulation(mathematical expression graphical representation, frequency spectrum) • Power and current relations. • Genertation of AM-Grid modulated class c amplifier • Block diagram of AM Transmitter-Low level and high level • Detection of AM Waves. Square Law detector, Envelope detector. • Advantages of SSB, Suppression of carrier-Balanced modulator(no derivation),Suppression of unwanted sideband-filter method, phase shift method and Third method. • Block diagram and operation of ISB and VSB.
3. AM Receiver	• Block diagram and operation of Radio Receiver- TRF Receiver, Superhetrodyne receiver, intermediate frequency (IF), automatic gain control (AGC), Delayed AGC.
4. Frequency & Phase Modulation	• Frequency (Angle) modulation: Definition frequency modulation (mathematical expression graphical representation, frequency spectrum), narrowband and wideband FM, bandwith formula, Pre-emphasis and de-emphasis • FM signal: Direct FM-Basic reactance and varactor diode modulator. • Phase Modulation, Definition & Comparison between AM, FM and PM.

5. FM Receiver	• FM receiver Block diagram, detection of FM waves, balanced slope detector, Stereophonic FM multiplex systems Transmitter, Receiver (block diagram only).
6. Noise,Trans mission Lines and Antennas	• Noises-external and internal noise. • Signal to noise ratio, Noise figure • Transmission lines: features, flat twin lead and coaxial cable. • ANTENNA: Antenna parameters-antenna gains, antenna resistance, radiation pattern, beam width and polarization definition. • Construction and radiation pattern of dipole, Yagiuda, parabolic reflector antennas (horn feed)

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/Semester	Marks
1.	Introduction to Analog Communication	04	09
2.	Amplitude modulation	14	21
3.	AM Receiver	05	06
3.	Frequency & Phase Modulation	12	14
4.	FM Receiver	05	09
5.	Noise Transmission Lines and Antennas	08	16
	Total:	48	75

5. SUGGESTED LIST OF EXPERIMENTS.

S.No	Experiment
1.	Perform Amplitude Modulation and Demodulation on trainer kit.
2.	Test the performance of SSB SC Modulation and Demodulation trainer kit.
3.	Test the performance of DSB-SC signal using balanced modulator on trainer kit.
4.	Perform frequency modulation and demodulation using trainer kit.
5.	Assemble two-band radio receiver & troubleshoot (mini-project type experiment)
6.	Field visit to All India Radio Transmitter Station.

6. SUGGESTED LEARNING RESOURCES

S.No	Author	Title of Books	Publication
1.	Kennedy, George and Bernard	Electronic & Communication System	McGraw Hill Educ India, 4th Edition 2004. ISBN:978-00-746-3682-4
2.	Mittal G.K	Radio Engineering	Khana Publishers, New Delhi
3.	Roddy, Dennis and Coolen, John	Electronic communication	PHI Learning New Delhi, ISBN:81-203-0984-7
4.	Lathi, B.P	Communication Systems	BS Publication, 2004
5.	Singh, R.P & Singh, S.D	Communication Systems	McGraw Hill Educ India, 2006. ISBN:978-00-706-3454-1
6.	Haykin, Simon	Analog Communication Systems	John Wiley & Sons, NY, 4th Edition, 2000. ISBN:0-471-17869-1
7.	Taub's, Herbert	Principles of Communication Systems	McGraw Hill Educ India, 6th Edition 2002. ISBN:978-00-705-2898-4

(EN403) CIRCUITS AND NETWORKS

1. RATIONALE:

This course is classified under basic technology group and is intended to enable the student understand the concepts and principles of the electrical and electronics engg. circuits and how to analyze them.

2. TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
EN403 CIRCUITS AND NETWORKS	L	T	P	C	TH	TM	TW	PR/OR	
	4	-	2	6	75	25	25	-	125

*Minimum passing % : Theory 40% **Duration of Theory Paper: 3 Hrs.***
Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:
PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

Unit-I Basic Terminology (9 hrs) (9 marks)
Definition of circuit, network, voltage, current, power
Mesh, loop, node, branch, active & passive elements. Linear & nonlinear, lateral & bilateral (definitions only).
Lumped and distributed parameters.
Voltage & current sources (ideal and practical).
Series and parallel equivalent expressions of resistors, capacitors and inductors (derivations not included).
Current & voltage divider Theorem (problems based on it).

Unit II- DC Network Theorems. (19 hrs) (27marks)
Kirchoff's Voltage and Current laws.
Reduction methods, Mesh analysis, Nodal Analysis, Superposition Theorem, Thevenin's theorem, Maximum power transfer theorem.
Star-Delta transformation.
(Statements and problems on all the above)

Unit III- AC Circuits. (12 hrs) (15 marks)
Response of R, L and C to ac signals (no derivations)
Series Resonance circuits : Series RLC circuit, resonant frequency, graphical representation of resonance, Resonance curve, half-power bandwidth of a resonant circuit, Q-factor. (No derivations)
Simple problems for calculation of Io, fo, BW, f1, f2, Q, Z.

RC-Integrator, RC- differentiator. (Sine and square wave inputs only)

Unit-IV Networks   **(12 hrs) (12 marks)**

Networks: Characteristic impedance, short circuit & open circuit impedance, Propagation constant,

Attenuation & phase constant, Image & iterative impedance

Symmetrical T, π networks

Derivation for only T network-Zo, Zoc, Zsc, γ, Z1, Z2 (Simple numericals)

Unit-V Filters and Attenuators   **(12 hrs) (12 marks)**

Filters-LPF, BPF, HPF, BRF (graphical interpretation), Constant k (LPF, HPF-T type only)-Design formulae & numerical.

Attenuator (Symmetrical T & π circuit), relationship of Neper & Decibel-Design formulae & numerical.

4. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (THEORY)

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Basic Terminology	9	9
2	DC Network Theorems	19	27
3	AC Circuits	12	15
4	Networks	12	12
5	Filters and Attenuators	12	12

5. SUGGESTED LIST OF EXPERIMENTS

Sr. No.	LIST OF EXPERIMENTS
1	Verification of Ohms law and its application to series parallel circuits
2	Verification of KVL and KCL
3	Verification of superposition theorem
4	Verification of Thevenins theorem
5	Verification of maximum power transfer theorem
6	Study of RLC series resonance circuits
7	RC Integrator and RC Differentiator
8	Study of filter networks (T and pi)

6. **SUGGESTED LEARNING RESOURCES**

Sr.No.	Author	Title	Publication and Year
1	Schaum series	Electronic Circuits	Latest
2	B.L. Thereja	Basic electrical engineering Vol.1	Latest
3	Royal Signals	Handbook of lines communication	Latest
4	Sudhakar Shyam Mohan	Circuits and networks	Latest

(EN404) ELECTRONIC INSTRUMENTATION

1.   RATIONALE

With the advancement of technology measurement techniques have taken rapid strides with the introduction of different types of instrumentation devices This course is intended to enable the student understand the facts, concepts, principles and applications of the instrumentation systems and will be able to apply the same in almost all areas of electronics and communication required in installation, testing, and commissioning, especially related with transducers and control system.

2.   TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme					Total Marks
					Theory Marks		Practical Marks			
EN 404 Electronic Instrumentation	L	T	P	C	TH	PA	PR/OR	TW		125
						TM				
	3	-	2	5	75	25	-	25		

Minimum passing % :**Theory** 40%   Duration of Theory Paper: 3 Hrs.
Legends:
L-*Lecture*; **T** - *Tutorial*; **P** - Practical; **C**- Credit;   **TH**- End Semester Theory; **TM** – Test Marks:
PR/OR - End Semester Practical / Oral Examinations; **TW**- Term Work

Unit I: INTRODUCTION TO INSTRUMENTATION

Objectives of Instrumentation system
Block diagram of a general instrumentation system and their functions
Characteristics of ideal transducer
Classification of transducers: Active and Passive transducers, Analog and Digital

transducers

Unit-2: TRANSDUCERS BASICS

Construction ,operation and characteristics of following Passive transducers:
Resistive   transducers: potentiometer,   strain   gauge(bonded   and semiconductor),RTD,Thermistor
Inductive transducer, varying of self inductance, mutual inductance ,reluctance, eddy currents,lvdt
Capacitive transducer: varying of distance ,Area, Permittivity
Active transducers:
Piezoelectric transducer: principle and materials used
Thermoelectric: principle (Seeback effect) materials used
Photoelectric: photovoltaic cell - principle and materials used
Optical transducers : construction and characteristics of LDR, photodiode, photo transistor Digital transducer: construction and working of shaft encoder

Unit - III : TRANSDUCER APPLICATIONS

Displacement measurement: linear and angular displacement using Resistive, Capacitive and Inductive transducers
Angular Speed measurement: photoelectric pickup, magnetic pickup
Pressure measurement: diaphragm with strain gauge.
Vibration measurement :piezoelectric accelerometer
Level measurement : float operated resistive method ,Capacitive
Flow measurement: electromagnetic flow meter and turbine meter

Unit – IV: SIGNAL CONDITIONING AND DATA PRESENTATION

Need for signal conditioning
Amplifiers: DC . AC Amplifiers ,Instrumentation Amplifier using opamps
Filters: applications
Bridge :basic of bridge circuits for strain gauge and RTD.
Types of data presentation elements:
digital displays: advantages and comparison of LED,LCD
plotters: comparison of strip chart recorder, X Y plotter

Unit – V: APPLICATION OF INSTRUMENTATION SYSTEMS

Data Acquisition system : block diagram and list of applications areas
SCADA : block diagram and list of applications areas
Process Control: block diagram and list of applications areas

3.   **SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)**

Unit No.	Topic	Teaching Hours/ Semester	MARKS
1.	Introduction	6	9
2.	Transducer Basics	14	18
3.	Transducer Applications	14	21
4.	Signal conditioning	8	15
5.	Applications of Instrumentation systems	6	12
TOTAL		48	75

4.   List of Experiments (8 to 10)

S. No.	Experiment
1.	Temperature measurement using thermocouple
2.	Temperature measurement using resistance temperature detector
3.	Study of light sensors:-photo transducers etc
4.	Displacement measurement using Linear Motion Potentiometer
5.	Displacement measurement using Inductive Transducer
6.	Displacement measurement using Capacitive Transducer
7.	Displacement measurement using lvdt
8.	Weight measurement using strain gauge bridge
9.	Speed measurement of motor using photo electric pickup
10	Study of Piezoelectric transducer

5.   SUGGESTED LEARNING RESOURCES

S.No.	Author	Title of Books	Publication & Year
1	Sawhney A.K.	Electrical & Electronic Measurement and Instrumentation	Khanna Publishers, Delhi, 2000
2	Rangan, C.S., et al;	Instrumentation Devices and Systems	Tata McGraw Hill, New Delhi 1990
3	Curtis Johnson	Process Control Instrumentation Technology	Pearson/Prentice Hall, 2006
4	Cerni & Foster	Instrumentation for Engineering Measurements	Tata McGraw Hill, New Delhi 5th,1986
5	Kalsi.H.S.	Electronics Instruments & Measurement	McGraw Hill India, 2nd Edition 2004 ISBN: 978-0-07-058370-2
6	Murty, D.V.S.	Transducers and Instrumentation	Prentice Hall of India, New Delhi, 2005 ISBN: 978-81-203-0953-1
7	Doeblin	Measurement Systems: Application and Design	McGraw Hill, India, 2006 ISBN: 978-00-706-61672-1
8	Anand B.	Electronic Instruments and Instrumentation Technology	Prentice Hall of India, New Delhi, 2006 ISBN:81-203-2454-4

****

(EN405) ANALOG ELECTRONICS

1. RATIONALE:

This course deals with the differential and operational amplifiers. The concept of feedback in operational amplifiers along with the application of operational amplifiers, active filter design, IC555 and fixed voltage regulators are also emphasized.

2. TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
EN405 Analog Electronics	L	T	P	C	TH	TM	TW	PR/OR	
	4	-	2	6	75	25	25	50	175

Minimum passing %: Theory 40% Duration of Theory Paper: 3 Hrs.
Legends:
L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:
PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

Unit I: Differential Amplifier   **(02hrs) (05 marks)**

Differential amplifier circuit and it's operation.
Different modes of operation-dual input balanced output differential amplifier and dual input un- balanced output differential amplifier (no derivations)

Unit II: Operational Amplifier Basics   **(08 hrs) (15 marks)**
Op-amp—Block diagram and its working, symbol and equivalent circuit of op-amp. Pin configuration of IC741.
Characteristics of ideal and practical Op-amp.
Op-amp Parameters(only definition)- I/p offset voltage, I/p offset current, I/p bias current, o/p offset voltage, input impedance, output impedance, bandwidth, CMRR, slew rate.

Unit III: Feed-back in Op-amps   **(06 hrs) (10 marks)**

Voltage series feedback amplifier- block diagram, circuit diagram, expression for voltage gain.
Voltage shunt feedback amplifier- block diagram, circuit diagram, expression for voltage gain.

Unit IV: Basic applications of Op-amps   (10 hrs) (15 marks)

Inverting Op-amp as summing, scaling , averaging amplifier and subtractor. Voltage to current and Current to voltage convertor.
Integrator and differentiator.
Voltage comparators, Schmitt trigger circuit, Sample and hold circuit, peak detection using op-amp.

Unit V: Active Filters   (06 hrs) (10 marks)

Concepts of active filters, comparison of active & passive filters. Butter worth low pass and high pass filter (1st order only), simple numerical problems on above filters.

Unit VI: Waveform Generation   (08hrs) (10 marks)

Op-amp Wein bridge oscillator, Op-amp as Astable multivibrator and triangular waveform generator.
Block diagram of IC 555 and its pin configuration, IC555 as Astable and monostable multivibrator (numerical problems)(no derivations).

Unit VII: Voltage Regulators   (08 hrs) (10 marks)

Circuit diagram and working of an Op-amp series voltage regulator.
Performance parameters of a regulator – load & line regulation and ripple rejection.
Salient features of three pin regulators, IC78XX series and IC79XX series fixed voltage regulators.
IC723 as a low voltage and high voltage regulator (numerical problems).

3.   **SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (THEORY)**

Unit No.	Unit	Teaching Hours / Semester	Marks
1	Differential Amplifier	2	5
2	Operational Amplifier Basics	8	15
3	Feed-back in Op-amps	6	10
4	Basic applications of Op-amps	10	15
5	Active Filters	6	10
6	Waveform Generation	8	10
7	Voltage Regulators	8	10

Legends: R = Remembrance; U= Understanding; A= Application and above levels

4. SUGGESTED LIST OF EXPERIMENTS

Sr. No.	LIST OF EXPERIMENTS
1	Determination of Op-amp (IC741) parameters
2	Inverting and non-inverting Op-amp amplifier
3	Op-amp as adder, subtractor and averager
4	Op-amp as voltage comparator
5	Op-amp as integrator and differentiator
6	Op-amp wein bridge oscillator
7	Op-amp as astablemultivibrator
8	IC fixed voltage regulators
9	IC 555 as astable/monostablemultivibrator
10	Op-amp as low pass and high pass filter

5. SUGGESTED LEARNING RESOURCES

Sr.No.	Author	Title	Publication and Year
1.	Gayakwad, R.A.	Op-amps and linear ICs	Latest
2.	Botkar,K.R.	Op-amps and linear Integrated circuits	Latest

(CS501) ENTREPRENEURSHIP DEVELOPMENT

1. RATIONALE

The course on Entrepreneurship Development focuses on creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects related to setting up of enterprise. This can be helpful in motivating technical students to start their own small-scale business/enterprise.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
CS 501 Entrepreneurship Development	L	T	P	C	-	-	PR/OR	TW	50
	-	-	2	2	-	-	-	50	

Minimum passing % Practical 40%

3. COMPETENCY TO BE DEVELOPED THROUGH THIS COURSE

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the competency – *Prepare a detailed project report for an identified product/service.*

4. DETAILED COURSE CONTENT

<div style="border:1px solid black;padding:8px">

Unit 1:Introduction   (7 Hours, 12 Marks)

Meaning of entrepreneurship, need in the present scenario, definition of an entrepreneurship, qualities of an entrepreneur, functions of an entrepreneur, risks and rewards of entrepreneurship.

Definition of Micro, Small And Medium Enterprises (MSME).Classification of Micro, Small And Medium Enterprises (MSME). Types of Enterprises - manufacturing, service and franchisee.

Unit 2:Forms of Business Organisation   (2 Hours, 9 Marks)

Main features of Sole Proprietorship, Partnership, Private Limited Company, Public Limited Company, Co-operative Society.

</div>

Unit 3:Entrepreneurial Support System   (6 Hours, 9 Marks)

Central Government Agencies: Functions of Small Industries Development Bank of India(SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC), Micro, Small And Medium Enterprises -Development Institute (MSME- DI), Technology Business Incubator (TBI), Khadi & Village Industries Commission (KVIC).

State Government Agencies: Functions of District Industries Centre(DIC), Goa Industries Development Corporation (GIDC), Economic Development Corporation (EDC), Financial Institutions-Banks, Goa Handicrafts and Rural Small Scale Industries Development Corporation (GHRSSIDC), Rural Development Agency (RDA), Khadi and Village Industries Board (KVIB).

Unit 4: Business Opportunity Identification   (7 Hours, 6 Marks)

Evaluation of business opportunity:- selection of industry, initial prospects study, product marketing concept, decision to proceed, feasibility study, project evaluation.

Unit 5: Market Research   (6 Hours, 12 Marks)

Definition of demand, factors affecting demand, law of demand,demand curves

Definition of supply, factors affecting supply,law of supply, supply curves.

Preparation of questionnaire. Data collection for setting up a small enterprise.

Unit 6: Legal Aspects   (4 Hours, 9 Marks)

Procedure of registration of Micro, Small And Medium Enterprise (MSME), meaning and registration of Value Added Tax(VAT), Service Tax, PAN. Slabs of Income tax.

Unit 7: Project Report   (16 Hours, 18 Marks)

Need for project report, importance of Project report,

scope of project report:Economic aspects, technical aspects,financial aspects, managerial aspects, production aspects.

List the contents of a project report.

Proforma of a project report which includes:-Introduction,scheme, profitability and projections, infrastructure, break- even point, names and addresses of suppliers, remarks.

Project Profile.

Project appraisal criteria:- technical feasibility, financial feasibility, economic viability, commercial viability, managerial competency, political and labour considerations.

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	MARKS
1	Introduction	7	12
2	Forms of Business Organisation	2	9
3	Entrepreneurial Support System	6	9
4	Business Opportunity Identification	7	6
5	Market Research	6	12
6	Legal Aspects	4	9
7	Project Report	16	18
TOTAL		48	75

5.MANDATORY ASSIGNMENTS

1. Preparation of a Case Study on leading entrepreneurs of Goa. (To be taken while conducting Unit 1)
2. Preparation of a Case Study on leading entrepreneurs of India. (To be taken while conducting Unit 1) Unit 1)
3. Filling of template of "Business Model Canvas"
4. Prepartion of Project Profile.
5. Preparation of Project Report.

6.SUGGESTED ACTIVITIES:

1. Visits to related departments (DIC,Banks,Tecnology Business Incubators, MSME-DI, NSIC, KVIC, KVIB).
2. Study visits to industries.
3. Organise entrepreneurship related event / activities.
4. Organise lectures/seminars with successful entrepreneurs.
5. Organise brainstorming sessions on ideation.
6. Establish an Entrepreneurship Development Cell.

7. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title of Books	Year of Publication
1.	*Sharad jawadekar, shobha dodlani,*	*Business entrepreneurship*	*Suvichar prakashan mandal pune,*
2.	*S.S. Khanna*	*Entrepreneurship development*	*S. Chand & Co. Ltd, New Delhi,*
3.	*Vasant Desai*	*Management of small Scale Industry in India*	*Himalaya Publishing House*
4.	*Dilip Sarwate*	*Entrepreneurial development Concepts and practices*	*Everest Publication House, Pune*
5.	*CB Gupta and P Srinivasan*	*Entrepreneurship Development*	*S. Chand and Sons, New Delhi*
6.	*PM Bhandari*	*Handbook of Small Scale Industry*	

Semester - V

Course code	Name of Course	TEACHING SCHEME				EXAMINATION SCHEME				Total marks
		L	T	P	C	Theory Marks		Practical Marks		
						TH	TM	PR/ OR	TW	
EN501	8051 Micro controller	3*	-	2*	5	75	25	25	25	150
EN502	Power Electronics	3*	-	2*	5	75	25	-	25	125
E1	Elective I	3*	-	2*	5	75	25	-	25	125
EN504	Computer Aided Design & Drafting	-	-	2*	2	-	-	50	50	100
IT501	Industrial Training	-	-	16	16					GRADE
	Total	**9**		**24**	**33**	**300**		**200**		**500**

Elective - I   ***Workload shall be doubled**

EN516 Electro Pneumatic and hydraulic Control circuits

EN513 Biomedical Instrumentation

EN511 Digital Communication

EN512 VHDL Programming

Semester - VI

Course code	Name of Course	TEACHING SCHEME				EXAMINATION SCHEME				Total marks
		L	T	P	C	Theory Marks		Practical Marks		
						TH	TM	PR/ OR	TW	
EN607	Industrial Instrumentation	3	-	2	5	75	25	-	25	125
EN608	Computer Control in Process Plant	3	-	2	5	75	25	-	25	125
E2	Elective II	3	-	2	5	75	25	25	25	150
E2	Institutional Elective/Elective-II	3	-	2	5	75	25	25	25	150
EN604	Electronic Project	-	-	6	6	-	-	50	50	100
CS602	Business Communication	-	-	2	2	-	-	50	50	100
	Total	**12**		**16**	**28**	**400**		**350**		**750**

ELECTIVE II

EN613- Advanced Microcontrollers

EN616- Industrial Automation

EN617- Analytical Instrumentation

EN618-Data communication

EN619- Building Automation

ME615-Renewable Energy Sources

IE6**-Institutional Elective

SEMESTER V

(EN501) 8051 MICROCONTROLLERS

1. RATIONALE:

With more and more computerization and automation of industrial processes, the application and use of the microcontrollers and embedded system in the industry has gained prominence and their applications are evolving rapidly. Microcontroller which is a true computer on a chip design to perform one or few dedicated functions , control many of the common devices in use today like digital watches, factory controllers, mobile phones ,digital cameras , GPS receivers, etc,. Therefore, this course on the microcontrollers is designed to develop the requisite skills to program and interface microcontrollers/debug/ troubleshoot microcontrollers based systems.

2. TEACHING AND EXAMINATION SCHEME:

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
(EN501) 8051 MICROCONTRO LLERS	L	T	P	C	TH	TM	TW	PR/O R	150
	3	-	2	5	75	25	25	25	

Minimum passing % :Theory 40% Duration of Theory Paper: 3 Hrs.
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. Detailed syllabus

Unit-I   Introduction to Microcontroller   teaching hours-(2)   marks (3)

- Concept of microcontroller. Comparison between Microprocessor and Microcontrollers, the differences between the features of Microcontrollers, 8031, 8051, 8751 and 8748

Unit-II   Architecture and organization of 8051

<div align="right">teaching hours-(10)   marks (18)</div>

- 8051Microcontroller hardware: 8051 oscillator and clock, program counter, and data pointer, A and B CPU registers, flags and program status word(PSW), Internal Memory, Internal RAM , the stack and the stack pointer, Special Function registers, internal ROM. Input /output Pins, PORTS and Circuits

Unit-III   Special Features of 8051

<div align="right">teaching hours-(10)   marks (18)</div>

- Counters and timers: Timer/counter interrupt, Timer modes of Operations, counting
- Serial data input/output: serial data interrupts, data transmission, data reception, serial data transmission modes
- Interrupts: timer flag interrupt, serial port interrupt, external interrupts, interrupt priority reset, interrupt control

Unit-IV   Assembly language instructions   teaching hours-(14)   marks (18)

- Addressing modes, external data moves, code memory, read only data moves, PUSH and POP OP codes, data exchanges,
- Byte level and bit level Logical operations, rotate and SWAP operations
- Arithmetic operations, flags, incrementing and decrementing, addition (unsigned), subtraction (unsigned) , multiplication and division, BCD addition.
- Jump and call instruction: the jump and call program range, Jumps, call and subroutine interrupts and returns.
- Programs based on above instructions

Unit-V   Assembly level Programming   teaching hours-(12)   marks (18)

- Programs based on data move instructions, logical operations, Unsigned additions, unsigned subtractions, BCD additions, Jump instructions, Software time delay routines.

4. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (THEORY)

UNIT NO	Topic	Teaching Hours/ Semester	Marks
1	Introduction to 8051	2	3
2	Architecture and Organization	10	18
3	Special Features of 8051	10	18
4	Assembly language instructions	14	18
5	assembly level Programming	12	18
	Total	48	75

5. SUGGESTED LIST OF EXPERIMENTS   (Any 8-10)

S. No.	Experiment
1.	Program using data move instruction
2.	Program using bit level logical instruction
3.	Program using byte level logical instruction
4.	Program using arithmetic instructions
5.	Program using Jump instructions
6.	Program to configure I/O Pin as output and Switch on LED connected at the pin
7.	Program to configure I/O Pin as input and connect push button switch
8.	Program to generate software time delay and flash LED
9.	Program to configure Timer and generate output delay pulse
10.	Program using interrupt service routine

6. SUGGESTED LEARNING RESOURCES

S.No.	Author	Title of Books	Publication
1	Kenneth J. Ayala	The 8051 Microcontroller Architecture, Programming and Applications	Recent
2	Muhammad Ali Mazidi	The 8051 Microcontroller and embedded system	Recent
3	MykePredko	Programming and Customizing the 8051 Microcontrollers	Recent

(EN502) POWER ELECTRONICS

1. RATIONALE

Power electronics is a subject that concerns the applications of electronic principles in to situation that are rated at power level rather than signal level. Many semiconductor devices such as SCR, DIAC, TRIAC, MOSFET and transistors are available for power applications. An effort is made in this course to provide understanding of the various electronic applications to enable the students to acquire some core skills related to power electronics.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
EN502 POWER ELECTRONICS	L	T	P	C	TH	TM	TW	PR/OR	125
	3	-	2	5	75	25	25	-	

Minimum passing %: theory 40%,

Duration of the theory papers: 3 hours

L: Lectures, T: tutorials, P: Practical, C: Credit, TH: end semester theory, TM: Test Marks, TW: term work, PR/OR: End Semester Practical/Oral Exam,

3. DETAILED COURSE CONTENT

Unit	Topics and Sub-topics
Unit-1 SCR, UJT and PUT **(12 hrs) (18 marks)**	• Working principle, symbol, characteristics of SCR,UJT, PUT • Two transistor model of SCR, triggering methods, turn on-turn off characteristics of SCR, di/dt rating, dv/dt rating, gate ratings, gate characteristics, snubber circuit, gate protection circuit over voltage & over current protection. • Types of commutation, Natural commutation, Forced commutation (A type- E type) • Simple triggering circuits using R, RC, pulse triggering using UJT, PUT.
Unit-II OTHER POWER ELECTRONICS DEVICES (6hrs) (9 marks)	• Working principle, symbol, characteristics of DIAC, TRIAC, LASCR, IGBT, Power MOSFET.

Unit-III **PHASE CONTROLLED** **RECTIFIER** **(6 hrs) (12 marks)**	• Single phase half wave & full wave controlled Rectifiers with R, RL, & RL with freewheeling diode load, 3 phase half wave controlled rectifier with resistive load.
Unit-IV **CHOPPER** **(5hrs) (6marks)**	• Concept of chopper circuit (single and two thyristor) • Working of Morgans Chopper
Unit-V **INVERTERS UPS AND** **SMPS** **(9 hrs) (12 marks)**	• Working principle of inverter • Series and Parallel inverter • Concept of UPS • Block diagram of UPS (on-line and off-line) • Block diagram of SMPS
Unit-VI **CYCLOCONVERTER** **AND AC VOLTAGE** **CONTROLLER** **(10hrs) (18 marks)**	• Operating principle of Cycloconverter • Types of Cycloconverter • 1 phase to 1 phase Cycloconverter, f/2, f/3 Cycloconverter, Application of Cycloconverters. • Working principle of voltage controller, Types of voltage controller with R Load. • Speed control of single phase AC motor using TRIAC

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Marks
1	SCR, UJT And PUT	12	18
2	Other Power Electronics Devices	06	09
3	Phase Controlled Rectifier	06	12
4	Chopper	05	06
5	Inverters UPS And SMPS	09	12
6	Cycloconverter And Ac Voltage Controller	10	18
	Total	**48**	**75**

5. SUGGESTED LIST OF EXPERIMENTS (Any 8)

Sr.No	Unit No.	Experiment
1.	I	Test the performance of SCR and the effect of dv/dt.
2.	I	Test the performance of DIAC & TRIAC
3.	I	Test the performance of PUT & UJT
4.	I	Test the performance of turning on SCR. (R triggering), RC triggering, pulse triggering.
5.	II	Test the performance of half wave controlled rectifier with R, RL, and RL with freewheeling diode
6.	II	Test the performance of full wave controlled rectifier with R, RL, and RL with freewheeling diode
7.	V	Test the performance of Morgans's chopper.
8.	V	Test the performance of Series inverter.
9.	V	Test the performance of Parallel inverter.
10	VI	Control the output power using TRIAC-DIAC.
11.	II	Test the different types of commutating methods.

6. SUGGESTED LEARNING RESOURCES

S.No	Author	Title of Books	Publication
1.	Bimbhra P.S	Power Electronics	Khanna Publishers Delhi
2.	Bhattacharya S.K &Chatterjee, S	Industrial Electronics & control	McGraw Hill Education, India
3.	Rashid Mohammed H	Power Electronics	Prentice Hall of India, New Delhi 3rd edition
4.	Sen, PC	Power Electronics	McGraw Hill Education, India
5.		SCR Manuals	
6.	Singh, M.D &Khanchandani, K.B	Power Electronics	McGraw Hill Education, India

(EN504) COMPUTER AIDED DESIGN AND DRAFTING

1. RATIONALE

One important skill required by industry of an diploma engineer is use of electronic design automation tools for minimizing time for design ,modification and updating existing records. Proper maintenance of documentation is essential for proper management as well as for for ISO certification .This course introduces the student to design and drafting of Electronic and Enstrumentation circuit using EDA tools.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
EN504 Computer aided Design and Drafting	L	T	P	C	TH	TM	TW	PR/OR	
	-	-	2	2	---	---	50	50	100

3. DETAILED SYLLABUS

The course is practical based and the student shall prepare computerized documentation for minimum of 8 of the activities listed below. The student may use software tools like Orcad, Eagle ,TINA, Matlab, Labview,Autocad(P&ID),Automation Studio.

1. Introduction to documention for ISO Certification.

2. Design of power supply for specified I,V,P rating and preparing documentation i.e circuit diagram ,bill of material ,enclosure diagram, front panel diagram and specification table using EDA tools

3. Design of an Astablemultivibrator for specified frequency and voltage using IC 555 and preparing documentation i.e circuit diagram ,bill of material ,enclosure diagram ,front panel diagram and specification table using EDA tools

4. Design of an RC amplifier for specified performance and preparing documentation i.e circuit diagram ,bill of material ,enclosure diagram,front panel diagram and specification table using EDA tools

5. Design of an Oscillator for specified performance and preparing documentation i.e circuit diagram ,bill of material ,enclosure diagram,front panel diagram and specification table using EDA tools

6. Design of an microcontroller based circuit for specified application and preparing documentation i.e circuit diagram ,bill of material ,enclosure diagram,front panel diagram and specification table using EDA tools

7. Design of an PLC based circuit for specified application and preparing documentation i.e circuit diagram ,bill of material ,enclosure diagram,front panel diagram and specification table using EDA tools

8. To Draw Structure of ISA Flow symbols
   a. Containers & vessels
   b. Electrical
   c. General instrument symbols- balloons
   d. Primary elements symbols- voltage, flow rate current, power, level
   e. and Temperature
   f. Valves & actuators

9. Draw the Process flow Diagrams using ISA Symbols
   a. Schematic for open Tank level Measurement
   b. Schematic for closed Tank level Measurement
   c. Control of water heating system
   d. P&ID for a chemical process

10. Simulation of designed circuit and evaluation.

4. **SUGGESTED LEARNING RESOURCES**

S.No.	Author	Title of Books	Publication
1	Louis Nashvilsky	Electronic Devices and Circuits	Recent
2	Curtis Johnson	Process instrumentation	Recent
3	MykePredko	Programming and Customizing the 8051 Microcontrollers	Recent
4	Autocad (P&ID)	Manual	Recent

(IT501) INDUSTRIAL TRAINING

1. RATIONALE:

Industrial Training is a newly introduced component, in the curriculum under Revised Semester Pattern system for all 03 year Diploma Programmes. It is a Training programme designed to expose & prepare the students for the Industrial work situation. This exposure and hands on experience, will further enhance the prospects of student fraternity to be better placed on completion of their course.

2. TEACHING AND EXAMINATION SCHEME

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory		Practical		
IT501	L	T	P	C	TH	TM	PR/OR	TW	
INDUSTRIAL TRAINING	-	-	16	16	-	-	30	70	GRADE

Minimum passing %: 40%

Legends:
PR/OR *-End Semester Practical / Oral Examinations;* ***TW-*** *Term Work*

3. DETAILED COURSE CONTENTS

Students are required to study and have hands-on experience wherever possible in the following areas (depending on availability):

1. Company Profile
2. Organizational Structure
3. Company Product Range
4. Manufacturing Facilities Available /Services provided
5. Plant / Facility Layout
6. Operations / Production Processes
7. Production Planning and Control
8. Detail study of Latest Equipment/ Technologies Used
9. Stores Functions
10. Material Handling Systems/ Equipments
11. Quality Management Systems / Functions
12. Maintenance and Repair Practices
13. Safety Practices / Safety Equipments
14. Utilities
15. Logistics
16. Sales and Marketing
17. Ethics, Statutory Rules and Regulations followed
18. Product Design and Development
19. Any other area specific to the Industry providing Training

4. TERM WORK & PRACTICALS

Evaluation Scheme					
TW				PR/OR	TOTAL Marks
Attendance Marks*	Industrial Mentor's assessmentMarks	Institute Mentor's assessment Marks	Training Report	Report Assessment & Seminar/Viva	
10	20	20	20	30	100

* 01 mark shall be deducted for every Absence (with or without permission).

Daily Dairy

The daily dairy should-be maintained in a book. It should reflect the day to day activities performed by the student (including task, men and materials involved). It should be counter signed by the Industry Mentor. It will become the basis for writing reports on the complete training.

Training Report

The training report should be submitted by the training students should include the following salient points- Certificate from institute, Certificate of training from company, detailed write up as per daily dairy, detailed drawings, working drawings, photographs, safety precautions, techniques for work minimization on site, organizational chart, Importance of project to the society, special methods/techniques/equipment should be separately high lightened, including environmental aspects. The report should be informative and technical, typed with double spacing on good quality bond paper and bound.

Assessment of Training Report be based on Knowledge, Presentation, Quality of contents and Sketches.

Note :

      a. Student/s undergoing Industrial Training shall follow Rules and Regulations of the Industry.

      b. Industrial Training will generally be organised and conducted in accordance with Industrial Training Manual duly prescribed by the Board.

5. SUGGESTED SPECIFICATION TABLE WITH MARKS & HOURS (THEORY)

Unit No	Name of the Unit	Teaching Hours	Marks
1	PR/OR	08 Weeks	30
2	TW		70
	Total	**08 Weeks**	**100**

Note:

    1. For Industrial training Grades will be awarded based on marks scored as follows:

<div align="center">

80% and above Marks – Grade 'A'

60% to 79% Marks – Grade 'B'

40% to 59% Marks – Grade 'C'

Marks below 40% - Grade 'D'

</div>

    2. TW and PR/OR shall be separate Heads of passing. Student has to secure minimum 'C' Grade for passing.

(EN511) DIGITAL COMMUNICATION

1. RATIONALE

This course on digital communication will enable the student to understand the underlying concepts such as digital modulation, information theory, coding, various multiplexing techniques and different switching techniques in Electric Telephone Exchange. The student will be able these principles in all areas related to digital communication systems and will expertise in maintenance of digital communication equipments.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Teaching Hours/ Week			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
EN511 Digital Communication	L	T	P	C	TH	TM	TW	PR/OR	125
	3	-	2	5	75	25	25	-	

Minimum passing % :Theory 40% Duration of Theory Paper: 3 Hrs.
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. DETAILED COURSE CONTENT

Unit-I   WAVE PROPAGATION   teaching hours-(6)   marks (10)

* Wave Propagation: Ground Wave, sky wave and space wave propagation, Troposcatter propagation, Virtual height, skip distance, MUF, critical angle, critical frequency.

Unit-II   INTRODUCTION TO DIGITAL COMMUNICATION

                              teaching hours-(10)   marks (15)

* Sampling theorem, Sampling & reconstruction using impulse, Aliasing effect & use of anti-aliasing filter, flat top sampling & appear true effect.
* Generation   & detection of PAM, PWM, PPM, PCM, DPCM, DM, ADM.
* Quantization, quantization error, compounding error, granular noise & slope over load.

Unit-III   DIGITAL MODULATION TECHNIQUES

                              teaching hours-(8)   marks (13)

* Basic principal, wave form, Block diagram for generation & detection of the following digital modulation techniques: Amplitude shift keying (ASK); Frequency shift keying

(FSK); phase shift keying (PSK); Binary phase shift keying (BPSK); quadrature phase shift keying (BPSK).

Unit-IV   MULTIPLEXING TECHNIQUES   teaching hours-(6)   marks (10)

- Block diagram of frequency division multiplexing (FDM)
- Block diagram of time division multiplexing (TDM)
- Advantages and comparison of the two systems.

Unit-V   INFORMATION THEORY   teaching hours-(8)   marks (12)

- Shannon &Hartley theorem, channel capacity, Gaussians channel, bandthwidth S/N trade off.

Unit VI   ELECTRONIC TELEPHONE EXCHANGE

teaching hours-(10)   marks (15)

- Space division switching, single Processor & dual processor, Centralised SPC configurations.
- Time division switching, control technique of the time division space switch, Basic time division time switch, Basic time multiplexed space switch.

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Marks
1	Wave Propagation	06	10
2	Introduction to Digital Communication	10	15
3	Digital Modulation Techniques	08	13
4	Multiplexing Techniques	06	10
5	Information Theory	08	12
6	Electronic Telephone Exchange	10	15
	Total	48	75

5. SUGGESTED LIST OF EXPERIMENTS

S. No.	Unit No	Experiment
1.	II	Perform PAM & demodulation on trainer kits
2.	II	Perform PWM & demodulation on trainer kits
3.	II	Perform PPM & demodulation on trainer kits
4.	II	Perform PCM & demodulation on trainer kits
5.	II	Perform signal sampling & reconstruction on trainer kits
6.	II	Perform DM techniques on trainer kits
7.	II	Perform ADM techniques on trainer kits
8.	III	Implement ASK modulation & demodulation on trainer kits
9.	III	Implement FSK modulation & demodulation on trainer kits
10.	III	Implement PSK modulation & demodulation on trainer kits
11.	IV	Perform TDM on trainer kits
12.	IV	Perform FDM on trainer kits

6. SUGGESTED LIST OF BOOKS & OTHER LEARNING RESOURCES

S.No.	Author	Title of Books	Publication
1	Singh, R.P.&Sapre, S.D.	Communication Systems	McGraw Hill Education, India, 2004 ISBN:978-00-706-3454-1
2	Taub& Schilling	Principles of Communication System	McGraw Hill Education, India, ISBN:0-07-462456-3
3	George Kennedy	Electronics Communication System	McGraw Hill Education, India, 2004 ISBN:978-00-706-4811-1
4	Haykin, Simon	Communication System	John Wiley & Sons, NY, 2000 ISBN:0-471-17869-1
5	Lathi, B.P	Communication System	BS Publication, Hyderabad ISBN:978-81-780-0015-2
6	Tocci, Ronald J. etal	Digital System: Principles & Application	Prentice Hall of India 2005, ISBN:978-81-203-3417-5
7	Bhattacharya, Amitabh	Digital Communication	McGraw Hill Education, India, 2005 ISBN:978-00-705-9117-2

(EN512) VHDL PROGRAMMING

1. RATIONALE

VHDL is hardware description language used in electronic design automation to describe digital and mixed signal system such as FPGA (Field Programmable Gate Array) and Integrated Circuits. VHDL can also be used as general purpose parallel programming language.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Teaching Hours/ Week			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
	L	T	P	C	TH	TM	TW	PR/OR	
EN512 VHDL PROGRAMMING	3	-	2	5	75	25	25	-	125

Minimum passing % :Theory 40% Duration of Theory Paper: 3 Hrs.
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. DETAILED COURSE CONTENT

Unit 1:

1.1 COMBINATIONAL CIRCUIT DESIGN: CMOS logic implementation of Switch, NOT, AND, OR, NAND, and NOR (Not any circuit). Digital logic variable, functions, inversion,   gate/circuits, Boolean algebra and circuit synthesis using gates (Up to 3 variables).

1.2 COMBINATIONAL CIRCUIT BUILDING BLOCKS: Circuit synthesis using Multiplexer, Demultiplexer, Encoders and Decoders.

Unit 2:

2.1 VHDL FOR COMBINATIONAL CIRCUIT: .Introduction to HDL and different level of abstraction VHDL Statements and Assignment, Representation of signals.

2.2 VHDL CODE: AND, OR, NAND, NOR gates, Implementation of Mux, Demux, Encoder, decoder. Four bit Arithmetic adder, subtractor and comparator in VHDL

Unit 3:

3.1 SEQUENTIAL CIRCUIT DESIGN: Introduction/Refreshing to Flip-flops and its excitation table, counters and Shift registers.

3.2 DESIGN STEPS: State diagram, State table, state assignment. Example for moore and mealy machines. Design of modulo counter (upto 3 bit) with only D flip-flops through state diagram

Unit 4:

4.1 VHDL FOR SEQUENTIAL CIRCUIT: VHDL constructs for storage elements. VHDL code for D Latch / D, JK and T Flip-flops with or without reset input.

4.2 VHDL EXAMPLES: Counters (up to 3 bit). Moore and Mealy type serial adder. VHDL code for serial Adder.

Unit 5:

5 PLDS AND FPGA: Introduction to PLA and PAL. Implementation of combinational circuits with PAL and PLA (upto 3 variable).Introduction to Complex Programmable Logic device, Field Programmable Gate Array and Custom chips (Functional Block diagram). Introduction to ASIC

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Marks
1	Combinational Circuit Design	9	15
2	Vhdl For Combinational Circuit Design	12	18
3	Sequential Circuit Design	9	15
4	Sequential Circuit Vhdl	12	18
5	PldsAndFpga	6	9
	Total	**48**	**75**

5. SUGGESTED LIST OF EXPERIMENTS (Any 8)

S. No.	Experiment
1.	Design and implementation of AND gate using HDL.
2.	Design and implementation of OR gate using HDL.
3.	Design and implementation of NOT gate using HDL.
4.	Design and implementation of MUX using HDL.
5.	Design and implementation of DMUX using HDL.
6.	Design and implementation of RS FF using HDL.
7.	Design and implementation of JK FF using HDL.
8.	Design and implementation of D FF using HDL.
9.	Design and implementation of counter using D FF in HDL.
10.	Design and implementation of register using HDL.

6. SUGGESTED LIST OF BOOKS & OTHER LEARNING RESOURCES

S.No.	Author	Title of Books	Publication
1	Bhasker J	VHDL Primer	Prentice Hall India -2009
2	Mano Michael D	Digital Design	Ciletti Pearson Education 2008
3	Stephen brown and Vranesic	Fundamentals of Digital Logic with VHDL design	2nd edition McGrawHill,2008
4	Nigel P. Cook,	"Digital Electronics with PLD Integration"	Prentice Hall, 2000
5	Ashok K.Sharma,	Programmable Logic Handbook: PLD, CPLD, and FPGA"	Mcgraw-Hill, 1998
6	Steve Waterman	Digital Logic Simulation and CPLD Programming with VHDL"	Prentice Hall, 2000

(EN513) BIOMEDICAL INSTRUMENTATION

1. RATIONALE:

There has been a tremendous increase in the use of electronic equipment in the medical field for clinical and research purposes.

The human body is a source of numerous signals, highly significant for diagnosis and therapy. These signals are picked up from the surface of the body or from with in this require electrodes of different types, even some parameters such as temperature, blood flow, blood pressure etc. Which are to be monitored routinely requires conversion of these signals in to corresponding electrical signals by various transducers.

After picking up these signals, they are processed in form most convenient for interpretation for further diagnosis.

This subject provides basic knowledge of the human physiology, aware principal of operation and the basic building blocks of the instruments are important to understand working of is instruments.

This knowledge is further useful for detail study of human signals in analytical instrumentation.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credit	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
EN513 BIOMEDICAL INSTRUMENTATION	L	T	P	C	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	25	-	125

Minimum passing % :Theory 40% Duration of Theory Paper: 3 Hrs.
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit;   TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	Fundamentals of physiology 1.1 Man- instrument system: - components, block diagram & working. 1.2 Cardiovascular system: - heart structure, blood circulation, heart sound, heartbeats, cardiac output. 1.3 Respiratory system: - physiology, mechanic, of birthing, lung volume & capacities. 1.4 Nervous system: - brain structure, organization neuronal communication, and neuronal signals. 1.5 Kidney: - structure, functions & operation.	14	20

02	Bioelectric signals & electrodes
	2.1 Bioelectric signals
	  a) Origin of bioelectric signals / potentials
	  b) Resting & action potentials
	2.2 Bio-electrodes / transducer
	  a) Electrode theory & electrode interface
	  b) Electrodes for measuring ECG, EEG & EMG – Microelectrodes, surface electrodes & needle electrodes.
	2.3 Biomedical recorders: -
	  a) ECG system: - block diagram, description, leads – unipolar, bipolar electrocardiogram, technical specification.
	  b) EMG system: - block diagram, description, and electromyography specification.
	  c) EEG:- block diagram description electroencephalogram, various stages of sleep, specification .
		12	18

03	Measurement of important parameters 3.1 Measurement of heart rate, heart sound (phonocardiograph) 3.2 Principle of blood pressure measurement, direct & indirect method, sphygmomanometer – diagram & working. 3.3 Measurement of respiration rate - Spiro meter. 3.4 Measurement of blood flow – plethysmograph, electromagnetic, ultrasonic method only. 3.5 Audiometery block diagram & description only.	05	10
04	Life support equipments 4.1 Defibrillator – types, dc defibrillation, diagram, working, electrodes – paddle electrodes, specification of defibrillator. 4.2 Pacemaker: - internal & external, pacing modes, block diagram, working, specification. 4.3 Dialysis machine – need, function, block diagram, description, specification.	06	12

05	Imaging systems 5.1 x-ray: - principle, block diagram, descriptions, image intensifiers, specification 5.2 CAT- block diagram, descriptions, working, and specification. 5.3 Ultrasonography – principle, various mode (A, B & M mode) block diagram, descriptions, specification.	**06**	**10**
06	Laboratory equipment & patient safety 6.1 centrifuge – types, principle of operation, uses 6.2 autoclave, incubator microtome, deionizer. 6.3 safety: - micro shock & macro shock, effects of leakage current on human body, types of leakage current, precaution to minimize electric shock hazards & leakage current.	**05**	**05**
	Total	**48**	**75**

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Marks
1	Fundamentals of physiology	14	20
2	Bioelectric signals & electrodes	12	18
3	Measurement of important parameters	05	10
4	Life support equipments	06	12
5	Imaging systems	06	10
6	Laboratory equipment & patient safety	05	05
	Total	48	75

5. List of Practical:
1. Plotting electrocardiogram using ECG system
2. Plotting electromayogram using EMG system
3. Plotting electroencephalogram for various positions electrodes placement.
4. Measurement of blood pressure.
5. Measurement of respiration rate by respiration meter.
6. Measurement of pulse rate
7. Visual and Aural Pulse Indicators
8. Temperature measurement
9. Study of centrifuge.
10. Signal conditioning circuits used with Biomedical Transducers
11. Report on visit to hospital for x-ray, CT scan & ultrasonography.

6. Learning Resources Books:

Sr. No.	Author	Title	Publisher
01	Leslip Cromwell, Fred J. Weibell, Erich A. Pfeiffer	Biomedical instrumentation & measurements	Prentice hall of India
02	R. S. Khandpur	Handbook of biomedical instrumentation	Tata McGraw Hill
03	John G. Webster, Editor	Medical instrumentation-application & design	--
04	Carr Joseph J., Brown J.M	Introduction to biomedical equipments technology	Pearson education Delhi

(EN516) ELECTRO PNEUMATIC AND HYDRAULIC CONTROL CIRCUITS

1. RATIONALE:

Hydraulic systems & pneumatic systems are widely used in all fields of engineering as clean source of motive power. Low cost automation systems with the use of pneumatics have become popular as manufacturing aids.

Diploma engineers come across such systems in all segments of industries.

Hence the subject will give the students basic skills and knowledge, which will be directly needed in the industrial environment.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Teaching Hours/ Week			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
EN516 Electro Pneumatic and hydraulic control circuits	L	T	P	C	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	25	-	125

Minimum passing % :Theory 40% Duration of Theory Paper: 3 Hrs.
Legends:

L-Lecture; T - Tutorial; P - Practical; C- Credit; TH- End Semester Theory; TM – Test Marks:

PR/OR - End Semester Practical / Oral Examinations; TW- Term Work

3. Contents: Theory

Chapter	Name of the topic	Hours	Marks
1	**Introduction to pneumatic Systems** 1.1 Applications of pneumatic system 1.2 General layout of pneumatic system 1.3 Merits and limitations of pneumatic systems	02	04

2	**Components of pneumatic system**
	2.1 Compressor – Reciprocating & Rotary compressors.
	
	2.2Control Valves – Pressure regulating valves, relief valve ,
	    Flow Control valves, types Direction Control Valves, types
	    of valve actuators
	
	2.3 Actuators – Rotary - Air motors, Types, working, Linear-Cylinders- Types, working .
	
	2.4 Accessories – Pipes, Hoses, Fittings, FRL unit
	
	      (Types, working and symbols of all components Construction not included)
		06	**08**

3	**3 Pneumatic Circuits**
	   3.1 Basic circuits for control of single acting cylinder ,control of double acting cylinder spring return
	
	   3.2 Speed control of cylinders ,
	
	   3.3 meter in meter out circuit
	
	   3.4 Fully manual ,semi automatic and fully automatic control of Double acting cylinder
	
	   3.5 Application of time delay and sequence valves
		06	**12**

4	**4.Introduction to hydraulic systems** 4.1 Practical applications of hydraulic systems. 4.2 General layout of oil hydraulic systems. 4.3 Merits and limitations of oil hydraulic systems.	**02**	**03**
5	**5. Components of Hydraulic systems** 5.1 Pumps – Vane pump, gear pump, lope impellar pump ,gerotor pump , piston pump, combination pump 5.1 hydraulic power pack – reservoir, types of fluids used 5.2 Comparison of hydraulic and pneumatic components	**04**	**09**

6	**6. Electropneumatic components** **6.1 Sensors and switches** 1.Manually actuated push button switches 2.Limit switches 3.Pressure switches 4.Solenoids 5.Relays 6.Timers 7.Temperature switches (only working and symbols with designation ,no constructional details) **6.2 Signal conditioning :** signal conditioning circuits for all switches and sensors mentioned in 6.1	10	12
7	**7. 8051 Microcontroller based circuits and programs for implementing following pneumatic circuits** 7.1 Control of single acting cylinder 7.2 Control of double acting cylinder 7.3 Control of double acting cylinder (using 5/2 way, single solenoid) 7.4 Control of double acting cylinder OR logic (Parallel circuit) 7.5 Control of double acting cylinder AND logic 7.6 Latching circuits 7.7 Automatic return of a double acting cylinder (using proximity switch) 7.8 Oscillating motion of a double acting cylinder 7.9 Control of double acting cylinder with time delay (Double solenoid) 7.10Sequence control in multi cylinder circuits(two cylinders only)	18	24
	Total	48	75

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Marks
1	Introduction to pneumatic Systems	02	04
2	Components of pneumatic system	06	08
3	Pneumatic Circuits	06	12
4	Introduction to hydraulic systems	02	03
5	Components of Hydraulic systems	04	09
6	Electropneumatic components	10	12
7	8051 Microcontroller based circuits and programs for implementing following pneumatic circuits	18	24
	Total	48	75

5. List of Practical:

Safety practices
Control of single acting cylinder
Control of single acting cylinder
Meter in and meter out circuit
Control of Pneumatic motor
Electropneumatic circuit for control semi automatic control of double acting cylinder
Electropneumatic circuit for control fully automatic control of double acting cylinder
Implementing sequence A+B+A-B-
Time delay circuit
Latching circuits

6. Learning Resources:

Sr. No.	Author	Title	Publisher
01	Andrew Parr	Hydraulics and Pneumatics	McGraw Hill International
03	Majumdar S.R	Pneumatics Systems Principles and Maintenance	Tata McGraw Hill
04	Stewart	Hydraulics and Pneumatics	Taraporewala Publication
04	Kenneth Ayala	Micro controller and Applications	Penram Publications

SEMESTER VI

(EN607) INDUSTRIAL INSTRUMENTATION

1. Rationale:

Pressure ,temperature, flow and level are important process variables which need to be measured in industry . Various techniques used for measurement of these parameters are dealt with in this course.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
EN607 Industrial Instrumentation	L	T	P	C	TH	TM	TW	PR/OR	125
	3	-	2	5	75	25	25	-	

Minimum passing %: theory 40%,

Duration of the theory papers: 3 hours

L: Lectures, T: tutorials, P: Practical, C: Credit, TH: end semester theory, TM: Test Marks, TW: term work, PR/OR: End Semester Practical/Oral Exam,

3. Contents: Theory

Chapter	Name of the topic	Hours	Marks
1	**1. FLOWMEASUREMENTS** Working Principle, Principle of operation and Application of the following flow Meters. Differential Head Meters: orifice plate and venturionly , Variable area meters rotameter only . Magnetic Meters, Turbine Meters, Vortex Meters, Ultrasonic Flow meters. Quantity Flow meters :rotating vane and lobe impleller type only Concept of Mass Flow meters: CORIOLLIS (In Brief). Open channel flow measurement (In Brief) Calibration Techniques for flow meter:-liquid meters & Gaseous meters	13	20

2	**2. TEMPERATURE MEASUREMENTS** Temperature Scales. Non Electrical methods for measurement of temperature Bimetallic Thermometer. Liquid in Glass, Pressure Thermometers. Electrical Methods for measurement of temperature: - Thermistors, RTD, Thermocouple, Radiation methods. Two wire, three wire and four wire RTD and its applications.	9	15
3	**3.PRESSURE MEASUREMENTS** Different types of pressure. Manometers: - U tube Manometer; Well type Manometer, Inclined Manometer, Micro manometer. Measurement of Vacuum: - Capsule Gauge, Pirani Gauge, Thermocouple Vacuum Gauge, Mcleod Gauge. Elastic pressure Transducer:- C Type Bourdon tube, Diaphragm, Bellow Gauge, Dead Weight Piston Gauge. Pressure Converters: - Pneumatic to Electric Current Converter. Current to Pneumatic Convertor, Voltage to current converter, current to voltage converter	13	20
4	**1. LEVEL MEASUREMENTS** Direct Methods:- hook type; Sight Glass; Float type; Displacer level Detectors Indirect Methods: - Hydrostatic Pressure Methods; Pressure Gauge Methods; Air Purge System. Electrical Methods: - Resistive; Inductive; Capacitive, Level Measurement with Gamma Rays. Ultrasonic Methods.	13	20
	Total	48	75

4. **SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)**

Unit No.	Topic	Teaching Hours/ Semester	Theory Marks Distribution for End Semester Exam *(Duration – 3 Hours)*
1.	FLOWMEASUREMENTS	13	20
2.	TEMPERATUREMEASUREMENTS	9	15
3.	PRESSUREMEASUREMENTS	13	20
4.	**LEVEL MEASUREMENTS**	13	20
	total	48	75

5. List of Practical:

(8 to 10 experiments of the following)
1. To determine the coefficient of discharge for an orifice plate.
2. To determine the coefficient of discharge of anventurimeter using the braking torque method.
3. To calibrate the coefficient of discharge of any one type of weir.
4. To built and test a circuitry of a liquid level indicator
5. To calibrate rotameter
6. To study characteristics of I to P converter
7. To study characteristics of P to I converter
8. To calibrate pressure gauge using dead weight tester
9. To determine the multiplication error of a C type Bourdon tube
10. To observe the temperature scanning technique using a Thermocouple temperature scanner
11. To oberve the temperature scanning technique using a RTD temperature scanner
12. To study the characteristics of Air-Flow Transducer using the RTD.
13. To study the characteristics of Air pressure Transducer
14. To study characteristic of humidity transducer

6. **Learning Resources:**

Sr. No.	Author	Title	Publisher
01	S.K. Singh	Instrumentation Measurements & Control	Tata McGraw
02	NakraChoudhry	Instrumentation Measurement & Analysis	Tata McGraw

(EN608) COMPUTER CONTROL IN PROCESS PLANT

1. Rationale

This course introduces the fundamentals of process controllers as well as DCS and SCADA which is widely used in industry the chemical, refineries, pulp, paper, steel , pharmaceuticals and fertilizer industries

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
EN608 Computer Control in Process Plant	L	T	P	C	TH	TM	TW	PR/OR	125
	3	-	2	5	75	25	25	-	

Minimum passing %: theory 40%,

Duration of the theory papers: 3 hours

L: Lectures, T: tutorials, P: Practical, C: Credit, TH: end semester theory, TM: Test Marks, TW: term work,

PR/OR: End Semester Practical/Oral Exam,

3. DETAILED COURSE CONTENT

Topic No.	TOPICS/SUBTOPICS	Periods	Marks
1.	**INTRODUCTION TO PROCESS CONTROL** 1.1 Current trends in computer control in process plant 1.2 Centralized computer control system 1.3 Distributed control system 1.4 Hierarchical control system	08	5
2.	**FINAL CONTROL ELEMENT**	10	

				15
	2.1 Final control element in process control loop			
	2.2 Actuator and control valve example in control loop of water heating system			
	2.3 Final control operation-			
	2.3.1 Signal conversion,			
	2.3.2 Actuator,			
	2.3.3 Control element			
	2.4 Signal conversion-			

	• Analog (relay/ amplifier)
	     • Digital (DAC)
	     • Electrical actuator-solenoid,
	     • DC motor,
	     • AC motor.			

	2.5 Pneumatic actuator-pneumatic actuator for converting pressure signal into mechanical shaft motion.			
	2.6 Hydraulic actuator- Hydraulic servo			

3.	**FUNDAMENTALS OFPROCESS CONTROLLERS**
	
	3.1 Define Process load, process lag, self regulation
	
	3.2 Controller system parameters- error, variable range, control lag, dead
	
	      time
	
	3.3 Discontinuous controller modes-
	     • Two position mode,
	     • Multi position mode and its applications
	3.4 Continuous controller modes-
	     • Proportional,
	     • Integral,
	     • Derivative mode and their applications
	3.5 Composite controller modes-
	     • PD,
	     • PI,
	     • PID controllers and their applications
	3.6 Multivariable control-
	       3.6.1 Cascade control and
	       3.6.2 Ratio control
	3.7 Feed forward control
	
	3.8 Adaptive controllers,
	
	3.9 Fuzzy logic system
		12	25

4.	**SCADA** 4.1 Introduction 4.2 SCADA block diagram and description	05	12

	4.3 Distributed SCADA system-
	
	     5.3.1 Star configuration,
	
	     5.3.2 Daisy chain configuration
	
	     5.3.3 Remote Terminal unit- I/o modules,
	
	 4.4 Communication modules, special software facilities		

5.	**DISTRIBUTED CONTROL SYSTEM**
	
	 5.1 Concept of Decentralized computer control
	
	 52 Comparison between distributed and centralized
	
	 5.3 Advantages of Distributed control system
	
	 5.4 Functional requirements of DCS
	
	       • Role of plant operator
	       • Maintenance Engg,
	       • Design and development engg,
	       • Manager and Supervisor
	 5.5 Hierarchy of DCS-Block diagram explanation
	
	 5.6 Block diagram explanation of Thermal power plant Automation System.
		10	18

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Theory Marks Distribution for End Semester Exam (Duration – 3 Hours)
1	INTRODUCTION TO PROCESS CONTROL	08	5
2	FINAL CONTROL ELEMENT	10	15
3	FUNDAMENTALS OFPROCESS CONTROLLERS	12	25
4	SCADA	05	12
5	DISTRIBUTED CONTROL SYSTEM	10	18
	Total	48	75

5. List of Practicals

1. To find characteristic of electrical actuator: Dc motor
2. To find characteristic of electrical actuator: Ac motor
3. To find characteristic of electrical actuator: Stepper Motor
4. To find characteristic signal converter: relays
5. To find characteristic signal converter: solenoid
6. To find characteristic signal converter: ADC/DAC
7. To build and test electronic controller (diff modes)
8. To find characteristic of position control system (diff modes)
9. To study closed loop temperature control
10. To study closed loop flow control
11. To study closed loop level control

6. Learning Resources/Books:

Sr. No.	Name of Book	Name of Author	Edition	Publication
1.	Computer Based Industrial control	Krishna Kant,		PHI
2.	Process Control Instrumentation Technology	Curtis D Johnson,		PHI
3	PC based Instrumentation-concepts/practice	N Mathivanan,		PHI

(EN604) ELECTRONICS PROJECT

1. RATIONALE

This phase-II of the project report is intended to integrate the entire major project by which several skills and competencies which have been developed in the students during his/her course of study and gets manifested through this project.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
	L	T	P	C	TH	TM	TW	PR/OR	
EN604Electronic Project	-	-	6	6	-	-	50	50	100

Minimum passing %: theory 40%,

Duration of the theory papers: 3 hours

L: Lectures, T: tutorials, P: Practical, C: Credit, TH: end semester theory, TM: Test Marks, TW: term work, PR/OR: End Semester Practical/Oral Exam,

3. DETAILED COURSE CONTENTS

The following are some of the suggested activities which the student has to undertake (which may slightly differ depending on the project chosen) during the project work. In so doing some process related and project related skills need to be evaluated.

1. Selection/Identification of project Work by market survey/industrial survey.
2. Project Proposal
3. Market survey for product sales & economic viability of product (for entrepreneurship)
4. Costing of the project/product
   i)   Capital costs
   ii)   Material & production cost
5. Design of project to obtain desired output.
6. Procurement of components & equivalents.
7. Working skill of fabrication.
8. Testing of product
   i)   Drafting
   ii)   Sketching
   iii) Layout
   iv)   Presentation
9. Project Report

(CS602) BUSINESS COMMUNICATION

1. RATIONAL :

The course on Business Communication will help in development of speaking, listening, writing, and reading skills in students, with special reference to business environment like writing business letters, notes, reports, documents, holding meetings and discussions, working in groups, etc. . Special provision has been made for language workshops where the communication skills of the students can be enhanced.

2. Teaching and Examination Scheme :

Course Code & Course title	Periods per week in hours			Total credits	Examination scheme				
					Theory Marks		Practical Marks		TOTAL Marks
	L	T	P	C	TH	TM	PR/OR	TW	
CS602 Business Communication	-	-	2	2	-	-	50	50	100

3. Competences to be developed through this course :

The course content should be taught and implemented with the aim to develop different type of skills leading to the achievement of the competency "Communicate effectively in given Business situations".

4. Detailed Course Content :

Unit 1.1: Communication Skills in the work place Communication within the organizational, Types of communication, functions of Internal & external communications Definition, components, importance of effective communication skills, types- verbal- non verbal, methods and hints to improve communication skills, body language, Précis and comprehension
Unit 1.2: Modern Office technology for communications: Using technology and internet to **obtain** information about suppliers, their credibility, latest specification of items, contacting people, quick feedback, social networking, skype, whatsapp, spell check, **dissemination** of information, send email to staff, paperless office, etc
Unit 2.1: Seminars Objectives, topic selection, audience, structure, tips for good beginning and end, aids to presentation.
Unit 2.2: Project work: A link between the theory and the practical   Tips: Narrow down to the topic, specific not vague, data collection, structure, critical thinking and analysis.
Unit 3.1 : Report writing: Understanding Objective and Subjective report writing (i)Feasibility report: Definition, types, economic feasibility, technical feasibility,

definition.   (ii) <u>Trouble Report:</u> Purpose, instances when trouble reports are written, procedure followed in writing trouble report   (iii) Formal Reports: Essay, Pamphlet, Booklet or Book report, Parts of a book Report, understanding how to write formal reports
Unit 3.2 : Illustrations in a report: Uses, types, Use of illustrations: Tables, graphs, charts, Venn diagram, organizational charts, flow charts, maps, photographs, drawings and diagrams.
Unit 4.1: Topic -Letter writing: Credit letter, Collection and sales letters
Unit 4.2: Memorandum: Definition, difference from letter, examples of memorandum
Unit 5.1: Meetings: Preparation, Notice for the meetings, Agenda
Unit 5.2.: Note taking during meetings, minutes of meeting
Unit 6.1: Tender: Procedure, Preparation, Types of tenders, Single tender, local tender, e tender, Structure, Tender Notice, Terms and conditions, Payment details, specification, Documents to be submitted, placing orders, Evaluations, drafting advertisements for tenders
Unit 7: Job Interviews: Preparing for a Job Interview, guidelines on facing job interviews, ways of scouting for jobs, Writing Job Application, resume,

Marking scheme :

Term Work   **Maximum marks**

Overall classroom performance…………………………..…….10

Workbook (assignments)………… …………………………………25

Classroom activity (language workshop)………… ………….....15

Term End Assessment

Components   **Maximum marks**

Questions on syllabus………………………..20

Activity…………………………………………..30

4. **Suggested specification table with hours and marks (Practical) :**

Unit No	Topic	Teaching hours per semester
1.	Communication Skills in the work place	04
2.	Organizing seminars, project work	04
3.	Report writing	05
4.	Letter Writing	05
5.	Meeting	05
6.	Tenders	04
7.	Job interviews	05
	Total hours	32

5. Suggested learning resources :

1. Business Correspondence and report writing, by R C Sharma & Krishna Mohan, Tata Mcgraw hill, New Delhi 2002,
2. Principles and practices of Business Communication ,Doctor R. Doctor A., Seth Publishers,14th edition,2006
3. The functional aspects of communication skills, P. Prasad, Sharma K. Rajendra, S. K. Kataria and Sons,2006
4. Raul R. Timm, How to make winning presentations, Sneha printers, Mumbai,
5. Stand and Deliver, how to become a masterful communicator and public speaker,
6. Dale Carnegie Training, CPI Cox & Wyman, UK.

(EN613) ADVANCED MICROCONTROLLER

1. Rationale:

The study of embedded systems is essential part of Computer Science. It deals with computer hardware with software embedded in it. This subject will enable student to develop logical thinking and use of "Firmware". It is practical oriented subject having theoretical prerequisites of Microprocessor, Digital Techniques, Data Structures and Computer Architecture. Students will be able to develop Real Time Systems, Device drivers, use interrupt service mechanism, program timing and counting devices and develop embedded C-Programs for Microcontroller.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
EN613Advanced Micro controller	L	T	P	C	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	25	25	150

Minimum passing %: theory 40%,

Duration of the theory papers: 3 hours

L: Lectures, T: tutorials, P: Practical, C: Credit, TH: end semester theory, TM: Test Marks, TW: term work, PR/OR: End Semester Practical/Oral Exam,

3. CONTENTS: THEORY

Chapter	Name of the Topic	Hours	Marks
01	**8051 I/O Ports & Interrupts** 8051 Parallel I/O Ports Interrupt handling &programming : concept of synchronous & asynchronous interrupts, ISR, programming external hardware interrupt & Timer interrupt.	08	16
02	**Introduction to Communication Protocol** Serial Communication – Study of SBUF, SMOD, SCON, PCON registers & programming for serial communication. Introduction of RS-232, Study of RS-232 Pinout Serial protocols: I2C, CAN, Fire wire, USB introduction & Comparison	12	20
03	**Embedded System** Software & Hardware development tools , IDE, Compiler, Debugger, Simulator, Emulator, In circuit Emulator(ICE),Target Board, Device Programmer	06	10
04	**Interfacing Applications** Interfacing of seven segment display & LCD display Interfacing diagram & pin out of LCD (Demonstration & programming in practical session only) Interfacing of Key board, ADC & DAC- interfacing diagram & programming. Interfacing of stepper motor- interfacing diagram & programming	14	20
05	**PIC Microcontroller:** overview of PIC Microcontroller, 18FXX series, special features , functional block diagram of input output pins, memory organizations, registers	08	9
	Total	48	75

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Theory Marks Distribution for End Semester Exam *(Duration – 3 Hours)*
1	**8051 I/O Ports & Interrupts**	08	16
2	**Introduction to Communication protocol**	12	20
3	**Embedded System**	06	10
4	**Interfacing Applications**	14	20
5	PIC Microcontroller	08	9
	Total	**48**	**75**

5. List of Practical

Students undertaking project based on Microcontroller should perform any 8 practical from the list given.

Students not undertaking Microcontroller based project should perform 9 practical in which practical number 10 & 11(Stepper Motor interfacing & ADC Interfacing) are compulsory.

1. Development and execution of the program for sending data on port lines.

2. Development and execution of the program for arithmetic operation and time delay.

3. Development and execution of the program for input and output operation.

4. Development and execution of the program for interface LEDs to particular port.

5. Development and execution of the program to generate a square wave on port.

6. Development and execution of the program for logical operators and data conversion.

7. Development and execution of the program PWM waveform generation.

8. Development and execution of the program to display a message on LCD (16x2).

9. To write 8051 C program to send "WELCOME" on serial port continuously.

10. Interface Stepper Motor to Microcontroller 8051 and development and execution of the program to run stepper motor.

11. Interface ADC to Microcontroller 8051 and development and execution of the program to display digital equivalent of analog input

12. Interface DAC to Microcontroller 805 and development and execution of the program to generate specified voltage.

6. Learning Resources:

Books:

Sr. No.	Author Title Publisher	Title	Publisher
1	Raj Kamal	Embedded Systems	Tata McGraw Hill
2	Muhammad Ali Mazidi, Janice GillispieMazidi	The 8051 Microcontroller And Embedded Systems	PHI
3	Ajay V Deshmukh	Microcontrollers (Theory And Applications)	Tata McGraw Hill
4	Kenneth J. Ayala	The 8051 Microcontroller	PRI
5	Frank Vahid, Toney Givargis	Embedded System Design: A unified Hardware/Software Introduction	John Wiley
6	David E. Simon	An Embedded Software Primer	Pearson Education

(EN616) INDUSTRIAL AUTOMATION

1. RATIONALE:

Programmable Logic Controller (PLC) system used in automation industries for application such as pick and place, welding, spray painting, cutting, drilling, transportation of the objects etc.

This course ideals with the hard ware ,programming techniques ,troubles shooitng as well as applications of PLCs

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
EN616 Industrial Automation	L	T	P	C	TH	TM	TW	PR/OR	150
	3	-	2	5	75	25	25	25	

Minimum passing %: theory 40%,

Duration of the theory papers: 3 hours

L: Lectures, T: tutorials, P: Practical, C: Credit, TH: end semester theory, TM: Test Marks, TW: term work,

PR/OR: End Semester Practical/Oral Exam,

3. DETAILED COURSE CONTENT

chapter	Name of the Topic	Hours	Marks
1	**Basics of automation** 1.1 Need of automation 1.2 Benefits of automation 1.3 Application areas – Process industries, Buildings, Robotics, Infrastructure, Aerospace, railways, Automobiles, Telecom, Electrical distribution, Medical	04	05
2	PLC Basics 2.1 Evolution and Role of PLC in Automation 2.2 Block Diagram & Principle of Working 2.3 PLC Classification based on Type and Size 2.4 PLC Characteristics – CPU, Racks, Power Supply, Memory, Input & Output Modules, Application Specific Modules, Speed of Execution, Communication, Redundancy.	08	15
3	**PLC Hardware** 3.1 Description and Function of various PLC Modules	06	10

	3.2 PLC Hardware Configuration 3.2.1 Addressing of PLC I/O 3.2.3 Diagnostic Features		
4	**PLC Programming languages** 4.1.1 Introduction to PLC Programming Languages – Ladder, Instruction List, Structured Text, **IEC 1131-3**	**04**	**08**
5	**Instruction set** I/O addressing of PLC. **Relay type instructions** - NO, NC, One shot, Latch, and Unlatch. **Timer instructions** - On delay timer, off delay timer, Retentive timer, and Timer reset. **Counter instructions** - up counter, down counter, high speed counter, counter reset. **Comparison instructions** –Equal, Not equal, Greater, Greater than equal, Less, Less than equal. **Logical instructions** –AND, OR, EX-OR, NOT.	**08**	**12**
6	**Basic Programming** Simple programming examples using ladder programming language based on relay, timer, counter, logical instruction	**06**	**08**

7	**PLC Applications**
	    5.1 Control of pneumatic cylinder
	
	    Logical control with and without latching, logical control with time response, sequence control
	
	    5.2 conveyor control
	    5.3 elevator control
	    5.4 bottle filling control
	    5.5 temperature control
		10	**12**

8	**Installation and troubleshooting** PLC installation- enclosures, rack, master control relay, grounding, noise suppression, maintenance guidelines. PLC troubleshooting- input and output troubleshooting using module LED status, troubleshooting of ladder program.	**04**	**5**
	Total	**48**	**75**

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Theory Marks Distribution for End Semester Exam (Duration – 3 Hours)
1	Basics of automation	04	05
2	PLC Basics	08	15
3	PLC Hardware	06	10
4	PLC Programming languages	04	08
5	Instruction set	08	12
6	Basic Programming	06	08
7	PLC Applications	10	12
8	Installation and troubleshooting	04	5
	Total	48	75

5. List of Practicals:

1. Verify functions of logic gates by using PLC.
2. Ladder program for Start stop logic using two inputs.
3. Ladder program for push to start and push to stop. (Use single Push Button)
4. Ladder program for blinking of LED's
5. Write and verify ladder program for sequential ON-Off control of Lamps.
6. Write and verify ladder program for sequential control of DC motors.
7. Use of Timers for Traffic Control.
8. Use of counters for pulse counting using limit switch/ proximity sensor.
9. Ladder program temperature On-Off control loop using PLC.
10. Ladder program of PLC based application using conveyor system.
11. Ladder program of PLC based application using Elevator system.
12. Ladder program for sequencing of cylinders
13. Ladder program of PLC based application for bottle filling

6.   Learning Resources/Books:

Sr. No.	Author	Title	Publisher
1	NIIT	Programmable Logic control- Principles and applications	Prentice Hall India
2	Madhuchand A Mitra&SamarjitSen Gupta	Programmable logic controllers and Industrial automation	Penram International

(EN617) ANALYTICAL INSTRUMENTATION

1. Rationale:

The area of analytical instrumentation involves a multidisciplinary approach covering instruments used in hospital for routine clinical analysis, drug and pharmaceutical laboratories, oil refineries and above all for environmental pollution monitoring. With the knowledge of this subject the student will be in a position to select the instrument for a particular problem with some idea of their merits, demerits and limitations. the aim of the subject is to describe the instruments, possessing some special features of interest as an illustration of the indicated principles and intended applications.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks	Practical Marks			
EN617 Analytical Instrumentation	L	T	P	C	75	TM	TW	PR/OR	
	3	-	2	5	75	25	25	25	150

Minimum passing %: theory 40%,

Duration of the theory papers: 3 hours

L: Lectures, T: tutorials, P: Practical, C: Credit, TH: end semester theory, TM: Test Marks, TW: term work, PR/OR: End Semester Practical/Oral Exam,

3. CONTENTS: THEORY

Chapter	Name of the Topic	Hours	Marks

01	Introduction
	1.6 Elements of Analytical Instrument
	    Block Diagram, Explanation.
	1.7 Laboratory Instruments
	1.7.1 PH Meter
	    a) Principle
	    b) Electrodes for PH measurement- Hydrogen electrode, Glass electrode and Calomel electrode
	    c) Null detector type PH Meter
	1.7.2 Blood cell counter
	1.7.3 Electrophoresis
	    - Paper electrophoresis
	    - Densitometer (double beam densitometer)
		07	12

02	**Colorimeters and Photometers**
	2.4 Calorimeter
	    2.1.1 Beer Lamberts law
	
	    2.1.2 Single beam filter photometer
	
	    2.1.3 Double beam filter photometer
	
	2.2 Spectrophotometer
	
	    2.2.1 Using prism
	
	    2.2.2 Using grating
	
	2.3 Flame photometer
	
	    2.3.1 Principle
	
	    2.3.2 Block Diagram
	
	    2.3.3 Application
		08	14

03	**Spectrometers**
	3.6 Mass spectrometer
	    3.1.1 Principle of operation
	    3.1.2 Magnetic deflection mass spectrometer
	    3.1.3 Components of a mass spectrometer
	    3.1.4 Applications
	3.7 NMR
	    3.2.1 Principle of NMR :- Nuclear spin, Nuclear
	        energy levels, Resonance condition, NMR
	        absorption and spectra chemical shift
	    3.2.2 Constructional details of NMR spectrometer
		08	14

04	**Chromatography** 4.4 Introduction and Classification 4.5 Basic parts of gas chromatography 4.6 Types of liquid chromatography 4.7 Basic liquid chromatography 4.5 Applications	07	12

05	**Analyzers**
	5.1 Blood gas analyzer
	    - Introduction
	    - Block diagram of complete blood gas
	      analyzer
	
	5.2 Infrared gas analyzer
	
	5.3 Thermal conductivity analyzer
		08	12

06	Environmental pollution monitoring Instruments 6.1 Air pollution monitoring Instruments 6.2 Types and concentration of various gas pollutants 6.3 Measurements techniques for gas pollutants Gases: CO, SO_2, Nitrogen oxide, Hydrocarbon, Ozone Measurements techniques for IR, gas chromatography, Colorimeter, Conductivitimeter, Chemiluminescence, Laser	10	16
	Total	48	80

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Theory Marks Distribution for End Semester Exam *(Duration – 3 Hours)*
1	Introduction	07	12
2	Colorimeters and Photometers	08	14
3	Spectrometers	08	14
4	Chromatography	07	12
5	Analyzers	08	12
6	Environmental pollution monitoring Instruments	10	16
	Total	48	75

5. List of Practical:

1. **Determine the pH of given solutions**
2. **Determine by Colorimeter**
3. **Determine by Flame photometer**
4. **Study of Spectrophotometer**
5. **Study of Gas chromatograph**
6. **Study of Blood gas analyzer**
7. **Study of Blood cell counter**
8. **Identify various components of NMR**

6. **Learning Resources:**

Books:

Sr. No.	Author	Title	Publisher & Address
1	Leslip Cromwell, Fred J. Weibell, Erich A. Pfeiffer	Biomedical instrumentation & measurements	Prentice hall of India
2	R. S. Khandpur	Handbook of Analytical instruments	Tata McGraw Hill
3	R. S. Khandpur	Handbook of biomedical instrumentation	Tata McGraw Hill
4	Carr Joseph J., Brown J.M	Introduction to biomedical equipment technology	Pearson education
5	A.G. Patil	Medical electronics	Excel Books

(EN618) DATA COMMUNICATION

1. RATIONALE

Progressing from communication over copper wire to today's fiberoptic & satellites communication, we have increased our ability to transmit more information , more quickly and over longer distances. As a result the technicians are supposed to have knowledge of optical & satellite communication. This subject will provide basic concepts and requisite knowledge and skill required.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Teaching Hours/ Week			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
EN618Data Communication	L	T	P	C	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	25	25	150

3. DETAILED COURSE CONTENT

Unit	Topics and Sub-topics
Unit – I **Optical fiber** Communication	• Need of fiber optical communication, Frequency used, advantages, Block diagram of optical communication and applications. • Mechanism of signal transmission through an optical fiber- snells law, critical angle, concept of total internal reflection, acceptance angle, acceptance cone and relation between numerical aperture and acceptance angle (No derivation), structure of optic fiber. • Types: step index & graded index, mono & multimode fiber, comparison. • Propagation in Single mode step index, Multimode step index and Multimode graded index fiber. • Losses in optical fibers: Absorption Losses, Scattering Losses ,Bending losses.Dispersion loss. • Light sources:Characteristics of light sources, principle of operation of LED and brief description, principle of operation of LASER : stimulated emission, comaparison of laser and led sourses • Detectors: PIN diode and avalanche photo diode (APD) Connectors and splicing:Fiber alignment and joint losses, Fusion splicing, Mechanical splicing: snug tube & V groove , requirements of good connector, connector types.

Unit - II Satellite communication	Introduction: • Frequency bands used and applications of satellite Communication; • Classification of satellite orbits : based on orientation(equatorial, polar), distance from earth(LEO,MEO,GEO) • Geosynchronous satellite and its features • Block diagram of satellite Communication subsystems • Domestic satellite system(INSAT) • Earth station
Unit – IV Computer Networks	Communication nerwork : Need and uses of network Serial and Parallel, synchronous and asynchronous , simplex and Duplex communication LAN Network topologies – Star, Mesh Ring and Bus topology Circuit and packet switching ISO MODEL for computer communication.: Concept and brief description of every layer. concept of protocol and protocols ued in different layers(names only)Block diagram and desription of FSK Modem

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit	Teaching Hours/ Semester	Marks
1	Optical fiber communication	18	33
2	Satellite communication	15	20
3	Data communication in computers	15	22
	Total	48	75

5. SUGGESTED LIST OF EXPERIMENTS

S. No.	Experiment
1	Study of optical fiber
2	Measurement of Band width of optical fiber
3	Measurement of losses in optical fiber
4	Field visit to industry of optical fiber cable
5	Study Of satellite transmitter and receiver
6	Study Of LAN Star
7	Study Of Bus LAN
8	Study of various interfacing connectors RJ45, RS 232 and mediums, thin coaxial cable, optical fiber connectors

6. SUGGESTED LIST OF BOOKS & OTHER LEARNING RESOURCES

Sr .No.	Author	Book Title	Publisher
1	G. Keiser,	Optical Fiber communications, 2nd Ed	Mc. Graw HillInc, USA, 1991.
2	Ferouzan	Data communication Network	Tata McGraw Hill
3	Anil K. Maini VarshaAgrawal	Satellite Communications 2nd edition	John Wiley & Sons, USA, 1986. ISBN: 978-81-265-2071-8
4	D. C. Agarwal,	Satellite Communications	Khanna, 1991
5	Frenzel	Communication Electronics	Tata McGraw Hill
6	Kennedy	Commucation Systems	Tata McGraw Hill 4th Edition

(EN619) BUILDING AUTOMATION

1. RATIONALE:-

Knowledge of building environments is fundamental to the design, operation and maintenance of today's complex buildings. Knowledge of systems and controls enables building personnel to create a healthy, productive indoor environment. Building management system plays a vital role in commercial buildings, Government offices, Hospitals, Pharmaceutical industries, Hotel industries, Clubs, Casinos, Air Ports, etc. As major role of instrumentation engineer is involved in this field, the knowledge of Building Management System is essential for instrumentation students. This course is introduced with the view of spreading the knowledge of BMS.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
EN619 Building Automation	L	T	P	C	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	25	25	150

Minimum passing %: theory 40%,

Duration of the theory papers: 3 hours

L: Lectures, T: tutorials, P: Practical, C: Credit, TH: end semester theory, TM: Test Marks, TW: term work, PR/OR: End Semester Practical/Oral Exam,

3. DETAILED COURSE CONTENT

Topic No.	TOPICS/SUBTOPICS	Periods	Marks
1.	Building Management System 1.1 Introduction to Building Management System and Integrated Building Management System 1.2 Roll of BMS in industrial and Commercial Building 1.3 Brief introduction of systems involved in BMS i] HAVC	08	12

	ii] Water Management System iii] Sewage Water System iv] Lighting System v] Electrical Monitoring System vi] Fire Monitoring System 1.4 Brief introduction of systems involved in **IBMS:** i] Access Control System ii] Fire Monitoring System iii] Close Circuit Television 1.5 Application of **BMS** Hospitals, Pharmaceuticals, Industries, Hotel industries, Commercial buildings, Government Offices, Clubs, Casinos, Air ports etc.		
2.	**HeatingVentilation Air Conditioning** 2.1 Inroduction to HAVC 2.2 Roll of HAVC in industry 2.3 Loads on HAVC systems 2.4 Components of air conditioning systems 2.5 Types of HAVC systems i] All Air System : Introduction to single path/Dual path all air system, variation in single path and dual path all air system ii] All Water System : Variation of all water system, series lop,one pipe main, two pipe direct return, two pipe reserve return, 3 pipe system. 4 pipe system.. iii] Air Water System iv] Unitary System Advantages and limitation of each of above mentioned system 2.6 Typical HVAC system in a small building	10	13

3.	**Psychometry**
	
	3.1 Definations: Adiabatic process, British Thermal units, Dew point
	
	   Temperature, isothermal process, latent heat, sensible heat, moisture
	
	   Content (humidity ratio), relaive humidity, saturation, specificvolume,
	
	   Enthalpy, dry bulb temperature, Wet bulb temperature
	
	3.2 Psychrometric Properties of Air
	3.3 Psychrometric Chart-Introduction, Construction and Examination.
	
	3.4 Air Mixing Process
	   i] Air Conditioning Process
	
	      Heating Process
	
	      Cooling Process
	
	   ii] Humidifying Process
	
	      Steam jet
	
	      Air washer (Recirculating and heated air washer)
	
	   Vapourizing Humidifiers
	
	3.5 Cooling and dehumidification in air washer
		12	15

4.	**High side and low side equipment in HVAC**
	
	4.1 High side Equipment
	
	   Schematics and control system involved in HSE (Chiller, Cooling Towers and
	
	   Boilers
	
	4.2 Low side equipment
	   AHU (Air Handling Unit)
		05	08

	Types of AHU as Constant volume and variable volume FLU, ALU,VAV Boxes Schematics and control of each Low side equipment.		

5.	**BMS Fundamentals**
	
	5.1 Introduction to BMS, BCS And EMS
	
	5.2 System configuration :
	
	   Hardware configuration : Several levels of processors in Microprocessors based
	
	   hierarchical configuration
	
	5.3 System Function
	   i] Zone Level Function
	
	   ii] System Level Controller Functions
	
	   iii] Operator Level Functions
	
	5.4 Communication Media:
	   Typical Wiring Configuration : Series bus, Star wiring
	
	5.5 Communication trunks in BMS transmission
	   i] Twisted Copper Pairs
	
	   ii] Fiber Optical Cable
	
	   iii] Common Carrier telephone channel
	
	5.6 Communication Protocol
	   i] Peer Communication Protocol
	
	   ii] Poll/Response Protocol
	
	   iii] Backnet
		10	15

6.0	**Microprocessor based/DDC Fundamentals in BMS.** 6.1 Roll of microprocessor in BMS 6.2 Evolution of DDC 6.3 Block diagram of DDC 6.4 Controller configuration 6.5 Types of Controller	08	12

	6.6 Controller Software i] Operating Software ii] Application software iii] Energy Management Software 6.7 Typical DDC Operators		

4. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Theory Marks Distribution for End Semester Exam (Duration – 3 Hours)
1	Building Management System	08	12
2	HeatingVentilation Air Conditioning	10	13
3	Psychometry	12	15
4	High side and low side equipment in HVAC	05	08
5	BMS Fundamentals	10	15
6	Microprocessor based/DDC Fundamentals in BMS.	08	12
	Total	48	75

5. Practicals:- (minimum 8 practical)

1. study of light sensors and circuits used in BMS

2. study of temperature sensors and control circuits

3. study of humidity sensor circuits

4 study of dust level sensing

5. study electricity monitoring circuits

6. Study of fire sensors and circuits.

7. Study of various annunciator circuits

8 .study of data acquisition circuits used in BMS

6. Reference Books:

Sr. No.	Name of Book	Name of Author	Edition	Publication
1.	Building Environment: HVAC Systems	Johnson Controls	-	-
2.	A Course in Refrigeration & Air Conditioning	S. C. Arora,S. Domkundwar	-	DhanpatRaiPVt. Ltd. Co.

(ME615) RENEWABLE ENERGY SOURCES

1. RATIONALE:

The power demand in the country is increasing at a very fast rate & power production is not able to keep pace with the power demand. The resources required for the generation of power are gradually getting exhausted. Therefore it becomes necessary to investigate the possibility of producing energy from non –conventional sources. Researches and efforts are being made to utilize the non conventional energy for power generation which in turn can meet the power demand. It is also necessary to know the basics of energy conservation. Looking into this need, this course has been introduced at the final year level as an optional course.

2. TEACHING AND EXAMINATION SCHEME

Course Code & Course Title	Periods/ Week (In Hours)			Total Credits	Examination Scheme				Total Marks
					Theory Marks		Practical Marks		
	L	T	P	C	TH	TM	PR/ OR	TW	
ME 615 RENEWABLE ENERGY SOURCES	3	-	2	5	75	25	25	25	150

Minimum passing % : Theory 40% and Practical 40%   Duration of Theory Paper: 3 Hrs.

3. COMPETENCY TO BE DEVELOPED THROUGH THIS COURSE
The student should be able to develop awareness for effective utilization of renewable energy sources, identify different components of solar energy devices, wind energy devices and biomass plant and apply principles of energy conservation and energy audit.

4. DETAILED COURSE CONTENT

Unit 1   Introductionto Energy Sources
Introduction. Major sources of energy: Renewable and Non–renewable. Primary and secondary energy sources. Energy scenario in India . Prospects of renewable energy sources. Need of renewable energy sources.
Unit 2   Solar Energy
Solar Radiation: Solar Radiations at earth's surface.
Flat plate Collectors: Construction and working of typical liquid collector and typical air collector. Concentrating collectors: Construction and working of parabolic trough reflector, mirror strip reflector, Fresnel lens collector.
Solar energy storage systems: Need for energy storage. Thermal storage:- packed bed storage

type, Electrical Storage: - battery storage type, Mechanical storage:- pumped hydroelectric storage, compressed air storage, flywheel storage. Solar pond:- principle of operation, description of non-convective solar pond, applications.

Applications of Solar energy:- Space heating-passive and active heating systems. Solar photovoltaic's- principle, basic photovoltaic system for power generation, applications. Solar water heater, solar distillation, solar cooker (box type), solar furnace, solar pumping, solar drier. Agriculture and Industrial process heat. (No derivations and numericals)

Unit 3   Wind Energy
Basic principle of wind energy conversion. Power in wind, Available wind power formulation, Power coefficient, Maximum power. Main considerations in selecting a site for wind mills. Advantages and limitations of wind energy conversion. Classification of wind mills. Basic components of a wind energy conversion system. Construction and working of horizontal axis wind mill. Applications of wind energy:-Basic wind energy conversion system with energy storage; wind assisted gas turbine generating unit; wind energy system with battery storage. Environmental aspects of wind energy system.
Unit 4   Energy from Biomass
Introduction. Biomass resources. Biomass conversion technologies:-direct combustion, thermo-chemical conversion, bio-chemical conversion. Biogas generation. Types of biogas plants:-floating drum type and fixed dome type,their construction and working. Factors affecting biogas generation. Thermal gasification of biomass. Gasifiers: - a) fixed bed gasifier - updraught,downdraught and cross draught b)fluidized bed gasifier. Applications of gasifier.
Unit 5   Energy Conservation
Global and Indian energy market. Need and importance of energy conservation. Principles of energy conservation. Energy audit. Types of Energy Audit. Concept of Green Building, Carbon footprints, Star Rating of Appliances.

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Topic	Teaching Hours/ Semester	Total Marks
1.	Introduction to Energy Sources	04	6
2.	Solar Energy	19	32
3.	Wind Energy	11	15
4.	Energy from Biomass	08	12
5.	Energy Conservation	06	10
	Total	**48**	**75**

6. SUGGESTED LIST OF ASSIGNMENTS

Term work shall consist of the record of the following assignments:

S. No.	Unit No.	Assignments
1	**1, 5**	To collect information about global and Indian energy market.
2	**2**	To perform an experiment on solar flat plate collector used for water heating.
3	**2**	Setting up a photovoltaic cell for lighting with focus on orientation of panels and measuring output in terms of voltage & current.
4	**2**	Perform an experiment using a solar cooker.
5	**2**	Visit to plant of solar heating system for hotel/hostel/railway stations etc and write a brief report on the visit.
6	**3**	To study construction and working of horizontal axis wind mill or to visit nearest wind farm.
7	**4**	To visit biomass / biogas plant of Municipal waste or elsewhere and write a brief report on the visit.
8	**5**	Perform energy audit for workshop / Office / SSI unit.

7. SUGGESTED LEARNING RESOURCES

S. No.	Name of Author	Title of the Books	Name of the Publisher
1	Dr. B. H. Khan	Non Conventional Energy Resources	Tata McGraw Hill
2	G. D. Rai	Non conventional energy sources	Khanna Publishers
3	S. P. Sukhatme	Solar energy Principles	Tata McGraw Hill
4	P. H. Henderson	India – The Energy Sector	University Press
5	D. A. Ray	Industrial Energy conservation	Pergaman Press
6	W. C. Turner	Energy Management handbook	Wiley Press
7	S,Rao,B. Parulekar	Energy Technology	Khanna Publishers

(IE6**) INSTIUTIONAL ELECTIVE

1. **RATIONALE** :

   It has been observed that the curriculum prescribed, is many times out of context of Industry, on account of the pace with which technology development is taking place at Industry end. Due to this, gap exists between the Industry requirement of manpower and manpower produced by the Polytechnics. Board takes some time to incorporate the development of technology in the curriculum and many a times technology becomes outdated when it is incorporated in the curriculum. Further the expertise to train students as per Industry current requirement is available at the institute, but the same cannot be taught to students, as it is not a part of curriculum.

   To address this situation, Board has decided to permit Institutions affiliated to Board, to identify such technologies or other aspects and teach the same to the students as an elective subject called "Institutional Elective". Through this Institutional Elective subject, Institutions will be able to cater to the requirements of Industry by identifying their immediate requirement and prepare the students for the requirement by developing the curriculum in consultation with the Industry.

   As many a time's same subject may not be offered more than one or two years, a non conventional way of teaching – learning may be required to be adopted. Participation of Industry experts, guest lecturers, visit to Industry, exploring the knowledge available on net, etc may be essential to achieve the objectives.

2. TEACHING AND EXAMINATION SCHEME :

Course code & course title	Periods/Week (in hours)			Total Credits	Examination Scheme				Total Marks
					Theory		Practical		
IE6** INSTIUTIONAL ELECTIVE	L	T	P	C	TH	TM	PR/OR	TW	
	3	-	2	5	75	25	25	25	150

3. DETAILED COURSE CONTENTS :

> a) Curriculum shall be drafted by the concerned department by interacting with Industry counterpart in regards to the Newer Technology required to be transferred for purpose of Teaching /Learning process.
> b) Department shall work out the modalities of execution of the curriculum at Industry/Institute Level.
> c) Curriculum shall be forwarded to Board for approval before its implementation.