SEMESTER -I

Subject Code	Subject	Hrs. /Week			Exam Hrs.	Maximum Marks				
		L	T	P		MS1	MS2	IA	Th.	Total
Personality Development Program for First 15th Days										
THEORY										
1D01	English &Communication Skills	2	0	0	3	10	10	20	60	100
1D02	Applied Chemistry-I	3	1	0	3	10	10	20	60	100
1D03	Applied Physics-I	3	1	0	3	10	10	20	60	100
1D04	Applied Mathematics-I	4	1	0	3	10	10	20	60	100
1D05	Computer Fundamental & Information Technology	3	1	0	3	10	10	20	60	100
Code	**Subject**	**Hrs. /Week**			**Exam Hrs.**	**IA (60%)**		**EA (40%)**		**Total**
		L	**T**	**P**		**MP1 (30%)**	**MP2 (30%)**			
1D06	Applied Chemistry Lab-I	0	0	2	2	30	30	40		100
1D07	Applied Physics Lab-I	0	0	2	2	30	30	40		100
1D08	Computer Fundamental & IT Lab I	0	0	2	2	30	30	40		100
1D09	**Engineering Drawing**	0	0	3	3	30	30	40		100
1D10	Workshop Practice – I	0	0	3	3	30	30	40		100
	TOTAL	**15**	**04**	**12**						**1000**

SEMESTER – II

Subject Code	Subject	Hrs. /Week			Exam Hrs.	Maximum Marks				
		L	T	P		MS1	MS2	IA	Th.	Total
THEORY										
2D01	Applied Chemistry-II	3	1	0	3	10	10	20	60	100
2D02	Applied Physics-II	3	1	0	3	10	10	20	60	100
2D03	Applied Mathematics-II	4	1	0	3	10	10	20	60	100
2D04	Electrical & Electronics Technology	3	1	0	3	10	10	20	60	100
2D05	Applied Mechanics	3	1	0	3	10	10	20	60	100
Code	**Subject**	**Hrs. /Week**			**Exam Hrs.**	**IA (60%)**		**EA (40%)**		**Total**
		L	**T**	**P**		**MP1 (30%)**	**MP2 (30%)**			
2D06	Applied Chemistry Lab-II	0	0	2	2	30	30	40		100
2D07	Applied Physics Lab-II	0	0	2	2	30	30	40		100
2D08	Electrical & Electronics Workshop	0	0	2	2	30	30	40		100
2D09	Workshop Practices-II	0	0	2	3	30	30	40		100
2D10	Computer Fundamental & IT Lab-II	0	0	2	2	30	30	40		100
	TOTAL	**16**	**05**	**10**						**1000**

SEMESTER – III

Code	Subject	CR.	Hrs. /Week			Exam Hrs.	Maximum Marks				
			L	T	P		MS1	MS2	IA	Th.	Total
Theory											
3DEEI01	Engineering Mathematics - II	3	3	1	0	3	10	10	20	60	100
3DEE02	Electric circuits	3	3	1	0	3	10	10	20	60	100
3DEE03	Power systems-I (Generation)	3	3	1	0	3	10	10	20	60	100
3DEEI04	DC Machines	3	3	1	0	3	10	10	20	60	100
3DEE05	Electrical & Electronic Measuring Instruments	3	3	1	0	3	10	10	20	60	100
3DEE06	Electronics Engg										

Practical's & Sectionals

Code	Subject	CR.	Hrs. /Week			Exam Hrs.	IA (60%)		EA (40%)	Total
			L	T	P		MP1*30%	MP2*30%	Pr.W40%	
3DEE07	DC Machines Laboratory Practice	2	0	0	2	3	30	30	40	100
3DEE08	Communication Skillsand Life Skills	2	0	0	2	3	30	30	40	100
3DEE09	Circuits and Measurements Lab	2	0	0	2	3	30	30	40	100
3DEEI10	Electronics Lab	2	0	0	2	3	30	30	40	100
	GRAND TOTAL	25	15	5	10					1000

SEMESTER – IV

Code	Subject	CR.	Hrs. /Week			Exam Hrs.	Maximum Marks				
			L	T	P		MS1	MS2	IA	Th.	Total
Theory											
4DEE01	Programming in C	3	3	1	0	3	10	10	20	60	100
4DEE02	A.C. Machines - I	3	3	1	0	3	10	10	20	60	100
4DEE03	Power Systems – II(T&D)	3	3	1	0	3	10	10	20	60	100
4DEEI04	Electrical Installationand Estimation	3	3	1	0	3	10	10	20	60	100
4DEE05	Digital Electronics and Microcontrollers	2	2	1	0	3	10	10	20	60	100
4DEE06	General mechanical Engineering										
Practical's & Sessionals											
Code	**Subject**	**CR.**	**Hrs. /Week**			**Exam Hrs.**	**IA (60%)**		**EA (40%)**	**Total**	
			L	T	P		MP1* 30%	MP2* 30%	Pr. W 40%		
4DEE07	Electrical Engineering Drawing	2	0	0	2	3	30	30	40	100	
4DEE08	Programming Lab in C	2	0	0	2	3	30	30	40	100	
4DEE09	A.C. Machines-I Lab	2	0	0	2	3	30	30	40	100	
4DEE10	Digital Electronics and Microcontrollers Lab	2	0	0	2	3	30	30	40	100	
	GRAND TOTAL	24	14	05	10					1000	

SEMESTER – V

Code	Subject	CR.	Hrs. /Week			Exam Hrs.	Maximum Marks				
			L	T	P		MS1	MS2	IA	Th.	Total
Theory											
5DEE01	Industrial Management	3	3	1	0	3	10	10	20	60	100
5DEE02	A.C. Machines - II	3	3	1	0	3	10	10	20	60	100
5DEE03	Power Systems –III (Switch Gear and Protection)	3	3	1	0	3	10	10	20	60	100
5DEE04	Power Electronics	3	3	1	0	3	10	10	20	60	100
5DEE05	Electrical drivesand Traction	3	3	1	0	3	10	10	20	60	100
5DEE06	Electrical utilization Automation										

Practical's & Sessionals

Code	Subject	CR.	Hrs. /Week			Exam Hrs.	IA (60%)		EA (40%)	
			L	T	P		MP1*30%	MP2*30%	Pr. W 40%	Total
5DEE07	Electrical CAD &PLC Lab	2	0	0	2	3	30	30	40	100
5DEE08	Power Electronics	2	0	0	2	3	30	30	40	100
5DEE09	A.C. Machines-I ILab	2	0	0	2	3	30	30	40	100
5DEE10	Project work	2	0	0	2	3	30	30	40	100
	GRAND TOTAL	20	15	05	10					1000

SEMESTER – VI

Code	Subject	CR.	Hrs. /Week			Exam Hrs.	Maximum Marks				
			L	T	P		MS1	MS2	TA	Th.	Total
Theory											
6DEE01	Distribution and Utilization	3	3	1	0	3	10	10	20	60	100
6DEE02	Energy Conservation and Audit	3	3	1	0	3	10	10	20	60	100
6DEE03	Power Electronics	3	3	1	0	3	10	10	20	60	100
6DEE04	Bio-Medical Instrumentation	3	3	1	0	3	10	10	20	60	100
6DEE05	Computer Hardware and Networks	3	1	1	0	3	10	10	20	60	100
Practical's & Sessional											
Code	**Subject**	**CR.**	**Hrs. /Week**			**Exam Hrs.**	**IA (60%)**		**EA (40%)**		**Total**
			L	T	P		MP1*30%	MP2* 30%	Pr. W 40%		
6DEE06	Power Electronics Lab	2	0	0	2	3	30	30	40		100
6DEE07	Bio-Medical Instrumentation Lab	2	0	0	2	3	30	30	40		100
6DEE08	Computer Hardware and Networks Lab	2	0	0	2	3	30	30	40		100
6DEE09	Seminar	2	0	0	2	3	30	30	40		100
6DMOI09	Project	4	0	0	0	0					100
	GRAND TOTAL	24	12	04	04						1000

Semester-I

1D01: English Communication & Skills-I		
Objective: English communication encompasses written, oral, visual and digital communication within a workplace context. This discipline blends together pedagogical principles of rhetoric, technology, and software to improve communication in a variety of settings ranging from technical writing to usability and digital media design.		
Unit	**Topic**	**35hrs**
Unit – I	Narration, Voice, Basic Sentence Patterns. (Nine basic sentence patterns)Tenses, Common errors (Noun, Pronoun, Articles, Adverb, Punctuation, Preposition etc.)Transformation of Sentences, Determiners, Preposition	**5**
Unit – II	Modals in Conversational Usage, Prefix, Suffix, Idioms & Phrasal verbs: Modals Can, Could, Should, Will, Would, May, Might, Must, Need not, Dare not, Ought to, Used to. **Phrase** At all; Instead of; In Spite of; As well as; Set up; Upset; Look up; Call off; Call out; Come across; Set right; Look other. **Idioms** Work up (excite); Break down; Stand up for; Turn down; Pass away; Pass on; Back up; Back out; Carry out; Done for (ruined); Bring about; Go through; Ran over; Look up (improve); Pick out (selected).	**8**
Unit – III	Composition - . Unseen Passage, Précis Writing Letter Writing: Letter to the editor of a magazine, newspaper, business letters, letters to relatives, friends, government officers. Report Writing Paragraph Writing, Essay Writing - Essays on general and local topics related to environmental problems.	**6**
Unit – IV	**Listening:** For improving listening skills the following steps are recommended, Listen to Prerecorded Tapes, Reproduce Vocally what has been heard, Reproduce in Written form. Summaries the text heard, Suggest Substitution of Words and Sentences, Answer Questions related to the taped text, Summaries in Writing **Vocabulary:** Synonyms. Homonyms. Antonyms and Homophones**,** Words often confused, as for example, I-me; your-yours; its-it's; comprehensible-comprehensive; complement-compliment] Context-based meanings of the words, for example, man[N] man [vb]; step[|N| ,step [vb] conflict Israel Palestinian conflict Emotional conflict, Ideas conflict learn. learn at this school I learnt from the morning news **Group Discussion :** Developing skill to initiate a discussion [How to open] Snatching initiative from others [Watch for weak points, etc.]	**8**
Unit – V	**Speaking:** Introducing English consonant-sounds and vowel-sounds**.,** Remedial exercises where necessary**,** Knowing Word stress**,** Shifting word stress in poly-syllabic words [For pronunciation practice read aloud a Para or page regularly while others monitor]**Delivering Short Discourses:** About one self Describing a Place, Person, Object Describing a Picture, Photo. **Expand a topic-sentence into 4-5 sentence narrative. Note :**1. The Medium of teaching and examination will be English.2. The Question on Essay Writing (Unit-7) will be compulsory. The student will have to attempt one essay out of two, touching the given points on general/local topic related to environmental problems.3. At least on question will be set from each unit.4. No theory question will be set from syllabus of practicals.	**8**

	Text Books: Intermediate English Grammar Raymond Murphy, Pub: Foundation Books, New Delhi2. Eng. Grammar, usage & Composition Tickoo & Subramanian Pub: Scand and Co.3. Living Eng. Structure Standard Alien. Pub: Longman4. A Practical Eng. Grammar Thomson and Martinet. (and its Exercise Books) Pub : ELBS5. High School English Grammar Wren & Martin. and Composition **Reference Book :**1. Communicative Skills for Engineers and Scientists by Sangita Sharma and Binod Sharma, New Delhi : Pearson.2. English for Engineers by Abidi & Ritu, New Delhi : Cengage Learning.	

1D02: Applied Chemistry-I

Objective	**Chemistry** is the science of matter, especially its chemical reactions, but also its composition, structure and properties. Chemistry is concerned with atoms and their interactions with other atoms, and particularly with the properties of chemical bonds.	
	Topic	**38 Hours**
Unit – I	**Atomic Structure**: Constituents of the Atom, Bohr's Model of the Atom, Quantum Number and Electronic Energy Levels , Aufbau's Principle, Pauli's Exclusion Principle, Hand's Rule + *l* Rule ,Electronic Configuration of Elements (s,p,d Block Elements)**Development of Periodic Table:** Modern Periodic Law, Long form of Periodic Table. Study of Periodicity in Physical and Chemical Properties with, special reference to Atomic and Ionic Radii, Ionizations, Potential. Electron Affinity. Electro negativity. Variation of Effective Nuclear Charge in a Period. Metallic Character.	**8**
Unit – II	**Electro Chemistry:** Ionization, Degree of Ionization, Factors which Influence Degree of Ionization .Hydrolysis – Degree of Hydrolysis, Hydrolysis Constant., pH Value, Buffer Solution Electrolysis, Faraday's Laws of Electrolysis	**8**
Unit – III	**Kinetic Theory of Gases:** Postulates of kinetic Theory**,** Ideal Gas Equation, Pressure and Volume Corrections, Vender**.** Walls Equations**,** Liquefaction of Gases, Critical Pressure and Critical Temperature**,** for Liquefaction.**,** Liquefaction of Gases by Joule – Thomson Effect, Claude's Method and Linde's Method **Carbon Chemistry:** Definition of Organic Chemistry. Difference between Organic and Inorganic Compounds. Classification and Nomenclature - Open Chain and Closed Chain Compounds, IUPAC System of Nomenclature. (up to C5).	**8**
Unit – IV	**Metals and Alloys:** General Principles and Terms listed in Metallurgy, Metallurgy of Iron and Steel, Different forms of Iron, Effect of Impurities on Iron and Steel6.5 Effect of Alloying Elements in Steel **Pollution:** Water Pollution, Causes and Effects, Treatment of Industrial Water Discharges -Screening, Skimming and Sedimentation Tanks, Coagulation, Reductions, Chlorination, Biological Methods. Air Pollution Causes and Effects Control Methods – Electrostatic Precipitator, Scrubbers, Gravitational Setting Methods, by Plants. Awareness on	**8**
Unit – V	**Water:** Sources of Water**,** Hardness of Water.**,** Degree of Hardness, Estimation of Hardness by EDTA method, Problems on Calculation of Hardness**,** Disadvantages of	**6**

	Hardness**,** Softening Methods**,** Lime-Soda Method**,** Permutite Method**,** Ion -Exchange Method Problems on Softening of Water**,** Drinking Water, its Requisites, Purification and Sterilization of Water.	
	Text Books: 1. Engineering Chemistry II (Hindi) Mathur and Agarwal2. Chemistry of Engineering Materials C.V. Agarwal3. Engineering Chemistry P.C. Jain and Monika4. Chemistry M.M. Uppal5.Applied Chemistry (Hndi) V.P.Mehta Jain Bros. Jodhpur **Reference Books:** Instrumental methods of Chemical analysis, MERITT & WILLARD (EAST – WEST press) Physical Chemistry , P.W Atkin (ELBS, OXFORD Press) 3 Physical Chemistry W.J.Moore (Orient Longman)	

1D03: Applied Physics-I		
Objective: physics employs mathematical models and abstractions of physics to rationalize, explain and predict natural phenomena. This is in contrast to experimental physics, which uses experimental tools to probe these phenomena.		
Unit	**Topic**	**36 Hours**
Unit – I	**Units and Dimensions :** Idea of various systems of units, SI units Basic, Supplementary and Derived Units, Prefixes & Symbols, Dimensions and Dimensional Formulae**,** Principle of Homogeneity of Dimensions**,** Dimensional Analysis**,** Applications and Limitations **Elasticity :** Elasticity**,** Stress and Strain**,** Elastic Limit & Hooke's law**,** Young's Modulus, Bulk Modules & Modulus of Rigidity, Poisson's Ratio	**8**
Unit – II	**Properties of Liquids:** Surface Tension & Surface Energy**,** Cohesive & Adhesive Force, Angle of Contact**,** Capillarity & Expression for Surface Tension **,** Streamline & Turbulent Flow**,** Reynolds Number, Viscosity & Coefficient of Viscosity. Stokes's law & Terminal Velocity	**8**
Unit – III	**Sound Waves:** Velocity of Sound Waves: Newton's Formula , Laplace Correction ,Factors affecting Velocity of Sound Waves Propagation of Progressive Wave, Displacement, Velocity and ,Acceleration of a particle during propagation of wave Superposition of Waves: Stationary Waves (without mathematical analysis) Resonance tube	**8**
Unit – IV	**Gravitation & Satellites:** Newton's law of Gravitation, Acceleration due to Gravity Kepler's laws of Planetary Motion (statement only), Artificial Satellite (simple idea), Geo-Stationary Satellites, Escape Velocity. Velocity & Time Period of an Artificial Satellite. **Transfer of Heat:** Modes of Transmission of Heat - Idea of Conduction, Convection & Radiation, Thermal Conductivity & Coefficient of Thermal Conductivity Black Body, Kirchoff's Laws & Stefan Boltzmann Law (statement only), Newton's Law of Cooling & its Derivation from Stefan's Law	**6**
Unit – V	**Electrostatics:** Coulomb's Law**,** Intensity of Electric Field, Intensity due to a Point Charge**,** Electric Lines of Forces & Electric Flux**,** Electric Potential, Electric Potential due to a Point Charge **D.C. Circuits :** Resistivity, Effect of Temperature on Resistance , Ohm's Law, Resistance in Series and Parallel and their Combination Kirchoff's Law Wheatstone Bridge Meter Bridge Principle of Potentiometer	**6**
	Suggested Text Books: 1.Engineering Physics Gaur & Gupta (hindi)2. Applied Physics Vol.-I Hari Harlal, NITTTR3. Applied Physics Vol.-II Hari Harlal, NITTTR4,Modern Engineering Physics – A.S. Vasudeva (S. Chand)5,Solid State Physics : Kittel**Suggested Reference Book:**Solid State Physics: S. O. Pillai, Wiley Eastern Ltd. **2.**Physics Vol-I & II – Resnick & Halliday (Wiley Eastern) 3.A Text Book of Optics – Brij Lal & Subramanyam	
1D04: Applied Mathematics-I		
Objective: We can use of abstraction and logical reasoning, mathematics developed from counting, calculation, measurement, and the systematic study of the shapes and motions of physical objects. Practical mathematics has been a human activity for as far back as written records exist.		
Unit	**Topic**	**35 Hours**
Unit – I	**Matrices and Determinants:** Definition and Properties of Determinants**,** Definition and Types of Matrix**,** Transpose of a Matrix, Symmetric, Skew Symmetric Matrices,	6

	Orthogonal matrices, Hermitian and Skew Hermitian, Minors and Cofactors, Adjoint and Inverse of a Matrix, Cramer's Rule,Solution of Simultaneous Linear Equations by Inverse Matrix Method., Characteristic Matrix, Characteristic Equation, Eigen Values & Vectors, Cayley Hamilton Theorem (verification only)	
Unit – II	**Trigonometry:** Allied Angle(sin (180±A), sin (90±A) etc., Sum and Difference Formula (without proof) and their Application, Product Formula and C-D Formula, T-Ratios of Multiple and Sub-Multiple Angles (2A, 3A, A/2), Solution of Trigonometric Equations : sin X = 0, tan X = 0,cos X = 0, sin X=A, cos X =A & tan x = A	6
Unit – III	**Introduction to Different Types of Expansion:** Factorial Notation, Meaning of C(n, r), P(n, r), Binomial Theorem for Positive Index, any Index, Exponential Theorem, Logarithm Theorem **Complex Number:** Definition of Complex Number**,** Operations on Complex Number (Add., Sub ,Multiplication, Division)**,** Conjugate Complex Number**,** Modulus and Amplitude of a Complex Number, Polar form of a Complex Number	8
Unit – IV	**Two Dimensional Coordinate Geometry:** General Introduction**,** Distance Formula and Ratio Formula ,Co-ordinate of Centroid, In-Centre, Ortho-Centre and Ex-Centreof a Triangle, Area of Triangle, Straight Line, Slope form, Intercept form, Perpendicular form, One Point Slope form, Two Point form & General form, Angle between Two LinesPerpendicular Distance of a Line from a Point	7
Unit-V	**Conic: Circle :** Definition and Standard Equations**,** Equations of Tangent and Normal at a Point (simple problems)**Parabola :** Definition and Standard Equations**,** Equations of Tangent and Normal at a Point (Simple problems)**Ellipse and Hyperbola :** Definition and Standard Equations**,** Equations of Tangent and Normal at a Point(simple problems)	8
	Text Books:1. Mathematics XI & XII NCERT, New Delhi2. Mathematics XI & XII Rajasthan Board, Ajmer(Hindi)3. Polytechnic Mathematics H. K. Dass4. Text Book on Differential Calculus Chandrika Prasad **Reference Books:**1:Advanced Engineering Mathematics, Erwin Kreyszig, Wiley 9th Edition.2:Higher Engineering Mathematics, B.V.Ramana, Tata McGraw Hill.3: Thomas Calculus, Maurice D. Weir, Joel Hass and others, Pearson, 11th Edition.	
1D05: Computer Fundamental & Information Technology		
Objective: Computer programming (often shortened to programming or coding) is the process of designing, writing, testing, debugging, and maintaining the source code of computer programs. This source code is written in one or more programming languages.		
Unit	**Topic**	**40 Hours**
Unit – I	**Introduction:** Computer: An Introduction**,** Generation of Computers & Types : PC, PC/XT, PC/AT, Main Frame, Super, Lap Top, Pam Top**,** Central Processing Unit (CPU) Memory Unit, Input/ Out Devices : Keyboard, Mouse (Optical), Digitizer, Scanner,Web Camera, Monitor (CRT, TFT) , Printers, Plotters, Bar Code Reader, Secondary Storage Devices : Floppy, Hard Disk, CD, DVD, Flash, Drive, Block Diagram Showing	**8**

	Interconnection of Computer Parts, **Data Representation:** Bit, Nibble, Byte, Word**,** **Number System** : Decimal, Binary, Hexadecimal & their Conversions, Arithmetic Operations (Addition, Subtraction using Binary Number System) 1s , 2s Compliment, Coding Technique : BCD, EBCDIC, ASCII ,Idea of: Hardware ,Software, Firmware, Free ware, Human ware, Computer Languages and Translators Machine, Assembly, High Level Language, Scripting Language, Object Oriented Language, Platform Independent Language, Translators: Assembler, Interpreter, Compiler	
Unit – II	**Operating System :** Definition of Operating System (OS)**,** Types of OS**,** Single user, Multi user**,** Multi Programming**,** Time Sharing**,** Multi Processing ,**Introduction to Windows XP:** Introduction to Windows Environment**,** Parts of Windows Screen**,** Icon, Menu, Start Menu**,** Minimizing , Maximizing , Closing Windows**,** Windows Explorer, Recycle Bin, Clipboard, My Computer, My Network Places Control Panel : Adding New Hardware and Software, Display, Font, Multimedia, Mouse, International System Accessories: Paint, Media Player, Scan disk, System Information.	**8**
Unit – III	**Information Concepts and Processing:** Definition of Data, Information**,** Need of Information**,** Quality of Information**,** Concepts of Data Security, Privacy, Protection**,** Computer Virus and their types**,** Scanning & Removing Virus **Computer and Communication:** Need of Data Transmission**,** Data Transmission Media**,** Baud rate and Bandwidth, Digital and Analog Transmission Serial and Parallel Data Transfer, Protocols, MODEM. Networking of Computers : LAN, WAN, MAN, Blue tooth 6.6 LAN Topologies: Bus, Star, Ring, Hybrid Introduction to Ports : RS232, IEEE 488, PS2, USB, UTP	**8**
Unit – IV	**Information Processing:** Word processor**,** Introduction to MS-Word**,** Starting MS-Word Special Features of MS-Word**,** Using Help**,** Opening Document, Typing and Editing**,** Copying, Inserting, Moving, Deleting**,** Copying from One Document to Others , Undo, Redo, Spell Check, Find and Replace**,** Formatting**,** Characters and Fonts **,**Spacing Removing Characters Formatting**,** Inserting Symbols**,** Paragraphs, Page Setting**,** Header and Footer**,** Page Breaks**,** Borders and Shading**,** Print Preview and Printing**,** Tables and Columns**,** Mail Merge**.** Auto Text and Auto correct**,** Introduction to Macro**,** Electronic Spread Sheet**,** Introduction to MS-Excel**,** Working with Spread Sheet**,** Editing the Worksheet**,** Worksheet Formatting**,** Formula Entering**,** Function Wizard**,** Saving and Printing Work Book**,** Analysis Tools **Data Tools** Charts Linking Work Sheets**,** Report Wizard**,** Data Base Application**,** Data Base Components**,** Working with Database**,** Creating Excel Database**,** Adding Records using Data Form**,** Deleting Records using Menu Command**,** Deleting Records using Data Form**,** Editing Records**,** Finding Records based on Criteria	**8**
Unit – V	**Internet:** Introduction to Internet**,** Bridges, Routers, Switch, Gate way**,** www, Web Site, URL**,** e-mail, e-Commerce**,** Web browsing, Web page**,** Introduction to Hyper text & HTML**,** Introduction to http & ftp Protocol. **Power Point:** Introduction to Power Point**,** Creating a Presentation/Slide**,** Adding Animation in Slide**,** Running a Slide Show	**8**
	Suggested Text Books: 1. Computer Fundamental V.K. Jain, Standard Pub.& Distributors2. PC Software for Windows made simple R.K. Taxali, TMH3. Mastering Windows XP TMH4. BPB Computer Course BPB Editorial Board,5.**1.** Computer Fundamental V.K. Jain, (Hindi Edition) **Suggested Reference Books:**1. Introduction to	

	Networking NANCE, PHI2. First Course in Computer Science Sanjeev Saxena, Vikas Publishing House First Look Microsoft Office 2003 Murray, Phi3.Web Based Application Development Ivan Beyross, TMHusing HTML, DHTML, Java script Pearl/ CGI	

1D06: Applied Chemistry Lab-I		
Objective: Develop the ability of students to carry out experiments, collect and interpret data, and critically report results through "hands-on" laboratory experiences.		
	List of Experiments	
	1. Identification of Acid and Basic Radicals in a Salt (Total Numbers = 5)2. Analysis of a Mixture Containing Two Salts (Not Containing Interfacing Radicals). (Total Numbers = 5)3. Determination of Percentage Purity of an Acid by Titration With Standard Acid.4. Determination of Percentage Purity of a Base by Titration With Standard Alkali Solution.5. Determination of the Strength of Ferrous Sulphate using Standard Ferrous Ammonium Sulphate and Potassium Dichromate as Intermediate Solution6. Determination of the Strength of Farrous Sulfate Solution using Standard7.Solution of Thiosulphate.To determine the strength of NaOH and Na_2CO_3 in a given alkali mixture8.Estimation of percentage of iron in plain carbon steel.9.To find the eutectic point for a two component system by using method of cooling curve.10.Determine the reaction rate constant for the Ist order reaction	
Text Books: 1.Engineering Chemistry , Mathur and Aggarwal2. A text Book of Engineering Chemistry , S.K. Jain & K.D. Gupta**Reference Books**:1.Practical Chemistry For Engineers , Dr. Renu Gupta & Dr. Sapna Dubey		
1D07: Applied Physics Lab-I		
Objective: : An experiment or test can be carried out using the scientific method to answer a question or investigate a problem. he results are analyzed, a conclusion is drawn, sometimes a theory is formed, and results are communicated through research papers.		
	List of Experiments	
	1. To Measure Internal Dia, External Dia and Depth of a Calorimeter usingVernier Callipers.2. To Measure Density of a Wire using Screwgauge3. To Measure Radius of Curvature of a Lens, Mirror using Spherometer.4. To Determine Refractive Index of Glass using Prism.5. To Determine the Refractive Index of Glass using Travelling Microscope6. To Determine Focal Length of a Convex Lens by Displacement Method.7. To Determine the Velocity of Sound at O0c using Resonance Tube.8. To Determine Young's Modulus of Elasticity using Searle's Apparatus.9. To Determine Acceleration due to Gravity using simple pendulum.10. To verify Newton's law of cooling.	
	Text Book: 1. Advanced Practical Physics – B.L. Workshop and H.T. Flint (KPH) 2. Practical Physics – S.L.Gupta&V.Kumar (PragatiPrakashan). **Reference Books:**1.. Advanced Practical Physics Vol.I& II – Chauhan& Singh (PragatiPrakashan)	
1D08: Computer Fundamental & IT Lab- I		
Objective: The choice of language used is subject to many considerations, such as company policy, suitability to task, availability of third-party packages, or individual preference. Ideally, the programming language best suited for the task at hand will be selected.		
	List of Experiments	
	1. Study of Computer Components 2. Practice of Computer Booting Process in XP 3. Demonstration of Windows Environment 4. Practice of using My Computer, Windows Explorer 5. Practice of using Control Panel 6. Practice of My Network Places 7. Practice	

	of CD and DVD Writing 8. Practice of Paint 9. Installation of Windows XP by using NTFS File System. 10. Demonstration of Network	
	Suggested Text Books: Yadav DS, Foundations of IT, New Age, Delhi. Curtin, Information Technology: Breaking News, Tata Mo Grew Hill. **Suggested Reference Books:**Nelson, Data Compression, BPB.	

1D09: Engineering Drawing		
Objective: In order to produce a good product, a neat drawing is a must. Therefore students must be well acquainted with the knowledge of Engineering drawing. Engineering drawing is the universal language of engineers and student must be made familiar with all the relevant aspect topics of machine drawing.		
	List of Experiments	
	1. Preparation of following on Imperial Size Drawing Sheet :-1.1 Lines, Letters and Scales 1.2 Geometrical Constructions and Engineering Curves. 1.3 Projection of Lines 1.4 Projection of Planes 1.5 Projection of Solids 1.6 Orthographic Projections of Simple objects 1.7 Section and Development of Surfaces of Solids i.e. Cone, Cylinder, Sphere etc.1.8 Section and Development of Surfaces of Prism and Pyramids1.9 Isometric Projections 1.10 Riveted Joints. 1.11 Screw Threads and Fasteners 1.12 Pulleys 1.13 Couplings 1.14 Bearing 1.15 Building Drawing**2. Preparation of following Drawings in Sketch Book (Home Assignment)**2.1 Lettering (On Graph Sheet)2.2 Projection of Points In Different Quadrants2.3 Isometric Projection of Various Planes2.4 Various Types of Rivet Heads2.5 Section and Conventions2.6 Set Screws2.7 Machine Screws2.8 Foundation Bolts, Keys	
	Text Books: 1. Engineering Drawing N D Bhatt2. Machine Drawing N D Bhatt3. Engineering Graphics V. Laxmi Narayan4. Machine Drawing V. Laxmi Narayan5. Engineering Drawing P S Gill6. Machine Drawing M L Mathur **Reference Books:** 1. A Text Book of Machine Drawing Laxmi Narayana and Mathur, M/s. Jain Brothers, New Delhi.	

2D10: Workshop Practice – I		
Objective: This subject is designed to give basic knowledge of carpentry shop , fitting shop , welding shop & sheet metal shop with practical expose		
	List of Experiments	
	Carpentry Shop1. Preparation of Cross-Half Lap Joint.2. Preparation of Dovetail Joint3. Preparation of Bridle Joint4. Preparation of Mortise and Tenon Joint5. Preparation of Mitre Joint6. Demonstration of Job on Wooden Polishing Work**Welding**7. Preparation of a Butt Joint by Gas Welding.8. Preparation of Lap Joint by Electric arc Welding.9. Preparation of T-Joint by Electric arc Welding.10. Demonstration on Brazing by the Instructor.11. Demonstration on Soldering.12. Demonstration on Gas Cutting.	
1	**Suggested Text Books :**1. Workshop Technology Gupta & Malani2. Workshop Technology Kumar & Mittal3. Workshop Technology Hajra, Chaudhary **Suggested Reference Books:** Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech Publishers.	

Semester-II

2D01: Applied Chemistry-II **(Cr, L:T:P:-3,3:1:0)**		
Objective: The reactions & synthesis procedures of materials like water analysis, chemical kinetics, corrosion and basic chemistry (IUPAC) behind them will makes interesting the topic & improve the research ability with their wide ideas.		
Unit	**Topic**	**40Hours**
Unit – I	**Fuels:** Definition, Classification, Calorific Value (HCV and LCV) and Numerical Problems on Calorific Value, Combustion of Fuels, Numerical Problems on Combustion**Solid Fuels:** Coal and Coke **Liquid Fuels:** Petroleum and its Distillation Cracking, Octane and Cetane Values of Liquid Fuels Synthetic Petrol, Power AlcoholBio-Gas, Nuclear Fuels – Introduction to Fission and Fusion Reactions.	**8**
Unit – II	**Corrosion:** Definition **Theories ff Corrosion:** Acid Theory (Rusting) **,** Direct Chemical Corrosion or Dry Corrosion**,** Wet Corrosion or Electro-Chemical Corrosion(Galvanic and Concentration Cell Corrosion)Various Methods for Protection from Corrosion	**8**
Unit – III	**Polymers:** Definition **Plastics:** Classification, Constituents**,** Preparation, Properties and Uses of Polythene, Bakelite Terylene and Nylon. **Rubber:** Natural Rubber, Vulcanization **,**Synthetic Rubbers - Buna - N, Buna-S, Butyland Neoprene	**8**
Unit – IV	**Cement and Glass:** Manufacturing of Portland Cement**,** Chemistry of Setting and Hardening of Cement**,** Glass : Preparation, Varieties and Uses. **Lubricants:** Definition, Classification Properties of Lubricants : Viscosity, Oiliness, Flash Point, Fire Point, Acid Value, Saponificatin, Emulsification, Cloud and PourPoint., Artificial Lubricants	**8**
Unit-V	**Miscellaneous Materials:** Refractory's: Definition, Classification and Properties Abrasives : Natural and Synthetic Abrasives**,** Paint and Varnish : Definition and Function of Constituents**,** Soap and Detergents : Definition, Properties and Uses**15. _ew Engineering Materials: (Brief Idea of Following)** Superconductors, Organic Electronic Materials Fullerences Optical Fibres	**8**
1 **Text Books**1. Practical Chemistry for Engineers Virendra Singh (Hindi)2. Hand book of Technical Analysis Bannerji Jain Bros.Jodhpur3. Engineering Chemistry-I(Hindi) Mathur & Agrawal.4.. Inorganic Chemistry Shivhare & Lavania**Suggested Reference Books:** Engineering Chemistry, Jain & Jain, Dhanpat RaiEngineering Chemistry, M.M. Uppal		

2D02:	Applied Physics-II	
Objective: physics is combined with problem solving and engineering skills, which then has broad applications. Career paths for Engineering physics is usually (broadly) "engineering, applied science or applied physics through research, teaching or entrepreneurial engineering".		
Unit	**Topics**	**38 Hours**
Unit – I	**A.C. Circuits:** Faraday's Laws of Electro Magnetic Induction, Lenz's Law Self and Mutual Inductance Alternating Current, Phase & Phase Difference**,** Instantaneous, Average and rms value of AC, Behaviour of Resistance, Capacitance and Inductance in anAC Circuit, AC Circuits Containing, R-L, R-C and LCR in Series ,Power in AC Circuit and Power Factor,Choke Coil	**8**
Unit – II	**Semi Conductor Physics:** Energy Bands in Conductor, Semi Conductor & Insulator**,** Chemical Bonds in Semiconductor**,** Intrinsic and Extrinsic Semiconductors**,**PN-Junction Diode, Working, Biasing and Characteristics Curves**,**Zener Diode and Voltage Regulation using it**,** Half Wave & Full Wave Rectifiers (only working, no derivations),Junction Transistors, Working, Biasing and Characteristic Curves, Brief Idea of Using Transistors as an Amplifier (without mathematical analysis)	**10**
Unit – III	**Modern Physics:** Photo Electric Effect**,** Einstein's Equation**,** Photo Cells**, Lasers:** Stimulated Emission and Population Inversion, Types of Laser - Helium Neon and Ruby Laser, Application of Lasers (brief idea only),Material Processing, Lasers in Communication Medical Applications	**8**
Unit – IV	**Nuclear Physics:** Idea of Nuclear Force**,** Mass - Defect and Binding Energy**,** Nuclear Reactions, Natural and Artificial Radioactivity **,** Law of Radioactive Disintegration Half Life & Mean Life, Idea of Nuclear Fission and Fusion. Chain Reaction, Nuclear Reactor	**8**
Unit –V	**Pollution and its control:** Introduction to Pollution – Water, Air, Soil , Noise, Nuclear andmental pollution, Types of Pollution , Brief idea about Noise Pollution and its Control, Nuclear Hazards, Nuclear Waste Management	**4**
1	**Suggested Text :1.**A Text Book of Applied Physics N.S. Kumar (Hindi)**2.**Principles of Physics Brijlal, Subhramanyam 3.Applied Physics Vol.-II Hari Harlal, NITTTR **Reference Books:**A Text Book of Applied Physics N.S. KumarPrinciples of Physics Brijlal, Subhramanyam	

2D03: Applied Mathematics-II		
Objective: Engineering mathematics is a branch of mathematics that concerns itself with mathematical methods that are typically used in science, engineering, business, and industry. Thus, "applied mathematics" is a mathematical science with specialized knowledge.		
Unit	**Topics**	**40 Hours**
Unit – I	**Limits:** Concept of Limit**,** L.H.L., R.H.L., Limit of Standard Functions , Concept of Continuity and Differentiability at a Point (simple Problems)**Function:** Definition of Function**,** Range and Domain of Function**,** Types of Function**,** Absolute Value Function**,** Exponential value Function**,** Identity Function**,** Reciprocal Function**,** Rational and Irrational Function, Increasing and decreasing Function	**8**
Unit – II	**Differential Calculus :** Standard Formulae (Except Hyperbolic Function)**,** Derivative of Sum, difference, Multiplication and Division of two Functions**,** Differentiation of Function of a Function**,** Logarithmic Differentiation**,** Differentiation of Implicit Functions**,** Differentiation of Parametric Functions**,** Differentiation by Trigonometric Transformations**,** Differentiation of a Function w.r.t. Another Function**,** Second Order Derivative**Applications of Differential Calculus:** Geometrical meaning of dy / dx . Tangents and Normals **,** Angle of Intersection between two Curves**,** Derivative as a Rate Measurer**,** Errors and Approximations**,** Maxima and Minima of Function with one Variable	**10**
Unit – III	**Integral Calculus:** General Introduction of Integral Calculus**,** Integration of Sum and difference of Functions, Integration by Simplification**,** Integration by Substitution Integration by Parts, Integration of Rational and Irrational Functions, Additional standard **F**ormulae, Integration of Trigonometric Functions, Definite Integral and its Properties.	**10**
Unit – IV	C**OORDINATE GEOMETRY Straight Lines: Differential Equations:** Definition of differential Equation. Order, Degree and Solution of a differential Equation. Solution of a differential Equation of First Order and First Degree using, Variable Separable Method**,** Homogenous Form**,** Reducible to Homogenous Form**,** Linear differential Equation Bernoulli's Equation**,** Exact differential Equation**,** Substitution Method**,** Solution of Linear Differential Equation of Higher order with Constant Coefficients Applications of Differential Equations to L-R, L-C, L-C-R ,Circuits of Standard Forms	**8**
Unit-V	**Vector Algebra:** Definition, Addition and Subtraction of Vectors Scalar and Vector Product of two Vectors Scalar Triple Product and Vector Triple Product , Applications of Vectors in Engineering Problems **Numerical Integration :** Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Newton - Raphson Rule	**4**
Suggested Text1. Text Book on Differential Calculus Chandrika Prasad (Hindi)2. Text Book on Integral Calculus Chandrika Prasad3. Differential Calculus M. Ray, S. S. Seth, & G. C. Sharma4. Integral Calculus M. Ray, S. S. Seth, & G. C. Sharma **Reference Books:** 1.Integral Calculus, M.Ray, S.S.Seth&G.C.sharma. 2.Vector Calculus, R.Kumar.		
2D04:	**Electrical & Electronics Technology**	
Objective: At the end of the course the student will be able to gauge various fundamentals aspects of Basic Electrical and Electronics engineering covering networks theory, single and three phase circuits, transformers and dc machines. Also it will impart knowledge about transistors and thyristor.		
Unit	**Topic**	**36 Hours**

Unit – I	**DC Networks :** Resistance, inductance, capacitance, current, voltage, power, Ohms law**,** Kirchhoff's Laws, Node Voltage and Mesh Current Analysis; Delta-Star and Star-Delta Transformation, Source Conversion. Classification of Network Elements, Superposition Theorem, Thevenin's Theorem.	**10**
Unit – II	**Single Phase AC Circuits :** Generation of Single Phase AC Voltage, EMF Equation, Average, RMS and Effective Values. RLC Series, Parallel and Series- Parallel Circuits, Complex Representation of Impedances. Phasor Diagram,Power and Power Factor.**Three Phase A.C. Circuits :** Generation of Three-Phase AC Voltage, Delta and Star-Connection, Line & Phase Quantities, 3-Phase Balanced Circuits, Measurement of Power in Three Phase Balanced Circuits.	**10**
Unit – III	**Transformer :** Faraday's Law of Electromagnetic Induction, Construction and Operation of Single Phase Transformer, EMF Equation, Voltage & Current Relationship and Phasor Diagram of Ideal Transformer.	**8**
Unit – IV	**Transistor:** Bipolar Junction Transistor, Transistor Current Components, Characteristics of CE, CB and CC Transistor Amplifiers.**Thyristors:** Diode and VI characteristic, four layer diode, Bi-directional thyristors.	**8**
Suggested Text /: Sahdev – Basic Electrical and Electonics Engg.J.B.Gupta – Basic Electrical and Electronics Engg.(Hindi)B.L. Thareja- Electrical Technology-Vol I**Reference Readings** 1.H.P. Tiwari – Electrical and Electronics Engg. 2. Basic Electrical and Electonics Engg, Tata Mcgraw Hill		

2D05:	Applied Mechanics	
Objective: This subject is design to give the basic knowledge of equilibrium of forces, center of gravity, centroid, moment of inertia and concept and application of work power energy**.**		
Unit	**Topics**	**40 Hours**
Unit – I	**Force:** Definition**,** Units**,** Different Types of Forces. **Coplanar Forces:** Resolution of Forces**,** Law of Parallelogram of Forces**,** Resultant of two or more Forces**,** Basic Conditions of Equilibrium**,** Lami's Theorem (No Proof)**,** Jib Crane**,** Law of Polygon of Forces (Only Statement)**Moment:** Definition, Units & Sign Convention., Principle of Moments, Application of Equilibrium Conditions for non-concurrent Forces	**8**
Unit – II	**Application of Principles of Forces & Moments:** Levers & their Types.**,** Reactions of Simply Supported Beams (Graphical & Analytical Method)**,** Steel Yard .**,**Lever Safety ValveFoundry Crane**Centre of Gravity:** Concept**,** Centroid**,** Calculation of C.G. of Regular Bodies**,** Calculation of C.G. of Plain Geometrical Figures **Friction:** Types of Friction**,** Laws of Friction**,** Angle of Friction**,** Angle of Repose**,** Friction on Horizontal and Inclined Plains**,** Application of.	**10**
Unit – III	**Simple Machines:** Basic Concepts**,** Loss in Friction**,** Inclined Plane**,** Simple & Differential Wheel and Axle (Neglecting Rope thickness) Screw Jack Lifting Crabs Systems of Pulleys**,** Worm and Worm Wheel **Rectilinear Motion:** Concept**,** Motion under Constant Velocity**,** Motion under Constant Acceleration**,** Velocity-time graph and its uses **Motion under Gravity:** Concept**,** Vertical Motion**,** Smooth Inclined Plane **Projectiles:** Concept	**10**
Unit – IV	**Simple Machines:** Basic Concepts**,** Loss in Friction**,** Inclined Plane**,** Simple & Differential Wheel and Axle (Neglecting Rope thickness)**,** Screw Jack**,** Lifting CrabsSystems of Pulleys, Worm and Worm Wheel **Rectilinear Motion:** Concept**,** Motion under Constant Velocity**,** Motion under Constant Acceleration**,** Velocity-time graph and its uses	**8**
Unit-V	**Motion under Gravity:** Concept**,** Vertical Motion**,** Smooth Inclined Plane **Projectiles:** Concept, Range, Maximum Height and Time of Flight, Equation of Trajectory Calculation of Velocity of Projectile at Certain Height, And at Certain instant **Newton's Laws of Motion:** Definitions**,** Momentum and it's Unit**,** Application of Second Law of Motion	**4**
1. **Suggested Text Books**Engineering Mechanics by, RK Rajpoot (Hindi)Engineering Mechanics by, RS Khurmi Engineering Mechanics By Chitranjan Aggarwal**Suggested Reference BooksEngineering Mechanics by Nelson , Tata Mcgraw HillEngineering Mechanics by Shailesh Kumar**		

2D06:Applied Chemistry Lab-II		
Objective: Develop the ability of students to carry out experiments, collect and interpret data, and critically report results through "hands-on" laboratory experiences.		
	List of Experiments	
	1. Determination of the Strength of Copper Sulphate Solution using a Standard Solution of thio Sulphate.2. Determination of pH Values of Given Samples. 3.Determination of Hardness of Water by EDTA Method.4. Estimation of Free Chlorine in Water.5.Determination of Acid Value of an Oil.6. Preparation of Soap.7.To determine the Viscosity & Viscosity Index of a given lubricating oil by Redwood Viscometer No. 1	
Text Books: 1.Engineering Chemistry , Mathur and Aggarwal2. A text Book of Engineering Chemistry , S.K. Jain & K.D. Gupta**Reference Books**:1.Practical Chemistry For Engineers , Dr. Renu Gupta & Dr. Sapna Dubey		
2D07: Applied Physics Lab-II		
Objective: This lab is to help the student to understand the concept of Diode, PN junctions, Half deflection method and the concept of cells**.**		
	List of Experiments	
	1. To Determine Acceleration due to Gravity using Simple Pendulum.2. To Verify Newton's Law of Cooling.3.. To Verify Law of Resistances.4. To Determine Specific Resistance of Material using Meter Bridge.5. To Determine Internal Resistance of a Primary Cell using Potentiometer.6. To Compare emf of two Primary Cells using a Potentiometer.7. To Draw Characteristic Curves of PN Diode and Determine its Static andDynamic Resistance.8. To Draw Characteristic Curves of a PNP/NPN Transistor in CB/CEConfiguration.9.. To Measure Resistance of a Galvanometer by Half-Deflection Metho	
Text Book: 1. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH) 2. Practical Physics – S.L.Gupta&V.Kumar (PragatiPrakashan). **Reference Books:**1.. Advanced Practical Physics Vol.I& II – Chauhan& Singh (PragatiPrakashan)		

2D08: **Electrical & Electronics Workshop**		
Objective: this lab will help the students learn about key and basic electrical devices and apparatus used in day-to-day life. Also this will be useful in gaining knowledge about house hold electrical circuits.		
	List of Experiments	
	1. Study of Symbol, Specification and Approximate Cost of Common Electrical Accessories, Tools and Wires & Cables Required for Domestic Installation. Study of : 2.1 Basic Electricity Rules for a Domestic Consumer2.2 Safety Precautions & use of Fire Fighting Equipments3. Use of series of Phase Tester, Series Test Lamp, Tong Tester and Megger in Testing of Electrical Installation.4. 4.1 Prepare a Potential Divider and Measure Resistance of a Filament Lamp Using Voltmeter and Ammeter.4.2 Measurement of Power and Energy Consumption by an Electric Heater using Watt Meter and Energy Meter.5. Preparation of Wiring Diagram, Wiring, Testing, Fault Finding & Costing for :5.1 Control of one Lamp by one Switch (using Batten and Tumbler Switch)5.2 Control of Stair Case Wiring (using Casing Capping, CFL and Flush Type Switches)5.3 Control of one Bell Buzzer and Indicator by one Switch(using Conduit and Flush type Switch)6. Prepare one Switch Board as per Institutional Requirement (using Flush type Switches, Sockets, MCB, ELCB, Etc.)7. Study, Connecting, Testing and Fault Finding of 7.1 Fluorescent Tube and its Accessories7.2 Ceiling Fan with resistance type and Electronic Regulator8. Study, Functioning, Fault Finding & Repairing of following Domestic Appliances -8.1 Automatic Electric Iron8.2 Air Cooler8.3 Electric Water Pump9. Design, Draw and Estimate the Material required for Installation For a small Residential Building/ Office/ Hall. **Identification of following Resistors and finding their Values:** 1.1 Carbon and Metal Film1.2 Variable Resistance Log and Linear1.3 Semi Variable Preset of One Turn & Multiturn**2. Identification of following Capacitor and finding their Values:** 2.1 Mica2.2 Ceramic2.3 Polysterene2.4 Electrolytic2.5 Tantalum**3. Identification of following Switches and Study of their Working Mechanism:** 3.1 Toggel3.2 Bandswiteh3.3 Rotary3.4 Push to on and off3.5 Press to on and off**4. Identification and Testing of following type of Connectors:** 4.1 Rack and Panel4.2 Printed Circuit Edge4.3 Coaxial4.4 Tape & Ribbon4.5 Plate**5. Study of Different Relays and their Contacts.6. Study of following Tools used in Electronic Workshop:** 6.1 Component Lead Cutter6.2 Wire Strippers6.3 Soldering Iron & Soldering Station6.4 De-Solder Pump**7. Measurement of Voltage, Current and Resistance using Analog &Digital Millimeter. 8. Testing of Electronic, Component such as Capacitor, Inductor, Diode and Transistor. 9. Measurement of Amplitude & Frequency of a Signal using CRO. 10. Verification of Ohm's law using Resistive Circuit and Analog Meters.11. Soldering of different passive component combination on general purpose PCB.12. Sketching of different Electronic Components Symbol on Drawing**	
Text Books : Electrical Workshop M.L. Gupta2. Domestic Devices & Appliances K.B. Bhatia3. Electrical Workshop S.L. Uppal4. Electrical Component & Shop Practice K.R. Nahar5. Maintenance of Electrical Equipments K. S. Janwal6. Hand Book of Philips Component **Reference Books:** 1.Electrical Components and Shop Practice ,K.R. Nahar		
2D09: Workshop Practice -II		

Objective: This Lab is design to give practical exposure of engineering workshop in different shop like smithy shop, machine shop, foundry shop, and student should be able to understand different types of tool, material and measuring instrument and their application.

	List of Experiments	
	Sheet Metal Shop: Preparation of following utility Jobs Involving Various Sheet Metal Joints (Single and Double Hem Joints, Wired Edge, Lap Joint Grooved Seam Joint, Single and Double Seam Joint) and Exercises (Soldering and Riveting Joints)1 Preparation of a Soap Tray &Mug2. Preparation of Funnel **Fitting and Plumbing Shop**1. Marking Filing & Hack Sawing Practice.2. Production of Utility Job involving Marking, Filling and Hack Sawing.3. Production of Utility Job involving Marking, Filling and Hack Sawing Drilling and Tapping.4. Cutting and Threading on G.I. Pipe5. Exercise on PVC Pipe Fitting.6. Repair of Taps and Cocks.	

1. **Suggested Text Books :** 1 Workshop Technology B.S. Raghhuwanshi2. Workshop Technology (Hindi) Tahil Maghnani3. Workshop Technology (Hindi) Vinay Kumar4. Domestic Devices and Appliances K.B. Bhatia**Suggested Reference Books:** Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech Publishers

2D10 : Computer Fundamental & IT Lab-II		
Objective: This lab is designed so that the better presentations and documents could be made by the students. It comprises the M.S. Excel, M.S. and PowerPoint presentations.		
	List of Experiments	
	1. Visit to Internet Site 2. Creating e-mail Account, Sending and Receiving e-mails. 3. Sending e-mail with Attachment & Signature 4. Searching Web Page/ Site using Search Engine (eg. google.com, yahoo.com, altavista.com etc.) 5. Exercise Based on MS-Word: 5.1 Document Preparation 5.2 Printing Document 5.3 Mail Merge usage5.4 Draw Table 6. Exercise Based on Ms-Excel: 6.1 Work Book Preparation 6.2 Printing Workbook6.3 Data-base usage6.4 Draw Charts7. Exercise Based on Power Point : 7.1 Creating Slide7.2 Adding, Animations in Slide7.3 Running Slide8. Creating Simple Web Page using HTML.	
Suggested Text Books: 1. Yadav DS, Foundations of IT, New Age, Delhi. 2.Curtin, Information Technology: Breaking News, Tata Mo Grew Hill. **Suggested Reference Books:1.**Nelson, Data Compression, BPB.		

Unit	Name of the topics	Hours
I	**FILTERS, ZENER DIODES AND OPTO-ELECTRONIC DEVICES** **1.1: FILTERS** Definition - Types - Capacitor filter - Inductor filter - L section filter - Pi section and RC filter - Comparison and Applications of Filters **1.2: ZENER DIODE** Construction, Working principle and Characteristics of Zener Diodes- Zener Breakdown-Avalanche breakdown- Zener diode as a Voltage regulator. **1.3: OPTO-ELECTRONIC DEVICES** Definition - Types - Symbol, Working, Characteristics and Applications of LED, 7 Segment LED - Photo diode, Photo transistor and Opto- coupler.	**5** **5** **4**
II	**BIPOLAR JUNCTION TRANSISTOR (BJT), FIELD EFFECT TRANSISTOR (FET) AND UNI JUNCTION TRANSISTOR (UJT)** **2.1 : BIPOLAR JUNCTION TRANSISTOR** Transistor biasing: Need for biasing - Types- Fixed bias, Collector to base bias and Self bias (Operation only, no derivation of circuit elements and parameters)–Define: Stability factor - Operation of Common Emitter Transistor as an Amplifier and as a switch. **2.2 : FIELD EFFECT TRANSISTOR (FET)** Construction – Working principle–Classification - Drain and Transfer Characteristics - Applications–Comparison between FET and BJT - FET amplifier (common source amplifier). **2.3 : UNIJUNCTION TRANSISTOR (UJT)** Construction- Equivalent Circuit-Operation-Characteristics- UJT as a relaxationoscillator.	**7** **5** **4**
III	**FEEDBACK, AMPLIFIERS AND OSCILLATORS** **3.1: FEEDBACK** Concept - effects of negative feedback-Types of negative feedback connections - Applications **3.2: AMPLIFIERS** Transistor amplifiers - Types - RC coupled amplifier - Working and Frequency response characteristics –Working of Common Collector Amplifier (Emitter follower)	**6** **6**

	Transistor oscillators–Conditions for oscillation (Barkhausen criterion)- Classifications– Hartley Oscillator– Colpitts Oscillator – RC Phase shift oscillator.	
IV	**SPECIAL SEMICONDUCTING DEVICES (SCR, DIAC AND TRIAC)** **4.1:SCR (SILICON CONTROLLED RECTIFIER)** Symbol – Layered Structure – Transistor analogy - Working–VI characteristics– Applications - Comparison between SCR and Transistor **4.2 : DIAC (Diode for Alternating Current)** Symbol – Layered structure - Working – VI characteristics- Applications **4.3 : TRIAC (Triode for Alternating Current)** Symbol – Layered structure - Working – VI characteristics- Applications	**5** **5** **4**
V	**WAVE SHAPING CIRCUITS** **5.1: CLIPPERSAND CLAMPERS** Construction and working of Positive, Negative and biased Clippers - Construction and working of Positive and Negative Clamper **5.2: Voltage Multipliers** Construction and working of Voltage Doubler and Tripler. **5.3: Multivibrator and Schmitt Trigger** Construction – Working – Waveform of Astable and Monostable Multivibrator using Transistors and Schmitt Trigger using Transistors.	**5** **3** **5**

TEXT BOOKS:

1. Electronics Devices & Circuits by Salivahanan S,N.Suresh Kumar, A.VallavarajTata McGraw Publication 3rdEdition 2016
2. Electronics Devices & Circuits by Jacob Millman and Halkias 3rd Edition, 2010, Tata McGraw– Hill publication

REFERENCE BOOKS:

1. Electronics Devices & Circuits by Salivahanan S,N.Suresh Kumar, A.VallavarajTata McGraw Publication 3rdEdition 2016
2. Electronics Devices and circuit theory by Boyestad & Nashelsky, PHI, New Delhi 2009
3. Electronic Principles by Malvino, -Tata McGraw Hill Publication 2010.
4. Optical Fiber Communication by Gerd Keiser 5th Edition, Tata McGraw– Hill.

RATIONALE:

- Electric circuit analysis is the process of finding the voltages across, and thecurrentsthrough the components in the network. Many Techniques are available for calculating these values.
- Part of the course is deal with basics of Network Analysis, introduction to network elements and explains methods for finding voltage and current across any network Component with DC Source, Single Phase AC and Three Phase AC Sources.
- This Course aims at making the student to conversant with different techniques of solving the problems in the field of Electric Circuits and Analysis.

OBJECTIVES:

The students should be able to:

- Explain the concept of Resistance, Capacitance and analyze different Circuit Elements, Energy Sources and analysis of Networks by Kirchhoff's Laws.
- Analyze the concepts of Nodal and Mesh Analysis and Analyze different Theorems forDC Circuits.
- Analyze Single Phase Circuits using Resistor, Inductor & Capacitor Elements.
- Analyze Balanced Three Phase AC Circuits and perform the Three Phase Power Measurement Calculations.
- Explain the Concept of storage batteries, care, maintenance and applications.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**DC CIRCUITS** Basic Concepts of Current, EMF, Potential Difference, Resistance and Resistivity– Ohm's Law –Work, Power, Energy- Resistance in Series, Parallel and Series - Parallel Circuits – Kirchhoff's Laws – Concept of Capacitance - Capacitors in Series and in Parallel - Problems in the above Topics.	18
II	**CIRCUIT THEOREMS** Definitions of Node, Branch and Network – Mesh Equations–Nodal Equations–Star / Delta Transformations – Superposition Theorem – Thevenin's Theorem –Norton's Theorem – Maximum PowerTransfer Theorem. (Problems in DC Circuits only)	18
III	**SINGLE PHASE CIRCUITS** Definitions of Sinusoidal Voltage and Current– Instantaneous, Peak, Average and Effective Values – Form Factor and Peak Factor (Derivation for Sine Wave) – Pure Resistive, Inductive andCapacitive Circuits –RL, RC, RLC Series Circuits – Impedance –Phase Angle – Use of 'J' Notations–Rectangular and Polar Coordinates - Phasor Diagram Power and Power Factor – Power Triangle – Apparent Power, Active and Reactive Power– Parallel Circuits (Two Branches Only)- Conductance, Susceptance and Admittance–Problems in allabove topics. **RESONANCE** Concept of Series Resonance – Parallel Resonance (R, L & C)- Applications (No Problems)	10 8

IV	**THREE PHASE AC CIRCUITS** Three Phase AC Systems-Phase Sequence –Necessity of Three Phase System–Concept of Balanced and Unbalanced Load - Balanced Star & Delta Connected Loads–Relation between Line and Phase Voltages and Currents – Phasor Diagram Three Phase Power – Power Factor – Three Phase Power and Power Factor Measurement by Single Wattmeter and Two Wattmeter Methods–Problems in all Topics.	8 10
V	**STORAGE BATTERIES** Classification of cells – Construction, Chemical action and physical changes during charging and discharging of Lead Acid, Nickel Iron and Nickel Cadmium Cells – Advantages and Disadvantages of Nickel Ion and Nickel Cadmium Cells over Lead Acid Cell - indication of fully charged and discharged battery – defects and their remedies – capacity - AH efficiency and WH efficiency (no problems) – methods of charging - care and maintenance – applications – maintenance free batteries – Lithium Cells, Lithium - Ion Cells and Mercury Cells – Concept of Recharged Cell.	17

TEXTBOOK

S.No	Name of the Book	Author	Publisher
1.	Electric Circuit Theory	Dr.M.Arumugam	Khanna Publishers

REFERENCE BOOKS

S.No	Name of the Book	Author	Publisher
1.	Circuits and Networks Analysis and Synthesis	A Sudhakar Shyammohan S Palli	Tata McGraw Hill Education Private
2.	Electric Circuits	Mahamood Nahvi Joseph A Edminister	Schaum Publishing Company, Newyork

RATIONALE

- ✓ This subject is classified under core technology group which intends to teach the facts, concepts, principles of electrical machines, such as DC generators, DC motors, Brushless DC motor, Single & Three Phase Transformers and DC Electrical Source (battery).
- ✓ Students will be able to analyze the characteristics of DC Generators and Motors, Brushless Dc Motor, Single & Three Phase Transformer, Battery & Qualitative Parameters of these Static and Dynamic Machines. These Machines are used in Transmission, Distribution and Utilization Systems.
- ✓ Knowledge gained by students will be helpful in the study of advanced subjects like Utilization of Electrical Energy, Switchgear & Protection, Manufacturing Processes and Maintenance of Electrical Machines.

OBJECTIVES

Students will be able to:

1. Explain the concept Electromagnetism and Principles.
2. Know the constructional details and working principles of DC Machines and Transformers.
3. Evaluate the performance of DC Generators, Motors and Transformers.
4. Study the applications of DC Generator, Motor and Transformer for specific fields.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**DC GENERATORS** Review of electromagnetic induction – Faraday's laws –Lenz's law - Fleming's right hand rule – Principle of operation of D.C. generator –Construction of D.C. generator – Types of armature windings(No Winding diagram) – EMF equation(Simple problems) –Types of D.C. generators – No load and load characteristics of DC generators – Causes of failure to build- up voltage and remedy – armature reaction – methods of compensating armature reaction – process of commutation – methods of improving commutation. Load characteristics of DC generators – Applications of DC generators.	15
II	**DC MOTORS** Principle of operation of D.C. Motor – Fleming's left-hand rule – ConstructionBack emf – Torque equation – Types of DC motors –Torque-current, Speed- current, Speed- Torque characteristics of different DC motors – Speed control of DC motors– Field control and armature control – necessity of Starters– 3 Point and 4 Point starters –losses in D.C. Machines – Testing of D.C. Machines – Predetermination of efficiency of motor and generator by Swinburne's test – Problems in the above topics – Applications of D.C. Motors.	15
III	**SINGLE PHASE TRANSFORMER** Principle of operation – Constructional details of core and shell type Transformers – EMF Equation – Voltage ratio –Transformer on No load – Transformer Full load – Current ratio – Phasor diagram on no load and Full load at different power factors. O.C. test, S.C. test –Determination of equivalent circuit constants– Determination of voltage regulation and efficiency – Condition for maximum efficiency– All day efficiency – Problems on the above topics - polarity test– Parallel operation of Single Phase transformers– Auto transformer –principle – Applications of transformers – Energy Efficient Transformer – Dry Type Transformer & Amorphous Core Transformer.	15

IV	**THREE PHASE TRANSFORMER** Three phase Transformer – construction, types of connections of transformer. Parallel operation of three phase transformers – grouping of transformers – Pairing of transformers - Load sharing of transformers with equal and unequal ratings – Cooling of transformers – Various coolingarrangements – Transformer accessories – conservator, breather, explosionvent, bucholz relay – ON load and OFF load tap changer.	15
V	**MAINTENANCE OF DC MACHINES AND TRANSFORMERS** Maintenance – Importance, Preventive and Breakdown maintenance - Advantages of preventive maintenance - Causes of Sparking in Commutators – Defects in Commutators and Remedies – Resurfacing of Commutators and Brushes – Maintenance of Brush Holder – Staggering of Brushes, Brush Pressure - Defects in DC Armature winding – Maintenance of Earthing of DC Machines. Maintenance of Transformer Oil - Transformer oil tester – Acidity test, BDV Test - Earthing – Measurement of earth resistance.	13

TEXTBOOK

Sl.No.	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	A Textbook of Electrical Technology Volume II	B.L. Theraja	S.Chand & Co.New Delhi
2	Electrical Technology	EdwardHughes	Addision – Wesley International Student Edition

REFERENCE BOOK

Sl.No.	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	Elements of Electrical Engineering	Maria Louis	Prentice - Hall of India Pvt
2	Electrical Machines	Nagarath	TMH Publications
3	Electrical Machines	Bhattacharya	TMH Publications

OBJECTIVES:

On completion of the following experiments, the students must be able to

- Know the Cold Checking of Active and Passive Component
- Find out the Unknown Resistance value of a Resistor using Colour Coding
- Find out the Unknown Capacitance value of a Capacitor using Colour Coding
- Find out the Unknown Inductance value of an Inductor using Colour Coding
- Understand the concept, working principle and applications of PN Junction diode
- Understand the concept, working principle and applications of Zener diode
- Understand the concept, working principle and applications of BJT and FET
- Understand the concept, working principle and applications of UJT
- Understand the concept, working principle and applications of SCR
- Understand the concept, working principle and applications of DIAC and TRIAC
- Understand the concept, working principle and applications of Clippers and Clampers
- Understand the concept, working principle and applications of various types of Negative feedback amplifiers
- Understand the concept, working principle and applications of Astable Multivibrator

DETAILED SYLLABUS

Contents: Practical

Exercises

Note: At least 5 experiments should be done using Soldering board / Bread board

1. Construct a circuit to test the forward and reverse bias characteristics of a PN Junction Silicon diode. Find the value of its cut-in voltage
2. Construct a circuit to test the forward and reverse bias characteristics of a Zener diode. Find the value of its reverse breakdown voltage
3. Construct a Full wave (center tapped) rectifier and test its input and output waveforms with and without Capacitor filter. Find its maximum voltage.
4. Construct a Full wave (Bridge) rectifier and test its input and output waveforms with and without Capacitor filter. Find its maximum voltage.
5. Construct a Common Emitter Transistor circuit and test its input and output characteristic curves.
6. Construct a Common Source Field Effect Transistor circuit and test its drain and transfer characteristic curves.
7. Construct a circuit to test the Turning on and Turning off characteristics of SCR and find out the forward break over voltage, the value of Latching and Holding currents.
8. Construct a circuit to test the bidirectional characteristics of DIAC and plot its switching characteristics.
9. Construct a circuit to test the bidirectional characteristics of TRIAC and plot its switching characteristics.
10. Construct a Common emitter amplifier circuit and test its frequency response characteristics with and without Current series feedback introduced in it.
11. Construct a circuit to test the switching characteristics of Astable Multivibrator
12. Construct a circuit to test the negative resistance Characteristics of UJT.

OBJECTIVES

On completion of this Practical Subject, the Students will be able to:

- Make the various Circuit connections in Machines Laboratory.
- Practically prove all the Theorems and Principles which are dealing with DC Current.
- Understand the Characteristics of Electrical Machines and to determine the Efficiency of the Machines.
- Test the performance of Transformer to find its Efficiency, Voltage Regulation and Characteristics.
- Study the various Speed Control Methods of DC Motor.

DETAILED SYLLABUS

ELECTRICAL CIRCUITS AND MACHINES PRACTICAL

LIST OF EXPERIMENTS:

CIRCUITS:

1. Verification of Super Position Theorem with two different DC Voltages for a common load.
2. Verification of Thevenin's Theorem with DC Supply
3. Measurement of Power
    a. using Ammeter and Voltmeter
    b. using Wattmeter for Single Phase Resistive Load.

MACHINES:

4. No load and FULL Load Characteristics of Self Excited DC Shunt Generator.
5. Load Characteristics of Self Excited DC Series Generator.
6. Load Test on DC Shunt Motor and Draw the Performance Curve.
7. Load Test on DC Series Motor and Draw the Performance Curve.
8. Predetermine the Efficiency of DC Machines by Swinburne's Test.
9. Speed Control of DC Shunt Motor by
    a. Armature Control Method
    b. Field Control Method
10. Load Test on Single Phase Transformer
11. Load Test on Three Phase Transformer
12. Predetermine the Efficiency and Regulation of Single-Phase Transformer by conducting O.Cand S.C Tests

13. Find the Equivalent Circuit Constants of Single-Phase Transformer by conducting O.C and S.CTests.

14. Connect two Single Phase Transformers for Parallel Operation.

15.a) Perform Breakdown Test And determine the Dielectric Strength of Transformer Oil

b) Conduct Acidity Test on Transformer Oil.

15	Rheostat – various ranges 50Ω/5A,100 Ω/5A, 300 Ω/2A, 600 Ω/2A(or equivalent)	4
16	AC Ammeter – various ranges 0-500mA,0-1/2A, 0-5/10A,0-10/20A (or equivalent)	8
17	DC Ammeter – various ranges 0-500mA, 0-2A,0-5A,0-10A,0-15/30A (or equivalent)	8
18	DC Voltmeter – 0-5/10V, 0-30V, 0-300V	8
19	AC Voltmeter – 0-75V, 0-150V, 0-300V, 0-600V	8
20	Wattmeter – various ranges LPF 150/300/600V 2.5A/5A,1/2.5A	6
21	Wattmeter – various ranges UPF 75/150/300,5/10A	6
22	Wattmeter – various ranges UPF 150/300/600V 10/20A	6
23	Transformer oil tester kit, Acidity test kit	Each 1

DETAILED SYLLABUS

LIST OF EXPERIMENTS:

1. Familiarization of tools used for Electrical repair works and personal Protection Equipments.
2. Dismantling of Electrical Iron Box, identifying the parts, checking theconditions, assembling, and testing.
3. Dismantling of Mixer Grinder, identifying the parts, checking the conditions,assembling and testing.
4. Dismantling of Wet Grinder, identifying the parts, checking the conditions, assembling, and testing.
5. Assembling the accessories of Ceiling Fan, test the connections of winding& Capacitor and run the Fan with Speed Regulator.
6. Connect the Battery and Inverter to supply partial load in a Domestic Wiringduring Mains Failure.
7. Assembling and testing of 15watts LED Light.
8. Battery Charging through Solar Panel. Connect Solar Panel to chargeBattery through Charge Controller.
9. Dismantling of Induction Heater, identifying the parts, checking theconditions, assembling, and testing
10. Dismantling of Microwave Oven, identifying the parts, checking theconditions, assembling and testing.

OBJECTIVES

At the end of this Practical Course the Students should be able to:

- Execute the Emergency Alarm Circuit
- Execute the wiring for Single Phase Service Connection with necessary items.
- Execute the wiring of Three Phase Supply using 3 Rotary Switches, MCB and DB tochange the Phases by connecting Single Phase Lamp Load
- Execute the wiring to controlling the intensity of Lamp by six places by using two2-Way Switches and 4 Intermediate Switches.
- Execute the wiring to connect a Single-Phase Motor with Main Switch, D.O.L Starterand M.C.B
- Execute The Wiring to Connect A 3 Phase Induction Motor with Main Switch, Star / Delta Starter and E.L.C.B.
- Execute the wiring to control lamps (Sodium Vapor Lamp, Mercury Vapor Lamp, Fluorescent Lamp)
- Execute the wiring for Test Board with necessary items.
- Execute the Go down /Tunnel wiring
- Prepare winding for Transformer and No Volt Coil.
- Give end connections for 3 Phase Induction Motor Winding.
- Testing of faulty Ceiling Fan.

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

WIRING

1. Emergency alarm wiring with 3 Bells and 3 Pushbuttons.
2. House Wiring for a Service Connection with Single Phase Digital Energy Meter Cutout, Main Switch, 4 Way D.B, Indicator Lamp.
3. Wiring and Testing of 3 Phase Supply using 3 Rotary Switches, MCB and DBto change the Phases by connecting Single Phase Lamp Load.
4. Controlling a Lamp by Six Places by using Two, 2-Way Switches& Four Intermediate Switches.
5. Wiring of Single-Phase Motor using Single Phase Main Switch, D.O.L Starter and MCB.
6. Wiring of Three Phase Induction Motor with Main Switch,Star/Delta Starter and ELCB.
7. Wiring of Sodium Vapor and Mercury Vapor Lamp.
8. Wiring and troubleshooting the Fluorescent Tube light.
9. Design and implement a Test Board with Indicator Lamp, FuseUnit to Test Electrical Appliances.
10. Go down / Tunnel wiring using 4 Lamps.

WINDING

1. Design, construct and test a 230/12-0-12 Volt, 500mA Transformer.
2. Design No Volt Coil for a 230/440 AC Contactor.
3. Demonstrate the end connection for a 3 Phase Induction MotorWinding for a 2 Poles / 4Pole Operations.
4. Dismantling a faulty Ceiling Fan and identify the fault, run the fanafter rectifying the fault.

RATIONALE

- This subject is classified under Core Technology group intended to teach Studentsabout facts, concepts, Principles of Electrical Machines such as Induction Motor, Alternator and Synchronous Motor.
- Students will be able to analyze the characteristics and qualitative parameters ofthese Machines.
- These Machines are widely used in Industries and for generation of electricity.
- The knowledge gained by the student is useful in the study of Technological Subjects such as Utilization System, Manufacturing Processes and Testing and Maintenance of Electrical Machines.
- The knowledge and skills obtained will be helpful in discharging Technical Functions such as Supervision, Controlling and as R & D Technicians.

OBJECTIVES

. The students will be able to understand the concepts of:

- Alternator Principle, Construction and their Types, EMF Induced and Cooling Techniques of Machines
- Performance of an Alternator, Testing, Characteristics, Parallel Operation, Load Sharingetc.,
- Three Phase Induction Motor, Principle, Construction, Types, Characteristics and Applications, Starting Methods
- Single Phase Motor Types, Construction, Characteristics and Applications, SynchronousMotor, Starting, Construction, Characteristics and Applications
- Maintenance of Induction Motors and Starters.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**ALTERNATOR PRINCIPLES AND CONSTRUCTION** Basic Principle of Alternators – Types of Alternators – Stationary Armature Rotating Field – Advantages of Rotating Field – Construction Details of Alternator – Salient Pole Rotor – Cylindrical Type Rotor – Types of A.C. Armature Windings – Types of Slots – Full Pitch and ShortPitched Windings – Phase Spread Angle and Effect of Distribution Factor – Pitch Factor – Relation between Frequency, Speed and Number of Poles – EMF Equation – Problems Methods of obtaining Sine Wave –Critical Speed of Rotor – Ventilation of Turbo Alternators – Advantages of Hydrogen Cooling and its Precaution – Excitation and Exciters.	10 2
II	**ALTERNATOR PERFORMANCE AND TESTING** Load Characteristics of Alternators – Reason for Change in Terminal Voltage –Qualitative Treatment of Armature Reaction for various Power Factor Loads – Effective Resistance – Leakage Reactance – Synchronous Reactance, Synchronous Impedance – Voltage Regulation – Determination of Voltage Regulation of Alternator by Direct Load Test - Pre-Determination of Regulation of Alternator by Indirect Method (EMF, MMF, and ZPF). Necessity and conditions for Parallel Operation of Alternators – Synchronizing by Dark Lamp Method, Bright Lamp Method, Dark - Bright Lamp Method and Synchro scope Method– Synchronizing Current, Synchronizing Power and Synchronizing Torque – Load Sharing of Alternators –Infinite Bus Bar.	10 6
III	**THREE PHASE INDUCTION MOTOR** Rotating Magnetic Field – Principle of Operation of Three Phase Induction Motors – Slip and Slip Frequency – Comparison between Cage and Slip Ring Induction Motors –Development of Phasor Diagram – Expression for Torque in Synchronous Watts – Slip-Torque Characteristics – Stable and Unstable Region – No Load Test and Blocked Rotor Test – Development of Approximate Equivalent Circuit	10

	– Problems on the above Topics – Simplified Circle Diagram.	
	Determination of Maximum Torque, Slip (Problems Not Required) – Starting Torque and Starting Current Expression – Relationship between Starting Torque and Full Load Torque – Speed Control of Induction Motors. Starters of Induction Motors – Direct online Starter and Its Merits for Cage Motors – Star Delta Starter- Auto Transformer Starter - Rotor Resistance Starter – Cogging –Crawling in Induction Motor– Double Cage Induction Motor-Induction Generator.	6
IV	**SINGLE PHASE INDUCTION MOTOR** Single Phase Induction Motors – Not Self Starting – Methods of Making itself Starting – Construction, Working Principle – Phasor Diagram-Slip Torque Characteristics- Split Phase Motor - Capacitor Motor - Shaded Pole Motor - Repulsion Motor - Universal Motor – Operation of Three Phase Motor with Single Phase Supply. **SYNCHRONOUS MOTOR** Principle of Operation –Not Self Starting – Methods of Starting–Effects ofExcitation on Armature Current and Power Factor– 'V' Curve and Inverted 'V" Curve of Synchronous Motor – The Phenomenon of Hunting and Prevention of Hunting by Damper Winding – Comparison between Synchronous Motor and Three Phase Induction Motor - Applications -Problems on Power Factor Improvement.	8 7
V	**MAINTENANCE OF INDUCTION MOTORS AND STARTERS** BIS Publication Dealing with The Code of Practice of Induction Motors and Starters – Classification of Cage Motor – Continuous Rating and Intermittent Rating – Various Types of Enclosures – Specifications of Motors – Selecting the Cable Rating – Single Phase Prevention using Current Operated Relay – Commissioning - Annual Maintenance Selection of Starters of Induction Motor – Common Induction Motor Troubles and their Remedies – Causes of Noise and Vibration – Care ofBearings – Static Balancing – Degreasing – Vacuum Impregnation - Varnishing – Effect of Unbalanced Supply on the Performance of Induction Motor.	7 7

TEXTBOOK

S.No	Author	Title	Publisher
1.	B.L. Theraja	A Textbook of Electrical Technology -Volume II	S.Chand& Co. New Delhi
2.	Edward Hughes	Electrical Technology	Addision– Wesley International Student Edition

REFERENCE BOOK

S.No	Author	Title	Publisher
1.	M.G.Say	Performance and Designof ACMachines	Pitman PublishingLtd
2.	Nagarath	Electrical Machines	TMH Publications
3.	Bhattacharya	Electrical Machines	TMH Publications

RATIONALE

Measurement is the basic and primary operation, the result of which is used only to describe the system and hence treated as an independent operation. Automation of any kind begins with the measurement of certain system parameters; In fact, Industrial growth moves hand in hand with the growth of the measurement of Science and Technology. Therefore, it is highly essential for Electrical Students to study about the measurement of various Electrical Parameters in a system and the construction and working of different Instruments used in measurement of suchparameters.

OBJECTIVES

At the end of the Semester, Students will be able to:

- To define basic measurement terms.
- To learn about various operating Forces and effects used in Instruments.
- To study the construction and working of Moving coil and Moving Iron instruments, CT and PT and Electrostatic Voltmeter.
- To understand the measurement of Resistance using different means.
- To study Single Phase and Three Phase Power Measurement using Wattmeter.
- To study the construction and working of Single Phase, Three PhaseEnergy Meter and study about calibrations.
- To study the construction and working of Power Factor Meters, andPhase Sequence Indicators.
- To study about the Frequency Measurement using different types of Frequency Meters.
- To learn about the measurement of Inductance and Capacitance usingBridges.
- To study about CRO and its applications.

DETAILED SYLLABUS

CONTENTS: Theory

UNIT	NAME OF THE TOPICS	HOURS
I	**CLASSIFICATION AND CHARACTERISTICS OF INSTRUMENTS** General - Definition of Measurement – Functions of Measurement System (Indicating, Recording and Controlling Function) – Applications of Measurement Systems – Classification – Absolute and Secondary Instruments – Indicating Recording and Integrating Instruments –Analog and Digital	10
	Definition of True Value, Accuracy, Precision, Error and Error Correction – Instrument Efficiency – Effects used in Instruments – Operating Forces – Deflecting, Controlling and Damping Forces.	5
II	**MEASUREMENT OF CURRENT, VOLTAGE AND RESISTANCE** Types of Instruments – Construction, Working and Torque Equation of Moving Coil, Moving Iron, Dynamometer Type (Shaded Pole) Instruments – Extension of Instrument Range Using Shunts and Multipliers. (Calculation, Requirements and Simple Problems). Tong Tester – Electrostatic Voltmeter – Rectifier Type Instruments –Instruments Transformers CT and PT – Testing, Errors and Characteristics of CT and PT.	10
	Classification of Resistance – Measurement using Conventional Method – (Ammeter – Voltmeter Method) Measurement of Low Resistanceusing Kelvin's Bridge Ohmmeter – Measurement of Medium Resistance using Wheatstone Bridge – High Resistance using Megger - Earth Resistance- –u Earth Tester – Multimeters.	5

III	**MEASUREMENT OF POWER, POWER FACTOR AND FREQUENCY** Power in D.C and A.C Circuits – Watt Meters in Power Measurement –Measurement of Energy in AC Circuits – Single Phase and Three Phase Energy Meters Construction and Operation –- Digital Energy Meter. Power Factor Meters – Single Phase Electro Dynamometer Type - Construction and Working – Phase Sequence Indicator – Phase Difference Measurement using Synchro scope –Tri-vector Meter – Merz Price Maximum Demand Indicator. Frequency Measurement Frequency Meter – Digital Frequency Meter (Simplified Block Diagram)	**7** **8**
IV	**MEASUREMENT OF L, C PARAMETERS, WAVEFORMS AND SIGNAL CONDITIONERS** Inductance – Maxwell's Inductance Bridge – Andersons Bridge – Measurement of Capacitance using Schering Bridge. CRO – Block Diagram – CRT – Applications - Measurements of Voltage, Frequency and Phase Difference Using CRO – Digital Storage Oscilloscope – Block Diagram. **SIGNAL CONDITIONER:** Basic Components of Signal Conditioning System	**5** **5** **3**
V	**SENSORS AND TRANSDUCERS** Definition – Types of Transducers **PASSIVE TRANSDUCERS**: Resistive Transducer – Strain Gauge – Capacitive Transducer – Inductive Transducer – Proximity Sensor – Construction and Operation of LVDT and RVDT **ACTIVE TRANSDUCERS**: RTD – Thermistor - Thermocouple – Synchrous – Piezoelectric Transducer-Measurement of Pressure and Vibration – Hall Effect Transducer – Photovoltaic Transducer – Photoconductive Transducer. **TELEMETRY:** Block Diagram and its Applications	**8** **7**

TEXT BOOKS:

S.No	Title	Author	Publishers
1.	A Course in Electrical and Electronics Measurementsand Instrumentation	A.K. Sawhney	Puneet Sawhney Dhanpat Rai & Co (P) Ltd., New Delhi 1993

REFERENCE BOOKS:

S.No	Title	Author	Publishers
1.	Electronic Instrumentation	HS Kalsi	Tata Mc Graw Hill Publishing Co., Delhi 2010
2.	Modern Electronic Instrumentation and Measurement techniques	Albert D. Helfrick William David Cooper	Prentic – Hall of India (P)Ltd., New Delhi 2010
3.	Electronics and Instrumentation	Dr.S.K.Battachariya Dr. Renu Vig	S.K. Kataria & Sons, New Delhi
4.	A course in Electrical and Electronic Measurement and Instrumentation	Umesh Sinha	Satya Prakashan, New Delhi

RATIONALE:

The subject Analog and Digital Electronics holds applications in all branches of engineering instrumentation and Industrial Automation. This will impart in depth knowledge of Number Systems, Logics of Combinational &Sequential circuits and memories.

OBJECTIVES:

On completion of the following units of the syllabus contents, the students must be able to

- Understand the basics of operational amplifier.
- Know the op-amp applications.
- Know the waveform generator and Active filter.
- Know the concept of D/A and A/D converters
- Know the applications of Special function IC, IC 555 Timer.
- Understand various Number Systems used in Digital Circuits
- Understand basic Boolean postulates and laws.
- Understand the De-Morgan's theorem.
- Understand the concept of Karnaugh Map.
- Learn about Basic logic Gates.
- Study about Boolean techniques.
- Learn the different digital logic families
- Learn arithmetic circuits- Adder/Subtractor
- Understand the encoder/decoder & MUX / DEMUX
- Understand the concept of parity Generator and checker
- Understand various types of flip-flops.
- Understand various types of counters
- Understand various modes of shift registers
- Understand various types of memories

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topics	Hours
I	**LINEAR ICS AND OP-AMPS** **1.1: OPERATIONAL AMPLIFIER** Ideal Op-Amp – Block diagram and Characteristics – Op-amp parametersCMRR – Slew rate – Concept of Virtual ground **1.2 : APPLICATIONS OF OP-AMP** Inverting amplifier –Summing amplifier – Non inverting amplifier – Voltage follower - Comparator – Zero crossing detector – Integrator – Differentiator-waveform generation (Schmitt Trigger only)–RC Low pass Active filter. **1.3 : OP-AMP SPECIFICATIONS** OP-amp 741 – Symbol – Pin diagram – Specifications	**4** **4** **2**
II	**A/D, D/A, SPECIAL FUNCTION ICs AND IC VOLTAGE REGULATORS** **2.1: SAMPLING AND QUANTIZATION** **2.2 : A/D CONVERTER** Analog to digital conversion using Ramp method – Successive approximationmethod – Dual slope method – Specifications of A/D converter **2.3 : D/A CONVERTER** Basic concepts – Weighted Resistor D/A converter – R-2R Ladder D/A converter – Specifications of DAC IC **2.4 : SPECIAL FUNCTION ICs** 2.4.1 : IC 555 Timer – Pin diagram - Functional Block diagram of IC 555 in Astable and Monostable Multivibrator mode - Schmitt trigger using IC 555 2.4.2: IC 565-PLL-Pin Diagram-Functional Block diagram of IC 565 2.4.3: IC 566-VCO-Pin Diagram-Functional Block diagram of IC 566 **2.5.: IC VOLTAGE REGULATORS** Positive IC Voltage Regulators: 78XX - Negative IC Voltage Regulators: 79XXand General-purpose IC Voltage Regulators using LM 723.	**2** **3** **2** **3** 3

III	**BOOLEAN ALGEBRA AND ARITHMETIC OPERATIONS** **3.1: NUMBER SYSTEMS** Decimal – Binary – Octal – Hexadecimal – BCD – Conversion from one numbersystem to other – Boolean Algebra – Basic laws and Demorgan's Theorems **3.2:** **UNIVERSAL GATES** Realization of basic logic gates using universal gates NAND and NOR -TristateBuffer circuit **3.3 : PROBLEMS USING 2, 3, AND 4 VARIABLES** Boolean expression for outputs – Simplification of Boolean expression using Karnaugh map (up to 4 variable)- Constructing logic circuits for the Boolean expressions **3.4 :ARITHMETIC OPERATIONS** Binary Addition-Binary Subtraction-1's compliment and 2's compliment-Signed binary numbers **3.5 : ARITHMETIC CIRCUITS** Half Adder-Full Adder-Half Subtractor-Full Subtractor	**2** **2** **2** **2** **2**
IV	**COMBINATIONAL AND SEQUENTIALLOGIC CIRCUITS** **4.1: PARITY GENERATOR AND CHECKER** **4.2 : DECIMAL to BCD ENCODER** **4.3 : 3 to 8 DECODER** **4.4 : MULTIPLEXER:** 4 to 1 Multiplexer **4.5 : DEMULTIPLEXER** :1 to 4 Demultiplexer **4.6 : FLIP-FLOPS (FF)** RS FF– JK FF: Master Slave FF and Edge triggered FF – D and T FF **4.7 : COUNTERS** 4 bit Asynchronous Up Counter –Mod N counter – Decade counter –4 bit Synchronous up counter **4.8:SHIFT REGISTER** 4 bit shift register – Serial in Serial out	**1** **1** **1** **1** **1** **2** **3** **2**

V	**MEMORIES** **5.1 : CLASSIFICATION OF MEMORIES** **5.2 :RAM** RAM organization-Address Lines and Memory Size- Read/write operations-StaticRAM-Bipolar RAM cell- Dynamic RAM- SD RAM- DDR RAM. **5.3 :ROM** ROM organization-Expanding memory- PROM- EPROM- and EEPROM- Flash memory- Anti Fuse Technologies.	**6** **6**

TEXT BOOKS:

1. Roger L. Tokheim Macmillan – Digital Electronics – McGraw – Hill –1994.
2. D.Roychoudhury & shail. B.Jain- Linear Integrated Circuits -New age International publishers - II Edition -2004.

REFERENCE BOOKS:

1. Albert Paul Malvino and Donold P. Leach – Digital Principles and Applications
2. William H.Goth Mann – Digital Electronics – An introduction to theory and practice –PHI 1998.
3. Linear Integrated Circuits by B.Suseela & T.R.Ganesh babu -Scitech publications-2018
4. Integrated circuits by K.R.Botkar-Khanna publisher's-1996.
5. R.P.Jain – Modern Digital Electronics – TMH 2003.

RATIONALE

The world is transitioning to cleaner mobility options with the aim at improving air quality and reducingdependency on fossil fuels. Electric Vehicles (EVs) have emerged a popular clean mobility choice to reduce emissions. EVs are powered fully or partially by batteries, they canhelp to reduce dependence on fossil fuels also air quality. Tamil Nadu is one of the most advanced states in India. Tamil Nadu has a highly developed industrial eco-system and is very strong in sectors like automobiles and auto-components. Many globally renowned companies have setup their manufacturing facilities in Tamil Nadu. Due the rapid depletion of fossil fuel and increase in fuel cost,environmental pollution, the shift to clean transport is necessary. This subject introduced by keepingall the above factors.

OBJECTIVES

1. To learn the environmental impact and history of Electric Vehicles.
2. To understand the concept of Electric Vehicle and its types.
3. To study the configurations of Electric Vehicles
4. To acquire knowledge about Energy Storages, Charging System, Effects and Impacts
5. To appreciate the Electric Mobility Policy Frame work India and EV Policy Tamil Nadu2019.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Environmental impact and history& Electric vehicle Types:** Environmental impact and history: Air pollution – Petroleum resources – History of Electric vehicles - History of Hybrid Electric Vehicles – Historyof Fuel Cell Vehicles – Hybrid electric Vehicle (HEV) - Plug-in Hybrid Electric Vehicle (PHEV) - Battery Electric Vehicle (BEV) – Fuel Cell Electric Vehicle (FCEV) – Description.	12
II	**Electric vehicle & Drive System:** Electric Vehicles: Configurations of Electric Vehicle – Performance of Electric Vehicles– Tractive Effort in Normal Driving – Energy Consumption. Hybrid Electric Vehicles: Concept of Hybrid Electric Drive Trains – Architecture of Hybrid Electric Drive Trains. Electric Propulsion Systems: Drive Systems: DC Motor Drives - Principle of Operation – Induction Motor Drives - Basic Operation Principles – Permanent Magnetic Brush Less DC Motor Drives – Principles – Construction and Classification.	12
III	**Energy Storages, Charging System, Effects and Impacts:** Energy Storages: Electrochemical Batteries – Battery Technologies –Lead Acid Batteries – Nickel Based Batteries – Lithium Based Batteries – Charging system –DC charging – Wireless charging – Power conversiontechniques. Effects of EV – Impacts on Power grid – Impacts on Environment – Impacts on Economy.	8 4
IV	**Electric Mobility Policy Frame work India:** Government of India Electric Mobility Policy Frame Work – Global Scenario of EV Adoption – Electric Mobility in India – National Electric Mobility Mission Plan 2020 –Action led by Original Equipment Manufacturers – Key Performance Indicator - Global Impact – Trends and Future Developments.	11

V	**Tamilnadu E-Vehicle Policy 2019:** Tamilnadu E-vehicle Policy 2019: Vehicle Population in Tamilnadu – Need of EV Policy – Advantage of EV Eco system – Scope and Applicability of EV Policy – Objectives of EV Policy – Policy Measures –Demand Side Incentives – Supply Side Incentives to promote EV. Manufacturing – Revision of Transport Regulation of EV – City Building Codes – Capacity Building and Skilling – Charging Structure – Implementing Agencies – R&D and Business Incubation – Recycling Ecosystem – Battery and EVs.	5 5

TEXT BOOKS:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles, Mehrdad Ehsani, Yimin Gao, Sebastien E.Gay, Ali Emadi, CR Press, London, New York.
2. Comparison of Electric and Conventional Vehicles in Indian Market: Total Cost of Ownership, Consumer Preference and Best Segment for Electric Vehicle (IJSR),Akshat Bansal, Akriti Agarwal

REFERENCE BOOKS:

1. A Comprehensive Study of Key Electric Vehicle (EV) Components, Technologies, Challenges,Impacts, and Future Direction of Development (MDPI), Fuad Un-Noor, Sanjeevi kumarPadmanaban, Lucian Mihet-Popa, Mohammad NurunnabiMollah and Eklas Hossain.
2. Electric Vehicles: A future Projection CII October 2020 report.
3. Design and analysis of aluminum/air battery system for electric vehicles, Shaohua Yang,Harold Knickle, Elsevier.
4. Propelling Electric Vehicles in India, Technical study of Electric Vehicles and Charging Infrastructure
5. Zero Emission Vehicles (Zevs): Towards A Policy Framework – Niti Aayog.
6. Faster Adoption of Electric Vehicles in India: Perspective of Consumers and Industry, TheEnergy and Resources Institute, New Delhi.
7. India EV Story: Emerging Opportunities by Innovation Norway

DETAILED SYLLABUS

Contents: Practical

Name of the Topics: Electrical Machines and Instrumentation Practical

Exercise:

1. Predetermine the Regulation of Alternator.
2. Load test on 3 Phase Alternator.
3. Synchronization of 3 Phase Alternator
4. Load test on Single Phase Induction Motor.
5. Load test on 3 Phase Induction Motor.
6. Determine the Equivalent Circuit Constants of 3 Phase Induction Motor.
7. Predetermine the performance of a 3 Phase Induction Motor.
8. Improvement of Power Factor of an Induction Motor with load.
9. Calibration of given Ammeter and Voltmeter.
10. Calibration of given Wattmeter.
11. Calibration of 3 Phase Energy Meter.
12. Measurement of Alternator Winding Resistance using Wheatstone Bridge
13. Measurement of value of unknown Capacitance using Schering Bridge.
14. Measurement of value of unknown Inductance using Anderson Bridge.
15. Displacement measurement using LVDT.
16. Measurement of earth Resistance by using Megger.

ANALOG AND DIGITAL ELECTRONICS PRACTICALDETAILED SYLLABUS

Contents: Practical

Exercises

Note: At least 6 experiments should be constructed using breadboard

1. Realization of basic gates using NAND & NOR gates.
2. Realization of logic circuit for De-Morgans Theorems
3. Test the performance of Half Adder and Full Adder.
4. Test the performance of Half Subtractor and Full Subtractor.
5. Test the performance of Decoder/Encoder.
6. Test the performance of RS, D, T & JK flip-flops.
7. Test the performance of Parity generator and checker using parity checker/ generator IC's.
8. Test the performance of Multiplexer/De-multiplexer using IC 4051
9. Test the performance of Inverting Amplifier and Non inverting amplifier using Op-ampIC 741.
10. Test the performance of Summing Amplifier, Difference Amplifier.
11. Test the performance of Zero Crossing Detector and Voltage Comparator using Op-amp IC741.
12. Test the performance of Integrator and Differentiator using Op-amp IC 741.
13. Test the performance of Astable multivibrator using IC 555.
14. Test the performance of IC Voltage Regulator Power Supplies using IC 7805, IC 7912.
15. Design the PCB of 4- bit ripple counter using FF using Software tool Multisim/OrCAD

DETAILED SYLLABUS

Contents: Practical

Name of the Topics: Electrical Circuits and Simulation Practical

Exercise

1. Generate the following waveforms
   (i) Sinusoidal waveform of Fundamental Frequency (50Hz)
   (ii) 3rd Order, 5th Order and 7th Order Harmonics for the Fundamental frequency.
2. Simulation of RLC series and RLC Parallel Response Circuits.
3. Step Response of RL and RC Series Circuit.
4. Simulation of Mesh and Nodal analysis for DC Circuits.
5. Verification of Superposition Theorem.
6. Verification of Thevenin's and Norton's Theorem.
7. Verification of Maximum Power Transfer Theorem.
8. Simulation of Full Wave Rectifier (Center Tapped and Bridge) with RL load.
9. Simulation of Single-Phase Half Wave Controlled Converter with RL Load and FreeWheeling Diode.
10. Simulation of Single-Phase Full Wave Controlled Converter with RL Load and FreeWheeling Diode.
11. Simulation of Three Phase Star Connected Balanced and Unbalanced Load
12. Simulation of Three Phase Delta Connected Balanced and Unbalanced Load
13. Simulation of Three Phase Non-Linear Star Connected Load with Three Phase 3 WireSystem.
14. Simulation of Three Phase Non-Linear Star Connected Load with Three Phase 4 WireSystem.
15. Simulation basic Logic Gates, Universal Logic Gates and Realization of Logic Gates usingUniversal Logic Gates.
16. Simulation of Half Adders and Full Adder.

DETAILED SYLLABUS

Contents: Theory

UNIT	NAME OF THE TOPICS	HOURS
I	**GENERATION OF ELECTRICAL POWER** Introduction- Conventional methods of power generations – schematic arrangement and choice of site for Hydro, Thermal, Nuclear power plants- Advantages and Disadvantages-comparison of these power plants - Principle and types of co-generation. Schematic arrangement of Diesel, Gas, Pumped storage schemes- Advantages and Disadvantages-Grid or Inter connected system-Advantages of Inter connected systems- Load Transfer through Inter connector-Load curves and Load duration curves-connected load-Average load-Maximum Demand Factor- Plant capacity factor-Load factor and its significance- Diversity factor-Simple problems- Load sharing between base load and peak load plants. Renewable Energy sources- Basic principle of Solar Energy, Wind Power Generation-Hybrid Renewable Energy Systems.	4 10 2

II	**A.C. AND H.V.D.C TRANSMISSION** **A.C. Transmission:** Introduction-Typical Layout of A.C. Power supply scheme -Advantages and Disadvantages of A.C Transmission- High Transmission Voltage- Advantages- Economic choice of Transmission voltage-Elements of a Transmission Line-over Head Line-Conductor materials and their properties- Line supports-its properties- Types of supports and their applications-spacing between conductors-length of span- Sag in overhead lines-Calculation of Sag-When the supports are at equal and unequal levels- Problems- Effect of windand ice loading over the line conductor (Qualitative treatment only) - constants of a Transmission line- Transposition of Transmission lines-Skin Effect- Ferranti Effect-Corona formation and corona loss-Factors affecting corona- Advantages and Disadvantages –Classification of O.H Transmission lines- Performance of single phase short transmission line-voltage regulation and Transmission Efficiency-Problems.	10
	H.V.D.C Transmission: Advantages and Disadvantages of D.C Transmission- Layout Scheme and principle of High Voltage D.C Transmission-D.C link configurations (Monopolar, Bipolar and Homopolar)-HVDC convertor Station (Schematic diagram only).	4

III	**FACTS, LINE INSULATORS AND UNDERGROUND CABLES:** Definition-Need for FACTS controllers- types of FACTS controllers-SVS-STATCOM-UPFC (block diagram explanation only). **Line Insulators:** Introduction - Line Insulator Materials-Properties of Insulators- Types & causes of failure of Insulators-Testing of Insulators-Potential Distribution over suspension Insulator String-String Efficiency - Methods of improving string efficiency - problems. **Underground cables:** Introduction-Advantages and requirement of cables-construction of a three-core cable-Insulating materials for cables- properties of Insulating materials used in cables-classification of cables- cables for three phase service-Construction of Belted cable, screened cable, pressure cables-Laying of underground cables-Direct laying, Drawing system, Advantages and Disadvantages.	7

IV	**CIRCUIT BREAKERS AND OVER VOLTAGE PROTECTION** Switch gear-Essential features of Switch gear-faults in a Power sy[illegible] only). **CIRCUIT BREAKERS:** Basic principle of circuit Breaker -Arc Phenomenon- methods of [illegible] Arc voltage – Re-striking voltage and recovery voltage-Rate of ris[illegible] voltage-C.B ratings – Breaking capacity, making capacity, short tim[illegible] reclosing in circuit Breakers - Classification of Circuit Breakers [illegible] and Working principle of Air Circuit Breakers, E.L.C.B, Residua[illegible] breaker SF6 and vacuum Circuit Breaker Maintenance of Circ[illegible] Rupturing capacity of circuit breaker- conditions to trip – Auto re[illegible] Fault clearance time – Inverse time overload relay – Maintenance [illegible] oil circuit breakers-SF6 Circuit Breakers. **FUSES:** L.V fuses-Rewirable fuse, HRC fuse-H.V. fuses & Cartrid[illegible] Type and Metal Clad-Fuses. **OVER VOLTAGE PROTECTION:** Voltage surge- causes of over voltage-Lightning-Types of lightning [illegible] Direct stroke, indirect stroke-Harmful Effects of lightning Protecti[illegible]	7

DETAILED SYLLABUS

Unit	Name of the Topics	Hours
I	**Architecture Of 8051 Microcontroller** **1.1 : Architecture** Microprocessor-Microcontroller-Comparison of microprocessor and microcontroller-Architecture diagram of microcontroller 8051-Functions of each block-Pin details of 8051-ALU- ROM-RAM-Memory organization of 8051-Special function registers-Program counter-PSW register-Stack-I/O ports-Timer-Interrupt-serial port-External memory- Oscillator and Clock- Reset-Power on reset-Clock cycle-machine cycle-Instruction cycle- Overview of 8051 family.	15

II	**8051 Instruction set and programming** **2.1: Instruction Set Of 8051** Instruction set of 8051-Classification of 8051 instructions-data transfer instructions - Arithmetic Instructions-Logical Instructions-Branching Instructions-Bit manipulation instructions- Assembling and running an 8051 program-Structure of Assembly Language-Assembler Directives- Different Addressing modes of 8051-Time delay routines. **2.2: Assembly language programs** 16-bit addition and 16-bit subtraction-8-bit multiplication and 8 bit division- BCD to HEX code conversion-HEX to BCD code conversion. -Smallest number/ Biggest number.	8 8
III	**Peripherals of 8051** **3.1 : I/O Ports** Bit addresses for I/O ports-I/O port programming-I/O bit manipulation programming. **3.2 : Timer/Counter** SFRS for Timer- Modes of Timers/counters- Programming 8051 Timer (Simple programs). **3.3 : Serial Communication** Basics of serial communication-SFRs for serial communication-RS232 standard-8051 connection to RS 232-8051 serial port programming.	3 4 4

	3.4: Interrupts 8051 interrupts-SFRs for interrupt-Interrupt priority.	4
IV	**Interfacing Techniques** **4.1: IC 8255** IC 8255-Block Diagram-Modes of 8255-8051 interfacing with 8255 **4.2: Interfacing** Interfacing external memory to 8051-Relay interfacing- Sensor interfacing -Seven segment LED display interfacing-Keyboard Interfacing-Steppermotor interfacing-ADC interfacing- DAC interfacing-DC motor interfacing using PWM-LCD interfacing.	3 13
V	**Advanced Microcontrollers** **5.1: Types of microcontrollers** PIC microcontroller-General Block diagram-Features-Applications- Arduino-General Block diagram-Variants-Features-Applications- Raspberry pi-General Block diagram-Features-Applications-Comparison of microcontrollers. **5.2: IoT** Introduction to IoT-Block diagram of home automation using IoT.	8 3

TEXT BOOKS:

1. "Ajit pal" "Microcontrollers, Principles and Applications ",PHI Ltd,-2011.
2. "Mazidi,Mazidi and D.MacKinlay" "8051 Microcontroller and Embedded Systems usingAssembly and C",2006 Pearson Education Low Price Edition.

REFERENCE BOOKS:

1. "R. Theagarajan" "Microprocessor and Microcontroller", Sci Tech Publication, Chennai.
2. www.microchip.com, www.raspberrypi.org,www.arduino.org.
3. "J.B. Peatman" "Design with PIC microcontrollers".
4. "Michael McRoberts", "beginning Arduino.
5. "Matt Richardson", "Getting started with Raspberry Pi".
6. 8."Samuel Greengard", "The Internet of Things".

ETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**CONTROL CIRCUIT COMPONENTS** Switches – Push Button, Selector, Drum, Limit, Pressure, Temperature (Thermostat), Float, Zero Speed and Proximity Switches. Relays – Voltage Relay, DC Series Current Relay, Frequency Response Relay, Latching Relay and Phase Failure Relay (Single Phasing Preventer). Over Current Relay – Bimetallic Thermal Over Load Relay and Magnetic Dash Pot Oil Filled Relay. Timer – Thermal Pneumatic and Electronic Timer. Solenoid Valve, Solenoid Type Contactor (Air Break Contactor), Solid State Relay, Simple ON-OFF Motor Control Circuit, Remote Control Operation and Interlocking of Drives.	10 6
II	**MOTOR CONTROL CIRCUITS** **CHAPTER: 2.1: DC MOTOR CONTROL CIRCUITS** Series Relay and Counter EMF Starters – Field Failure Protection – Jogging Control, Dynamic Braking **CHAPTER: 2.2:AC MOTOR CONTROL CIRCUITS** DOL Starter – Automatic Auto Transformer Starter (Open Circuit and Closed-Circuit Transition) – Star/Delta Starter (Semi-Automatic and Automatic) – Starter for Two Speed Two Winding Motor – Reversing the Direction of Rotation of Induction Motor – Dynamic Braking – Three Step Rotor Resistance Starter for Wound Induction Motor – Secondary Frequency Acceleration Starter.	3 12
III	**INDUSTRIAL CONTROL CIRCUITS** Planner Machine Control – Skip Hoist Control – Automatic Control of a Water Pump – Control of Electric Oven – Control of Air Compressor – Control of Over Head Crane - Control of Battery-Operated Truck – Control of Conveyor System – Control of Elevator - Trouble Spots in Control Circuits – General Procedure for Trouble Shooting.	14

IV	**PROGRAMMABLE LOGIC CONTROLLER** Automation – Types of Automation (Manufacturing and Non-Manufacturing) – Advantages of Automation –PLC Introduction – BlockDiagram of PLC–Principle of Operation–Modes of Operation– PLC Scan–Memory Organization–Input Module (Schematic and WiringDiagram) – Output Module (Schematic and Wiring Diagram). Types ofProgramming Devices – Comparison between Hardwire Control System and PLC System –PLC Types (Fixed and Modular) – Input Types – Output Types – Criteria for Selection of Suitable PLC – List of Various PLCs available.	7 7
V	**PLC PROGRAMMING AND SCADA** Different Programming Languages – Ladder Diagram – Relay Type Instruction – Timer Instruction – ON Delay and OFF Delay Timer – Retentive Timer Instruction – Cascading Timers – Counter Instruction UP Counter – Down Counter – UP/DOWN Counter - Ladder LogicDiagram for DOL Starter, Automatic STAR-DELTA Starter - RotorResistance Starter and EB to Generator Change over System.Supervisory Control Data Acquisition System (SCADA) – Block Diagram of SCADA, Features and Functions of SCADA – Introduction to DCS.	7 7

TEXT BOOKS:

1. "S.K.Battacharya" "Control of Electrical Machines", New Age International Publishers,New Delhi

REFERENCE BOOKS:

1. "Pradeep Kumar, Srivastava" Exposing Programmable Logic Controllers with Application", BPB Publications
2. "Stephen Herman" Industrial Motor Control", 6th Edition, Cengage Learning
3. "David Bailey, Edwin Wright" "Practical SCADA for Industry", Newnes Publishers

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**INTRODUCTION TO PLC:** Automation – Types of Automation (Manufacturing and Non-Manufacturing) – Advantages of Automation - PLC Introduction - Definition – Block diagram of PLC – Principle of Operation –Modes of Operating System – PLC Scan - Hardwire Control System compared with PLC System - Advantages and Disadvantages of PLCs. Criteria for selection of suitable PLC –Memory Organization – Input Types – Discrete input – Analog in/out - Elements of Power Supply Unit - PLC Types (Fixed I/O and Modular I/O) - List of various PLCs available –Applications of PLC.	**10** **6**
II	**INPUT/OUTPUT MODULES** The I/O Section - Discrete I/O Modules (DC and AC) – Analog I/O Modules - Special I/O Modules– I/O Module Specification - Typical Discrete and Analog I/O field Devices –Sensors – Limit Switch– Reed Switch – Proximity Sensor (Inductive and Capacitive). Types of Photo Electric Sensor - Sinking and Sourcing I/O Modules– TTL Output Module – Relay Output Module –Isolated Output Module –Input /Output Addressing Scheme in important commercial PLCs.	7 8

III	**PLC PROGRAMMING** Types of Programming Methods – Types of Programming Devices –Logic Functions – AND Logic – OR Logic – NOT Logic - Relay Typeinstructions –Timer Instructions – ON Delay and OFF Delay Timer. Retentive Timer Instruction – Cascading Timers – Counter Instruction – UP Counter – DOWN Counter – UP/DOWN Counter – Cascading Counters – Program Control Instructions –Data Manipulation Instruction – Data Compare Instructions – Math Instructions - Sequencer Instructions - PID Instruction – PWM Function – Simple programs using above instructions. Develop ladder logic for: Bottle Filling System – Automatic Car Parking System - EB To Generator Changeover System – Batch Process – Elevator System -DOL Starter- Automatic Star-Delta Starter – Traffic Light Control.	4 5 5
IV	**NETWORKING** Levels of Industrial Network – Network Topology –Network Protocol – OSI Reference Model - Networking with TCP / IP Protocol - I/O Bus networks – Block diagram of I/O Bus networks – Types of I/O Bus networks. Protocol standards – Advantages of I/O Bus networks - Gateway – Token passing – Data Highway – Serial Communication – Device Net – Control Net – Ethernet – Modbus –Fieldbus – Profibus- Sub Netting – Subnet mask - File transfer protocol.	7 7
V	**DATA ACQUISITION SYSTEMS** Computers in Process Control – Types of Processes - Structure ofControl system – ON/OFF Control – Closed loop Control - PID Control – Motion Control –Block diagram of Direct Digital Control. Supervisory Control and Data Acquisition (SCADA)–Block diagram of SCADA – Features of SCADA – Functions of SCADA - SCADAsoftware - Data Loggers – Tags – Alarms - landlines for SCADA – use of modems in SCADA.	7 7

TEXT BOOK:

S.No	Name of the Book	Author	Publisher	Edition
1	Introduction to Programmable Logic Controllers	Gary Dunning	Cengage Learning India PvtLtd – Third Edition 2011	
2	Technician's Guide to Programmable Logic Controllers	Richard A. Cox	Delmer – Sixth Edition 2011	
3	Programmable Logic Controllers – Principle andApplications	John W. Webb	Prentice Hall	
4	Programmable Logic Controllers – ProgrammingMethods and Applications	John R Hackworth and Fredrick D. Hackworth	Pearson Education	
5	Programmable Logic Controllers	W. Bolton	Newness	
6	Programmable Controller Theory and Implementation	L.A.Bryan E.A.Bryan	An Industrial Text Company Publication – Second Edition 1997	

REFERENCE BOOKS:

S.No	Name of the Book	Author	Publisher	Edition
1	Programmable Logic Controllers	Frank D.Petruzella	Tata McGraw Hill Edition-Fourth Edition 2011	
2	Practical SCADA for industry	David Bailey Edwin Wright	Newnes	

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**FUNDAMENTALS OF ENERGY SYSTEMS AND SOLAR RADIATION** 1.1. FUNDAMENTALS OF ENERGY SYSTEMS: Introduction to Energy - Energy consumption and standard of living - classification of Energy Resources-consumption trend of Primary Energy Resources-importance of Renewable Energy Sources- Energy for Sustainable Development. - Various Forms of Renewable Energy 1.2 SOLAR RADIATION: Outside Earth's Atmosphere – Earth Surface –Analysis of Solar Radiation Data – Geometry – Measurement of Solar Radiation – Solar Radiation Data in India.	8 8
II	**SOLAR THERMAL CONVERSION AND SOLAR PV SYSTEMS** 2.1 SOLAR THERMAL APPLICATIONS: Solar Collectors - Flat Plate Collectors- Concentrating Collectors - Comparison of Collectors - Selection of Collector for Various Applications - Solar Water Heaters - Solar Industrial Heating System – Solar Cookers - Solar Pond ElectricPower Plant. 2.2. SOLAR PV SYSTEMS: A Brief History of PV, PV in Silicon: Basic Principle, Classification of PV Cells - Equivalent Circuit and Electrical Characteristics of Silicon PV Cells – Series Parallel Connections of Solar Cells - Solar PV Array and Solar Panel - Solar Panel Applications - Grid Connected PV System – Stand Alone Solar PV Power Plant – Hybrid Solar PV System.	7 8

III	**WIND, TIDAL & WAVE ENERGY** **WIND ENERGY**: Introduction-Basic Principles of Wind Energy Conversion: Nature of the Wind, Power in the Wind, Forces on the Blades and Wind Energy Conversion-Wind Data and Energy Estimation-Site Selection-Classification of Wind Energy Conversion Systems - Types of Wind Machines-Horizontal Axis Wind Turbine(HAWT) -Vertical Axis Wind Turbine(VAWT) – Comparison Between HAWT & VAWT - Generating System - Energy Storage – Applications of Wind Energy – Power Generation – Pumping Station - Safety and Environmental Aspects. **TIDAL & WAVE ENERGY:** Basic Principle of Tidal Power – Components and Operation of Tidal Power Plant – Wave Energy- Wave Energy ConversionDevices.	**10** **4**
IV	**BIO – ENERGY** **BIOMASS RESOURCES**: Introduction – Photo Synthesis – Usable Forms of Bio Mass, Their Composition and Fuel Properties - Biomass Resources. **BIOMASS ENERGY CONVERSION**: Biomass Conversion Technologies – Urban Waste to Energy Conversion – Biomass Gasification – Biomass Liquification – Biomass to Ethanol Production – Biogas Production from Waste Biomass – Types of Bio Gas Plants - Applications – Bio Diesel Production – Biomass Energy Scenario in India.	**6** **8**
V	**GEOTHERMAL AND OCEANIC ENERGY** **GEO THERMAL ENERGY**: Energy inside the Earth – Uses of Geothermal Energy – Geothermal Wells – Potential in India - Types of Geothermal Heat Pump Systems - Types of Geothermal Power Plants. **OCEANIC ENERGY**: Ocean Energy Resources – Principle of Ocean Thermal Energy Conversion (OTEC) – Method of Ocean Thermal Electric Power Generation.	**7** **7**

TEXT BOOK

S.No	Name of the Book	Author	Publisher	Edition
1	Non-Conventional Energy Sources	G.D. Rai	Khanna Publishers, New Delhi	1999

REFERENCE BOOKS

S.No	Name of the Book	Author	Publisher	Edition
1	Non-Conventional Energy Sources and Utilization	R.K. Rajput	S.Chand & Company Ltd.	2012
2	Renewable Energy Sources	Twidell J.W. and Weir A	EFN Spon Ltd.	1986
3	Non-Conventional Energy Resources	B.H.Khan	Tata Mc Graw Hill., New Delhi.	2nd Edn, 2009

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

Exercise

1. Wire and Test the Control Circuit for Jogging in Cage Induction Motor.
2. Wire and Test the Control Circuit for Semi-Automatic Star –Delta Starter.
3. Wire and Test the Control Circuit for Automatic Star –Delta Starter.
4. Wire and Test the Control Circuit for Dynamic Braking of Cage Motor.
5. Wire and Test the Control Circuit for Two Speed Pole Changing Motor.
6. Wire and Test the Control Circuit for Forward and Reverse Operation.
7. Wire and Test the Control Circuit for Automatic Rotor Resistance Starter.
8. Wire and Test the DOL Starter with Single Phase Preventer using PLC.
9. Wire and Test the Star –Delta Starter using PLC.
10. Wire and Test the Control Circuit for Automatic Rotor Resistance Starter using PLC.
11. Develop and execute the Ladder Logic Diagram in PLC for 3 Stage Lift Operation.
12. Wire and Test the Sequential Operation of Solenoid Valve and a Motor for Tank FillingOperation using PLC.

13. Develop and execute the Ladder Logic to Interface PLC with Conveyor Model for countingthe object moving in the Conveyer.
14. Wire and Test the Control Circuit for Jog Forward, Jog Reverse, Forward and ReverseOperations using PLC.

DETAILED SYLLABUS

PROGRAMMABLE LOGIC CONTROLLER PRACTICALLIST OF EXPERIMENTS

1. Interfacing of Limit switch, Reed switch and Proximity switch with PLC.
2. DOL starter with single phase prevention.
3. EB to Generator Change over switch implementation with interlocking
4. Star Delta starter
    a. Single phasing prevention
    b. Adjustable star-delta transfer time
    c. Pre-settable overload trip time
5. Automatic load transfer
    a. Transfers load from one phase to another when onephase in a three-phase system fails
    b. Automatically restores when power is resumed
    c. Time delays are affected to prevent action during short time failure
6. Fill the water in water tank and maintain the water level.
    a. When water level comes below lower-level switch ON the pump
    b. When water level reaches the high level switch OFF the pump
    c. Include manual switch to operate the pump at any level of water.

7. Fire alarm
    a. Multiple alarms
    b. Sound alarm
    c. If not acknowledged, Sound alarms 1 and 2
    d. Similarly go up to 4 alarm conveyor belt sorting
8. Three floor Lift control
9. Traffic light control
10. Automatic operation of double acting pneumatic cylinder – Multi cycle
11. Sequential operation of two Double Acting Cylinders for the sequence A+,B+,B-,A-
12. Analog input to PLC as a set of valves for a comparator function block

    -The input is multilevel illumination control. The input is setting is by means of a potentiometer in an analog input to the PLC. The outputs turn on several groups of lamps to obtain desired level illumination.
13. Heater control with PID function of the PLC

    - A 1000 W water heater is controlled using the PID function of the PLC. The temperature transducer is a temperature transmitter with 4 to 20 mA output and Pt 100 Probe.
14. Round table liquid filling system

    - Dropping of Reagents into test tubes. The feedback is from potentiometer. The program must ensure that the end limits of the pot are never reached by carefully balancing the clockwise and anti- clockwise revolution.
15. Slow speed motor control using PWM function of the PLC

    - Slow speed 12V DC 18W permanent magnet motor with fly wheel is controlled with the PWM output and feedback from a low- resolution encoder.

DETAILED SYLLABUS

Contents: Practical

Name of the topic	Exp. No	Experiment
Solar PV Module	1	Measurement of Solar Radiation
	2	I-V and P-V Characteristics of PV Module
	3	I-V and P-V Characteristics of PV Modules in Series
	4	I-V and P-V Characteristics of PV Modules in Parallel
	5	Effect of Tilt Angle on PV Module power
	6	Effect of shading on output of Solar Panel
	7	Working of Blocking Diode
Power flow calculation	8	Power flow calculation of standalone PV System for AC Load
	9	Power flow calculation of standalone PV system for DC Load
	10	Calculation of Maximum Power Point
Solar Thermal conversion	11	Direct type Solar Dryer
	12	Indirect type Solar Dryer
	13	Solar Water Heater
	14	Solar Cooker
	15	Solar Air Heater
Wind mill	16	Demo model of Wind Mill

DETAILED SYLLABUS

PART-A

ELECTRICAL SYMBOLS-DRAWING (5*2=10)

1. Draw the symbols for Components: Resistor, Capacitor, Inductor, Diode, Transistor, FET, SCR, UJT, TRIAC, DIAC, and Gates AND, OR, NOT, NAND,NOR, EXOR.
2. Draw the Symbols used in Electrical Wiring: Relays, Contactors, Fuses, Main Switch, Electric Bell, Earth, DPST, DPDT, TPST, and Neutral Link.
3. Draw the Symbols for Instruments: Ammeter, Voltmeter, Wattmeter,Energy Meter, Frequency Meter, Power Factor Meter, Timer and Buzzers.
4. Draw the Symbols for Machines: Armatures, Alternators, Field winding (Shunt,Series and Compound) Transformer and Autotransformer.

PART-B

(1*60=60)

ELECTRICAL CONNECTION DIAGRAMS- DRAWING

1. Draw the Single Line Diagram of Single Phase MCB Distribution Board.
2. Draw the Single Line Diagram of Three Phase MCB Distribution Board.
3. Draw the Single Line Diagram of typical MV Panel.
4. Draw the Single Line Diagram of Motor Control Centre (MCC) Panel.
5. Draw the Single Line Diagram of Fire Alarm Riser Arrangement in Multi-Storey Building.
6. Draw the Single Line Diagram of Intercom Arrangement in Multi Storey Building.
7. Draw the Front-End Schematic Diagram of typical Sub Switch Board (SSB).
8. Draw the Winding Diagram of Lap Connected DC Armature withCommutators Connections and Brush Positions.
9. Draw the Control and Main Circuit of Automatic Star Delta Starter.
10. Draw the Mush Winding Diagram of a Three Phase Induction Motor.
11. Draw the Concentric Winding Diagram of a Single-Phase Induction Motor.

NOTE FOR EXAMINERS

1. Five symbols should be asked from part A exercise 1to 4 with at least onefrom each.
2. One sketch should be asked from part B exercise 1 to 13.
3. Printed output of the given symbols and sketch is to be evaluated

DETAILED SYLLABUS

Contents: Practical

Exercises

Part A

The following experiments should be written using 8051 assembly language program and should be executed in the 8051-Microcontroller trainer kit.

1. 8 / 16 bit addition
2. 8 / 16 bit subtraction
3. 8 bit multiplication
4. 8 bit division
5. BCD to Hex code conversion
6. Hex to BCD code conversion
7. Smallest / Biggest number
8. Time delay routine (Demonstrate by Blinking LEDS).
9. Using Timer/ counter of 8051

Part B (Interfacing Application Boards)

The following experiments can be written using C compiler or 8051 assembly language and to be executed.

10. Interfacing Digital I/O board
11. Interfacing DAC
12. Interfacing Stepper motor
13. Interfacing Seven segment LED display or LCD
14. Sending data through the serial port between microcontroller kits
15. Interfacing DC motor using PWM.

RATIONALE:

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and startups aims at instilling and stimulating human urge for excellenceby realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

OBJECTIVES:

At the end of the study of 5th semester the students will be able to

- To excite the students about entrepreneurship
- Acquiring Entrepreneurial spirit and resourcefulness
- Understanding the concept and process of entrepreneurship
- Acquiring entrepreneurial quality, competency and motivation
- Learning the process and skills of creation and management of entrepreneurialventure
- Familiarization with various uses of human resource for earning dignified means ofliving
- Know its contribution in and role in the growth and development of individual and thenation
- Understand the formation of E-cell
- Survey and analyze the market to understand customer needs
- Understand the importance of generation of ideas and product selection
- Learn the preparation of project feasibility report
- Understand the importance of sales and turnover
- Familiarization of various financial and non-financial schemes
- Aware the concept of incubation and starts ups

DETAILED SYLLABUS

Unit	Name of the Topics	Hours
1	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** ● Concept, Functions and Importance ● Myths about Entrepreneurship ● Pros and Cons of Entrepreneurship ● Process of Entrepreneurship ● Benefits of Entrepreneur ● Competencies and Characteristics ● Ethical Entrepreneurship ● Entrepreneurial Values and Attitudes ● Motivation ● Creativity ● Innovation ● Entrepreneurs - as problem solvers ● Mindset of an employee and an entrepreneur ● Business Failure – causes and remedies ● Role of Networking in entrepreneurship	**10**
2	**BUSINESS IDEA AND BANKING** ● Types of Business: Manufacturing, Trading and Services ● Stakeholders: Sellers, Vendors and Consumers ● E- Commerce Business Models ● Types of Resources - Human, Capital and Entrepreneurialtools ● Goals of Business and Goal Setting ● Patent, copyright and Intellectual Property Rights ● Negotiations - Importance and methods ● Customer Relations and Vendor Management ● Size and Capital based classification of business enterprises ● Role of Financial Institutions ● Role of Government policy ● Entrepreneurial support systems	**10**

	● Incentive schemes for State Government ● Incentive schemes for Central Government	
3	**STARTUPS, E-CELL AND SUCCESS STORIES** ● Concept of Incubation center's ● Activities of DIC, financial institutions and other relevance institutions ● Success stories of Indian and global business legends ● Field Visit to MSME's ● Various sources of Information ● Learn to earn ● Startup and its stages ● Role of Technology – E-commerce and social media ● Role of E-Cell ● E-Cell to Entrepreneurship	**10**
4	**PRICING AND COST ANALYSIS** ● Calculation of Unit of Sale, Unit Price and Unit Cost ● Types of Costs - Variable and Fixed, Operational Costs ● Break Even Analysis ● Understand the meaning and concept of the term Cash Inflow and Cash Outflow ● Prepare a Cash Flow Projection ● Pricing and Factors affecting pricing ● Understand the importance and preparation of Income Statement ● Launch Strategies after pricing and proof of concept ● Branding - Business name, logo, tag line ● Promotion strategy	**10**
5	**BUSINESS PLAN PREPARATION** ● Generation of Ideas, ● Business Ideas vs. Business Opportunities ● Selecting the Right Opportunity ● Product selection ● New product development and analysis	**10**

	• Feasibility Study Report – Technical analysis, financial analysis and commercial analysis • Market Research - Concept, Importance and Process • Marketing and Sales strategy • Digital marketing • Social Entrepreneurship • Risk Taking-Concept • Types of business risks	

TEXT BOOKS:

1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra -282002
2. Dr. G.K. Varshney, Business Regulatory Framework, Sahitya Bhawan Publications, Agra –282002

REFERNCE BOOKS:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill (India)Private Limited, Noida - 201301
2. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small business management,Pearson Education India, Noida - 201301
3. Charantimath Poornima M. Entrepreneurship Development and Small Business Enterprises,Pearson Education, Noida - 201301
4. Trott, Innovation Management and New Product Development, Pearson Education, Noida -201301
5. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing House Pvt. Ltd.,New Delhi-110044
6. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited, New Delhi
7. I. V. Trivedi, Renu Jatana, Indian Banking System, RBSA Publishers, Rajasthan
8. Simon Daniel, HOW TO START A BUSINESS IN INDIA, BUUKS, Chennai - 600018
9. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioner's guide to writing the Business Plan, Notion Press Media Pvt. Ltd., Chennai 600095.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**DISTRIBUTION** **1.1. Substation:** Introduction-Sub Stations-Classification of Sub Stations-Indoor and Outdoor S.S — Gas Insulated S.S- Comparisons-Layout 110/11KV Substation and 11KV/400V Distribution Substation-Substation Equipments-Bus Bar- Types of Bus Bar Arrangement -Advantages and Disadvantages. **1.2 Distribution:** Distribution System-Requirements of a Distribution System-Part of Distribution System- Classification of Distribution Systems-Comparison of Different Distribution Systems (A.C And D.C) -A.C Distribution -Types-Connection Schemes of Distribution System-A. C Distribution Calculations- Calculation of Voltage At Load Points on Single Phase Distribution Systems (With Concentrated Load Only)- Distribution Fed At One End, Both Ends and Ring Mains-Problems- Three Phase, Four Wire, Star Connected Unbalanced Load Circuit- Problems- Consequence of Disconnection of Neutral in Three Phase Four Wire System (Illustration with an Example)	8 12
II	**INDUSTRIAL DRIVES** Introduction to Electric Drive – Advantages of Electric Drives – Transmission of Power-Types of Electric Drives-Individual, Group and Multi Motor Drives — Advantages and Disadvantages of Individual And Group Drive -Factors Governing The Selection of Motors-Nature and Classification of Load Torque-Matching of Speed Torque Characteristics of Load and Motor-Standard Ratings of Motor- Classes of Load Duty Cycles -Selection of Motors for Different Duty Cycles-Selection of Motors for Specific Application-Braking- Features of Good Braking System- Types of Braking - Advantages of Electric Braking - Plugging, Dynamic	18

	and Regenerative Braking - As Applied to Various Motors.	
III	**ELECTRIC TRACTION** Introduction To Traction Systems - Advantages and Disadvantages of Electric Traction. System of Track Electrification - Methods of Supplying Power-Rail Connected System and Over Head System-O.H. Equipments-Contact Wire, Centenary and Droppers – Current Collection Gear for OHE –Bow and Pantograph Collector-Different Systems of Track Electrification-Advantages of Single Phase Low Frequency A. C. System- Booster Transformer-Necessity- Methods of Connecting B.T-Neutral Sectioning. **Traction Mechanics:** Units and Notations used in Traction Mechanics-Speed Time Curve for Different Services - Simplified Speed Time Curve-Derivation of Maximum Speed-Crest Speed, Average Speed, Schedule Speed (Definitions Only)-Tractive Effort and Power Requirement- Specific Energy Output- Specific Energy Consumption - Traction Motors and Control: Desirable Characteristics of Traction Motors-Motors used for Traction Purpose-Methods of Starting and Speed Control of D.CTraction Motors- Rheostatic Control-Energy Saving with Plain Rheostatic Control Series- Parallel Control- Energy Saving with Series Parallel Starting - Shunt Transition -Bridge- Transition- Multiple Unit Control –Regenerative Braking. Recent Trends in Electric Traction-Magnetic Levitation (MEGLEV) — Suspension Systems.	**8** **9**

IV	**ILLUMINATION** Introduction - Definition and Units of Different Terms used in Illumination-Plane Angle, Solids Angle, Light, Luminous Flux, Luminous Intensity, Luminous Efficacy Candle Power, Lumen, Illumination, M.S.C.P, M.H.C.P, M.H.S.C.P- Reduction Factor, Luminance, Glare Lamp Efficiency. Space-Height Ratio, Depreciation Factor Utilization Factor, Waste Light Factor, Absorption Factor, Beam Factor, Reflection Factor. Requirements of Good Lighting System- Laws of Illumination- Problems. Types of Lighting Scheme- Factors to be Considered while Designing Lighting Scheme- Design of Lighting Scheme (Indoor and Outdoor)- Problems- Lighting Systems- Factory Lighting, Flood Lighting, Street Lighting. **Sources of Light:** Arc Lamp, Incandescent Lamp, HalogenLamp, Sodium Vapour Lamp, High Pressure Mercury Vapour Lamp, Fluorescent Tube –Induction Lamp- Energy Saving Lamps (C.F.L And L.E.D Lamps)-Limitation and Disposal Of C.F.L-Benefits of Led Lamps-Comparison of Lumen Output for LED, CFL and Incandescent Lamp **Earthing and Maintenance of Lighting:** Fluorescent Lamp Disposal – Precautions in erecting lighting installations – Symptoms to identify the end of the useful life of lamp – Causes for lowering the illumination level.	**8** **9**

V	**ELECTRIC HEATING AND WELDING** **Electric Heating:** Introduction – Advantages of Electric Heating – Modes of Heat Transfer - Classification of Electric Heating - Power Frequency Electric Heating – Direct and Indirect Resistance Heating-Infrared Heating-Arc Heating –High Frequency Electric Heating – Induction Heating-Induction Stove –Eddy Current Heating and Dielectric Heating. **Electric Furnaces:** Resistance Furnace-Requirements of Heating Elements-Commonly used Heating Element Materials- Resistance Furnace for Special Purposes-Temperature Control of Resistance Furnace-Arc Furnace -Direct and Indirect Arc Furnace- Temperature Control of Arc Furnace-Reasons for Employing Low Voltage and High Current Supply - Induction Furnace-Direct and Indirect Core Type Induction Furnace- Coreless Induction Furnace-Power Supply for Coreless Induction Furnace. **Electric Welding:** Introduction-Types of Electric Welding- Requirements of Good Weld- Preparation of Work -Resistance Welding-Butt Welding, Spot Welding, Seam Welding, Projection Welding and Flash Welding-Arc Welding-Carbon Arc Welding, Metal Arc Welding, Atomic Hydrogen Arc Welding, Inert Gas Metal Arc Welding-Comparison between Resistance and Arc Welding. Radiation Welding - Ultrasonic Welding, Electron Beam Welding, Laser Beam Welding-Electric Welding Equipments (A.C. And D.C).	**5** **6** **6**

TEXT BOOK

S.No	Name of the Book	Author	Publisher	Edition
1	A Course in Electrical Power	Soni&Gupta	Dhanpat Rai& Sons, New Delhi	

REFERENCE BOOKS

S.No	Name of the Book	Author	Publisher	Edition
1	Electric Power	SL Uppal	Khanna Publishers, New Delhi	
2	Modern Electric Traction	H Partab	Dhanpat Rai & sons, New Delhi	
3	Electrical Power Distribution System	AS Pabla	Tata McGraw Hill Publishing Co, New Delhi	
4	Utilization of Electric Power	NV Suryanarayana	Tata McGraw Hill Publishing Co, New Delhi	

RATIONALE

Energy conservation is the effort made to reduce the consumption of energy by usingless of an energy service. Energy can be conserved by reducing wastage and losses, improving efficiency through technological upgrades and improved operation and maintenance. Energy Audit is the key to a systematic approach for decision-making in the area of energy management. The effective use of energy to maximize profits (minimize costs) and enhance competitive positions, it is necessary to conserve energy. Hence it is necessary to study energy auditing methods and energy saving opportunities in electrical system.

OBJECTIVES

At the end of the Semester, Students will be able to:

- ✓ Explain necessity and importance of Energy Conservation
- ✓ Explain the goal with energy conservation techniques is to reducedemand,protect supplies, develop and use Alternative Energy Sources.
- ✓ Explain the energy efficient technologies in Electrical System
- ✓ Explain the Periodic maintenance of Electrical Systems.
- ✓ Explain Technical losses and commercial losses in installation Systems.
- ✓ Explain How to product output or to lower operating costs.
- ✓ Discuss about Energy Conservation Equipment
- ✓ Explain Energy Conservation in Lighting System
- ✓ Identify where and how energy and factors affecting consumptionconsumed.
- ✓ Explain Energy Costs.
- ✓ Explain how to Detect and improving energy Efficiency.
- ✓ Explain the concept and types of Energy of Energy Audit.
- ✓ Explain the importance of Energy Audit.
- ✓ List the Instruments for Audit and Monitoring Energy and Energy Savings
- ✓ Explain Energy cost in Indian Scenario.
- ✓ Draw the Energy Audit Report Format

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**ENERGY CONSERVATION AND ITS IMPORTANCE** Definition - Need for and importance of Energy Conservation - Primary and Secondary Energy - Energy Demand and Supply - Energy Conservationin Household, Industries and Community Level - Energy for sustainable Development - Energy Conservation in India - Energy Conservation Approaches – Safe working of Electrical Equipments and Electrical Safety. Energy Conservation Techniques - Principles of Energy ConservationMethods - Difference between Energy conservation and Energy audit - Relevant clauses of Energy Conservation - BEE and its Roles - MEDA andits Roles - Energy Audit in Energy Conservation Star Labelling: Need and its benefits – Role of Tamilnadu Energy Development Agency (TEDA) – Introduction to ISO 50001 – Energy Audit Certificate.	**5** **6**
II	**ENERGY CONSERVATION IN ELECTRICAL MACHINES** Need for Energy Conservation in Induction Motor and Transformer - Methods of Energy Conservation in Induction Motor - Energy Saving Opportunities with Energy Efficient Motors - Energy Conservation Techniques in Induction Motor By: Improving Power Quality -Variation in Efficiency and Power Factor with Loading Motor Survey Matching Motor Rating with Load - Minimizing the Idle and Redundant Running of Motor Operating in Star Mode -Rewinding of Motor - Replacement by Energy Efficient Motor Periodic Maintenance Energy Conservation Techniques in Transformer. Loading Sharing Parallel Operation Isolating Techniques. Replacement by Energy Efficient Transformers - Periodic Maintenance - Energy Conservation Equipment: Soft Starters, Automatic Star Delta Convertor, Variable Frequency Drives, Automatic P. F. Controller (APFC), Intelligent P. F. Controller (IPFC)Energy Efficient Motor; Significant Features, Advantages, Applications and Limitations.	**6** **5**

III	**ENERGY CONSERVATION IN ELECTRICAL INSTALLATIONSYSTEMS** Aggregated Technical and commercial losses (ATC); Power system at state, regional, national and global level. Technical losses; causes and measuresto reduce by - Controlling I2R losses. Optimizing distribution voltage.Balancing phase currents Compensating reactive power flow Commercial losses: pilferage causes and remedies. Energy conservation equipment: Maximum Demand Controller, KVAR Controller, Automatic Power Factor controller (APFC) Energy Conservation in Lighting System Replacing Lamp sources. Using energy efficient luminaries. Using light-controlled gears. Installation of separate transformer / servo stabilizer for lighting. Periodic survey and adequate maintenance programs. Energy Conservation techniques in fans, electronic regulators.	6 5
IV	**ENERGY AUDIT AND INSTRUMENTS** Definition, objective and principles of Energy Management, Need of EnergyAudit and Management, types of Energy Audit, Audit Process, Energy Auditof Building System, Lighting System, HVAC System, Water Heating System,Heat Recovery opportunities during Energy Audit, Industrial Audit Opportunities. Energy Flow Diagram (Sankey Diagram) Simple Payback Period, Energy Audit Procedure (walk through audit and detailed audit) Instruments for Audit and Monitoring Energy and Energy Savings EnergyAudit Instruments - Basic Measurements – Electrical Measurements, Light,Pressure, Temperature and Heat Flux, Velocity andFlow Rate, Vibrations,etc. Instruments Used in Energy systems: Load and Power FactorMeasuring Equipments, Wattmeter, Flue Gas Analysis, Temperature andThermal Loss Measurements, Air Quality Analysis etc.	6 6

V	**ENERGY COSTS AND ENERGY AUDIT REPORT** Understanding Energy Costs Energy Cost in Indian Scenario - Co- generation and Tariff - Concept, Significance for Energy Conservation - Co-generation - Types of Cogenerations on basis of sequence of Energy use (Topping cycle, bottoming cycle) - Types of Co-generation basis of Technology (Steam Turbine Co-generation, Gas Turbine Co-generation, Reciprocating Engine Co-generation) Factors governing the selection of Co-generation System. Advantages of Co-generation - Tariff: Types of Tariff Structure: Special Tariffs; Time-Off- Day Tariff, Peak-Off-Day Tariff, Power Factor Tariff, Maximum Demand Tariff, Load Factor Tariff - Application of Tariff System to reduce Energy bill. Benchmarking and Energy Performance - Energy Audit Report Format - Guidelines for writing Energy Audit Report - Data presentation in Report.	6 6

TEXT BOOKS:

1. "M A Chaudhari, S M Chaudhari & S A Asarkar ", "Energy Conservation & Audit ", "Nirali Prakashan" Publication.

2. "Y. B. Mandake", "Pankaj Mohan", "Dr. D.B. Talange" Energy Conservation and Audit, "Tech – Neo" Publications.

REFERENCE BOOKS

1. "Er. Udit Mamodiya" "Electrical Energy Conservation & Auditing", Ashirwad Publication.

2. O.P. Gupta, "Energy Technology", Khanna Publishing House, New Delhi

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**THYRISTOR FAMILY, TRIGGER AND COMMUTATION CIRCUITS** Thyristor Family (Review) –SCS, SUS, SBS, LASCR and GTO. Symbol, Circuit, Working, Characteristics and Applications - UJT, SCR, DIAC, TRIAC, IGBT, GTO and MOSFET. Gate Triggering Circuits – Requirements, Types. Circuit, working of – R, RC, Synchronized UJT Triggering Circuits. Pulse Transformer in Trigger Circuits —– IC based Advance Triggering Circuits for SCR & TRIAC (Using IC TCA 785) - Driverand Power circuits for Thyristor.	7
	Commutation Circuits – SCR Turn Off Methods – Natural Commutation –Forced Commutation – Class A, Class B, Class C, Class D, Class E and Class F. SCR rating and their importance.	6
II	**PHASE CONTROLLED RECTIFIERS** Introduction – Phase Controlled Rectifiers. Circuit Diagram, Working and Waveform - Half Wave, Full Wave Controlled Rectifier with Resistive, Inductive Loads and Free Wheeling Diode - Single Phase Fully Controlled Bridge, Single Phase Dual Converter with R Load, RL Load - Single Phase Semi Converter with Continuous and Discontinuous Load Current. AC – AC Converter.	8
	Three Phase Half Controlled Bridge, Fully Controlled Bridge with RL Load - Complete Protection of Thyristors against Surge Current, Surge Voltage,Dv/Dt, Di/Dt Protection.	7

III	**CHOPPERS AND INVERTERS** **Choppers** – Introduction, Principle of Chopper Operation. Control Strategies – Constant Frequency System and Variable Frequency System. Chopper Circuit Classification – Step Up Chopper, Step Down Chopper, Voltage, Current, Load Commutated Chopper, Fist Quadrant, Second Quadrant, Two Quadrant and Four Quadrant Choppers. Circuit Diagram, Working and Waveform – Step Up Chopper, Morgan Chopper, Jones Chopper. Applications of Choppers – SMPS	8
	Inverters – Introduction, Classification of Inverter. Circuit Diagram, Working and Waveform Parallel Inverter, Half Bridge Inverter, Full Bridge Inverter, Modified MC Murray Full Bridge Inverter, MC Murray Bedford Full Bridge Inverter.	3
	Three Phase Bridge Inverter Under 180° Mode,120° Mode Operations - Pulse Width Modulated Inverters, (Single Pulse, Multiple Pulse, Sinusoidal Pulse) Applications of Inverters – UPS - Online, Offline.	4
IV	**CONTROL OF DC DRIVES** Introduction – DC Drive. Basic DC Motor Speed Equation – Operating Region, Armature Voltage Control, Field Current Control, ConstantTorque and Constant HP Regions - Circuit Diagram, Output Waveforms and Output Equation of – Separately Excited DC Motor in – A) Single Phase Full Converter Drives B) Single Phase Dual Converter Drives C)Three Phase Semi Converter Drives.	7
	DC Chopper for Series Motor Drive – Four Quadrant Control of DC Motor – DC to DC Converter using MOSFET and IGBT - Block Diagram, Explanations of Closed Loop Control of DC Drives, Phase Locked Loop Control of DC Drives - Microprocessor Based Closed Loop Control of DC Drives.	8

V	**CONTROL OF AC DRIVES** Introduction AC Drive - Torque Speed Characteristics of Three Phase Induction Motor, Speed Control of Induction Motor, Stator Voltage Control, Variable Frequency Control, Necessity of Maintaining V/F Ratio. Rotor Resistance Control Inverters for Variable Voltage and Variable Frequency Control -Static VAR Compensation. Speed Control by Rotor Resistance for Slip Ring Induction Motors – Static Scherbius Drive (Slip Power Recovery Scheme) - Closed Loop Control of AC Drive Block Diagram – Micro Computer based PWM Control of Induction Motor – Introduction to Cyclo Converter with Simple Circuit – Single Phase and Three Phase.	8 7

TEXT BOOKS

S. No.	Author	Title	Publication	Edition
1	MD Singh, KB Khanchandani	Power Electronics	McGraw Hill Publishing CompanyNew Delhi	Third reprint 2008

REFERENCE BOOKS

S. No.	Author	Title	Publication	Edition
1.	Mohammed H.Rashid	Power Electronics	New Age Publication.	Third Edition,2004
2.	Mohan, Undeland, Robbins.	Power Electronics	Wiley India Edition.	Media Enhanced Third Edition
3.	Dr.P.S.Bimbhra	Power Electronics	Khanna Publishers.	Fourth Edition, 2011.
4.	M.S.Jamil Asghar	Power Electronics	PHI Learning Private Limited	Eastern Economy Edition, 2010

RATIONALE

Bio Medical Engineering Education is in the growing stage. But every year, there is a tremendous increase in the use of Modern Medical Equipment in the Hospital and Health Care Industry therefore it is necessary for every Student to understand the functioning of various Medical Equipments. This Subject to enable the students to learn the basic principles of different Biomedical Instruments viz Clinical Measurement, Bio - Medical Recorders, Therapeutic Instruments, Biotelemetry and Modern Imaging Techniques Instruments.

OBJECTIVES

After learning this subject, the student will be able to understand the about:

- The generation of Bio-Potential and its measurement using various Electrodes.
- The measurement of Blood Pressure.
- The measurement of Lung Volume.
- The measurement of Respiration Rate.
- The measurement of Body Temperature and Skin Temperature.
- The principles of operations of ECG Recorder.
- The principles of operations of EEG Recorder.
- The principles of operations of ENG Recorder.
- The working principles of Audio Meter.
- The principles of operations of Pacemaker.
- The basic principle of Dialysis.
- The basic principle of Short-Wave Diathermy.
- The basic principle of Ventilators.
- The working principles of Telemetry.
- The basic principle of Telemedicine.
- To learn about Patient Safety.
- The various methods of Accident Prevention.
- The basic principle of various types of Lasers.
- The basic principle of CT and MRI Scanner.
- The principle of operation of various Imaging Techniques

DETAILED SYLLABUS

Contents: Theory

Units	Name of the topic	Hours
I	**BIO-ELECTRIC SIGNALS AND ELECTRODES** Bio – Potential and Their Generation – Resting and Action Potential –Propagation of Action Potential. Electrodes – Micro – Skin Surface – Needle Electrodes. **CLINICAL MEASUREMENT** Measurement of Blood Pressure (Direct, Indirect) – Blood Flow Meter (Electro Magnetic& Ultrasonic Blood Flow Meter) – Blood Ph Measurement - Measurement Of Respiration Rate – Measurement of Lung Volume – Heart Rate Measurement – Measurement of Body and Skin Temperature - Chromatography, Photometry, Flurometry.	3 10
II	**BIO - MEDICAL RECORDERS** Electro Cardiograph (ECG) – Lead System – ECG Electrodes – ECG Amplifiers – ECG Recording Units – Analysis of ECG Curves. Electroencephalograph (EEG) – 10-20 Lead System – EEG Recording Units – EEG Wave Types – Clinical use of EEG – BrainTumor. Electro Myograph (EMG) – EMG Waves – Measurement of Conduction Velocity - EMG Recording Units – Electro Retino Graph (ERG)- ERG Recording Units, Audiometer - Principle – Types – Basics Audiometer Working.	8 7

III	**THERAPEUTIC INSTRUMENTS** Cardiac Pacemaker – Classification – External Pace Makers – Implantable Pacemaker – Programmable Pacemaker – Cardiac Defibrillators – Types – AC and DC Defibrillators -Heart Lung Machinewith Block Diagram. Dialysis – Hemo Dialysis – Peritoneal Dialysis. Endoscopes Endoscopic Laser Coagulator and Applications – Physiotherapy Equipment – Short Wave Diathermy – Micro Wave Diathermy – Ultrasonic Therapy Unit (Block / Circuit) – Ventilators – Types – Modern Ventilator Block Diagram.	15
IV	**BIOTELEMETRY AND PATIENT SAFETY** Introduction to Biotelemetry – Physiological – Adaptable to Biotelemetry – Components of a Biotelemetry System – Application of Telemetry - – Tele-medicine - Introduction, Working, Applications. Patient Safety: Physiological effects of Electric Current – Micro and Macro Shock – Leakage Current – Shock Hazards from Electrical Equipment. Methods of Accident Prevention – Grounding – Double Insulation – Protection by Low Voltage – Ground Fault Circuit Interrupter – Isolation of Patient Connected Parts – Isolated Power Distribution System. Safety Aspects in Electro Surgical Units – Burns, High Frequency Current Hazards, Explosion Hazards.	8 7
V	**MODERN IMAGING TECHNIQUES** LASER Beam Properties – Block Diagram – Operation of CO2 And Ndyag LASER – Applications of LASER in Medicine. X Ray Apparatus –Block Diagram – Operation – Special Techniquesin X-Ray Imaging –Tomogram – Computerized Axial Tomography, CT Scanner –Ultrasonic Imaging Techniques – Echo Cardiograph – Angiography – Magnetic Resonance Imaging Techniques.	5 10

TEXT BOOK

1. Dr.M. Arumugam – Biomedical Instrumentation, Anuradha Publications, Chennai.

REFERENCE BOOKS

1. Leslie Cromwell –Fred j. Wibell, Erich A.P Feither – Bio Medical Instrumentation andMeasurements, II Edition.
2. Jacobson and Webstar – Medicine and Clinical Engineering.
3. R.S .Khandpur – Hand book of Bio –Medical Instrumentation.
4. Medical Electronics - Kumara doss
5. Introduction to Medical Electronics. B.R. Klin
6. Introduction to Biomedical Instrumentation Mandeep Singh Printice Hall India2010.

RATIONALE

Maintaining and servicing the computers, laptops and peripherals are essential requirements of the computer students. The clear understanding of computer network devices and protocolsare also taught in this subject.

OBJECTIVES

1. On completion of the following units of syllabus contents, the students can Identify the major components that make up the system unit.
2. Understand the principle of operations of Keyboard, mouse and displays.
3. Study about the specification of I/O Ports of all I/O devices like serial, parallel, USB – Game port, Blue tooth and IP Connectors
4. Understand the technology of high-quality multiple color graphic output devices like Dotmatrix, Inkjet, Laser, Line, MFP and computer system.
5. Understand the operations to Power Supply devices. Know the use of diagnostic Software. Identify the major components of Laptop. Troubles shoot the problems in Laptop.
6. Understand the concept of data communication.
7. Discuss the advantages and disadvantages of different network topologies. Compare different network classifications based on different category.
8. Know the use of different network devices.
9. Understand the different layers of OSI and their functions. Compare different LAN protocols. Identify the protocols used in TCP /IP and compare with OSI model. Understand IP address concepts and TCP/IP suite.

DETAILED SYLLABUS

UNIT I - MOTHERBOARD COMPONENTS AND MEMORY STORAGE DEVICES		**13 HOURS**
1.1	**Introduction:** Parts - Mother board, sockets, expansion slots, memory, power supply, drives and front panel and rear panel connectors – Hardware, Software and Firmware.	**3**
1.2	**Processors:** Architecture and block diagram of multi core Processor (any one), Features of new processor Definition only chipsets (Concepts only)	**2**
1.3	**Bus Standards** Overview and features of PCI, AGP, USB, PCMCIA, Processor BUS – High	**2**
1.4	**Primary Memory**: Introduction-Main Memory, Cache memory –DDR2- DDR3, RAM versions – 1TB RAM – Direct RDRAM	**1**
1.5	**Secondary Storage:** Hard Disk – Construction – Working Principle – Specification of IDE, Ultra ATA, Serial ATA; HDD Partition - Formatting. Troubleshooting hard disk drives.	**3**
1.6	**Removable Storage:** CD&DVD construction – reading & writing operations; CD-R, CD-RW; DVD-ROM, DVD-RW; construction and working of DVD Reader / Writer. Blue-ray: Introduction – Disc Parameters – Recording and Playback Principles – Solid state memory devices.	**2**
UNIT II I/O DEVICES AND INTERFACE		**15 HOURS**
2.1	**Keyboard and Mouse:** Keyboard: Signals – operation of membrane and mechanical keyboards–troubleshooting; wireless Keyboard**.** Mouse- types, connectors, operation of Optical mouse and Troubleshooting.	**3**
2.2	**Printers:** Introduction – Types of printers– Dot Matrix, Laser, line printer, MFP (Multi-Function Printer), Thermal printer - Operation –Construction – Features and Troubleshooting	**4**
2.3	**I/O Ports:** Serial, Parallel, USB, Game Port, Bluetooth interface, IR connector, fire ware, Signal specification problems with interfaces.	**3**
2.4	**Displays and Graphic Cards:** Panel Displays– Principles of LED, LCD and TFT Displays. SVGA Port signals – common problems and solutions.	**3**
2.5	**Power Supply:** SMPS: Principles of Operation and Block Diagram of ATX Power Supply, connector specifications	**2**

UNIT III Maintenance and Trouble Shooting of Desk top andMobile Phones		**15 HOURS**
3.1	**BIOS:** Standard CMOS setup, Advanced BIOS setup, Power management, advanced chipset features, PC Bios communication – upgrading BIOS, Flash BIOS - setup.	**3**
3.2	**POST:** Definition – IPL hardware – POST Test sequence – beepcodes and error messages.	**2**
3.3	M**obile phone components:** Basics of mobile communication. Components - battery**-** antenna-ear piece- microphone -speaker- buzzer- LCD- keyboard. Basic circuit board components – Namesand functions of different ICs used in mobile phones.	**3**
3.4	**Tools & Instruments used in mobile servicing**: Mobile servicing kit – soldering and de-soldering components using different soldering tools - Use of multi- meter and battery booster.	**2**
3.5	**Installation & Troubleshooting:** Assembling and disassembling of different types of mobile phones – Installation of OS - Fault finding & troubleshooting-Jumpering techniquesand solutions.	**2**
3.6	**Software and Antivirus**: Flashing- Formatting- Unlocking -Use of secret codes-Downloading- Routing; Mobile Viruses – Precautions – Antivirus Software.	**3**
UNIT – IV COMPUTER NETWORK DEVICES AND OSI LAYERS		**15 HOURS**
4.1	**Data Communication:** Components of a data communication – Data flow: simplex – half duplex – full duplex; Networks – Definition - Network criteria – Types of Connections: Point to point – multipoint; Topologies: Star, Bus, Ring, Mesh, Hybrid – Advantages and Disadvantages of each topology.	**3**
4.2	**Types of Networks:** LAN – MAN – WAN – CAN – HAN – Internet –Intranet –Extranet, Client-Server, Peer to Peer Networks.	**3**
4.3	**Transmission Media:** Classification of transmission media - Guided – Twisted pair, Coaxial, Fiber optics; Unguided – Radiowaves – Infrared – LOS – VSAT – cabling and standards.	**3**
4.4	**Network devices:** Features and concepts of Switches – Routers (Wired and Wireless) – Gateways.	**3**
4.5	**Network Models:** Protocol definition - standards - OSI Model – layered architecture – functions of all layers.	**3**

UNIT V 802.X AND TCP/IP PROTOCOLS		15 HOURS
5.1	**Overview of TCP / IP:** OSI & TCP/IP – Transport Layers Protocol – connection oriented and connectionless Services –Sockets – TCP & UDP.	**3**
5.2	**802.X Protocols:** Concepts and PDU format of CSMA/CD (802.3) – Token bus (802.4) – Token ring (802.5) – Ethernet – type of Ethernet (Fast Ethernet, gigabit Ethernet) –Comparison between 802.3, 802.4 and 802.5	**3**
5.3	**Network Layers Protocol:** IP –Interior Gateway Protocols (IGMP, ICMP, ARP, RARP Concept only).	**3**
5.4	**IP Addressing:** Dotted Decimal Notation –Subnetting & Super netting – VLSM Technique-IPv6 (concepts only)	**3**
5.5	**Application Layer Protocols:** FTP– Telnet – SMTP– HTTP – DNS – POP	**3**

TEXT BOOKS

S.No	Title	Author	Publisher	Year of Publishing / Edition
1.	Computer Installation and Servicing	D.Balasubramanian	Arasan Ganesan Institute of Technology	1993
2.	The complete PC upgrade and Maintenance	Mark Minasi	BPB Publication	1997
3.	Troubleshooting, Maintaining and Repairing PCs	Stephen J Bigelow	Tata MCGraw Hill Publication	2004
4.	Computer Networks	Andrew S.Tanenbaum	Prentice-Hall of India, New Delhi	2002
5.	Data Communication and networking	Behrouz A.Forouzan	Tata Mc-Graw Hill, New Delhi	2006
6.	Data and Computer Communications	William Stallings	Prentice-Hall of India	Eighth Edition 2007

REFERENCE BOOKS

S.No	Title	Author	Publisher	Year of Publishing / Edition
1.	Computer Networks	Achyut Godbole	Tata Mc-GrawHill - New Delhi	
2.	Principles of Wireless Networks– A unified Approach	Kaveh Pahlavan and Prashant krishnamoorthy	Pearson Education	2002

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

Exercise

1. To study the various Electrical Symbols, IE Rules 28, IE Rules 30, IE Rules 31, IE Rules54, IE Rules 56, IE Rules 87.
2. To study the various types of Earthing.
3. To study the various types of Electrical Wiring Methods.
4. Estimate the quantity of material and cost required for Residential Building (1BHK).
5. Estimate the quantity of material and cost required for Computer Centre having 10Computers, AC Unit, UPS, Light and Fan.
6. Estimate the quantity of material and cost required for Industrial Power Wiring having 4 Machines.
7. Estimate the quantity of material and cost required for street light service having 12Lamps Light Fitting.
8. Estimate the quantity of material and cost required for 3 Phase Service connection to abuilding having 5KW Load.
9. Estimate the quantity of material and cost required for Irrigation Pump Wiring (5HP).
10. Estimate the quantity of material and cost required for School Building having 3 ClassRooms.
11. Estimate the quantity of material and cost required for erection of a 15HP InductionMotor in a Saw Mill/Flour Mill.

DETAILED SYLLABUS

Contents: Practical

Name of the Topics: Power Electronics Practical

Exercise

1. Construct the Line synchronized Ramp trigger circuit using UJT with ACLoad to measure Firing Angles.
2. Construct Lamp control circuit using DIAC – TRIAC to measure various outputvoltage for Firing Angles.
3. Construct and test the SCR Commutation Circuits (Class B & Class D)
4. Construct and test the Half Wave Controlled Rectifier with R- Load, RL Load
5. Construct and test the Single Phase Fully Controlled Bridge with RL- Load andFree Wheeling Diode.
6. Construct and test the Single-Phase Semi Controlled Bridge with R- Load
7. Construct and test the DC Chopper Control Circuit using Thyristor (any class).
8. Construct and test the Step-Up Chopper.
9. Construct PWM based Step Down DC Chopper using MOSFET/IGBT.
10. Construct and test the Single-Phase Single Pulse / Sinusoidal PWM Inverter using MOSFET/IGBT.
11. Construct and test the SMPS using MOSFET/IGBT.
12. Construct and test the Open Loop Speed Control Circuit for DC Shunt Motorand Single-Phase AC Motor.

DETAILED SYLLABUS

List of Experiments:

1. Construction and Testing of Differential amplifier.
2. Construction and Testing of Instrumentation amplifier.
3. Measurement of pH of given solution.
4. Measurement of Blood pressure.
5. Measurement of ECG waveform.
6. Construction and verification of pacemaker circuit.
7. Construction and testing of high gain amplifier.
8. Measurement of Body and Skin temperature.
9. Study, handle and use the following Instruments/Equipments:
    a. Cardiac monitor.
    b. ECG stimulator.
    c. Muscle stimulator.
    d. Vascular Doppler recorder.
    e. Pressure plethysmograph.
    f. Skin sympathetic response meter.

DETAILED SYLLABUS

PART A - COMPUTER SERVICING AND NETWORKPRACTICAL	
1	Identification of system layout (Study Exercise) a) Front panel indicators & switches and front side & rear side connectors. b) Familiarize the computer system Layout: Marking positions ofSMPS, Motherboard, HDD, DVD and add on cards. c) Configure bios setup program and troubleshoot the typical problemsusing BIOS utility.
2	HARD DISK a) Install Hard Disk. b) Configure CMOS-Setup. c) Partition and Format Hard Disk. d) Identify Master /Slave / IDE Devices. e) Practice with scan disk, disk cleanup, disk De-fragmentation, Virus Detecting and Rectifying Software.
3	a) Install and Configure a DVD Writer & Blu-ray Disc Writer. b) Recording a Blank DVD & Blu-ray Disc.
4	Assemble a system with add on cards and check the working condition of thesystem and install Dual OS.
5	Identification of mobile phone components (Study Exercise) a) Basic mobile phone components. b) Familiarizing the basic circuit board components: Marking position of different IC and Switches in the Network and Power sections of the PCB.
6	Flashing, Unlocking and Formatting memory cards in Mobile phones.
7	Do the following cabling works in a network a) Cable Crimpling b) Standard Cabling c) Cross Cabling d) I/O Connector Crimping e) Testing the Crimped cable using a Cable tester

8	a) Configure Host IP, Subnet Mask and Default Gateway in a system in LAN(TCP/IP Configuration). b) Configure Internet connection and use IPCONFIG, PING / Tracert andNet stat utilities to Debug the Network issues.
9	Transfer files between systems in LAN using FTP Configuration. Install aprinter in LAN and share it in the network.

PART B – SYSTEM ADMINISTRATION PRACTICAL	
10	Installation of Windows 2008 / 2013 Server.
11	Installation and configuration of DHCP Server.
12	Installation and configuration of Mail Server.
13	a) Installation of Red Hat Linux using Graphical mode. b) Installation of Red Hat Linux using VMware.
14	a) Creating a user in Linux Server and assigning rights. b) Configuring and troubleshooting.
15	a) Configuring and troubleshooting of /etc/grub.conf b) Configuring and trouble shooting of /etc/passwd

Note:

The students must and should install software's. After the demonstration, the same isuninstalled. Each batch has to learn to install and use the tools.