SEMESTER—1

Credit	Hours	Marks		
2	30	I	E	To
		15	35	50

SUBJECT: Language(English)
CODE: ZDSE-101
CATEGORY: General Education Component

Objectives

- Develop effective communication skills among the students for the business world.

Learning Outcomes

- Able to differentiate in the vowels and consonants that can help the students to pronounce words better and be able to learn phonetics.
- Learn the correct pronunciation of the words helping in the reduction of Mother Tongue Influence.
  Able to communicate effectively and will have improved verbal communication.
- Learn to frame the sentences properly with the correct formation. This will improve the written skills of the students.
- Able to write paragraphs on different topics with the correct usage of vocabulary and will improve the written as well as verbal communication.
- Learn the correct usage of the punctuation marks, will draft formal & informal emails and will comprehend the article.

Unit	Topic	Key Learning
I	**Communication**	• Meaning of Communication, Importance of Communication, • Types of Communication, Process of Communication, • Communication network in an organization, Barriers to Communication, Essentials of good Communication.
II	**Grammar and Usage**	• Subject and verb agreement, • Tenses: simple past (negatives/interrogatives) present perfect, • past perfect continuous,past perfect,expressing future time (will and going to), • Passive voice (perfect tenses and modals),Modals (must, should ought to, would), • Linking words (to like because although, instead of, if, as, since, who, which that, when however, in spite of), • Reported speech, statements, questions (yes/no).
III	**Reading Skills**	• Prose texts: The Gift of the Magi by O. Henry • Poems: 1. Death the Leveller by James Shirely • 2. Mending wall – Robert Frost • Drama: Refund by Fritz Karinthy
IV	**Listening Skills**	• The process of listening, • Types of listening, • Benefits of effective listening, • Barriers to listening.
V	**Writing Skills**	• Paragraph Writing:(Describing objects,describing people,Narrating events,stories) • Letter Writing: Application for leave Application for jobs, asking for information from various agencies (e.g. Last date for getting prospects; price of items before placing orders) Note making • Ending (punctuation, spelling, appropriate vocabulary, structures)

Suggested Readings:

- **Sethi, J & et al. A Practice Course in English Pronunciation, Prentice Hall of**
- **India, New Delhi.**
- **Sen, Leena. Communication Skills, Prentice Hall of India, New Delhi.**
- **Prasad, P. Communication Skills, S.K. Kataria& Sons.**
- **Bansal, R.K. and J.B. Harrison. Spoken English, Orient Language.**
- **Roach Peter. English Phonetics and Phonology.**
- **A.S. Hornby's. Oxford Advanced Learners Dictionary of Current English, 7th Edition.**
- **Prasad, P. The Functional Aspects of Communication Skills, Delhi.**
- **McCarthy, Michael. English Vocabulary in Use, Cambridge University Press.**
- **Rajinder Pal and PremLata. English Grammar and Composition, Sultan Chand Publication.**
- **Idioms & Phrases (English-Hindi), Arihant Publication (India) Pvt. Ltd.**
- **One Word Substitution, Dr. Ashok Kumar Singh, Arihant Publications (India) Pvt,Ltd**

Credit	Hours	Marks		
2	60	I	E	To

SUBJECT: Language English Lab

		35	15	50

CODE: ZDSE-101P
CATEGORY: General Education Component

Objectives: Develop effective communication skills among the students for the business world

Learning Outcomes

- Able to differentiate in the vowels and consonants that can help the students to pronounce words better and be able to learn phonetics.
- Learn the correct pronunciation of the words helping in the reduction of Mother Tongue Influence. Able to communicate effectively and will have improved verbal communication.
- Learn to frame the sentences properly with the correct formation. This will improve the written skills of the students.
- Able to write paragraphs on different topics with the correct usage of vocabulary and will improve the written as well as verbal communication

List of Practical's

1. **1.** Greetings and starting a conversation.
2. Nov Verbal Communication Techniques during conversation.
3. Verbal Communication Techniques during Conversation.
4. PPT presentation.
5. Debate.
6. Situational dialogues / Role play.
7. Telephonic skills.
8. Group Discussions

Suggested Readings:

- Sethi, J & et al. A Practice Course in English Pronunciation, Prentice Hall of
- India, New Delhi.
- Sen, Leena. Communication Skills, Prentice Hall of India, New Delhi.
- Prasad, P. Communication Skills, S.K. Kataria& Sons.
- Bansal, R.K. and J.B. Harrison. Spoken English, Orient Language.

SUBJECT: Applied Mathematics -I

CODE: ZDSC-103

CATEGORY: General Education Component

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Objectives

- Develop the knowledge in the area of algebraic functions to solve engineering problems.

Learning Outcomes

- Learn the applications of Sets, Relations and Functions.
- Learn to solve special series and sequences
- Understand basic arithmetic and calculation methods.
- Learn co-ordinate Geometry.
- Learn to solve Statistics and Probability related problems.

Unit	Topic	Key Learning
I	**Sets, Relations and Functions**	• Theory of Sets, • Relations, • Functions, • Polynomials and Graphical Representation
II	**Sequence and Series**	• Introduction to Sequence and Series, • Arithmetic Progression (A.P.), • Geometric Progression (G.P.), • Harmonic Progression (H.P.)
III	**Algebra-I**	• Partial Fraction, • Permutation, • Combination, • Binomial Theorem
IV	**Trigonometry**	• Trigonometric Ratio, • Compound Angles, • Multiple and sub multiple angles, • Transformations of products into sums or differences and vice versa
V	**Straight Lines**	• Cartesian and Polar Coordinate, • Different Forms of a Straight Line, • General Equation of a Line, • Distance of a Point from a Line

Suggested Readings:

- Mathematics for class XI Part I and II NCERT.
- Mathematics for class XII Part I and II NCERT.

SUBJECT: Environmental Studies
CODE: ZDGE-105
CATEGORY: General Education Component

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Objectives

- Create awareness between the students about our ecosystem, related problems and our role in that.

Learning Outcomes

- Encourage to solve the environment related problems and Make other people aware about environment problems
- Comply with the safety policies of ecosystem and environment
- Identify and recommend the opportunity for improving the environment hazards to the organization and society
- Report the polices and procedure need to adapt for environmental safety
- Create awareness among the employees and the society regarding the hazards of environmental pollution

Unit	Topic	Key Learning
I	**Understanding our Environment**	• Definition, Scope and Importance, • Natural Resources • Forest Resources • Water Resources • Mineral Resources • Energy Resources • Food Resources • Land Resources
II	**Livingthings in Ecosystem**	• What is Ecosystem, Habitat and ecological niche • interaction of species with each other • adapting to environment • bio geographic zones of India • Energy flow in ecosystem • cycling of materials • Kinds of ecosystem.
III	**Atmosphere and Climate**	• The atmosphere, • layers of the atmosphere, • climate, greenhouse effect, • the Ozone layer, • deforestation, • soil erosion
IV	**Urbanisation**	• Causes of urbanisation, Manifestations of Urbanisation • social economic and environmental problems in urbanisation, • Agriculture, Unsustainable patterns of modern industrialised agriculture • green revolution.
V	**Environmental Pollution**	• Causes of Air pollution, major air pollutants, • classification of air pollutants, • thermal inversions, • photochemical smog, • acid preparation in air ,impact of air pollution

Suggested Readings:

- Industrial Safety and Health management" Pearson Prentice Hall,2003 by C.RayAsfahl
- National Safety Council, "Accident Prevention Manual for Industrial Operations", N. S. C. Chicago, 1988.
- Industrial Accident Prevention" McGraw-Hill Company, New York,1980 by Heinrich H.W.

SUBJECT: Basics of Electronics Engineering

CODE: EDEC-107
CATEGORY: Skill Education Component

Credit	Hours	Marks		
2	30	I	E	To
		15	35	50

Objectives

- Exposure to the concepts, theories and practices in the field of electronics and identify its unique vocabulary.

Learning Outcomes

- Able to understand the emergence of electrons and electronic engineering.
- Identify different electronic components and understand basic concept of current and voltage.
- Able to explain the basic concept of semiconductor diodes like p-n junction diodes and Zener diodes.
- Able to describe the working of rectifier circuits such as half and full wave rectifiers.
- Able to demonstrate the working of SMPS, inverters and UPS

Unit	Topic	Key Learning
I	**Overview of Atom and Sub-Atomic Particles**	• Atom and its elements, • Electron, • Force, • Field intensity, • Potential, • Energy, • Kinetic energy, • energy Mass Relationship.
II	**DC Circuits**	• Electronic components, • Active and Passive components, • Concept of Current and Voltage sources, • Constant voltage and current sources, • Conversion of voltage source into current source and vice versa.
III	**Basics of Semiconductor**	• Semiconductor materials, • Metals and Semiconductors and Photo-electric emission. N-type and P-type semiconductor, • PN junction diode, • Forward & Reverse bias, • Zener diode.
IV	**Introduction to electronic components**	• Photo diode, • LED, • Types and applications of diode. • Diode as a rectifier, • Half wave and full wave rectifier, • Introduction to Filters.
V	**Power supply**	• Introduction and Working of Switched Mode Power Supply (SMPS), • Voltage Regulator, • Introduction to Inverters and UPS.

Suggested Readings:

- Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi.
- Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delhi
- Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi

SUBJECT: Basics of Electronics Engineering Lab
CODE: EDEC-107P
CATEGORY: Skill Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives: Exposure to the concepts, theories and practices in the field of electronics and identify its unique vocabulary.

Learning Outcomes

- Able to understand the emergence of electrons and electronic engineering.
- Identify different electronic components and understand basic concept of current and voltage.
- Able to explain the basic concept of semiconductor diodes like p-n junction diodes and Zener diodes.
- Able to describe the working of rectifier circuits such as half and full wave rectifiers.
- Able to demonstrate the working of SMPS, inverters and UPS.

List of Practical's

1. Identification and testing of electronic components such as resistor, inductor, capacitor, diode, transistor and different types of switches used in Electronic circuits
2. Study of current, voltage and resistance measurement using of Multi-meter
3. Study of Power and Energy measurement using Wattmeter and Energy meter**.**
4. Study of V-I Characteristic of Diode.
5. Observation of input and output wave shapes of a half-wave rectifier and verification of relationship between dc output and ac input voltage
6. Observation of input and output wave shapes of a full wave rectifier and verification and relationship between dc and ac input voltage
7. Study of V-I Characteristic of Zener Diode. And use of Zener Diode as voltage regulator.
8. Design of 7 segment display using LED and bread board.
9. Study of SMPS Circuit.

Suggested Readings:

- Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi.
- Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delhi
- Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi

SUBJECT: Applied Physics
CODE: ZDSC-109
CATEGORY: Skill Education Component

Credit	Hours	Marks		
2	30	I	E	To
		15	35	50

Objectives

- Enhance the learning activities and the required knowledge of students in the area of basic physics and Optics.

Learning Outcomes

- Able to differentiate between fundamental and derived units.
- Able to understand the concept of surface tension and viscosity.
- Able to explore different types of vibrations.
- Able to understand the concept of heat.
- Able to demonstrate the concept of light using reflection and refraction.

Unit	Topic	Key Learning
I	**Units & Dimensions**	• M.K.S. fundamentals & derived units, • S.I. base units' supplementary units and derived units, • Dimensions of various physical quantities, • uses of dimensional analysis.
II	**Surface Tension and Viscosity**	• Molecular forces, • molecular theory of surface tension, • surface energy, • capillary action, • concept of viscosity, • coefficient of viscosity, • principle and construction of viscometers.
III	**Vibrations**	• Vibration as simple spring mass system, • elementary and qualitative concept of free and forced vibrations, • resonance. Effects of vibrations on building bridges and machines members.
IV	**Heat**	• Temperature and its measurement, • thermoelectric, • platinum resistance thermometers and pyrometers. • Conduction through compound media and laws of radiations.
V	**Optics**	• Nature of light, • reflection and refraction of a wave from a plane surface. • Overhead projector and Epidiascope.

Suggested Readings:

- Concept of Physics, Prof. H.C. Verma, Part-1 (Bharti Bhawan)
- Concept of Physics, Prof. H.C. Verma, Part-2 (Bharti Bhawan)
- A Text Book of Applied Physics : Egale Parkashan, Jullandhar

SUBJECT: Applied Physics
CODE: ZDSC-109P
CATEGORY: Skill Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives: Enhance the learning activities and the required knowledge of students in the area of basic physics and Optics.

Learning Outcomes

- Able to differentiate between fundamental and derived units.
- Able to understand the concept of surface tension and viscosity.
- Able to explore different types of vibrations.
- Able to understand the concept of heat.
- Able to demonstrate the concept of light using reflection and refraction.

List of Practical's

1. To determine the surface tension of a liquid by rise in capillary.
2. To determine the viscosity of a given liquid.
3. To determine the frequency of tuning fork using a Sonometer.
4. To determine the frequency of AC main using Sonometer.
5. Time period of a cantilever.
6. Familiarisation with vernier calliper, screw gauge and spherometer and determination of their vernier constants and least counts
7. To find diameter of solid cylinder using a vernier calliper
8. To find diameter of hollow cylinder using vernier calliper
9. To find area of cross-section of wire/needle using screw gauge
10. To find thickness of glass strip using spherometer.

Suggested Readings:

- Concept of Physics, Prof. H.C. Verma, Part-1 (Bharti Bhawan)
- Concept of Physics, Prof. H.C. Verma, Part-2 (Bharti Bhawan)
- A Text Book of Applied Physics : Egale Parkashan, Jullandhar

Credit	Hours	Marks

SEMESTER-2

2	30	I	E	To
		15	35	50

SUBJECT: Applied Chemistry
CODE: ZDSC-102
CATEGORY: General Education Component

Objectives

- Enable to develop the concept, processes, theoretical principles and experimental findings in Chemistry.

Learning Outcomes

- Able to understand different symbols and formulae of Chemistry.
- Able to differentiate between different models of atoms and understand the electronic configuration of different atoms.
- Able to explore different periodic properties of elements.
- Able to outline different sources and quality of drinking water.
- Able to provide the difference between different types of lubricants.
- Able to outline various types of corrosion and their preventive measures.
- Able to define polymers and demonstrate its properties.

Unit	Topic	Key Learning
I	**Basic concept of Chemistry**	• S.I. Units of pressure, volume, density, specific gravity, • surface tension and viscosity; Matter, element, • compound and mixtures, atoms, molecules, ons, • symbols and formulae, • Writing chemical formulae of simple chemical compounds
II	**Atomic structure and Chemical Bonding**	• Rutherford model of the structure of atom, • Bohr's theory of electrons, atomic number, quantum numbers. • electronic configuration of 1 to 30 elements, • Chemical bond, types of chemical bonding: ionic and covalent (sigma and pie bonds) with suitable examples
III	**Periodic Properties of Elements**	• Periodic law, periodic table, • periodicity in properties like atomic radii and volume, ionic radii. • ionization energy and electron affinity. Division of elements into s, p, d and f blocks.
IV	**(i) Water** **(ii) Lubricants**	• Sources of Water, Types of Water (Hard and soft water), • Quality criteria of drinking water (with special emphasis on hardness, total dissolved solids (TDS), Chloride, • alkalinity present in water) • Introduction to lubricants and lubrication, • Principle of Lubrication, Properties of lubrication, • Types of lubrication, bio-degradable lubricants, • Additives of lubricants
V	**(i) Corrosion** **(ii) Polymers**	• Definition, Direct chemical action theory, • Electrochemical theory, • Prevention of Corrosion (Alloying, providing metallic coatings, • Cathodic protections, Heat treatment), • Types of Corrosion.Definition, • monomer and degree of polymerization, • Brief introduction of addition & condensation polymers with suitable examples (PVC, Polyester, Teflon, Nylon 66, Bakelite), Applications of Polymers.

Suggested Readings:

- Chemistry in Engineering by J.C. Kuricose & J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
- Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
- Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.

SUBJECT: Applied Chemistry

CODE: ZDSC-102 P
CATEGORY: General Education Component

Credit	Hours	Marks		
2	60	I	E	To
		35	15	50

Objectives

- Enable to develop the concept, processes, theoretical principles and experimental findings in Chemistry.

Learning Outcomes

- Able to understand different symbols and formulae of Chemistry.
- Able to differentiate between different models of atoms and understand the electronic configuration of different atoms.
- Able to explore different periodic properties of elements.
- Able to outline different sources and quality of drinking water.
- Able to provide the difference between different types of lubricants.
- Able to outline various types of corrosion and their preventive measures.
- Able to define polymers and demonstrate its properties.

List of Practical

1. Determination of strength of given HCl iterating against N/10 NaOH volumetrically.
2. Volumetric analysis and study of apparatus used therein. Simple problems on volumetric analysis equation
3. Estimation of total alkalinity of water volumetrically
4. Determine the pH of given sample using pH meter
5. Determination of total, temporary and permanent hardness of given water sample.
6. To determine the flash and fire point of a given lubricating oil.
7. To determine the viscosity of a given lubricating oil by Redwood viscometer.
8. Detection of metal iron in the rust (solution of rust in concentrated HCl may be given)
9. Synthesis of Urea formaldehyde and Bakelite polymer.

Suggested Readings:

- Chemistry in Engineering by J.C. Kuricose & J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
- Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
- Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.

SUBJECT: Applied Mathematics-II

CODE: ZDSC-104

CATEGORY: General Education Component

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Objectives

- Make use of matrices, determinants, complex numbers and geometric concepts to solve engineering problems

Learning Outcomes

- Able to acquire knowledge in the area of relations and functions.
- Make use of Limits, continuity and geometric progression and their wider applications in engineering problems.
- Will be able to solve problems related to matrices and determinants.
- Will be able to do vector analysis.
- Able to understand geometric concepts.

Unit	Topic	Key Learning
I	Relations and Functions	• Types of Relations, • Types of Functions, • Composition of Functions, • Invertible Functions
II	Calculus	• Limit, • Continuity, • Differentiation Geometric Progression (G.P.), • Integration
III	Algebra-II	• Complex Numbers, • Matrices, • Determinants, • Probability
IV	Vector Analysis	• Introduction, • Position Vector, • Products of Vectors., • Physical Applications
V	Conic Section	• Circle, • Parabola, • Ellipse, • Hyperbola

Suggested Readings:

- Mathematics for class XI Part I and II NCERT.
- Mathematics for class XII Part I and II NCERT.
- Engineering Mathematics - Part I & II by H.K. Dass, S. Chand & Co

SUBJECT: Value Education
CODE: ZDGE-106
CATEGORY: General Education Component

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Objectives

- Use the principles and tools for the development of the person

Learning Outcomes

- Able to outline the need, objectives and types of Value Education.
- Will be able to make use of self-Exploration and Ethical Corporate Behavior in the organization.
- Apply the Social Values wherever required.
- Apply ethical and inclusive practices in professional practice
- Make the application of 7 Habits when required in the organization.
- Will make the swatch Bharat Campaign as important aspect of your organization.
- Use resources correctly and efficiently.
- Keep your immediate work area clean and tidy.
- Ensure your work meets the agreed requirements.

Unit	Topic	Key Learning
I	**Introduction**	• Definition of Values-Why values? –Types of Values: i) Personal values ii) Social values iii) Professional values iv) Moral and spiritual values v) Behavioural (common) values)
II	**Self-Exploration**	• Self-Exploration–what is it? - its content and process, • Ethical Corporate Behaviour, its Development, Ethical Leadership.
III	**Cultural values**	• Culture, • Concepts Values and Ethics, • Human Values-Classification of Values, • Understanding Harmony in the Human Being
IV	**Social Values**	• Definition of Society – Units of Society – Individual, family, • different groups – Community – Social consciousness – Equality and Brotherhood – Dialogue – Tolerance – Responsibility
V	**Habits**	• Habits, • Swach Bharat Abhiyan

Suggested Readings:

- Values for life, Better yourself Books, Bandra Mumbai by Dr. S. Ignacimuthu S.J.,
- Values (Collection of Essays) by Sri Ramakrishna Math, Chennai-4., (1996)

SUBJECT: Basics of Electrical Engineering

CODE: EDEE-108

CATEGORY: Skill Education Component

Credit	Hours	Marks		
2	30	I	E	To
		15	35	50

Objectives

- Provide quality electrical engineering knowledge with extensive hands-on and laboratory experience.

Learning Outcomes

- Outline various electrical quantities and their units.
- Able to derive Ohm's Law and make use of its applications.
- Make use of the capacitors and use them in series and parallel connection.
- Able to understand the electromagnetic effects and its laws.
- Outline the various concepts of AC Circuits and its connection with resistance, inductance and capacitance.

Unit	Topic	Key Learning
I	**Basic Electrical Quantities**	• Basic concept of charge, • current, • voltage, • resistance, • power, • energy and their units, • Conversion of units of work, • power and energy from one form to another
II	**DC Circuits**	• Ohm's Law, Series – parallel resistance circuits, • calculation of equivalent resistance, • Kirchhoff's Laws and their applications
III	**Capacitors**	• Capacitor and its capacity, • Concept of charging and Discharging of capacitors, • Types of Capacitors and their use in circuits, • Series and parallel connection of capacitors, • Energy stored in a capacitor.
IV	**Electromagnetic Effects**	• Permanent magnets and Electromagnets, • Faraday's Laws of Electromagnetic Induction, • dynamically induced e.m.f., its magnitude and induction, • inductance and its unit. • Mutually induced e.m.f., its magnitude and direction. • Force acting on a current carrying conductor in magnetic field, • its magnitude and direction.
V	**AC Circuits**	• Concept of AC Generation, • Difference between AC and DC, • Concept of alternating current and voltage, • equation of instantaneous values, • average value, r.m.s value, form factor, power factor etc., • A.C. Series Circuits with (i) resistance and inductance (ii) resistance and capacitance and (iii) resistance inductance and capacitance

Suggested Readings:

- Electrical Technology by BL Theraja, S Chand and Co, New Delhi.
- Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Sons, New Delhi.
- Experiments in Basic Electrical Engineering by SK Bhattacharya, KM Rastogi; New Age International (P) Ltd.; Publishers New Delhi.

SUBJECT: Basics of Electrical Engineering
CODE: EDEE-108P
CATEGORY: Skill Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives: Provide quality electrical engineering knowledge with extensive hands-on and laboratory experience.

Learning Outcomes

- Outline various electrical quantities and their units.
- Able to derive Ohm's Law and make use of its applications.
- Make use of the capacitors and use them in series and parallel connection.
- Able to understand the electromagnetic effects and its laws.
- Outline the various concepts of AC Circuits and its connection with resistance, inductance and capacitance.

List of Practicals

1. Verify that resistance of conductor is directly proportional to resistivity and length and inversely proportional to cross- sectional area of the conductor
2. Verification of Ohm's Law
3. Study of series resistive circuits
4. Study of parallel resistive circuits.
5. Verification of Kirchhoff's current and voltage laws applied to DC circuits
6. Charging and Discharging of a capacitor
7. Verification of Faraday's Laws of electromagnetic induction.
8. To find ratio of inductance values of a coil having air /iron core respectively and to see the effect of introduction of a magnetic core on coil inductance
9. Study of R.L., R.L.C and R.C series circuit and measurement of power and power factor.

Suggested Readings:

- Electrical Technology by BL Theraja, S Chand and Co, New Delhi.
- Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Sons, New Delhi.
- Experiments in Basic Electrical Engineering by SK Bhattacharya, KM Rastogi; New Age International (P) Ltd.; Publishers New Delhi.

Credit	Hours	Marks

SUBJECT: Basics of Computer
CODE: ZDFC-108
CATEGORY: Skill Education Component

2	30	I	E	To
		15	35	50

Objectives

- Build basic technical skills and develop any kind of computer application**.**

Learning Outcomes

- State the applications of Computers and understand the basic components of computer.
- Identify & describe various parts of computers like CPU, keyboard, monitor, etc.
- View files, work with files and customize window.
- Able to Differentiate in various operating system.
- Apply the office Applications for the task assigned by the authorities.
- Outline the basics of Networking.
- Make use of Internet and its applications when required.

Unit	Topic	Key Learning
I	**Introduction to Computer system**	• Basic Applications of Computer; • Block Diagram of Computer System, Input / Output Devices, • Computer Memory, • Concepts of Hardware and Software; • Computer Virus: Definition, • Types of viruses, Characteristics of viruses, Anti-virus software.
II	**Operating System**	• Overview of operating system: Definition, • Functions of operating system, Need and its services, • Types of operating system, • Batch Processing, • Spooling, Multiprocessing, Multiprogramming, Time-Sharing, • Comparison between DOS and windows, • Comparison between Unix and Windows.
III	**Office Applications**	• Introduction to MS Word, Introduction to MS Excel, • Introduction to MS PowerPoint, • Menus, Shortcuts, Document types, Formatting documents, • spread sheet and presentations, • Working with Spreadsheets, • Different templates.
IV	**Networking**	• Network Technologies, • Introduction to Internet: Network connecting devices, • Topologies, HTTP, HTTPS DNS, • Hub, Switches, Router, Repeater, Firewalls
V	**World Wide Web**	• WWW and Web Browsers Introduction, • Objectives, • Concept of internet, • Overview of search engines, • Popular search engines in use, • Surfing the web and websites.

Suggested Readings:

- Computers and Beginners by Jain, V.K.;
- Computer Fundamentals by Anita Goel, Pearson.

SUBJECT: Basics of Computer
CODE: ZDFC-108P
CATEGORY: General Education Component/Skill Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives: Build basic technical skills and develop any kind of computer application**.**

Learning Outcomes

- State the applications of Computers and understand the basic components of computer.
- Identify & describe various parts of computers like CPU, keyboard, monitor, etc.
- View files, work with files and customize window.
- Able to Differentiate in various operating system.
- Apply the office Applications for the task assigned by the authorities.
- Outline the basics of Networking.
- Make use of Internet and its applications when required.

List of Practical's

1. Troubleshooting
2. Practical based on to be exposed/shown various components and supposed how to switch on a computer.
3. Handling Boot Setup, Installation of Operating System
4. WordPad, Notepad, Sticky Note, Snipping tool, Paint
5. Ms Word
6. MS-Excel- Creating charts, Creating tables
7. MS-PowerPoint
8. Case study on Operating systems (Windows/ Ubuntu/ Android/iOS)
9. Networking
10. Sending E-mails

Suggested Readings:

1. Introduction to Information Technology, Leon Tech World by Leon and Leon
2. Foundations of Computing, BPB Publiction by Sinha, Kr. Pradeep and Preeti Sinha;
3. Word Processing and Typing by Sharon Spencer, Heinemann.
4. MS Office by S.S. Srivastava, Firewall Media.
5. Microsoft Office 2010 by Bittu Kumar, V & S Publications
6. Data Communication and Networking by Behrouz.A. Forouzan, McGraw Hill

SEMESTER-3

SUBJECT: Engineering Science
CODE: EDSC-201
CATEGORY: General Education Component

Credit	Hours	Marks		
3	45	I	E	To
		15	35	50

Objectives

- Enhance the technical skills for doing electrical wiring and earthing.

Learning Outcomes

- Able to work with different types of measuring instruments such as voltmeter, ammeter and wattmeter etc.
- Able to draw different symbols for electrical devices and equipment.
- Will be able to differentiate between different types of wires used.
- Will be able to do earthing of wires and measure the earth resistance.
- Will be able to take necessary precautions while handling electrical equipment's.

Unit	Topic	Key Learning
I	**Measuring Instruments**	• Construction and working principles of moving iron and moving coil voltmeters and ammeters, • dynamometer type wattmeter, • ohm meter, • megger and induction type energy meter- their circuit connection and application for measurement of electrical quantities.
II	**Electrical Engineering Drawing**	• Schematic and wiring diagram for domestic simple wiring, • symbols used for different electrical devices and equipment's.
III	**Electrical Wiring**	• Types of wiring – cleat wiring, casing and capping, C.T.S./T.R.S. wiring, metal sheath wiring, • conduit wiring and concealed wiring – their procedure. • Factors of selection of a particular wiring system, • importance of switch, • Fuse, Types of fuse and their uses.
IV	**Earthing**	• Necessity of earthing, • definitions of fundamental terms in earthing like earth, • earth lead, • earth electrode, • earth wire, • Types of earthing, • detailed study of pipe earthing, • Strip earthing and plate earthing, • Specifications of materials used for earthing, • Measurement of Earth resistance
V	**Safety Precautions**	• Precautions in handling tools, • Electric shock – First Aid in Electric Shock, • Precautions to be observed while installing different electrical appliances in houses, • Electricity rules regarding wiring

Suggested Readings:

SUBJECT: Engineering Science
CODE: EDSC-201P
CATEGORY: General Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives: Enhance the technical skills for developing electrical wires and doing earthing.

Learning Outcomes

- Able to work with different types of measuring instruments such as voltmeter, ammeter and wattmeter etc.
- Able to draw different symbols for electrical devices and equipment.
- Will be able to differentiate between different types of wires used.
- Will be able to do earthing of wires and measure the earth resistance.
- Will be able to take necessary precautions while handling electrical equipment's.

List of Practicals

1. Measurement of resistance by ammeter and voltmeter method and Ohm meter.
2. Calibration of ammeter, voltmeter and wattmeter with the help of standard meters.
3. Drawing schematic diagram to give supply to consumers.
4. Practice on casing and capping wiring.
5. Practice on cleat wiring.
6. Practice on CTS/TRS wiring.
7. Installation of pipe earthing.
8. Installation of plate earthing.
9. Prevention of Electric Shock - First Aid.

Suggested Readings:

SUBJECT: Digital Electronics
CODE: EDDE-203
CATEGORY: General Education Component

Credit	Hours	Marks		
3	45	I	E	To
		15	35	50

Objectives

- To build the understanding of digital design and digital system.

Learning Outcomes

- Explain the importance of digitization.
- Verify and interpret truth tables for all logic gates.
- Realize all logic functions with NAND and NOR gates
- Design half adder and full adder circuit
- Demonstrate and design 4-bit adder, 2's complement subtractor
- Verify and interpret truth tables for all flip flops.
- Verify and interpret truth tables of multiplexer, demultiplexer, encoder and decoder ICs
  Design and realize different asynchronous and synchronous counters

Unit	Topic	Key Learning
I	**Introduction & Number System**	• Distinction between analog and digital signals, • Applications and advantages of digital signals
		• Binary, octal and hexadecimal number system • Conversion from decimal and hexadecimal to binary and vice-versa. • Binary addition, subtraction, 1's and 2's complement method of addition/subtraction
II	**Logic gates and Families**	• Concept of negative and positive logic, • Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, • NAND and NOR as universal gates. • Introduction to TTL and CMOS logic families
III	**Logic Simplification**	• Boolean algebra, • Implementation of Boolean (logic) equation with gates, • Karnaugh map (up to 4 variables) and simple application in developing combinational logic circuits • Half adder and Full adder circuit, • design and implementation, • Half and Full subtractor circuit, • design and implementation.
IV	**Multiplexers and De-Multiplexers**	• Multiplexers and De-Multiplexers, • Basic functions and block diagram of MUX and DEMUX,Different types and ICs
V	**Latches, flip flops and Counters**	• Concept and types of latch with their working and applications, • Operation using waveforms and truth tables of RS, T, D, and Master/Slave JK flip flops, • Difference between a latch and a flip flop • Introduction to Asynchronous and Synchronous Counters • Binary counters • Divide by N ripple counters, Decade counter, counter

Suggested Readings:

- Digital Electronics by Soumitra Kumar Mandal, Tata McGraw Hill Education Pvt Ltd,
- Fundamentals of Digital Electronics by Naresh Gupta, Jain Brothers, New Delhi
- Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi
- -books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.
- **Websites for Reference:** http://swayam.gov.in

Credit	Hours	Marks

SUBJECT: Digital Electronics
CODE: EDDE-203P
CATEGORY: General Education Component

1	30	I	E	To
		35	15	50

Objectives: Build the understanding of digital design and digital system.

Learning Outcomes

- Able to distinguish between analog and digital signals.
- Able to work with number system
- Identify symbols of different logic gates and plot the truth tables
- Able to simplify the logic expressions using Boolean algebra or K-Map
- Obtain the knowledge of multiplexers, latches and flip flops.

List of Practicals

1. Verification of truth tables for AND, OR, NOT and NAND logic gates.
2. Verification of truth tables for NOR, XOR and XNOR logic gates.
3. Construction and verification of operations of half adder and full adder circuits using basic gates.
4. Construction and verification of operations of half & full Subtractor circuit using basic gates.
5. Study and verification of truth tables for 4:1 MUX using gates.
6. Study and verification of truth tables for 1:4 DEMUX using gates.
7. Construction and verification of truth tables for S-R, D and J-K flip flops.

Suggested Readings:

- Digital Electronics and Applications by Malvino Leach, Tata McGral Hill, New Delhi.
- Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi.
- Digital Fundamentals by Thomas Floyds, Universal Book Stall.
- Digital Electronics by RP Jain, Tata McGraw Hill, New Delhi.

SUBJECT: Digital Electronics
CODE: EDMS-207P
CATEGORY: Skill Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives: Build the understanding of digital design and digital system.

Learning Outcomes

- Able to distinguish between analog and digital signals.
- Able to work with number system
- Identify symbols of different logic gates and plot the truth tables
- Able to simplify the logic expressions using Boolean algebra or K-Map
- Obtain the knowledge of multiplexers, latches and flip flops.

List of Practicals

1. Verification of truth tables for AND, OR, NOT and NAND logic gates.
2. Verification of truth tables for NOR, XOR and XNOR logic gates.
3. Construction and verification of operations of half adder and full adder circuits using basic gates.
4. Construction and verification of operations of half & full Subtractor circuit using basic gates.
5. Study and verification of truth tables for 4:1 MUX using gates.
6. Study and verification of truth tables for 1:4 DEMUX using gates.
7. Construction and verification of truth tables for S-R, D and J-K flip flops.

Suggested Readings:

- Digital Electronics and Applications by Malvino Leach, Tata McGral Hill, New Delhi.
- Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi.
- Digital Fundamentals by Thomas Floyds, Universal Book Stall.
- Digital Electronics by RP Jain, Tata McGraw Hill, New Delhi.

SUBJECT: Entrepreneurship Management
CODE: ZDGE-205
CATEGORY: General Education Component

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Objectives

- Expose to the fields of entrepreneurship development

Learning Outcomes

- Will be able to develop outline of new projects for their own ventures
- Outline the skills that are required to be needed to start new ventures
- Will be able to develop Business Plans
- Will elaborate the importance of feasibility report
- Will be able to Identify the risks associated with the specific project

Unit	Topic	Key Learning
I	**Entrepreneurship**	• Meaning, • Nature and Scope, • Characteristics and Qualities of a Successful Entrepreneur, • Relationship between Entrepreneurship Development and Economic Development
II	**Entrepreneurship and Society**	Entrepreneurship and Society, New Venture Development- Meaning and Stages, Sources of Financing Entrepreneurship, Managerial Vs Entrepreneurial Approach.
III	**EDP Programs**	• EDP Programs, • Concept of Economic Freedom, • Financial Markets and Entrepreneurship, • Venture Capital; Angel Capital
IV	**Entrepreneurial Strategies and Business Plan:**	• Entrepreneurial Strategies and Business Plan, • Presenting Business Plans to the Investors, • Future of Entrepreneurship in India
V	**Women Entrepreneurship**	Concept, Factors governing women entrepreneurship, Schemes for women entrepreneurship, Rural Entrepreneurship, Concept, advantage and challenges.

Suggested Readings:

SUBJECT: Analog Electronics
CODE: EDAE-207
CATEGORY: Skill Education Component

Credit	Hours	Marks		
2	30	I	E	To
		15	35	50

Objectives

- Carry out analysis and design of analog electronic circuits

Learning Outcomes

- Able to understand the semiconductor diodes.
- Make use of the applications of PN Diode.
- Exposure to bipolar transistor, their symbols and mechanism of current flow.
- Able to make use of transistor biasing circuits.
- Able to work with transistor amplifiers and its applications.

Unit	Topic	Key Learning
I	**Semi-Conductor Physics**	• Review of basic atomic structure and energy levels, concept of insulators, conductors and semiconductors • Atomic Structure of Ge and Si • Concept of intrinsic and extrinsic semiconductors, P and N impurities and doping of impurity • P and N type semiconductors and their conductivity, Effect of temperature on conductivity of intrinsic semiconductor. • Energy Level diagram of conductors, insulators and conductors and minority and majority carriers.
II	**Semi-Conductor Diode**	• PN junction Diode, mechanism of current flow in PN junction, Drift and diffusion current, Depletion layer, forward and reverse biased PN junction, potential barrier. • Concept of junction capacitance in forward and reverse bias characteristics. • Diode as half wave, full wave and bridge rectifier. PIV rectification efficiencies and ripple factor calculations. • Types of diode characteristics and applications of Zener Diode, Zener and avalanche break down
III	**Introduction to Bipolar transistor**	• Concept of bipolar transistor, structure, PNP and NPN transistor, their symbols and mechanism of current flow, current relations in transistor, • CB CC CE configuration of the transistor, Input and Output characteristic in CB and CE configurations and current amplification factor
IV	**Single stage transistor amplifier**	• Single stage transistor amplifier circuit, a.c load line and its use in calculation of current and voltage gain of a single stage amplifier circuit. • Explanation of phase reversal of output voltage with respect to input voltage. • H- parameters and their significance and calculation of current and voltage gain.
V	**Field Effect Transistor and MOSFET**	• Construction, operation and characteristics of FET. • FET amplifier circuit and its working principle **MOSFET** • C-MOS – Advantages and applications • Comparison of JFET, MOSFET AND BJT

Suggested Readings:

- Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hills, New Delhi.
- Electronics Principles by Malvino, Tata McGraw Hills, New Delhi.
- Electronic Devices and Circuits by Millman and Halkias, McGraw Hills, New Delhi.

SUBJECT: Analog Electronics
CODE: EDAE-207P
CATEGORY: Skill Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives: Carry out analysis and design of analog electronic circuits

Learning Outcomes

- Able to understand the semiconductor diodes.
- Make use of the applications of PN Diode.
- Exposure to bipolar transistor, their symbols and mechanism of current flow.
- Able to make use of transistor biasing circuits.
- Able to work with transistor amplifiers and its applications.

List of Practical's

1. Familiarization with operation of following instruments: Multi-meter, CRO, Signal generator, Regulated Power Supply by taking readings of relevant quantities with their help.
2. Plot V-I characteristics for PN junction diode and calculate its dynamic resistance
3. Plot V-I characteristics for PN junction diode and calculate its static resistance
4. Plot V-I characteristics of Zener diode.
5. Observe the wave shape of following rectifier circuit
   a. Half wave rectifier
   b. Full wave rectifier
   c. Bridge rectifier
6. Plot input and output characteristics and calculate parameters of transistors in CE configuration
7. Plot input and output characteristics and calculate parameters of transistors in CB configuration.
8. Measure the Q-Point and note the variation of Q-Point by increasing the base resistance in fixed bias circuit.
9. Measure the Q-Point and note the variation of Q-Point by changing out of bias resistance in potential divider circuit

   Electronics

Suggested Readings:

- Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hills, New Delhi
- Electronics Principles by Malvino, Tata McGraw Hills, New Delhi
- Electronic Devices and Circuits by Millman and Halkias, McGraw Hills, New Delhi

Credit	Hours	Marks

SUBJECT: Electrical Engineering Materials and Wiring
CODE: EDMW-209
CATEGORY: General Education Component

3	45	I	E	To
		30	70	100

Objectives

- Create awareness about material science and its applications in engineering.

Learning Outcomes

- Able to classify different magnetic materials.
- Able to understand the conducting and semi-conducting materials.
- Able to classify different insulating materials.
- Exposure to various wiring accessories.
- Able to do different types of electrical wiring.

Unit	Topic	Key Learning
I	**Conducting and Semi-Conducting Materials**	• Concept of Conducting materials, • Effect of alloying, • Low resistance materials, • Properties of Aluminium and copper, • High Resistance Materials, • Properties of Eureka and Nichrome, • Classification and application of semi conducting materials
II	**Magnetic Materials**	• Classification of magnetic materials, • soft and hard magnetic materials, • Properties of soft and hard magnetic materials, • Properties of pure Iron, Silicon steel, Nickel, Cobalt, Alnico, • Ferrites & applications,
III	**Insulating materials**	• General properties of Insulating materials, • Classification of Insulating Materials, • Insulating glasses, Insulating gasses
IV	**Wiring Accessories**	• Types of Wires, Types of Switches, lamp holders, ceiling roses, • Sockets, • fuses, • Main boards, • distribution boards, • Switch boards, • Fuse materials, • Wiring tools, • wire joints
V	**Wiring Circuits**	• Simple Lamp Circuits, • Stair Case wiring, • Series and parallel circuits, • Master switch circuits, • Corridor wiring circuits, • Selection of number of sub circuits and selection of wires/cables.

Suggested Readings:

SEMESTER-4

SUBJECT: Statistical Process Control
CODE: ZDGE-202
CATEGORY: General Education Component

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Objectives

- Build an understanding of statistical process control

Learning Outcomes

- Able to understand the tools and techniques of process control.
- Identify and analyze the causes in processes.
- Build an understanding on flow control.
- Will be able to acquire the knowledge of control chart methodology.
- Will be able to acquire the knowledge of control chart design:

Unit	Topic	Key Learning
I	**Introduction Of SPC**	• Definition of Statistical Process Control, importance of SPC, • Process Control, • Tools for Process Control, • Techniques for Process Control, • Need of SPC
II	**Cause Identification**	• Methodology to identify assignable causes, • cause and effect diagram, master cause analysis table, • Why-Why analysis table
III	**SPC flow control**	• SPC procedure flow chart, operator role in SPC for individual sub-group, • Reaction Plan
IV	**Control Chart Methodology**	• Introduction, • control chart for variables, • data collection, • subgroup size • subgroup frequency, control limits, • interpretation for flow control, • interpret the process capability
V	**Control Chart Design**	• P-chart, • C-chart, • X-R chart, • histogram

Suggested Readings:

SUBJECT: ELECTRONIC INSTRUMENTS AND MEASUREMENT
CODE: EDIM-204
CATEGORY: General Education Component

Credit	Hours	Marks		
3	45	I	E	To
		15	35	50

Objectives

The study of this subject will help students to gain the knowledge of working principles and operation of different instruments. During practical sessions, he will acquire the requisite skills

Learning Outcomes

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

Unit	Topic	Key Learning
I	**Basics of Measurements**	Measurement, method of measurement, types of instruments Specifications of instruments: Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors, loading effect, importance and applications of standards and calibration
II	**Voltage, Current and Resistance Measurement**	• Principles of measurement of DC voltage, DC current, AC voltage, AC current • Principles of operation and construction of permanent magnet moving coil (PMMC) instruments and Moving iron type instruments
III	**Cathode Ray Oscilloscope**	• Construction and working of Cathode Ray Tube(CRT) • Block diagram description of a basic CRO and triggered sweep oscilloscope, front panel controls,Specifications of CRO and their explanation • Measurement of current, voltage, frequency, time period and phase using CRO • Digital storage oscilloscope (DSO) : block diagram and working principle
IV	**Impedance Bridge Q Meters**	• Wheat stone bridge • AC bridges: Maxwell's induction bridge, Hay's bridge, De-Sauty's bridge, Schering bridge and Anderson bridge • Bock diagram description of laboratory type RLC bridge, specifications of RLC bridge,Block diagram and working principle of Q meter
V	**Digital Instruments**	• Comparison of analog and digital instruments • Working principle of ramp, dual slope and integration type digital voltmeter,Block diagram and working of a digital multi-meter • Specifications of digital multi-meter and their application.

Suggested Readings:

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

Credit	Hours	Marks

SUBJECT: ELECTRONIC INSTRUMENTS AND MEASUREMENT

CODE: EDIM-204P

CATEGORY: General Education Component

1	30	I	E	To
		35	15	50

Objectives:

The study of this subject will help students to gain the knowledge of working principles and operation of different instruments. During practical sessions, he will acquire the requisite skills.

Learning Outcomes

- Describe and demonstrate the specifications (accuracy, precision, sensitivity, resolution, range, errors, loading effects) of measuring instruments.
- Demonstrate the working principle of measuring instruments like multi-meter, CRO, DSO
- Measure frequency, voltage, time period and phase using CRO and DSO
- Measure rise time and fall time using CRO and DSO
- Measure of remittance, capacitance, inductance and using different bridges
- Use of logic pulser, logic analyzer and signature analyzer

List of practical

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

Suggested Readings:

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

SUBJECT: Control System
CODE: EDCS-206
CATEGORY: General Education Component

Credit	Hours	Marks		
2	30	I	E	To
		15	35	50

Objectives

- To understand the Basics of Controlling Systems
- To understand control System Representation
- To Understand the time response analysis.
- To Understand the stability.

Learning Outcomes

- Will be able to know the different controlling systems.
- Will be familiarizing with the control system representation.
- Will be able to understand the time response analysis.
- Will be acquire concept of stability

Unit	Topic	Key Learning
I	Introduction	• Basic elements of control system • open loop control system, closed loop control system • control system terminology • manually controlled closed loop systems • automatic controlled closed loop systems • basic elements of a servo mechanism
II	Controlling Systems	• Examples of automatic control systems • use of equivalent systems for system analysis • linear systems, non-linear systems • control system examples from chemical systems, mechanical systems, electrical systems • introduction to laplace transform
III	Control system representation	• Transfer function • block diagram • reduction of block diagram • problems on block diagram • Mason's formula signal flow graph
IV	Time Response Analysis	• Standard test signals, time response of first and second-order system • time constant, time response of second order system • time response specifications, • steady-state errors and error constants • problems in first and second order system.
V	Stability	• Routh Hurwitz Criterion • Root Locus • Bode Plotting using semi log graph paper

Suggested Readings:

- Control Systems by Nagrath and Gopal
- Control Systems by KUO
- Control Systems by Ogata

SUBJECT: Control System Lab
CODE: EDCS-206 Lab
CATEGORY: General Education Component

Credit	Hours	Marks		
2	60	I	E	To
		35	15	50

Objectives

- To understand the Basics of Controlling Systems
- To understand control System Representation
- To understand the time response analysis.
- To understand the stability.

Learning Outcomes

- Will be able to know the different controlling systems.
- Will be familiarizing with the control system representation.
- Will be able to understand the time response analysis.
- Will be acquire concept of stability.

List of Practicals

1. Study of characteristic of servomotor

2. Characteristics and speed control of a stepper motor

3. To demonstrate the synchro characteristic and use a synchro pair as error detector

4. Characteristics of a potentio meter

5. Study of speed control of motor with tachometeric feed back.

6. Design of a DC speed control system

7. Simulation of a position control system with PC 8. Study of ON-OFF controller

Suggested Readings:

- Control Systems by Nagrath and Gopal
- Control Systems by KUO
- Control Systems by Ogata

SUBJECT: Plant Maintenance and Safety

CODE: EDMS--208
CATEGORY: Skill Education Component

Credit	Hours	Marks		
3	45	I	E	To
		30	70	100

Objectives

- The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency
- Manage maintenance operations satisfactorily by following safety rules.

Learning Outcomes

- Recognize troubles in mechanical elements.
- Assemble, dismantle and align mechanisms in sequential order.
- Carry out plant maintenance using tri-bology, corrosion and preventive maintenance

Unit	Topic	Key Learning
I	Fundamentals of maintenance engineering	• Definition and aim of maintenance engineering • Primary and secondary functions and responsibility of maintenance department • Types of maintenance • Types and applications of tools used for maintenance
II	Fault tracing	• Fault tracing-concept and importance. • Decision tree-concept, need and applications • Sequence of fault finding activities, show as decision tree • Types of faults in machine tools and their general causes.
III	Periodic and preventive maintenance	• Periodic inspection-concept and need • Degreasing, cleaning and repairing schemes • Overhauling of mechanical components. • Overhauling of electrical motor • Common troubles and remedies of Electric motor • Repair complexities and its use
IV	Industrial safety	• Accident - causes, types, results and control • Mechanical and electrical hazardstypes, causes and preventive steps/procedure • Safety colour codes. • Fire prevention and fire fighting, equipment and methods. .
V	Recovery, reconditioning and retrofitting	• Definition of recovery, reconditioning and retrofitting • Methods of recovery and their applications • Selection criteria of recovery methods • Reconditioning - process, features and advantages • Retrofitting - concept, need and applications

Suggested Readings:

- Maintenance Engineering Handbook, Higgins & Morrow, DA Information Services
- Maintenance Engineering, H.P.Garg, S. Chand and Company.
- Maintenance of Machine Tools, Gilbirg & Morrow.

SUBJECT: Transducers and Signal Conditioning

CODE: EDTS-210
CATEGORY: Skill l Education Component

Credit	Hours	Marks		
2	30	I	E	To
		15	35	50

Objectives

- To understand the Basics of Transducers and Signal Conditioning
- To understand Piezoelectric Transducers.
- To Understand Principle of analog signal conditioning.
- To Understand Digital signal conditioning.

Learning Outcomes

- Will be able to know the Basics of Transducers and Signal Conditioning
- Will be familiarizing with the Piezoelectric Transducers.
- Will be able to understand the Principle of analog signal conditioning
- Will be acquire concept of Digital signal conditioning.

Unit	Topic	Key Learning
I	Basic Concept s	• Definition and classification of transducers • Variable Resistance Transducers Construction, working principle, selection criteria and application of- 1. Potentiometer, strain gauge, load cell 2. Hot wire anemometer, photo resistors 3. Resistire temperature transducers 4. Thermistors 5. Carbon Microphones
II	Piezoelectric Transducers	• Construction, basic principle, selection criteria and application ofuse of equivalent systems for system analysis i. Piezoelectric Transducer ii. Seismic pick up iii. Ultrasonic Transducer
III	Other types of transducers	• Transducers based upon hall effect block diagram • Optical transducers-photo diode, photo transistor LDR, and LED • Digital transducer-single shaft encoder • Techo generator
IV	Principle of analog signal conditioning	• Linerarization • Various types of conversions (from V to F, from F to V, V to I converters and I to V converters) . • Filtering and impedance matching • Advantages, disadvantages and limitations
V	Digital signal conditioning	• A/D conversion, D/A conversion • Multiplexer/ Demultiplexer, Encoder/Decoder • Sample and hold, Data Acquisition system(DAS)

Suggested Readings:

- Electrical and Electronics Measurement and Instrumentation by A.K. Shawney, Dhanpat Rai and Co., New Delhi
- Mechanical and industrial measurement by R.K. Jain, Khanna Publishers, New Delhi
- Transducers by Peter Norton
- Mechatronics by Bolton, Prentice Hall of India, New Delhi .

SUBJECT: Transducers and Signal Conditioning

CODE: EDTS-210P
CATEGORY: Skill l Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives

- To understand the Basics of Transducers and Signal Conditioning
- To understand Piezoelectric Transducers.
- To Understand Principle of analog signal conditioning.
- To Understand Digital signal conditioning.

Learning Outcomes

- Will be able to know the Basics of Transducers and Signal Conditioning
- Will be familiarizing with the Piezoelectric Transducers.
- Will be able to understand the Principle of analog signal conditioning
- Will be acquire concept of Digital signal conditioning.

List of Practical-

1.Study of strain gauge and measurement of strain for a given sample

2. Study of piezoelectric pressure transducer

3. Study of RTD (Resistance Temperature detector)

4. Study of thermistors

5. Study of calibration of LVDT

6. Study of capactive transducer and measurement of angular displacement

7. Study of magnetic pick up 84

8. Study and draw the characteristics of a capacitance transducer

9. Study of thermocouple

10. To study and draw the characteristics of following - LDR - Photo diode - Photo transistor - Capacitance transducers

Suggested Readings:

- Electrical and Electronics Measurement and Instrumentation by A.K. Shawney, Dhanpat Rai and Co., New Delhi
- Mechanical and industrial measurement by R.K. Jain, Khanna Publishers, New Delhi

SEMESTER-5

SUBJECT: Principles of Instrumentation

CODE: EDPI-301
CATEGORY: General Education Component

Credit	Hours	Marks		
3	45	I	E	To
		15	35	50

Objectives

- The syllabus has been designed to integrate the basic knowledge to make the base of understanding instrument technology. The basic principles involves in instrumentation system, displays etc. are included in the syllabus. This concept will help the students to pick up the higher knowledge which is to be imparted in the following years.

Learning Outcomes

- Will be familiar with the Basic building blocks of any instrumentation systems
- Will have in depth knowledge of Performance characteristics of Oscillator Instruments
- Will be able to know Display and recording devices
- Will be able to know Instrument selection

Unit	Topic	Key Learning
I	Basic building blocks of any instrumentation systems	• Scope and necessity of instrumentation • Name of important process variables, their units • Building blocks of instrumentation system • Various testing signals
II	Performance characteristics of Oscillator Instruments	• Static and dynamic characteristics of instruments • Concept of time constant, response time, natural frequency, damping co-efficient • Order or instruments (1st and 2nd order) with Industrial application • Ramp, sinusoidal, step response of different orders of instruments systems
III	Display and recording devices	• Operating mechanism in indicators and recording devices • Various indicating, integrating and recording methods and their combination,Basics of printing devices • Scanning, data logging and field buses • Bar graph LCD, Seven segment display, X-Y recorder, scanners
IV	Instrument selection	• Factors affecting instrument selection, accuracy, precision, linearity, resolution, sensitivity, hysteresis, reliability, serviceability, loading effect, range advantage and limitation, cost effectiveness and availability • Static and dynamic response • Environmental effects • Calibration tools
V	Errors	• Sources and classification of errors, the remedial action • Grounding, earthing, guarding and shielding • Precautions • Analytical execution

Suggested Readings:

- Mechanical and Industrial Measurement of by RK Jain, Khanna Publishers, New Delhi
- Industrial Instrumentation by Donald P Eickrman
- Electrical and Electronics Measurement of by AK Shawney, Dhanpat Rai and Company, New Delhi
- Advanced Instrumentation and Control by MF Kureshi

SUBJECT: Principles of Instrumentation Lab

CODE: EDPI-301P
CATEGORY: General Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives

- The syllabus has been designed to integrate the basic knowledge to make the base of understanding instrument technology. The basic principles involves in instrumentation system, displays etc. are included in the syllabus. This concept will help the students to pick up the higher knowledge which is to be imparted in the following years

Learning Outcomes

- Will be familiar with the Basic building blocks of any instrumentation systems
- Will have in depth knowledge of Performance characteristics of Oscillator Instruments
- Will be able to know Display and recording devices
- Will be able to know Instrument selection

List of Practical

1. To find the constant of 1st order instrument
2. To find the constant of 2nd order instrument
3. To find the response of 1st order instrument with step, sinusoidal and ramp input
4. To find the response of 2nd order instrument with step, sinusoidal and ramp input
5. To assemble seven segment display using LEDs
6. To make fourteen segments display using LCD and verify it
7. To make the DOT Matrix display and its verification
8. Make any word using LCD and LED
9. To study circular and strip chart recorder

Suggested Readings:

- Mechanical and Industrial Measurement of by RK Jain, Khanna Publishers, New Delhi
- Industrial Instrumentation by Donald P Eickrman
- Electrical and Electronics Measurement of by AK Shawney, Dhanpat Rai and Company, New Delhi
- Advanced Instrumentation and Control by MF Kureshi

SUBJECT: Programmable Logic Controller
CODE: EDPL-305
CATEGORY: General Education Component

Credit	Hours	Marks		
3	45	I	E	To
		15	35	50

Objectives

- Familiarize the students with PLC.

Learning Outcomes

- Able to understand the basic concept of PLC.
- Will be able to demonstrate the working of PLC.
- Will be able to understand the instruction set of PLC.
- Will be able to do ladder programming.
- Exposure to different applications of PLC.

Unit	Topic	Key Learning
I	**Introduction to PLC**	• What is PLC, concept of PLC, • Building blocks of PLC,Functions of various blocks, • limitations of relays. • Advantages of PLCs over electromagnetic relays. • Different programming languages, • PLC manufacturer etc.
II	**Working of PLC**	• Basic operation and principles of PLC, • Architectural details processor, Memory structures, • I/O structure, Programming terminal, • power supply
III	**Instruction Set**	• Basic instructions like latch, • master control self-holding relays, • Timer instruction like retentive timers, resetting of timers, • Counter instructions like up counter, • down counter, resetting of counters, • Arithmetic Instructions (ADD, SUB, DIV, MUL etc.), • MOV instruction, RTC (Real Time Clock Function), • Comparison instructions like equal, • not equal, greater, greater than equal, less than, less than equal
IV	**Ladder Diagram Programming**	• Programming based on basic instructions, timer, counter, • sequencer, • and comparison instructions using ladder program.
V	**Applications of PLC**	• Assembly, Packaging, Process controls, Car parking, Doorbell operation, Traffic light control, Microwave Oven, • Washing machine, Motor in forward and reverse direction, • Star-Delta, DOL Starters, Paint Industry, • Filling of Bottles, Room Automation

Suggested Readings:

- Programmeble Logic Controllers by Thomas E.Kissel
- Design with Micro Controller by C Nagara, Murthy, S Ramgopal, Joshi B Peatman; McGraw Hill, 1988
- The 8051 Micro controller Architecture Programming and Applications, Second Edition by Kanneth J; Ayala Penram International Publishing (India) 1996
- Festo Didactic – Programmable Logic Controllers Basic Level – TP 301 – A Training Manual on PLCs
- Instrument Engineers Handbook Vol.II, by Liptak, P, Chittor Book Company

SUBJECT: Programmable Logic Controller
CODE: EDPL-305P
CATEGORY: General Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives: Familiarize the students with PLC.

Learning Outcomes

- Able to understand the basic concept of PLC.
- Will be able to demonstrate the working of PLC.
- Will be able to understand the instruction set of PLC.
- Will be able to do ladder programming.
- Exposure to different applications of PLC.

List of practicals'

1. Components/sub-components of a PLC, Learning functions of different modules of a PLC system.
2. Practical steps in programming a PLC (a) using a Hand-held programmer (b) using computer interface.
3. Introduction to step 5 programming language, ladder diagram concepts, instruction list syntax
4. Basic logic operations, AND, OR, NOT functions.
5. Logic control systems with time response as applied to clamping operation.
6. Sequence control system e.g. in lifting a device for packaging and counting.
7. Use of PLC for an application (teacher may decide).

Suggested Readings:

- Programmeble Logic Controllers by Thomas E.Kissel
- Design with Micro Controller by C Nagara, Murthy, S Ramgopal, Joshi B Peatman; McGraw Hill, 1988
- The 8051 Micro controller Architecture Programming and Applications, Second Edition by Kanneth J; Ayala Penram International Publishing (India) 1996
- Festo Didactic – Programmable Logic Controllers Basic Level – TP 301 – A Training Manual on PLCs
- Instrument Engineers Handbook Vol.II, by Liptak, P, Chittor Book Company

SUBJECT: Quality Management
CODE: EDQM-303
CATEGORY: General Education Component

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

Objectives

- Develop the understanding regarding Quality from industry approach.

Learning Outcomes

- Able to develop basic understanding of Quality.
- Exposure to different quality policies.
- Able to work with quality management principles
- Able to work with 7 QC tools.
- Able to improve product quality.

Unit	Topic	Key Learning
I	**Introduction**	• Importance of quality in the management of company. • Concepts of quality management. • Quality dimensions of goods and services. • Quality management evolution and works of quality gurus.
II	**Quality policy and quality organization**	• International and European quality organizations. • European quality policy. • International, • regional and national standardization. • System of assessment of quality conformity in Europe.
III	**Management systems and quality management principles for excellence:**	• Quality management systems. • Quality control methods. • Quality audit and certification of management systems. • Sustainable development. • Environment management systems. • Occupational health and safety management system. • Eco-labelling. • Total quality management
IV	**Process Quality Improvement**	• Introduction to process quality, • Graphical and statistical techniques for process, • 7 QC tools, • Process capability analysis, • Measurement system analysis, • ISO 9001 and QS 9000
V	**Product Quality Improvement**	• Quality Function Deployment, • Robust Design and Taguchi Method, • Design Failure Mode & Effect Analysis, • Product Reliability Analysis, • Six Sigma in Product Development

Suggested Readings:

- Besterfield D. H. Quality Control. New Jersey, 2001. 471 p.
- Dale, B. G. Managing Quality. Oxford: Blackwell Publishing, 2002. 471 p.
- Evans J. R., Lindsay W. M. The management and control of quality. USA: South-Western college publishing, 1999.
- Foster T. S. Managing quality: An Integrative Approach. New Jersey: Prentice Hall, 2002. 476 p.
- Goetsch D. L., Davis S. B. Quality management. Introduction to TQM for production, processing and services. New Jersey: Prentice Hall, 2003.
- D. C. Montgomery, Introduction to Statistical Quality Control, John Wiley & Sons, 3rd Edition.
- Mitra A., Fundamentals of Quality Control and Improvement, PHI, 2nd Ed., 1998.
- J Evans and W Linsay, The Management and Control of Quality, 6'th Edition, Thomson, 2005
- Besterfield, D H et al., Total Quality Management, 3rd Edition, Pearson Education, 2008.
- D. C. Montgomery, Design and Analysis of Experiments, John Wiley & Sons, 6th Edition,2004
- D. C. Montgomery and G C Runger, Applied Statistics and Probability for Engineers, John Wiley & Sons, 4th Edition.

Credit	Hours	Marks		
2	30	I	E	To

SUBJECT: Electronic Device Circuit

		15	35	50

CODE: EDDC-307
CATEGORY: Skill Education Component

Objectives

- Familiarize the students with different electronic devices.

Learning Outcomes

- Able to understand the charge carriers in semi-conductors.
- Will be able to understand the junctions.
- Will be able to understand the concept of MOSFET.
- Acquire the knowledge of bipolar junction transistor.
- Will be able to generate feedbacks from electronic devices

Unit	Topic	Key Learning
I	**Introduction**	• Energy Bands and Charge Carrier in Semiconductor: Bonding forces and energy bands in solids, • Charge Carriers in Semiconductors, • Carrier Concentrations, • Drift Mechanism. • Excess carriers in Semiconductors: Optical Absorption, • Carrier Lifetime: Direct Recombination, • Steady State Carrier Generation, • Quasi-Fermi Level, • Diffusion of carriers and Einstein relation.
II	**Junctions**	• Equilibrium Conditions, • Forward and Reveres Biased Junctions; Steady State Conditions. • Optoelectronic Devices: Photodiode V-I characteristic, • Photodetector, Solar Cells, Light Emitting Diode.
III	**MOSFET**	• Device structure and its operation in equilibrium, • V-I characteristics. Circuits at DC, • MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, • Small signal operation and models, single stage MOS amplifier, • MOSFET internal capacitances and high frequency model, • frequency response of CS amplifier
IV	**BJT**	• Review of device structure operation and V-I characteristics, • BJT circuits at DC, BJT as amplifier and switch, • biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, • BJT internal capacitances and high frequency model, • frequency response of CE amplifier.
V	**Feedback**	• The general feedback structure, • properties of negative feedback, • the four basic feedback topologies, • the series-shunt feedback amplifier, • the series-series feedback amplifier, • the shunt-shunt and shunt series feedback amplifier.

Suggested Readings:

- A text book of Basic Electronics and Linear Circuits by NN Bhargava and others, Tata McGraw Hill, New Delhi.
- Electronics Principles by SK Sahdev, Dhanpat Rai and Co., New Delhi.
- Electronics Principles by Albert Paul Malina, Tata McGraw Hill, New Delhi.
- Operational Amplifiers and Linear Circuits by Rama Kant and A. Gaykwad, Prentice Hall of India, New Delhi.
- Electronic Devices Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi.

SUBJECT: Electronic Device Circuit
CODE: EDDC-307P
CATEGORY: Skill Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives: Familiarize the students with different electronic devices.

Learning Outcomes

- Able to understand the charge carriers in semi-conductors.
- Will be able to understand the junctions.
- Will be able to understand the concept of MOSFET.
- Acquire the knowledge of bipolar junction transistor.
- Will be able to generate feedbacks from electronic devices.

List of practical's

1. **1.** Study of Lab Equipment's and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. P-N Junction diode: Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. Applications of PN Junction diode: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor.
4. Characteristics of Zener diode: V-I characteristics of Zener diode, Graphical measurement of forward and reverse resistance.
5. Application of Zener diode: Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. Characteristic of BJT: BJT in CE configuration- Graphical measurement of hparameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
7. Measurement of Operational Amplifier Parameters: Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
8. Applications of Op-amp: Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.
9. Field Effect Transistors: Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
10. Oscillators: Sinusoidal Oscillatorsa. Wein's bridge oscillator b. phase shift oscillator.

Suggested Readings:

- A text book of Basic Electronics and Linear Circuits by NN Bhargava and others, Tata McGraw Hill, New Delhi.
- Electronics Principles by SK Sahdev, Dhanpat Rai and Co., New Delhi.
- Electronics Principles by Albert Paul Malina, Tata McGraw Hill, New Delhi.
- Operational Amplifiers and Linear Circuits by Rama Kant and A. Gaykwad, Prentice Hall of India, New Delhi.
- Electronic Devices Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi.

SUBJECT: Electrical Machines
CODE: EDES-309
CATEGORY: Skill Education Component

Credit	Hours	Marks		
2	30	I	E	To
		15	35	50

Objectives

- Electrical machines is a subject where a student will deal with various types of electrical machines which are employed in industries, power stations, domestic and commercial appliances etc. After studying this subject, diploma holder must be competent to repair and maintain these machines and give suggestions to improve their performance. Practical aspects of the subject will make the students capable of performing various tests on the machines as per latest BIS specifications.

Learning Outcomes

- Describe star delta 3-phase connections.
- Explain phase, line voltages and current relationships in 3-phase power supply.
- Demonstrate the concept of single-phase transformers.
- Measure the power and power factor in 3 phase load.
- Determine the efficiency of a single-phase transformer.
- Apply the working principle of rotating electrical machines.
- Demonstrate the working of DC, AC motors.
- Connect and run a DC shunt motor with supply through a 3-point starter.

Unit	Topic	Key Learning
I	Three Phase Supply	• Advantage of three-phase system over single-phase system,Star Delta connections • Relation between phase and line voltage and current in a three-phase system • Power and power factor in three-phase system and their measurements by one, two and three wattmeter methods
II	Transformers	• Principle of operation and constructional details of single phase Transformer. • Voltage Regulation of a transformer, Losses in a transformer • Efficiency, condition for maximum efficiency and all day efficiency • CTs and PTs (Current transformer and potential transformer) • CVT (Constant Voltage Transformer)
III	Introduction to Rotating Electrical Machines	• E.M.F induced in a coil rotating in a magnetic field • Definition of motor and generator • Basic principle of a generator and a motor • Torque due to alignment of two magnetic fields and the concept of Torque angle • Basic Electromagnetic laws (Faraday's laws of Electromagnetic Induction)
IV	DC Machines	• Principle of working of d.c motors and d.c generator, their constructional details. • Function of the commutator for motoring and generating action • Factors determining the speed of a DC motor • Different types of excitation • Characteristics of different types of DC machines

		• Starting of DC motors and starters
V	A.C. Motors	• Revolving magnetic field produced by poly phase supply • Brief introduction about three phase induction motors, its principle of operation • Principle and working of Synchronous Machines • Application of Synchronous Machines

Suggested Readings:

- Electrical Machine by SK Bhattacharya, Tata McGraw Hill Education Pvt Ltd, New Delhi
- Electrical Machines by Nagrath and Kothari, Tata McGraw Hill Education Pvt Ltd, New Delhi
- Experiments in Basic Electrical Engineering: by S.K. Bhattacharya, KM Rastogi: New Age International (P) Ltd. Publishers, New Delhi
- Electrical Machines by SK Sahdev, Uneek Publications, Jalandhar
- Electrical Engineering by JB Gupta, SK Kataria & Sons, New Delhi

SUBJECT: Electrical Machines
CODE: EDES-309P
CATEGORY: Skill Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives

- Electrical machines is a subject where a student will deal with various types of electrical machines which are employed in industries, power stations, domestic and commercial appliances etc. After studying this subject, diploma holder must be competent to repair and maintain these machines and give suggestions to improve their performance. Practical aspects of the subject will make the students capable of performing various tests on the machines as per latest BIS specifications.

Learning Outcomes

- Describe star delta 3-phase connections.
- Explain phase, line voltages and current relationships in 3-phase power supply.
- Demonstrate the concept of single-phase transformers.
- Measure the power and power factor in 3 phase load.
- Determine the efficiency of a single-phase transformer.
- Apply the working principle of rotating electrical machines.
- Demonstrate the working of DC, AC motors.
- Connect and run a DC shunt motor with supply through a 3-point starter.

List of Practicals

1. Demonstrate various instruments use viz Ammeter, Voltmeter, Wattmeter, p.f meter etc for their identification and and connecting procedure in a circuit
2. To measure power and power factors in 3 Phase load by two wattmeter method
3. To determine the efficiency of a single phase transformer from the data obtained through open circuit and short circuit test
4. To measure power and power factor of a single phase induction motor
5.Torun a synchronous motor with a.c supply and to measure speed to verify the relation N=12O f/ P
6. To make connections of starting and running winding of a single phase capacitor motor and to run it with the help a DOL starter and to measure its speed

Suggested Readings:

- Electrical Machine by SK Bhattacharya, Tata McGraw Hill Education Pvt Ltd, New Delhi
- Electrical Machines by Nagrath and Kothari, Tata McGraw Hill Education Pvt Ltd, New Delhi
- Experiments in Basic Electrical Engineering: by S.K. Bhattacharya, KM Rastogi: New Age International (P) Ltd. Publishers, New Delhi
- Electrical Machines by SK Sahdev, Uneek Publications, Jalandhar
- Electrical Engineering by JB Gupta, SK Kataria & Sons, New Delhi

Credit	Hours	Marks

SEMESTER-6

3	45	I	E	To
		15	35	50

SUBJECT: Power Electronics

CODE: EDPE-302

CATEGORY: General Education Component

Objectives

- Build an understanding about Power electronics

Learning Outcomes

- Able to understand the working concept of Thyristors.
- Able to understand the different types of inverters.
- Will be able to work with step up and step-down chopping operation.
- Will be able to perform cyclo-converter.
- Will be exposed to applications of Thyristors.

Unit	Topic	Key Learning
I	**Thyristors**	• Principle of operation of SCR (Thyristors), • Static V-I Characteristics of Thyristor, • Two transistor analogy of Thyristor, • Gate characteristics of Thyristor, • Switching characteristic of Thyristor during turn on and turn off, • Turn on methods of Thyristor (Unijunction Transistor).
II	**Inverters**	• Introduction, • Inverter classification, • Voltage source series inverter, • Voltage source Parallel inverter (single phase), • Single phase Voltage source half and full Bridge Inverter with resistive load, • Single phase Current source Inverter with ideal Switches
III	**Chopper**	• Principle of step down and step up chopper operation, • Chopper configuration and quadrant of operation, Type A, B, C, D and E chopper, ChopperControl strategy of chopper, source filter.
IV	**Cyclo converter**	• Principle of Cyclo-converter operation), • Single phase to single phase circuit step up Cyclo converter, • Single phase to single phase circuit step down Cyclo converter
V	**Thyristors applications**	• Single phase half wave and full wave A. C regulator with resistance load, • Switch mode power supply • Buck converter, • Boost converter, • Buck-boost converter, • Bridge converter, • Snubber Circuit and free-wheeling diode.

Suggested Readings:

- Power Electronics by P.C. Sen Tata Mc Graw Hill. New Delhi.
- Power Electronics by P.S. Bhimbhrah, Khanna Publishers, New Delhi
- Power Electronics by M.S. Berde, Khanna Publishers, New Delhi.

.

SUBJECT: Power Electronics
CODE: EDPE-302P
CATEGORY: General Education Component

Credit	Hours	Marks		
1	30	I	E	To
		35	15	50

Objectives: Build an understanding about Power electronics.

Learning Outcomes

- Able to understand the working concept of Thyristors.
- Able to understand the different types of inverters.
- Will be able to work with step up and step-down chopping operation.
- Will be able to perform cyclo-converter.
- Will be exposed to applications of Thyristors.

List of Practicals

1. Single phase Semi / Full Converter with R & R-L load
2. Three phase Semi / Full Converter with R load
3. Single phase AC voltage controller using SCRs for R load
4. Single-Phase PWM bridge inverter for R load
5. Three-Phase inverter for R load
6. Step down dc chopper using power MOSFET / IGBT
7. Resonant converter
8. Load & line regulation of SMPS
9. Simulation of any two-quadrant chopper circuit
10. Simulation of PWM inverter
11. Case study of any one of the following: HVDC transmission system, Photovoltaic System, Wind generator system

Suggested Readings:

- Power Electronics by P.C. Sen Tata Mc Graw Hill. New Delhi.
- Power Electronics by P.S. Bhimbhrah, Khanna Publishers, New Delhi.
- Power Electronics by M.S. Berde, Khanna Publishers, New Delhi.
- Power Electronics by MH Rashid.
- Industrial Electronics and Control by SK Bhattacharya and S. Chatterji, New Age Publications. New Delhi.
- Power Electronics by S Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi.

SUBJECT: Microprocessors and peripheral devices

CODE: EDMP-304

Credit	Hours	Marks		
4	60	I	E	To
		30	70	100

CATEGORY: General Education Component

Objectives

- Build basic understanding about interfacing memory and peripheral devices to a microprocessor

Learning Outcomes

- Able to understand the organization of microcomputer system.
- Exposed to the architecture of Microprocessor.
- Build an understanding on instruction timing and cycles.
- Able to do basic programming in 8085 microprocessors.
- Able to understand the interfacing techniques.

Unit	Topic	Key Learning
I	**Evolution of Microprocessor**	• Typical organization of a microcomputer system and functions of its various blocks. • Microprocessor, • its evolution, • function and impact on modern society
II	**Architecture of a Microprocessor (With reference to 8085 microprocessors**	• Concept of Bus, • bus organization of 8085, • Functional block diagram of 8085 and function of each block, • Pin details of 8085 and related signals, • Demultiplexing of address/data bus generation of read/write control signals, • steps to execute a stored programme
III	**Instruction Timing and Cycles**	• Instruction cycle, machine cycle and T-states, • Fetch and execute cycle
IV	**Programming (with respect to 8085 microprocessor)**	• Brief idea of machine and assembly languages, • Machines and Mnemonic codes. • Instruction format and Addressing mode. • Identification of instructions as to which addressing mode they belong. • Concept of Instruction set. • Explanation of the instructions of the following groups of instruction set. • Data transfer group, • Arithmetic Group, • Logic Group, • Stack, I/O and Machine Control Group. • Programming exercises in assembly language. (Examples can be taken from the list of experiments).
V	**Memories and I/O interfacing**	• Concept of memory mapping, • partitioning of total memory space. • Address decoding, • concept of peripheral mapped I/O and memory mapped I/O. • Interfacing of memory mapped I/O devices.

Suggested Readings:

- Familiarization of different keys of 8086-microprocessor kit and its memory map.
- Steps to enter, check /modify data or program and to execute a program on 8086 microprocessor kit.
- Writing and execution of ALP on 8086 for addition/subtraction of two 16-bit numbers (signed & unsigned).

SUBJECT: Spreadsheet Modelling

CODE: EDSM-306

Credit	Hours	Marks		
2	30	I	E	To
		15	35	50

CATEGORY: General Education Component

Objectives

- Master advanced functions of Spreadsheet Applications that enable to produce reports, and to perform complex statistical calculations.

Learning Outcomes

- Work with spreadsheets and save them in different formats for developing proper formats.
- Create mathematical and logical formulas using standard spreadsheet functions.
- Choose, create and format charts to communicate information meaningfully.
- Work with tables and lists to analyze, filter and sort data to analyze the results for different data sets.
- Enhance productivity by working with named cell ranges, macros and templates

Unit	Topic	Key Learning
I	**Formatting**	• Introduction to Electronic Spreadsheets, • Feature of MS-Excel, Entering Data, • Entering Series, • Editing Data, • Cell Referencing, • ranges,
II	**Functions and Formulae**	• Date and time Functions, • Auto sum, • Copying Formula, • Formatting Data, • Creating Database, • Sorting Data, • Filtering, etc. Mathematical functions (rounddown, roundup, sumif), statistical functions (countif, countblank, rank), • text functions (left, right, mid, trim, concatenate), • financial functions (pv, fv, pmt), • lookup functions (hlookup, vlookup), • two level nested functions.
III	**Charts**	• Create, modify a pivot table/data pilot, • Filter, sort data in a pivot table/data pilot, • use one-input, two-input data tables/multiple operations tables
IV	**Analysis: Using tables.**	• Creating charts, • Adding secondary axis to a chart, • Change the chart type, • formatting charts, • Change display units on the axis of chart, • change scale of value axis
V	**Analysis: using Sorting and filtering:**	• sort data by multiple columns at same time, • create a customized list and perform a custom sort, • macros**,** • Customer feedback analysis using Google Doc

SUBJECT: Spreadsheet Modelling
CODE: EDSM-306P
CATEGORY: General Education Component

Credit	Hours	Marks		
2	60	I	E	To
		35	15	50

Objectives: Master advanced functions of Spreadsheet Applications that enable to produce reports, and to perform complex statistical calculations

Learning Outcomes

- Work with spreadsheets and save them in different formats for developing proper formats.
- Create mathematical and logical formulas using standard spreadsheet functions.
- Choose, create and format charts to communicate information meaningfully.
- Work with tables and lists to analyze, filter and sort data to analyze the results for different data sets.
- Enhance productivity by working with named cell ranges, macros and templates.

List of Practicals

1. Charts and Tables
2. Text Functions
3. Date and time Functions
4. Statistical functions
5. Financial Function
6. Pivot
7. Look Up
8. Nested
9. Case Study Analysis in different areas
10. Sorting functions
11. Google form development and Analysis

SUBJECT: Project Management
CODE: EDPM-310
CATEGORY: Skill Education Component

Credit	Hours	Marks		
2	30	I	E	To
		30	70	100

Objectives

- Develop an understanding among the students about the various concepts of Project Management.

Learning Outcomes

- Will be able to know about the Basics of Project Management
- Will be able to know the Project Identification and Selection
- Will be able to know the Project Planning.
- Will be able to know the industrial PERT and CPM
- Will be able to know about Resources Considerations in Projects

Unit	Topic	Key Learning
I	Basics of Project Management.	• Introduction. • Need for Project Management • Project Management Knowledge Areas and Processes • Project Management Processes
II	Project Identification and Selection	• Project Identification Process • Project Initiation • Pre-Feasibility Study • Feasibility Studies • Project Break-even point.
III	Project Planning	• Project Planning • Need of Project Planning • Project Life Cycle • Project Planning Process • Work Breakdown Structure (WBS)
IV	PERT and CPM	• Development of Project Network. • Time Estimation • Determination of the Critical Path • PERT Model • CPM Model
V	Resources Considerations in Projects	• Resource Allocation • Scheduling • Project Cost Estimate and Budgets • Cost Forecasts