

## Math-212APPLIED MATHEMATICS-II

<b>Total Contact Hours</b>		T	P	C	
Theory	64 hours		2	0	2

**Pre-requisite:-** Must have completed Mathematics I.

**AIMS**After completing the course the students will be able to:

1. Solve problems of Calculus and Analytic Geometry.
2. Develop mathematical skill, attitudes and logical perception in the use of mathematical instruments.
3. Apply principles of Differential Calculus to work out rate measures, velocity, acceleration, maxima & minima values
4. Use Principles of Integral Calculus to compute areas and volumes.
5. Acquire proficiency in solving technological problems with mathematical clarity and insight.

### COURSE CONTENTS

- |  |                |
|--|----------------|
| <b>1. FUNCTIONS &amp; LIMITS.</b>                          | <b>4 Hours</b> |
| 1.1 Constant & Variable Quantities                         |                |
| 1.2 Functions & their classification                       |                |
| 1.3 The concept of Limit                                   |                |
| 1.4 Limit of a Function                                    |                |
| 1.5 Fundamental Theorems on Limit                          |                |
| 1.6 Some important Limits                                  |                |
| 1.7 Problems   |                |
| <b>2. DIFFERENTIATION</b>                                  | <b>4 Hours</b> |
| 2.1 Increments   |                |
| 2.2 Differential Coefficient or Derivative                 |                |
| 2.3 Differentiation ab-initio or by first Principle        |                |
| 2.4 Geometrical Interpretation of Differential Coefficient |                |
| 2.5 Differential Coefficient of $X^n$ , $(ax + b)^n$       |                |
| 2.6 Three important rules                                  |                |
| 2.7 Problems   |                |
| <b>3. DIFFERENTIATION OF ALGEBRAIC FUNCTIONS</b>           | <b>4 Hours</b> |
| 3.1 Explicit Functions                                     |                |
| 3.2 Implicit Functions                                     |                |
| 3.3 Parametric forms                                       |                |

3.4	Problems	
<b>4.</b>	<b>DIFFERENTIATION OF TRIGONOMETRIC FUNCTIONS</b>	<b>4 Hours</b>
4.1	Differential Coefficient of Sin x, Cos x, Tan x from first principle.	
4.2	Differential Coefficient of Cosec x, Sec x, Cot x	
4.3	Differentiation of inverse Trigonometric functions.	
4.4	Problems.	
<b>5.</b>	<b>DIFFERENTIATION OF LOGARITHMIC &amp; EXPONENTIAL FUNCTIONS</b>	<b>4 Hours</b>
5.1	Differentiation of ln x	
5.2	Differentiation of Log $a^x$	
5.3	Differentiation of $a^x$	
5.4	Differentiation of $e^x$	
5.5	Problems	
<b>6.</b>	<b>RATE OF CHANGE OF VARIABLE.</b>	<b>4 Hours</b>
6.1	Increasing and decreasing functions	
6.2	Maxima and Minima values	
6.3	Criteria for maximum & minimum values	
6.4	Methods of finding maxima & minima	
6.5	Problems	
<b>7.</b>	<b>INTEGRATION</b>	<b>8 Hours</b>
7.1	Concept	
7.2	Fundamental Formulas	
7.3	Important Rules	
7.4	Problems	
<b>8.</b>	<b>METHODS OF INTEGRATION</b>	<b>6 Hours</b>
8.1	Integration by substitution	
8.2	Integration by parts	
8.3	Problems	
<b>9.</b>	<b>DEFINITE INTEGRALS</b>	<b>6 Hours</b>
9.1	Properties	
9.2	Application to area	
9.3	Problems	
<b>10.</b>	<b>PLANE ANALYTIC GEOMETRY &amp; STRAIGHT LINE</b>	<b>6 Hours</b>
10.1	Coordinate System	
10.2	Distance Formula	
10.3	The Ratio Formulas	

- 10.4 Inclination and slope of a line
- 10.5 The slope Formula
- 10.6 Problems

**11. EQUATIONS OF THE STRAIGHT LINE**

**6 Hours**

- 11.1 Some important Forms
- 11.2 General Form
- 11.3 Angle Formula
- 11.4 Parallelism & Perpendicularity
- 11.5 Problems

**12. THE EQUATIONS OF THE CIRCLE**

**8 Hours**

- 12.1 Standard form of Equation
- 12.2 Central form of Equation
- 12.3 General form of Equation
- 12.4 Radius & Coordinates of the centre
- 12.5 Problems

**REFERENCE BOOKS**

1. Thomas Finny - Calculus and Analytic Geometry
2. Ghulam Yasin Minhas - Technical Mathematics Vol - II, Ilmi Kitab Khana, Lahore.
3. Prof. Riaz Ali Khan - Polytechnic Mathematic Series Vol I & II, Majeed Sons, Faisalabad
4. Prof. Sana Ullah Bhatti - Calculus and Analytic Geometry, Punjab Text Book Board, Lahore.

**INSTRUCTIONAL OBJECTIVES**

**1.USE THE CONCEPT OF FUNCTIONS AND THEIR LIMITS IN SOLVING SIMPLE PROBLEMS.**

- 1.1     Define a function.
- 1.2     List all types of functions.
- 1.3     Explain the concept of limit and limit of a function.
- 1.4     Explain fundamental theorems on limits.
- 1.5     Derive some important limits.
- 1.6     Solve simple problems on limits.

**2.      UNDERSTAND THE CONCEPT OF DIFFERENTIAL COEFFICIENT.**

- 2.1     Derive mathematical expression for a differential coefficient.
- 2.2     Explain geometrical interpretation of differential coefficient.
- 2.3     Differentiate a constant, a constant associated with a variable and the sum of finite number of functions.
- 2.4     Solve related problems.

**3.USE RULES OF DIFFERENTIATION TO SOLVE PROBLEMS OF ALGEBRAIC FUNCTIONS.**

- 3.1     Differentiate ab-initio  $x^n$  and  $(ax+b)^n$ .
- 3.2     Derive product, quotient and chain rules.
- 3.3     Find derivatives of implicit functions & explicit functions
- 3.4 Differentiate parametric forms, functions w.r.t another function and by rationalization.
- 3.5     Solve problems using these formulas.

**4.USE RULES OF DIFFERENTIATION TO SOLVE PROBLEMS INVOLVING TRIGONOMETRIC FUNCTIONS.**

- 4.1     Differentiate from first principle  $\sin x$ ,  $\cos x$ ,  $\tan x$ .
- 4.2     Derive formulas for derivation of  $\sec x$ ,  $\operatorname{cosec} x$ ,  $\cot x$ .
- 4.3     Find differential coefficients of inverse trigonometric functions.

**5.USE RULES OF DIFFERENTIATION TO LOGARITHMIC AND EXPONENTIAL FUNCTIONS.**

- 5.1 Derive formulas for differential coefficient of logarithmic and exponential functions.
- 5.2     Solve problems using these formulas.

**6.UNDERSTAND RATE OF CHANGE OF ONE VARIABLE WITH RESPECT TO ANOTHER.**

- 6.1 Write expression for velocity, acceleration and slope of a line.
- 6.2 Define an increasing and a decreasing function, maxima and minima values, point of inflexion.
- 6.3 Explain criteria for maxima and minima values of a function.
- 6.4 Solve problems involving rate of change of variables.

**7.APPLY CONCEPT OF INTEGRATION IN SOLVING TECHNOLOGICAL PROBLEMS.**

- 7.1 Explain the concept of integration.
- 7.2 Write basic theorems of integration.
- 7.3 List some important rules of integration.
- 7.4 Derive fundamental formulas of integration.
- 7.5 Solve problems based on these formulas/rules.

**8. UNDERSTAND DIFFERENT METHODS OF INTEGRATION.**

- 8.1 List standard formulas.
- 8.2 Integrate a function by substitution method.
- 8.3 Find integrals by the method of integration by parts.
- 8.4 Solve problems using these methods.

**9. UNDERSTAND THE METHODS OF SOLVING DEFINITE INTEGRALS.**

- 9.1 Define definite integral.
- 9.2 List properties of definite integrals using definite integrals.
- 9.3 Find areas under the curves.
- 9.4 Solve problems of definite integrals.

**10. UNDERSTAND THE CONCEPT OF PLANE ANALYTIC GEOMETRY.**

- 10.1 Explain the rectangular coordinate system.
- 10.2 Locate points in different quadrants.
- 10.3 Derive distance formula.
- 10.4 Prove section formulas.
- 10.5 Derive Slope formula.
- 10.6 Solve problem using the above formulas.

**11. USE EQUATIONS OF STRAIGHT LINE IN SOLVING PROBLEMS.**

- 11.1 Define a straight line.
- 11.2 State general form of equation of a straight line.
- 11.3 Derive slope intercept and intercept forms of equations of a straight line.
- 11.4 Derive expression for angle between two straight lines.
- 11.5 Derive conditions of perpendicularity and parallelism of two straight lines.

11.6 Solve problems involving these equations/formulas.

**12. SOLVE TECHNOLOGICAL PROBLEMS USING EQUATION OF CIRCLE.**

12.1 Define a circle.

12.2 Describe standard, central and general forms of the equation of a circle.

12.3 Convert general form to the central form of equation of a circle.

12.4 Deduce formulas for the radius and the coordinates of the center of a circle from the general form.

12.5 Derive equation of the circle passing through three given points.

12.6 Solve problems involving these equations.

**Ch-222 APPLIED CHEMISTRY**

T	P	C
1	3	2

**Total Contact Hours**

Theory 32 Hours  
Practical 96 Hours

**AIMS** After studying this course a student will be able to:

1. Understand the significance and role of chemistry in the development of modern technology.
2. Become acquainted with basic principles of chemistry as applied in the study of relevant technology.
3. Know scientific methods for production, properties and use of materials of industrial & technological significance.
4. Gain skill for efficient conduct of practicals in a chemistry lab.

**COURSE CONTENTS**

**1. INTRODUCTION AND FUNDAMENTAL CONCEPTS. 2 Hours**

- 1.1 Scope and significance of the subject.
- 1.2 Orientation with reference to this technology.
- 1.3 Terms used & units of measurement in the study of chemistry.
- 1.4 Symbols, valency, radicals, formulae.
- 1.5 Chemical reactions & their types.

**2. ATOMIC STRUCTURE. 2 Hours**

- 2.1 Sub-atomic particles.
- 2.2 Atomic number and At. Mass.
- 2.3 The periodic classification of elements, periodic law

**3. CHEMICAL BOND. 3 Hours**

- 3.1 Nature of chemical bond.
- 3.2 Electrovalent bond with examples.
- 3.3 Co-valent bond (Polar and non-polar, sigma & Pi bonds with examples).
- 3.4 Co-ordinate bond with examples.

**4. GASES AND LIQUIDS. 4 Hours**

- 4.1 The liquid and gaseous state.
- 4.2 The liquids and their general properties (Density, viscosity, surface tension capillary action etc).
- 4.3 Gases and their general properties.
- 4.4 Gas laws (Boyle's law, charle's law, & Graham's law of diffusion etc).
- 4.5 Problems involving gas laws.

**5. WATER. 3 Hours**

- 5.1 Chemical nature and properties.

- 5.2 Impurities.
- 5.3 Hardness of water (types, causes & removal).
- 5.4 Scales of measuring hardness (degrees clark, french, PPM, Mg/litre).
- 5.5 Boiler feed water, scales and treatment.
- 5.6 Sea-water desalination, sewage treatment.
- 6. ACIDS, BASES AND SALTS. 2 Hours**
- 6.1 Definitions with examples.
- 6.2 Properties, their strength, basicity & acidity.
- 6.3 Salts and their classification with examples.
- 6.4 pH-value and scale.
- 7. NUCLEAR CHEMISTRY. 2 Hours**
- 7.1 Introduction.
- 7.2 Radioactivity (Alpha, beta and gamma rays).
- 7.3 Half life process.
- 7.4 Nuclear reaction & transformation of elements.
- 8. ELECTRO-CHEMISTRY. 4 Hours**
- 8.1 Ionization and Arrhenious theory of ionization.
- 8.2 Electrolytes and Electrolysis.
- 8.3 Faraday laws and numericals related to them.
- 8.4 Application of Electrolysis (Electroplating etc.)
- 9. ELECTRICAL INSULATING MATERIAL. 2 Hours**
- 9.1 Introduction.
- 9.2 Solid Insulators with chemical nature.
- 9.3 Liquid Insulators with chemical nature.
- 9.4 Gaseous insulators with chemical nature.
- 9.5 Uses and their classification on the basis of state, application and temp limit.
- 10. ELECTRICAL CONDUCTING MATERIAL. 2 Hours**
- 10.1 Introduction.
- 10.2 Atomic structure of conductors.
- 10.3 Mechanism of conductance.
- 10.4 Properties of some important conductors. (Al, Cu, Ag etc.)
- 11. ELECTRO CHEMICAL CELLS. 2 Hours**
- 11.1 Introduction.
- 11.2 Electrode potential
- 11.3 Cell reaction & Cell voltage.
- 11.4 Galvanic cell, lead accumulator.
- 12. ELECTRICAL MATERIALS OF SPECIAL INTEREST. 2 Hours**
- 12.1 Materials for fuses.
- 12.2 Contact materials.
- 12.3 Material used for making heating elements.
- 12.4 Materials of high conductivity and resistivity.

**13. POLLUTION.**

**2 Hours**

13.1The problem and its dangers.

13.2Causes of environmental pollution.

13.3Common pollutants.

13.4Remedies to combat the hazards of pollution.

## **Ch-222APPLIED CHEMISTRY**

### **INSTRUCTIONAL OBJECTIVES**

#### **1.UNDERSTAND THE SCOPE, SIGNIFICANCE AND FUNDAMENTAL ROLE OF THE SUBJECT.**

- 1.1Define chemistry and its terms.
- 1.2State the units of measurements in the study of chemistry.
- 1.3Describe language of chemistry and chemical reactions.
- 1.4Write chemical formula of common compounds.
- 1.5Describe types of chemical reactions with examples.

#### **2.UNDERSTAND THE STRUCTURE OF ATOMS AND ARRANGEMENT OF SUB ATOMIC PARTICLES IN THE ARCHITECTURE OF ATOMS.**

- 2.1Define atom.
- 2.2Describe the fundamental sub atomic particles
- 2.3Distinguish between atomic no. and mass no's between isotopes and isobars.
- 2.4Explain the arrangements of electrons in different shells and sub energy levels.
- 2.5Explain the grouping and placing of elements in the periodic table.
- 2.6State the periodic law of elements.

#### **3.UNDERSTAND THE NATURE OF CHEMICAL BONDS.**

- 3.1Define chemical bond.
- 3.2Describe the nature of chemical bond.
- 3.3Differentiate between electrovalent and covalent bonding.
- 3.4Explain the formation of polar and non polar, sigma and pi-bond with examples.
- 3.5Describe the nature of coordinate bond with examples.

#### **4.GASES AND LIQUIDS.**

- 4.1Understand the states of matter.
  - 4.1.1Describe the liquid and gaseous states of matter.
  - 4.1.2State the general properties of liquid.
  - 4.1.3State the general properties of gases.
- 4.2Understand Gas equation.
  - 4.2.1State Boyle's law, Charle's law, Graham's law of diffusion, Dalton's law of partial pressure.
  - 4.2.2State the mathematical forms of these laws.
  - 4.2.3Derive gas equation
  - 4.2.4Solve Problems using gas law and gas equation.

#### **5.UNDERSTAND THE CHEMICAL NATURE OF WATER.**

- 5.1Describe the chemical nature of water with its formula.
- 5.2Describe the general impurities present in water.
- 5.3Explain the causes and methods to remove hardness of water.
- 5.4Express hardness in different units like mg/liter. p.p.m, degrees clark and degrees French.

- 5.5 Describe the formation and nature of scales and sludge in boiler feed water.
- 5.6 Explain the method for the treatment of scales.
- 5.7 Explain the sewage treatment and desalination of sea water.

**6. UNDERSTAND THE NATURE OF ACIDS, BASES AND SALTS.**

- 6.1 Define acids, bases and salts with examples.
- 6.2 State general properties of acids and bases.
- 6.3 Define and differentiate between acidity and basicity and use the related terms.
- 6.4 Define salts, give their classification with examples.
- 6.5 Explain p-H value of solution and pH scale.

**7. UNDERSTAND THE FUNDAMENTALS OF NUCLEAR CHEMISTRY.**

- 7.1 Define nuclear chemistry and radio activity.
- 7.2 Differentiate between Alpha, Beta and Gamma particles.
- 7.3 Explain half life process.
- 7.4 Explain transformation of some elements by nuclear reaction with examples.
- 7.5 State important uses of isotopes.
- 7.6 Explain with examples the phenomenon of Fission & Fusion.

**8. UNDERSTAND THE CONCEPT OF IONIZATION AND ELECTROLYSIS.**

- 8.1 Define electrochemistry
- 8.2 State electrochemical units.
- 8.3 State important points of Arrhenius theory of ionization.
- 8.4 Explain the nature of electrolytes
- 8.5 Explain electrolysis with examples.
- 8.6 State Faraday's laws of electrolysis.
- 8.7 Solve problems related to the laws.
- 8.8 List important applications of electrolysis and describe electroplating in detail.

**9. UNDERSTAND THE NATURE OF ELECTRICAL INSULATING MATERIALS.**

- 9.1 Define an electrical insulating material and explain a dielectric.
- 9.2 Explain the chemical nature of some solid insulators and their thermal classification.
- 9.3 Describe the chemical composition with insulating properties of boards, fibrous insulators, polymers, silicon, rubber, mica & asbestos.
- 9.4 Describe liquid insulators.
- 9.5 Describe some gaseous insulators i.e, air,  $\text{CO}_2$ ,  $\text{SF}_6$ , with their dielectric strengths.

**10. UNDERSTAND THE STRUCTURE OF CONDUCTORS AND MECHANISM OF ELECTRICAL CONDUCTANCE.**

- 10.1 Define an electrical conductor and give examples.
- 10.2 Explain conducting properties of a conductor on the basis of their electronic arrangement in atom and their energy bands.
- 10.3 Describe atomic structure of Ag, Au, Cu and Al.

- 10.4 Explain semiconductor with examples.
- 10.5 State important properties of good conductor with examples.

**11. TO UNDERSTAND THE MEANING AND SETTING OF ELECTRO CHEMICAL CELLS.**

- 11.1 Define an electrochemical cell, electrolyte and cathode and anode reactions.
- 11.2 Explain cell reaction with the example of electrolysis.
- 11.3 Explain the construction and function of Daniel cell and dry cell.
- 11.4 Describe lead storage battery with its charging and discharging process.

**12. UNDERSTAND THE COMPOSITION AND PROPERTIES OF SOME SPECIAL MATERIALS USED FOR ELECTRICAL PURPOSES.**

- 12.1 Explain compositions and properties with examples of materials used as "fuses".
- 12.2 Describe the composition and properties of contact materials in electrical installations.
- 12.3 Explain properties of materials used as "heating elements".
- 12.4 List materials of high conductivity and high resistivity used in electrical engineering.

**13. UNDERSTAND THE NATURE OF POLLUTION.**

- 13.1 Define Pollution (air, water, food).
- 13.2 Describe the causes of environmental pollution.
- 13.3 Enlist some common pollutants.
- 13.4 Describe methods to prevent pollution.

## Ch-222APPLIED CHEMISTRY

### LIST OF PRACTICALS

- 1.To introduce the common apparatus, glassware and chemical reagents used in the chemistry lab.
- 2.To purify a chemical substance by crystallization.
- 3.To separate a mixture of sand and salt.
- 4.To find the melting point of substance.
- 5.To find the pH of a solution with pH paper.
- 6.To separate a mixture of inks by chromatography.
- 7.To determine the co-efficient of viscosity of benzene with the help of Ostwald viscometer.
- 8.To find the surface tension of a liquid with a stalagmometer.
- 9.To perform electrolysis of water to produce Hydrogen and Oxygen.
- 10.To determine the chemical equivalent of copper by electrolysis of Cu SO.
- 11.To get introduction with the scheme of analysis of salts for basic radicals.
- 12.To analyse 1st group radicals ( $\text{Ag}^+$  -  $\text{Pb}^{2+}$  -  $\text{Hg}^+$ ).
- 13.To make practice for detection 1st group radicals.
- 14.To get introduction with the scheme of II group radicals.
- 15.To detect and confirm II-A radicals ( $\text{Hg}^{2+}$ ,  $\text{Pb}^{2+}$ ,  $\text{Cu}^+$ ,  $\text{Cd}^{2+}$ ,  $\text{Bi}^{3+}$ ).
- 16.To detect and confirm II-B radicals ( $\text{Sn}^{2+}$ ,  $\text{Sb}^{3+}$ ,  $\text{As}^{3+}$ ).
- 17.To get introduction with the scheme of III group radicals ( $\text{Fe}^{3+}$  -  $\text{Al}^{3+}$ ,  $\text{Cr}^{3+}$ )
- 18.To detect and confirm  $\text{Fe}^{3+}$ ,  $\text{Al}^{3+}$  and  $\text{Cr}^{3+}$ .
- 19.To get introduction with the scheme of IV group radicals.
- 20.To detect and confirm  $\text{An}^{2+}$  and  $\text{Mn}^{2+}$  radicals of IV group.
- 21.To detect and confirm  $\text{Co}^{2+}$  and  $\text{Ni}^{2+}$  radicals of IV group.
- 22.To get introduction with the Acid Radical Scheme.
- 23.To detect dilute acid group.
- 24.To detect and confirm  $\text{CO}_3^{2-}$  and  $\text{HCO}_3^-$  radicals.
- 25.To get introduction with the methods/apparatus of conducting volumetric estimations.
- 26.To prepare standard solution of a substance.
- 27.To find the strength of a given alkali solution.
- 28.To estimate  $\text{HCO}_3^-$  contents in water.
- 29.To find out the %age composition of a mixture solution of  $\text{KNO}_3$  and  $\text{KOH}$  volumetrically.
- 30.To find the amount of chloride ions ( $\text{Cl}^-$ ) in water volumetrically.

### RECOMMENDED BOOKS

- 1.Text book of intermediate chemistry (I & II).
- 2.Ilmi Applied Science by Sh. Atta Muhammad.
- 3.Polytechnic Chemistry by J.N. reddy Tata Mc Graw Hill (New Delhi).
- 4.Applied Chemistry for Engineers by Eric S. Gyngell.

**Mgm-211 BUSINESS COMMUNICATION**

T	P	C
1	0	1

**Total contact hours**

Theory 32 Hrs.

**Prerequisites:** The students shall already be familiar with the language concerned.

**AIMS** The course has been designed to enable the students to.

1. Develop communication skills.
2. Understand basic principles of good and effective business writing in commercial and industrial fields.
3. Develop knowledge and skill to write technical report with confidence and accuracy.

**COURSE CONTENTS**

- 1. COMMUNICATION PROCESS. 6 Hours**
  - 1.1 Purposes of communication
  - 1.2 Communication process
  - 1.3 Distortions in communication
  - 1.4 Consolidation of communique
  - 1.5 Communication flow
  - 1.6 Communication for self development
  
- 2. ORAL COMMUNICATION SKILLS. 6 Hours**
  - 2.1 Significance of speaking.
  - 2.2 Verbal and non-verbal messages.
  - 2.3 Strategic steps of speaking.
  - 2.4 Characteristics of effective oral messages.
  - 2.5 Communication Trafficking.
  - 2.6 Oral presentation.
  
- 3. QUESTIONING SKILLS. 3 Hours**
  - 3.1 Nature of question.
  - 3.2 Types of questions.
  - 3.3 Characteristics of a good question.
  - 3.4 Questioning strategy
  
- 4. LISTENING SKILLS. 5 Hours**
  - 4.1 Principles of active listening.
  - 4.2 Skills of active listening.
  - 4.3 Barriers to listening.
  - 4.4 Reasons of poor listening.
  - 4.5 Giving Feedback.
  
- 5. INTERVIEWING SKILLS. 3 Hours**
  - 5.1 Significance of interviews.
  - 5.2 Characteristics of interviews.

- 5.3 Activities in an interviewing situation
- 5.4 Types of interviews.
- 5.5 Interviewing strategy.
  
- 6. REPORT WRITING. 3 Hours**
  - 6.1 Goals of report writing
  - 6.2 Report format.
  - 6.3 Types of reports.
  - 6.4 Report writing strategy.
  
- 7. READING COMPREHENSION. 2 Hours**
  - 7.1 Reading problems.
  - 7.2 Four Reading skills.
  
- 8. GROUP COMMUNICATION. 4 Hours**
  - 8.1 Purposes of conducting meetings.
  - 8.2 Planning a meeting.
  - 8.3 Types of meetings.
  - 8.4 Selection of a group for meeting.
  - 8.5 Group leadership skills.
  - 8.6 Running a successful meeting.
  - 8.7 Active participation techniques.

**RECOMMENDED BOOKS**

1. Sh. Ata-ur-Rehman Effective Business Communication & Report Writing.
2. Ulman J.N. Could JR. Technical Reporting.

**Mgm-211 BUSINESS COMMUNICATION.**

**INSTRUCTIONAL OBJECTIVES**

**1.UNDERSTAND THE COMMUNICATION PROCESS.**

- 1.1 State the benefits of two way communication.
- 1.2 Describe a model of communication process.
- 1.3 Explain the major communication methods used in organization.
- 1.4 Identify the barriers to communication and methods of overcoming these barriers.
- 1.5 Identify misconceptions about communication.

**2. UNDERSTAND THE PROCESS OF ORAL.**

- 2.1 Identify speaking situations with other peoples.
- 2.2 Identify the strategy steps of speaking.
- 2.3 Identify the characteristics of effective speaking.
- 2.4 State the principles of one-way communication.
- 2.5 State the principles of two-way communication.
- 2.6 Identify the elements of oral presentation skills.
- 2.7 Determine the impact of non-verbal communication on oral communication.

**3.DETERMINE THE USES OF QUESTIONING SKILLS TO GATHER AND CLARIFY INFORMATION IN THE ORAL COMMUNICATION PROCESS.**

- 3.1 Identify different types of questions.
- 3.2 Determine the purpose of each type of question and its application.
- 3.3 Identify the hazards to be avoided when asking questions.
- 3.4 Demonstrate questioning skills.

**4.DEMONSTRATE THE USE OF ACTIVE LISTENING SKILL IN THE ORAL COMMUNICATION PROCESS.**

- 4.1 State the principles of active listening.
- 4.2 Identify skills of active listening.
- 4.3 Identify barriers to active listening.
- 4.4 State the benefits of active listening.
- 4.5 Demonstrate listening skills.
- 4.6 Explain the importance of giving and receiving feed back.

**5.Determine the appropriate interview type for the specific work-related situation and conduct a work-related interview.**

- 5.1 State the significance of interviews.
- 5.2 State the characteristics of interviews.
- 5.3 Explain the activities in an interviewing situation.
- 5.4 Describe the types of interviews.
- 5.5 Explain the interviewing strategy.

5.6 Prepare instrument for a structured interview.

**6. PREPARE A REPORT OUT-LINE, BASED ON SUBJECT MATTER AND AUDIENCE.**

6.1 Identify the different types of reports.

6.2 Determine when to use an informal or formal report presentation.

6.3 Identify the stages of planning a report.

6.4 Identify the parts of a report and choose the parts appropriate for each type of report.

6.5 Draft a report outline.

**7. DEMONSTRATE READING COMPREHENSION.**

7.1 Identify major reading problems.

7.2 Identify basic reading skills.

7.3 State methods of previewing written material.

7.4 Identify methods of concentration when reading.

7.5 Demonstrate reading comprehension.

**8. UNDERSTAND THE PRINCIPLES OF GROUP COMMUNICATIONS.**

8.1 State the purpose and characteristics of major types of meeting.

8.2 Explain responsibilities of a meeting/committee.

8.3 Identify problems likely to be faced at meeting and means to overcome these problems.

8.4 Distinguish between content and process at meetings.

8.5 Explain the key characteristics of a good group facilitator.

## Mgm 221 BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS

### Total Contact Hours

Theory	32		T	P	C
Practical	0	1	0	1	

**AIMS** The students will be able to develop management skills, get acquainted the learner with the principles of management and economic relations and develop commercial/economic approach to solve the problems in the industrial set-up.

### COURSE CONTENTS

- 1. ECONOMICS** **2 Hours**
  - 1.1 Definition: Adam Smith, Alfred Marshall, Prof. Robins.
  - 1.2 Nature and scope
  - 1.3 Importance for technicians.
  
- 2. BASIC CONCEPTS OF ECONOMICS** **1 Hour**
  - 2.1 Utility
  - 2.2 Income
  - 2.3 Wealth
  - 2.4 Saving
  - 2.5 Investment
  - 2.6 Value.
  
- 3. DEMAND AND SUPPLY.** **2 Hours**
  - 3.1 Definition of demand.
  - 3.2 Law of demand.
  - 3.3 Definition of supply.
  - 3.4 Law of supply.
  
- 4. FACTORS OF PRODUCTION.** **2 Hours**
  - 4.1 Land
  - 4.2 Labour
  - 4.3 Capital
  - 4.4 Organization.
  
- 5. BUSINESS ORGANIZATION.** **3 Hours**
  - 5.1 Sole proprietorship.
  - 5.2 Partnership
  - 5.3 Joint stock company.

<b>6. ENTERPRENEURIAL SKILLS</b>	<b>4 Hours</b>
6.1 Preparing, planning, establishing, managing, operating and evaluating relevant resources in small business.	
6.2 Business opportunities, goal setting.	
6.3 Organizing, evaluating and analyzing opportunity and risk tasks.	
<b>7. SCALE OF PRODUCTION.</b>	<b>2 Hours</b>
7.1 Meaning and its determination.	
7.2 Large scale production.	
7.3 Small scale production.	
<b>8. ECONOMIC SYSTEM</b>	<b>3 Hours</b>
8.1 Free economic system.	
8.2 Centrally planned economy.	
8.3 Mixed economic system.	
<b>9. MONEY.</b>	<b>1 Hour</b>
9.1 Barter system and its inconveniences.	
9.2 Definition of money and its functions.	
<b>10. BANK.</b>	<b>1 Hour</b>
10.1 Definition	
10.2 Functions of a commercial bank.	
10.3 Central bank and its functions.	
<b>11. CHEQUE</b>	<b>1 Hour</b>
11.1 Definition	
11.2 Characteristics and kinds of cheque.	
11.3 Dishonour of cheque.	
<b>12. FINANCIAL INSTITUTIONS</b>	<b>2 Hours</b>
12.1 IMF	
12.2 IDBP	
12.3 PIDC	
<b>13. TRADE UNION</b>	<b>2 Hours</b>
13.1 Introduction and brief history.	
13.2 Objectives, merits and demerits.	
13.3 Problems of industrial labour.	
<b>14. INTERNATIONAL TRADE.</b>	<b>2 Hours</b>
14.1 Introduction	

14.2 Advantages and disadvantages.

- |  |                |
|--|----------------|
| <b>15. MANAGEMENT</b>                        | <b>1 Hour</b>  |
| 15.1 Meaning                                 |                |
| 15.2 Functions                               |                |
| <b>16. ADVERTISEMENT</b>                     | <b>2 Hours</b> |
| 16.1 The concept, benefits and draw-backs.   |                |
| 16.2 Principal media used in business world. |                |
| <b>17. ECONOMY OF PAKISTAN</b>               | <b>1 Hour</b>  |
| 17.1 Introduction                            |                |
| 17.2 Economic problems and remedies.         |                |

**BOOKS RECOMMENDED**

- 1.Nisar-ud-Din, Business Organization, Aziz Publisher, Lahore
- 2.M. Saeed Nasir,Introduction to Business, Ilmi Kitab Khana, Lahore.
3. S.M. Akhtar, An Introduction to Modern Economics, United Limited, Lahore.

**Mgm-221 BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS.**

**INSTRUCTIONAL OBJECTIVES**

**1.UNDERSTAND THE IMPORTANCE OF ECONOMICS.**

- 1.1 State definition of economics given by Adam Smith, Alfred Marshall and Professor Robins.
- 1.2 Explain nature and scope of economics.
- 1.3 Describe importance of study of economics for technicians.

**2.UNDERSTAND BASIC TERMS USED IN ECONOMICS.**

- 2.1 Define basic terms, utility, income, wealth, saving, investment and value.
- 2.2 Explain the basic terms with examples

**3. UNDERSTAND LAW OF DEMAND AND LAW OF SUPPLY.**

- 3.1 Define Demand.
- 3.2 Explain law of demand with the help of schedule and diagram.
- 3.3 State assumptions and limitation of law of demand.
- 3.4 Define Supply.
- 3.5 Explain law of Supply with the help of schedule and diagram.
- 3.6 State assumptions and limitation of law of supply.

**4.UNDERSTAND THE FACTORS OF PRODUCTION**

- 4.1 Define the four factors of production.
- 4.2 Explain labour and its features.
- 4.3 Describe capital and its peculiarities.

**5. UNDERSTAND FORMS OF BUSINESS ORGANIZATION.**

- 5.1 Describe sole proprietorship, its merits and demerits.
- 5.2 Explain partnership, its advantages and disadvantages.
- 5.3 Describe joint stock company, its merits and demerits.
- 5.4 Distinguish public limited company and private limited company.

**6.UNDERSTAND ENTERPRENEURIAL SKILLS**

- 6.1 Explain preparing, planning, establishing and managing small business set up
- 6.2 Explain evaluating all relevant resources
- 6.3 Describe organizing analyzing and innovation of risk of task

**7. UNDERSTAND SCALE OF PRODUCTION.**

- 7.1 Explain scale of production and its determination.
- 7.2 Describe large scale production and it merits.
- 7.3 Explain small scale of production and its advantages and disadvantages.

**8. UNDERSTAND DIFFERENT ECONOMIC SYSTEMS.**

- 8.1 Describe free economic system and its characteristics.
- 8.2 Explain centrally planned economic system, its merits and demerits.
- 8.3 State mixed economic system and its features.

**9. UNDERSTAND WHAT IS MONEY**

9.1 Define money

9.2 Explain barter system and its inconveniences.

9.3 Explain functions of money.

**10. UNDERSTAND BANK AND ITS FUNCTIONS.**

10.1 Define bank.

10.2 Describe commercial bank and its functions.

10.3 State central bank and its functions.

**11. UNDERSTAND CHEQUE AND DISHONOR OF CHEQUE.**

11.1 Define cheque.

11.2 Enlist the characteristics of cheque.

11.3 Identify the kinds of cheque.

11.4 Describe the causes of dishonor of a cheque.

**12. UNDERSTAND FINANCIAL INSTITUTIONS.**

12.1 Explain IMF and its objectives.

12.2 Explain organisational set up and objectives of IDBP.

12.3 Explain organisational set up and objectives of PIDC.

**13. UNDERSTAND TRADE UNION, ITS BACKGROUND AND FUNCTIONS.**

13.1 Describe brief history of trade union.

13.2 State functions of trade union.

13.3 Explain objectives, merits and demerits of trade unions.

13.4 Enlist problems of industrial labour.

**14. UNDERSTAND INTERNATIONAL TRADE.**

14.1 Explain international trade.

14.2 Enlist its merits and demerits.

**15. UNDERSTAND MANAGEMENT**

15.1 Explain meaning of management.

15.2 Describe functions of management.

15.3 Identify the problems of business management.

**16. UNDERSTAND ADVERTISEMENT.**

16.1 Explain the concept of advertisement.

16.2 Enlist benefits and drawbacks of advertisement.

16.3 Describe principal media of advertisement used in business world.

**17. UNDERSTAND THE ECONOMIC PROBLEMS OF PAKISTAN.**

17.1 Describe economy of Pakistan.

17.2 Explain economic problems of Pakistan

17.3 Explain remedial measures for economic problems of Pakistan.  
measure.

**TC-214: TELECOM DEVICES & CIRCUIT**

<b>T</b>	<b>P</b>	<b>C</b>
3	3	4

**Total contact hours:**

Theory: 96 Hours

Practical: 96 Hours

**Pre-requisite:** Electrical Essentials and Networks (EL.T. 114)

**AIM.**Apply the principles of operation and function of various electronic components and devices to practical circuits.

**SPECIFIC:**

1. Identify various electronics components/devices used in the field of electronics.
2. Explain the principle of operation of various type of electronic components/ devices.
3. Identify the function of each electronic components/devices.
4. Identify the pin configurations of various electronics components/devices.
5. Identify specification of electronic components/devices.
6. Identify the use of electronic components.

**COURSE CONTENTS.**

1. **VACUUM TUBES.** (2 Hours)
  - 1.1 Introduction to various types of electron emission.
  - 1.2 Diode, construction, operation and application.
  - 1.3 Triode, construction, operation and application.
  - 1.4 Cathode ray tube, construction, operation and application.
2. **DIODES AND APPLICATIONS.** (9 Hours)
  - 2.1 Biasing the PN junction.
    - 2.1.1 Depletion region, Junction barrier potential
    - 2.1.2 Forward and reverse bias.
  - 2.2 Rectifier Diode.
    - 2.2.1 Half wave and full wave (Bridge) rectifier.
    - 2.2.2 Ripple factor, surge current.
    - 2.2.3 Rectifier filter: L, PI and T filters.
  - 2.3 Diode limiting and clamping circuits.
    - 2.3.1 Single end and double end limiter.
    - 2.3.2 Voltage multiplier circuits (Doubler, Tripler, Quadrupler)
  - 2.4 Diode Data Sheet
  - 2.5 Common faults in rectifier.
  - 2.6 Diode as a switch.
3. **BIPOLAR JUNCTION AND FIELD EFFECT TRANSISTORS.** (27 Hours)
  - 3.1 Transistor types and BJT construction .

- 3.2 Basic Transistor operation, Forward, Reverse Bias. Transistor current.
- 3.3 Transistor Parameters and Ratings
- 3.4. Transistor as a voltage amplifier.
- 3.5 Transistor amplifier configuration, comparison and uses.
- 3.6 Transistor, modes of operation.
- 3.7 Transistor as a switch.
- 3.8 Transistor and IC packages and terminal Identification.
  - i) General purpose transistors (TO-18, TO-39, TO-46, TO-52, TO-72, TO-92, TO-23 AB)
  - ii) Power Transistor (TO-3, TO-218, TO-220, TO-225)
  - iii) RF Transistor.
- 3.9 BJT Biasing Techniques:
  - 3.9.1 The DC operating point.
  - 3.9.2 The fixed base bias.
  - 3.9.3 The emitter bias.
  - 3.9.4 Voltage divider bias.
  - 3.9.5 The collector bias.
- 3.10 Field Effect Transistor and its Biasing:
  - 3.10.1 Junction Field Effect Transistor (JFET).
  - 3.10.2 JFET Characteristics and parameter.
  - 3.10.3 JFET Biasing.
  - 3.10.4 Metal oxide Semiconductor FET (MOSFET) types.
  - 3.10.5 MOSFET Biasing.

**4. SPECIAL DIODES. (12 Hours)**

- 4.1 Zener Diodes.
  - 4.1.1 Zener Diode as voltage Regulator, percentage of regulation.
  - 4.1.2 Zener limiting.
- 4.2 Varactor Diodes.
  - 4.2.1 Varactor in Tuning Circuits.
- 4.3 Optical Diodes
  - 4.3.1 Light Emitting Diode(LED)
  - 4.3.2 Liquid crystal Diode(LCD)
  - 4.3.3 Photo diode.
- 4.4 Other Diodes.
  - 4.4.1 Schottky diode, construction, characteristics, uses
  - 4.4.2 Tunnel Diode, Negative resistance region.
  - 4.4.3 Tunnel Diode Oscillator.
  - 4.4.4 PIN Diode.
  - 4.4.5 Step Recovery Diode.
  - 4.4.6 LASER Diode
  - 4.4.7 IMPATT Diode.
  - 4.4.8 Gunn Diode.

**5. THYRISTOR, SPECIAL DIODES & TRANSISTORS. (10 Hours)**

- 5.1 The Shockley diode.
- 5.2 Silicon Controlled Rectifier (SCR)

- 5.3 SCR Applications.
  - 5.4 Silicon Controlled Switch (SCS)
  - 5.5 Diac and Triac
  - 5.6 Unijunction Transistor (UJT)
  - 5.7 Photo diode & Photo transistor
  - 5.8 Light Activated SCR (LASCR)
  - 5.9 Opto-coupler.
- 6. OPERATIONAL AMPLIFIER. (12 Hours)**
- 6.1 Introduction to operational Amplifier.
  - 6.2 The differential Amplifier.
  - 6.3 OP-AMP Data Sheet Parameters.
  - 6.4 OP-AMP with negative Feedback.
  - 6.5 Inverting and non-inverting amplifiers.
  - 6.6 Voltage follower.
  - 6.7 Summing and difference amplifiers.
  - 6.8 Introduction to 741 OP AMP.
- 7. INTEGRATED CIRCUITS. (4 Hours)**
- 7.1 Introduction to ICs
  - 7.2 Integrated transistors and diodes.
  - 7.3 Integrated resistors and capacitors.
- 8. LOGIC GATES. (20 Hours)**
- 8.1 Types of logic gates
  - 8.2 Supply Voltage, input and output voltage, input and output currents, fan-in and fan-out Propagation Delay Time and Power Dissipation.
  - 8.3 DTL, HTL, and RTL gates.
  - 8.4 Standard TTL gates
    - 8.4.1 TTL NAND gate.
    - 8.4.2 Open Collector TTL
    - 8.4.3 Totem pole TTL
  - 8.5 Other TTL types.
    - 8.5.1 High Speed and Low Power.
    - 8.5.2 Schottky TTL
    - 8.5.3 Emitter coupled logic (ECL)
  - 8.6 MOS and CMOS Gates
    - 8.6.1 P-MOS and N-MOS logic gates.
    - 8.6.2 CMOS logic gates.
    - 8.6.3 Integrated Injection Logic(IIL)
  - 8.7 Comparison of major Logic Families.
  - 8.8 Interfacing logic families
    - 8.8.1 TTL driving 5V C MOS
    - 8.8.2 TTL driving 15 V C MOS
    - 8.8.3 C MOS driving TTL



## TC-214 TELECOM DEVICES & CIRCUITS

### INSTRUCTIONAL OBJECTIVES.

#### 1. VACUUM TUBES.

- 1.1 Understand construction, working and application of basic electron tubes
  - 1.1.1 Enlist various types of electron emissions with application of each of them
  - 1.1.2 Explain function of a Diode using a labelled diagram of a diode tube.
  - 1.1.3 List the type of cathodes, materials and their work functions.
  - 1.1.4 Explain the construction and working of triode tube.
  - 1.1.5 Explain the function of multigridded in electron tubes-(tetrode & pentode tubes.)
  - 1.1.6 Sketch & label the construction of a cathode ray tube
- 1.1.7 Explain the working of a cathode ray tube (CRT)
  - 1.1.8 List applications of CRT.

#### 2. SEMICONDUCTOR DIODES.

- 2.1 Understand principles, characteristics and application of various types of semiconductor diodes.
  - 2.1.1 Compare the energy band structure for conductors, insulators and semiconductors.
  - 2.1.2 Explain semiconductor doping
  - 2.1.3 List donor and acceptor materials for silicon & germanium
  - 2.1.4 Define majority carriers and minority charge carriers.
  - 2.1.5 Explain the effect of temperature & light on the resistance of
    - (a) intrinsic semiconductor and
    - (b) Extrinsic semiconductor
- 2.2 PN Junction Theory:
  - 2.2.1 Draw a PN Junction
  - 2.2.2 Define the terms depletion layer capacitance & diffusion capacitance.
  - 2.2.3 Sketch the voltage-current characteristics curve for a PN junction.
  - 2.2.4 Determine  $R_F$ ,  $r_d$ ,  $R_R$  and  $I_s$  from the diode characteristics curve.
  - 2.2.5 List the typical values of barrier potentials for silicon and germanium diode.
- 2.3 Understand PN Diode Applications
  - 2.3.1 List the uses of PN diode.
  - 2.3.2 Explain half and full wave rectifier using a neat circuit diagram.
  - 2.3.3 Define Ripple factor, surge current.
  - 2.3.4 Explain function of rectifier (L, PI, T filters)
  - 2.3.5 Define the terms limiter (clipper) and clamper.
  - 2.3.6 Draw a diode limiter circuit.
  - 2.3.7 Explain the working of a diode limiter/ clipper (single end and double end limiter).
  - 2.3.8 Enlist the applications of limiter circuit.
  - 2.3.9 Draw a diode clamper circuit.
  - 2.3.10 Explain the working of diode clamper circuit.
  - 2.3.11 Explain its uses as voltage multiplier (doubler).
  - 2.3.12 Explain the working of a voltage doubler circuit.
  - 2.3.13 List the applications of voltage multiplier circuit.
  - 2.3.14 Explain the operation of a diode as a switch.

- 3. BIPOLAR JUNCTION AND FIELD EFFECT TRANSISTORS (BJTs & FETs).**
- 3.1 Understand bipolar junction and field effect transistors, its biasing and basic BJT circuits.
- 3.1.1 Draw and label physical structure and symbols for NPN and PNP transistors.
  - 3.1.2 Show the four operation mode of BJT and application of each mode .
  - 3.1.3 Compute the values of  $I_E$ , and Beta (dc) for given value of  $I_B$  and  $I_C$ .
  - 3.1.4 Explain the working of basic BJT voltage amplifier w.r.t. bias of junctions, flow of charge carriers and transistor currents.
  - 3.1.5 Define transistor cut off and breakdown voltages.
  - 3.1.6 List four maximum ratings specified by manufacturers parameters of transistors.
  - 3.1.7 Drive the expression for  $I_C$  versus  $I_B$  for CE. configuration in the active region
  - 3.1.8 Sketch the input and output static characteristics curves for common base (CB) amplifier.
  - 3.1.9 Repeat 3.1.8 for CE amplifier.
  - 3.1.10 Repeat 3.1.8 for CC amplifier.
  - 3.1.11 List the types of transistor structures.
  - 3.1.12 Draw and label the structure of epitaxial transistor.
  - 3.1.13 Name the advantages of MESA transistor over alloy transistor.
  - 3.1.14 Enlist the advantages of I.C. over conventional circuit
  - 3.1.15 List the three broad categories of BJTs with package types used for each
  - 3.1.16 Identify the high frequency limitations of BJT.
- 3.2 Understand BJT Biasing Techniques
- 3.2.1 Explain the purpose of dc bias in a transistor circuit.
  - 3.2.2 Show how bias effects the operation of BJT.
  - 3.2.3 Draw and label load line on the characteristic curves for CE configuration
  - 3.2.4 Locate the Q-point for linear operation of the amplifier.
  - 3.2.5 List the causes of Q-point thermal instability.
- 3.3 Understand Basic BJT Circuits
- 3.3.1 Sketch the circuit for single ended CE amplifier
  - 3.3.2 Draw the h parameter approximate model for CE amplifier
  - 3.3.3 Repeat 3.3.2 for CB and CC configuration.
  - 3.3.4 Write down the expressions for a CE circuit for (a)  $A_i$ , (b)  $R_i$  (c)  $A_v$  (d)  $R_o$  (e)  $A_p$  and  $G_p$ .
  - 3.3.5 Repeat 3.3.4 for CB and CC circuits.
  - 3.3.6 Repeat 3.3.4 for CE with an emitter resistor.
  - 3.3.7 Compute  $A_i$ ,  $R_i$ ,  $A_v$ ,  $R_o$  and  $A_p$  for CE, CB and CC configurations.
  - 3.3.8 Compare the three BJT configurations.
  - 3.3.9 Draw a Darlington pair (emitter follower) circuit.
  - 3.3.10 Explain the working of darlington pair.
  - 3.3.11 List the applications of darlington pair .
- 3.4 Understand FIELD EFFECT TRANSISTORS
- 3.4.1 Explain the principle of the n-channel JFET using illustrations.
  - 3.4.2 Sketch the construction of n-channel JFET.
  - 3.4.3 Sketch & label a family of drain characteristics of a n-channel JFET.

- 3.4.4 Define the terms  $I_{DSS}$  and  $V_p$ .
  - 3.4.5 Explain the effect of change in  $V_{GS}$  the JFET characteristics.
  - 3.4.6 Explain above from 3.4.1 thru 3.4.3 for p-channel JFET.
  - 3.4.7 Define the major data-sheet parameter of a JFET.
  - 3.4.8 Explain the principle of n-channel enhancement MOSFET.
  - 3.4.9 Sketch & label the family of drain characteristics of n-channel enhancement MOSFET
  - 3.4.10 Repeat 3.4.9 for n-channel depletion-enhancement MOSFET.
  - 3.4.11 Sketch symbols for p & n-channel JFET, n-channel enhancement MOSFET, p- and n-channel depletion- enhancement MOSFET.
  - 3.4.12 List three advantages of n-channel over p-channel MOSFET.
  - 3.4.13 Sketch the cross- section of V-MOSFET.
  - 3.4.14 Explain the working of V-MOSFET.
  - 3.4.15 Compare the V-MOSFET with other FETs.
  - 3.4.16 List the applications of MOSFET.
  - 3.4.17 Sketch the cross section of complementary MOSFET (CMOS).
  - 3.4.18 List the applications of CMOS.
- 3.5 Understand FET Biasing
- 3.5.1 Explain to FET biasing.
  - 3.5.2 Draw DC load line and locate bias point on the family of drain characteristic curves of JFET.
  - 3.5.3 Draw a self-bias arrangement p-channel & n-channel JFET.
  - 3.5.4 Set the Q-point for a self-biased JFET.
  - 3.5.5 Explain the Q-point stability of a JFET.
  - 3.5.6 Show zero bias of D-MOSFET.
- 3.6 Understand Basic FET Circuits
- 3.6.1 List the three of configuration of FET amplifier.
  - 3.6.2 Sketch & label the circuit for CS-JFET amplifier.
  - 3.6.3 Write down expressions for  $A_v$  and  $Z_i$  and  $Z_o$  for CS
  - 3.6.4 Repeat 3.6.1 thru 3.6.3 for common drain (CD) and common gate (CG) JFET amplifiers.
  - 3.6.5 Draw generalized MOSFET amplifier configuration .
  - 3.7.6 Define (i) transconductance,  $g_m$  (ii) drain resistance,  $r_d$  and (iii) amplification factor of an FET.

#### 4. SPECIAL DIODES.

- 4.1 Understand the characteristics and applications of diode used for a special purposes Zener Diode.
- 4.1.1 Draw the V-I characteristic of a Zener diode.
  - 4.1.2 Identify the characteristic features of Zener diode.
  - 4.1.3 Explain the working of Zener diode as voltage regulator.
  - 4.1.4 Define the terms line regulation, and load regulation for Zener diode.
  - 4.1.5 Derive formulae to find the range of series resistor ( $R_s$ ) and load resistor ( $R_L$ ) for a Zener regulator for given variations in line voltage and current.
  - 4.1.6 Solve problems to find the values of  $R_s$  and  $R_L$  for Zener diode regulator.
  - 4.1.7 Use Zener diode in a limiter/clipper circuit.

- 4.1.8 List the other applications of Varactor diode.
- 4.2 Understand the characteristics of a Varactor diode.
  - 4.2.1 Identify the key parameters of varactor diode.
  - 4.2.2 Enlist the applications of varactor diode.
  - 4.2.3 Draw the circuit of electronic tuner of a receiver using varactor diode.
- 4.3 Understand the characteristics of Optical Diodes (LED, LCD and Photodiode)
  - 4.3.1 Define the term optical devices.
  - 4.3.2 List the name of opto electronic devices.
  - 4.3.3 Explain the electroluminescence process in LED.
  - 4.3.4 List the materials with colour of emission used for LED
  - 4.3.5 Explain the effect of bias on the operation of normal and colour emissive LED.
  - 4.3.6 List the applications of LEDs.
  - 4.3.7 Describe the term Liquid crystal.
  - 4.3.8 Explain the working principle of both types of LCD.
  - 4.3.9 Compare LCD with a LED.
  - 4.3.10 List the applications of LCDs.
  - 4.3.11 Explain the operation of a photo diode.
  - 4.3.12 Name the materials used for photodiode with their colour sensitivity and characteristics
  - 4.3.13 List the applications of photodiodes.
  - 4.3.14 Draw a circuit of photoelectric relay using a photodiode.
- 4.4 Understand special diodes (Schottky, tunnel, PIN, LASER, IMPATT, Gunn)
  - 4.4.1 List main type of special diodes.
  - 4.4.2 Explain the basic internal structure and working of a schottky diode.
  - 4.4.3 Name the primary application areas of schottky diode
  - 4.4.4 Explain the principle of tunnel diode using energy level diagram.
  - 4.4.5 List the names of material used for making tunnel diode.
  - 4.4.6 Sketch the construction along with symbol for a tunnel diode.
  - 4.4.7 Compare the V-I characteristics of a tunnel diode with that of an ordinary diode.
  - 4.4.8 List the applications of tunnel diode.
  - 4.4.9 Sketch the basic parallel tunnel diode amplifier.
  - 4.4.10 Sketch the tunnel diode oscillator circuit.
  - 4.4.11 Explain briefly the working of circuit in 4.1.9 & 4.1.10
  - 4.4.12 Show & label the three regions of a PIN diode structure
  - 4.4.13 Explain the effect of bias on the resistance of PIN diode
  - 4.4.14 List the names of the materials used for making PIN diode
  - 4.4.15 Enlist the applications of PIN diode .
  - 4.4.16 Explain the term LASER.
  - 4.4.17 Differentiate between incoherent and coherent light
  - 4.4.18 Sketch the structure of double heterojunction semiconductor laser diode.
  - 4.4.19 List the names of the materials with field of application for laser diode.
  - 4.4.20 List the application of lasers.
  - 4.4.21 Describe the working of laser diode and photo diode pick up system of compact disk (CD) players

- 4.4.22 Explain Gunn effect in bulk semiconductors.
- 4.4.23 List the names of material exhibiting Gunn effect.
- 4.4.24 Sketch a Gunn diode construction.
- 4.4.25 Identify the formation of Gunn domain in a Gunn diode .
- 4.4.26 List the application of Gunn diode.
- 4.4.27 Give the name for acronym IMPATT.
- 4.4.28 Explain briefly the principle of IMPATT diode.
- 4.4.29 Sketch the structure of IMPATT diode.
- 4.4.30 Explain the two behavioral effect of IMPATT diode to produce 180 phase difference between the RF applied voltage and resulting current pulse.
- 4.4.31 List the merits and demerits of IMPATT diode.
- 4.4.32 Enlist applications of IMPATT diode.

## 5. THYRISTORS & SPECIAL DEVICES.

- 5.1 Understand thyristors, UJT and opto devices & their application.
  - 5.1.1 Explain the term thyristor
  - 5.1.2 Name the important thyristor family devices
  - 5.1.3 Sketch the construction of shockley diode
  - 5.1.4 Draw and label the forward v-i characteristics for a shockley diode
  - 5.1.5 List the methods to turn off and turn on shockley diode
  - 5.1.6 Explain the working of a shockley diode relaxation oscillator.
  - 5.1.7 Compare an SCR with a shockley diode.
  - 5.1.8 Draw and label the schematic symbol for an SCR
  - 5.1.9 Explain the turn-on process of SCR using transistor equivalent.
  - 5.1.10 Sketch the V-I characteristics for an SCR.
  - 5.1.11 Interpret the SCR data sheet parameters.
  - 5.1.12 Explain the phase-control of an SCR .
  - 5.1.13 Draw basic circuits for SCR used in the areas of
    - a) power control
    - b) switching and
    - c) protection
  - 5.1.14 Explain briefly the circuits drawn under 5.1.13.
  - 5.1.15 Compare a Diac with a shockley diode in terms of
    - a) basic structure
    - b) symbol
    - c) operation
  - 5.1.16 Compare a triac with an SCR in terms of
    - a) basic structure
    - b) symbol (operation)
  - 5.1.17 Sketch the transistor equivalent circuit for a triac
  - 5.1.18 Explain the phase-shift control of triac with a diac as a switching device as used in light for UJT.
- 5.2 Understand Unijunction Transistor characteristics.
  - 5.2.1 Sketch the structure of a unijunction transistor (UJT).
  - 5.2.2 Sketch the equivalent circuit and symbol for UJT.

- 5.2.3 Explain the working of UJT circuit of 5.2.2.
  - 5.2.4 Draw the V-I characteristic curve for UJT.
  - 5.2.5 Draw a circuit for UJT relaxation oscillator.
  - 5.2.6 List the three factors controlling the period of oscillation of a relaxation oscillator
  - 5.2.7 Sketch a UJT time delay circuit.
- 5.3 Understand properties of Photo-sensitive Devices.
- 5.3.1 compare a photo-transistor with a conventional BJT.
  - 5.3.2 List the factors controlling collector current of a photo transistor.
  - 5.3.3 Draw the circuit for forward and reverse acting light operated relay using a phototransistor.
  - 5.3.4 Sketch the circuit of a photo darlington pair
  - 5.3.5 List the requirements to turn-on and turn-off a light activated SCR (LASCR).
  - 5.3.6 List the types of input devices normally used in a opt-coupler
  - 5.3.7 List five types of output devices used in opto-coupler.
  - 5.3.8 List the applications of opto-coupler.
- 6. OPERATIONAL AMPLIFIER (LINEAR INTEGRATED CIRCUIT).**
- 6.1 Understand the working and applications of operational amplifier.
    - 6.1.1 Draw the block diagram and symbol for an operational amplifier (OP AMP).
    - 6.1.2 Identify the function of each block of an OP AMP.
    - 6.1.3 List ten important OP AMP parameters.
    - 6.1.4 Define the terms (a) bias current (b) offset voltage for an OP AMP.
    - 6.1.5 Explain the method of bias current compensation for an OP AMP.
    - 6.1.6 Draw inverting and non-inverting amplifier using op amp.
    - 6.1.7 Explain the inverting and non-inverting amplifier.
    - 6.1.8 Identify the virtual ground point of an OP AMP for calculating gain.
    - 6.1.9 Derive expression for voltage gain of both types of amplifiers discussed under 7.1.7.
    - 6.1.10 Sketch the four modes of operations of differential amplifier.
    - 6.1.11 Sketch a voltage follower circuit using an OP AMP.
    - 6.1.12 Explain the working of an OP AMP comparator.
    - 6.1.13 List the applications of OP AMP (741 OP AMP).
- 7. INTEGRATED CIRCUITS (ICs).**
- 7.1 To understand and apply ICs & integrated components
    - 7.1.1 Define integrated circuits.
    - 7.1.2 Compare IC with discrete circuit.
    - 7.1.3 Sketch the cross-section of an IC transistor.
    - 7.1.4 List three types of IC diode.
    - 7.1.5 Identify how the storage time is eliminated in a metal semiconductor diode.
    - 7.1.6 List six important characteristics of integrated components.
    - 7.1.7 Interpret linear IC data sheet parameters.
    - 7.1.8 Interpret digital IC data sheets parameters.
    - 7.1.9 Identify the types of interface ICs.

## 8. LOGIC GATE CIRCUITS.

- 8.1 Understand logic gate circuits.
  - 8.1.1 Define a logic gate.
  - 8.1.2 List the types of logic gates with their symbols.
  - 8.1.3 Define positive & negative logic.
  - 8.1.4 Explain the working of diode OR and gates and draw their truth tables.
  - 8.1.5 Enlist the merits and demerits of diode logic.
  - 8.1.6 Write Boolean expressions for OR and gates.
  - 8.1.7 Draw the circuits of NOT gate or inverter using
    - a) BJT
    - b) FET.
  - 8.1.8 Explain the operation of NOT gate.
  - 8.1.9 Sketch a NAND and NOR gates using DTL.
  - 8.1.9 Explain the working of DTL gates.
  - 8.1.10 Draw RTL and HTL NAND gate circuits.
    - 8.1.11 Describe the working of RTL and HTL NAND gates.
- 8.2 Understand comparison of Logic Gates Performance.
  - 8.2.1 List the factors to assess the performance of logic gates.
  - 8.2.2 Define the following terms
    - a) power dissipation
    - b) voltage levels
    - c) propagation delay time
    - d) speed-power product
    - e) noise margin.
  - 8.2.3 Compare HTL gate with RTL and DTL gates.
- 8.3 Understand characteristics of Transistor Logic (TTL)
  - 8.3.1 Define the term TTL.
  - 8.3.2 List the performance characteristics of TTL.
  - 8.3.3 Draw a basic TTL NAND gate circuit.
  - 8.3.4 Explain the operation of the above circuit.
  - 8.3.5 List the two major types of output circuits for TTL Gates.
  - 8.3.6 Draw a TTL NAND gate with open collector output.
  - 8.3.7 Draw a TTL AND gate with totem pole output.
  - 8.3.8 List the advantages of totem pole output circuit.
  - 8.3.9 Explain the data sheet parameters for TTL.
  - 8.3.10 List five series of TTL circuits.
  - 8.3.11 Compare the circuit for low power TTL NAND gate with that of standard TTL .
  - 8.3.12 List the key feature of advanced schottky TTL gates.
  - 8.3.13 Define the term emitter-coupled logic (ECL).
  - 8.3.14 Draw a circuit for ECL OR/NOR gate.
  - 8.3.15 List the merits & demerits of ECL as compared to TTL.
  - 8.3.16 Enlist the main feature of integrated injection logic (IIL).
  - 8.3.17 Draw the circuit of IIL NAND and NOR gates.

- 8.4 Understand characteristics of MOS and CMOS logic gates.
  - 8.4.1 Draw the circuit for n-channel and p-channel MOS, NAND and NOR gates circuit.
  - 8.4.2 Explain the working of N-MOS NAND gate.
  - 8.4.3 Sketch the circuit of a CMOS inverter.
  - 8.4.4 Discuss the operation of a CMOS inverter.
  - 8.4.5 Draw the circuit of a CMOS NAND gate.
  - 8.4.6 Explain the operation of CMOS gate and draw its truth table.
  - 8.4.7 Draw the circuit of a CMOS NOR-gate.
  - 8.4.8 Define the term HCMOS.
  - 8.4.9 Compare the CMOS and TTL characteristics.
  - 8.5.10 List the precaution in handling CMOS devices.
  - 8.4.11 Compare the major logic families.
  - 8.4.12 List the applications of the following technologies ICs:
    - a) TTL,
    - b) ECL,
    - c) IIL,
    - d) MOS.
  - 8.4.13 Define the terms SSI, MSI, LSI, VLSI and VVLSI.
  
- 8.5 Understand methods of interfacing various logic families.
  - 8.5.1 List the factors to be considered in interfacing logic families.
  - 8.5.2 Draw the circuit for the TTL driving 5-V CMOS and 15- V CMOS gates.
  - 8.5.3 Identify the need of the pull-up resistor in interfacing TTL and CMOS.
  - 8.5.4 Discuss the worst case parameters for CMOS-to-TTL interfacing.

**TEXT /REFERENCE BOOKS:**

1. Milliman "Microelectronic"
2. Floyd "Electronic Fundamentals"
3. Floyd "Digital Fundamentals"
4. J.D. Grainfield "Practical Digital Design"

## LIST OF PRACTICAL

96 HrS.

1. Identify the various diodes, transistors & IC package, number system and terminals.
2. Draw the forward & reverse characteristics of a P.N. junction diode.
3. Assemble a full wave diode rectifier circuit with a PI filter & calculate the ripple factor of output wave.
4. Assemble a double side biased diode limiter circuit.
5. Familiarize with a voltage quadrupler circuit.
6. Demonstrate diode as a switch with LED as a load.
7. Troubleshoot a faulty diode rectifier circuit.
8. Use a Zener diode as voltage regulator with diode rectifier.
9. Assemble a double side Zener diode limiter.
10. Demonstrate the performance of power supply using IC regulator.
11. Use varactor diode in a resonant circuit.
12. Assemble a tunnel diode oscillator .
13. Plot the input & output characteristics of a transistor in common base configuration.
14. Plot the input & output characteristics of a transistor in common emitter configuration.
15. Plot the input and output characteristics of transistor in common collector configuration.
16. Plot the transfer characteristics curve of transistor in CE configuration.
17. Consult data sheet for a transistor to study its parameters and ratings.
18. Assemble a transistor voltage amplifier and find its voltage gain.
19. Demonstrate the characteristics of CB, CE & CC amplifier using curve tracer.
20. Plot the characteristics curves for a common source FET amplifier.
21. Demonstrate MOSFET as a switch and study the performance .
22. Plot the characteristics curves for SCR & UJT.
23. Assemble a light dimmer using a Diac & a Triac.
24. Demonstrate the working of an opto-coupler.
25. Assemble a differential amplifier using transistor.
26. Demonstrate the working of an operational amplifier.
27. Use of op-Amp as an inverting & non-inverting amplifier and a voltage follower.
28. Draw the frequency response of an op-amp.
29. Troubleshoot an operational amplifier.
30. Demonstrate the use of digital logic probe & logic pulser.
31. Recognize an open & a short TTL NAND gate in an IC using logic probe & pulser
32. Troubleshoot a combinational logic circuit using logic probe & pulser.
33. Troubleshoot a frequency counter using oscilloscope.

**TC-222: DIGITAL CIRCUITS & MICRO-PROCESSOR**

<b>Total Contact Hours:</b>		<b>T</b>	<b>P</b>	<b>C</b>
Theory: 64 hrs.	2	3	3	
Practical: 96 hrs.				

**COURSE CONTENTS**

<b>1NUMBER SYSTEMS AND BINARY CODES.</b>	<b>2 Hrs.</b>
1.1Introduction	
1.2Decimal Numbering System	
1.3Binary Numbering System	
1.4Converting binary numbers into decimal numbers	
1.5Converting decimal numbers into binary numbers	
1.6Octal numbering system	
1.7Hexadecimal numbering system	
1.8Binary word length	
1.9Binary codes	
1.10Subtraction using the one's complement	
1.11Subtraction using the two's complement	
1.12Signed numbers	
<b>2DIGITAL GATING CIRCUITS.</b>	<b>2 Hrs.</b>
2.1Introduction	
2.2Three basic gating circuits	
2.3Inverted gates	
2.4Boolean algebra	
2.5Combinational logic circuits	
<b>3DIGITAL INTEGRATED CIRCUITS.</b>	<b>2 Hrs.</b>
3.1Introduction	
3.2Digital integrated circuit (IC) specifications.	
3.3Digital integrated circuits families	
3.4System operating speed	
3.5Commercially packaged IC gates	
<b>4FLIP-FLOP CIRCUITS.</b>	<b>4 Hrs.</b>
4.1Introduction	
4.2S-R Flip-Flop	
4.3T Flip-Flop	
4.4D Flip-Flop	
4.5J-K Flip-Flop	
4.6Commercially packaged IC Flip-Flops	
<b>5COMBINATIONAL LOGIC CIRCUITS.</b>	<b>6 Hrs.</b>
5.1Introduction	

- 5.2 Exclusive-OR gate
- 5.3 Half-Adder circuits
- 5.4 Full-Adder circuits
- 5.5 Parallel binary adder circuits
- 5.6 One's complement subtracter circuits
- 5.7 Decoder circuits
- 5.8 Binary-to-decimal decoders
- 5.9 BCD-to-decimal decoders
- 5.10 Encoder circuits
- 5.11 Multiplexer circuits
- 5.12 Demultiplexing circuits
- 5.13 Code converter circuits
- 5.14 Commercially packaged IC combinational logic circuits
- 5.15 Comparator

## **6 REGISTER AND COUNTER CIRCUITS.**

**4 Hrs.**

- 6.1 Introduction
- 6.2 Shift Registers
  - 6.2.1 Shift Register Functions
  - 6.2.2 Serial In-Serial Out Shift Registers
  - 6.2.3 Serial In-Parallel Out Shift Registers
  - 6.2.4 Parallel In-Serial Out Shift Registers
  - 6.2.5 Parallel In-Parallel Out Shift Registers
  - 6.2.6 Bidirectional Shift Registers
  - 6.2.7 Shift Register Counters
  - 6.2.8 Shift Register Applications
- 6.3 Counters
  - 6.3.1 Asynchronous Counters
  - 6.3.2 Synchronous Counters
  - 6.3.3 Up/Down Synchronous Counters
  - 6.3.4 A Procedure for the Design of Sequential Circuits
  - 6.3.5 Cascaded Counters
  - 6.3.6 Counter Decoding
  - 6.3.7 Counter Applications

## **7 MEMORY SYSTEMS.**

**4 Hrs.**

- 7.1 Introduction
- 7.2 Main Memory
  - 7.2.1 Memory Concepts
  - 7.2.2 Read Only Memories (ROMs)
  - 7.2.3 Programmable ROMs (PROMs and EPROMs)
  - 7.2.4 Read/Writ Random Access Memories (RAMs)
  - 7.2.5 Memory Expansion
  - 7.2.6 Magnetic Bubble Memories (MBMs)
  - 7.2.7 Magnetic Surface Storage Devices
  - 7.2.8 Special Memories and Applications

<b>8</b>	<b>MICROPROCESSOR.</b>	<b>4 Hrs.</b>
	8.1 Introduction to microprocessor	
	8.2 Microprocessor power and speed.	
	8.3 Block diagram of microprocessor.	
<b>9</b>	<b>PROCESSOR ARITHMETIC.</b>	<b>2 Hrs.</b>
	9.1 Decimal and Hexadecimal conversion.	
	9.2 Multiple precision arithmetic (Addition, subtraction, multiplication, division)	
	9.3 Floating point Arithmetic.	
<b>10</b>	<b>MICROPROCESSOR ARCHITECTURE.</b>	<b>6 Hrs.</b>
	10.1 Introduction.	
	10.2 Word lengths.	
	10.3 Addressable memory RAM & ROM.	
	10.4 Speed of microprocessor.	
	10.5 Semiconductor manufacturing processes to build microprocessor LSI, NMOS, CMOS, VLSI, VVLSI	
	10.6 Other microprocessor architectural characteristics.	
	10.6.1 Parallel processing.	
	10.6.2 Coprocessing.	
	10.6.3 Cache memory techniques.	
	10.6.4 Pipelining techniques.	
	10.6.5 Wider buses.	
	10.6.6 Microprocessor support circuit, serial I/O, UART	
	10.7 Block diagram of a 8-Bit 8085 microprocessor.	
	10.7.1 Purpose of address, data and bus.	
	10.7.2 List of registers with their function.	
	10.7.3 Purpose of ALU and Accumulator, I/O Parts	
	10.7.4 Purpose of program counter and stack pointer.	
	10.7.5 Purpose of controlled logic.	
	10.7.6 Pin diagram of 8085 microprocessor with purpose of each pin.	
	10.8 Logic Schematic to generate control signals for processor: IOM, RD, VR, MEMR, MEMW, IOR, IOW.	<b>4 Hrs.</b>
	10.9 Instruction set of 8085 microprocessor.	<b>2 Hrs.</b>
	10.10 Microprocessor Terminology.	<b>2 Hrs.</b>
	10.10.1 Machine Language.	
	10.10.2 Assembly Language.	
	10.11 Microprocessor Programming.	<b>6 Hrs.</b>
	10.11.1 Machine Language and Assembly Language Programming.	
	10.11.2 Need of instruction set.	
	10.11.3 Five major groups of instruction set.	
	10.11.4 Operation code and Operand of instruction set.	
	10.11.5 Basic Instruction types & subroutine.	
	10.11.6 Four data manipulation functions-data transfer, arithmetic, logic & branching	

- 10.11.7 Microprocessor addressing modes.
- 10.12 Apply instruction set of 8085 to write assembly language programs. **4 Hrs.**
  - 10.12.1 Programming in memories and translation into hexa codes.
  - 10.12.2 Programming in the proper format showing memory addresses, hex machine codes, memories and comments/explanation.
  - 10.12.3 Arithmetic instructions and condition of Flag register for given data.
  - 10.12.4 Program instructions for addition and subtraction of various bytes.
  - 10.12.5 Logic operations and condition of flag register for each operation
  - 10.12.6 Unconditional and conditional jump and corresponding change in Flag register condition.
  - 10.12.7 Application of jump instruction.
  - 10.12.8 Flow chart symbols.
  - 10.12.9 Flow chart for simple programs.
  - 10.12.10 Flow chart for conditional loop-indexing & counting.
  - 10.12.11 Programming using unconditional and conditional jump instruction.
  - 10.12.12 Programming using counter techniques.
  - 10.12.13 Stack, stack pointer, program counter and subroutine.
  - 10.12.14 Sequence of program during subroutine execution.
  - 10.12.15 Action of program counter and stack pointer during a subroutine execution.
  - 10.12.16 Unconditional and conditional call and return instruction.
  - 10.12.17 PUSH, POP instructions.
  - 10.12.18 I/O statements in Assembly language.
  - 10.12.19 Debugging a program.
  - 10.12.20 Trouble shooting a simple program.
  - 10.12.21 Debugging Techniques.
  - 10.12.22 Fetch cycle, execute cycle and instruction cycle
  - 10.12.23 Memory read & write timing diagram.
  - 10.12.24 Polling and Interrupts-necessity.
  - 10.12.25 Types of interrupts.
  - 10.12.26 Interfacing.
  - 10.12.27 Interface circuits, devices and peripheral chips 8155, 8255 and 8279.
  - 10.12.28 D/A and A/D Interface.
  - 10.12.29 I/O port addressing.
  - 10.12.30 Direct memory addressing (DMA) merits.
  - 10.12.31 Programmable DMA controller 7257
  - 10.12.32 Programmable Interface controller 8259
  - 10.12.33 Introduction to Data communication.
  - 10.12.34 Asynchronous and synchronous data communication
  - 10.12.35 Parallel I/O GPIB and SCSI
  - 10.12.36 Serial Data Transmission UART
  - 10.12.37 Serial communication lines RS 232 and RS 422
  - 10.12.38 MODEMS

**11 APPLICATION OF MICROPROCESSOR.**

**(02 Hours)**

- 11.1 Merits of microprocessor control over discrete logic control.
- 11.2 Typical microprocessor application.

- 11.3 Traffic control.
  - 11.4 Lift Control.
  - 11.5 Temperature monitoring.
  - 11.6 Stepper motor control.
- 12 MEMORY ORGANIZATION. (04 Hours)**
- 12.1 Introduction to segmentation, parallel processing, queering and coprocessing.
  - 12.2 ROMS and RAMs
  - 12.3 Paged memory.
  - 12.4 Characteristics of memory Access mode, Access Time, Access rate alterability performance and cycle time.
  - 12.5 Mass Storage.
    - 12.5.1 Floppy disks and floppy disc drives.
    - 12.5.2 Winchester disk drive hard disk.
    - 12.5.3 Magnetic tape storage.
    - 12.5.4 Optical storage devices.
- 13 16-BIT MICROPROCESSOR INTEL 8088. (02 Hours)**
- 13.1 The 8088 architectural model (Block diagram.)
  - 13.2 The function of each unit
  - 13.3 The 8088 instruction set.
  - 13.4 Basic control instruction READ,WRITE,ADD,COMPLETE,JUMP,LOAD,STORE AND SHIFT.
  - 13.5 Flow chart showing sequential micro operation for a control instruction.
  - 13.6 The 8088 Hardware chip - Pin configuration.
  - 13.7 Co-processor Intel 8088.
  - 13.8 Interface Devices.
- 14 32-Bit Microprocessors. (02 Hours)**
- 14.1 The Intel 80486 Architectural model.
  - 14.2 The function of each unit.
  - 14.3 the 80486 instruction set.
  - 14.4 Basic control instruction for 80486.
  - 14.5 Flow chart showing sequential micro operation for a control instruction.
  - 14.6 The Intel 80486 hardware Pin diagram.
  - 14.7 The interface devices for Intel 80486.

**TC-222: DIGITAL CIRCUITS & MICRO-PROCESSOR**

**INSTRUCTIONAL OBJECTIVES:**

- 1 UNDERSTAND NUMBER SYSTEMS AND BINARY CODES. 2 Hrs.
- 2 UNDERSTAND DIGITAL GATING CIRCUITS. 2 Hrs.
- 3 UNDERSTAND DIGITAL INTEGRATED CIRCUITS. 2 Hrs.
- 4 UNDERSTAND FLIP-FLOP CIRCUITS. 4 Hrs.
- 5 UNDERSTAND COMBINATIONAL LOGIC CIRCUITS. 6 Hrs.
- 6 UNDERSTAND REGISTER AND COUNTER CIRCUITS. 4 Hrs.
- 7 UNDERSTAND MEMORY SYSTEMS. 4 Hrs.
- 8 UNDERSTAND MICROPROCESSOR ARCHITECTURE, PROGRAMMING, INTERFACING AND APPLICATIONS
  - 8.1 Define the term microprocessor.
  - 8.2 Differentiate between micro controller/dedicated microprocessor and general purpose microprocessor.
  - 8.3 Define word length/size and data path size
    - 8.4 Differentiate between a 8-bit, 16-bit and 32-bit microprocessors.
    - 8.5 Identify the effect of word size on processor speed.
    - 8.6 List the four basic steps of a microprocessor cycles repeated to execute a program (list of micro instructions).
    - 8.7 Show the two functional internal units of 8086/8088 device.
    - 8.8 Explain how the memory and internal array are structured.
    - 8.9 Explain the purpose of:
      - 8.9.1 The bus interface unit (BIU)
      - 8.9.2 The execution unit (EU)
    - 8.10 Define the terms:
      - 8.10.1 Memory segment.
      - 8.10.2 Offset address
      - 8.10.3 Serial fetch/execute cycle
      - 8.10.4 Overlapped fetch/execute cycle
    - 8.11 Compare the serial-and overlapped fetch/execute cycle
    - 8.12 Sketch the internal organization of the 8088 microprocessor.
    - 8.13 List the functional parts of BIU.
    - 8.14 Explain the function of
      - 8.14.1 Instruction queue
      - 8.14.2 Segment Register (CS) and
      - 8.14.3 Instruction pointer (IP) and address summing block
    - 8.15 Explain the segmented addressing method.

- 8.16 Compute the effective address of next instruction in the memory using the contents of IP and CS.
- 8.17 Compare the 8086 with the 8088 processor.
- 8.18 Describe the function of 8086 queue.
  - 8.18.1 How does the queue speed up the process operation.
- 8.19 List the functional parts of execution unit (EU) of 8088.
- 8.20 Explain the operation of :
  - 8.20.1 Arithmetic logic unit (ALU).
  - 8.20.2 General Registers
  - 8.20.3 Flag Registers
  - 8.20.4 Stack pointer register
- 8.21 List the pointers and index registers of 8088.
- 8.22 Explain the purpose of control unit (CU).
- 8.23 Describe the purpose of:
  - 8.23.1 Address bus
  - 8.23.2 Data bus
  - 8.23.3 Control bus
- 8.24 Describe the function of each pin of 8088 using the data sheet.

## **9 UNDERSTAND THE PURPOSE AND METHOD OF PROGRAMMING MICROPROCESSORS.**

- 9.1 Define a program.
- 9.2 Identify the instruction sets.
- 9.3 Define a programming language.
- 9.4 List the three programming languages for a microcomputer.
- 9.5 Define a program statement.
- 9.6 Explain the operation of data addressing mode.
- 9.7 Sketch the format of assembly language program using data address modes.
- 9.8 Define the following fields:
  - 9.8.1 Label
  - 9.8.2 Of code
  - 9.8.3 Operand and
  - 9.8.4 Comment
- 9.9 Compare assembly language with machine language.
- 9.10 Describe the operation of 8086 when it executes, ADD AX, BX
- 9.11 Describe the operation and results for the following instruction of 8086:
  - 9.11.1 MOV BX, 03FFH
  - 9.11.2 MOV AL, 0DBH
  - 9.11.3 MOV DH, CL
  - 9.11.4 MOV BX, AX
- 9.12 Write the 8088 assembly language statements which will perform the task: ADD 5 to 2.
- 9.13 Translate the program written in assembly language under 3.1.1 into machine language program.
- 9.14 List the five major groups categories of 8086/8088 instructions set.
- 9.15 Relate the following instructions to the corresponding instruction category MOV, ADD, ROL, PUSH, POP, NOT, AND, OR, XOP, INC, DEC, CMP, SUB, TEST, REP, JNC, LLC, HLT, ESC, JMP, STO, XCHG, SAL.

- 9.16 Write a task list for a simple programming problem [Take a sample temperature data every hour for 24 hours and add 10 to each sample and put the each value in memory locations].
- 9.17 Define a flow-chart.
- 9.18 Sketch a flow chart for the problem under 3.2.6.
- 9.19 List the major steps in developing an assembly language program.
- 9.20 Explain the necessity of high level languages.
- 9.21 Define the terms:
- 9.21.1 Assembler
  - 9.21.2 Interpreter
  - 9.21.3 Compiler
- 9.22 List the area of application for the following programming language:
- 9.22.1 Assembly language,
  - 9.22.2 High level languages.
- 9.23 Identify the need to develop a detonated algorithm for a program before writing down assembly level instructions.
- 9.24 List three basic structure type used when writing programs.
- 9.25 Write the 8088 instructions to perform the given operations.
- 9.26 Implement WHILE-DO and REPEAT-UNTIL program structure in 8088 assembly language (conditional/unconditional jump, loop and string instructions).
- 9.27 Describe the operation for five major group of instruction for 8088
- 9.28 Define debugging program.
- 9.29 List program debugging techniques.
- 9.30 Debug an assembly language program using:
- 9.30.1 Debugged
  - 9.30.2 Monitor
  - 9.30.3 Emulator
- 9.31 Define the term interfacing.
- 9.32 Illustrate the memory address allocation in a microcomputer.
- 9.33 Sketch the CPU-Memory organization.
- 9.34 Name the two cycles used by the CPU to transfer data to and from the memory.
- 9.35 Sketch the basic timing diagram for a 8088 base CPU memory.
- 9.35.1 Read cycle
  - 9.35.2 Write cycle
- 9.36 What is an I/O port.
- 9.37 List types of I/O port
- 9.38 Identify the purpose of programmable peripheral interface (PPI).
- 9.39 Name the main advantage of an interrupt-driven I/O.
- 9.40 Define DMA.
- 9.41 Discuss the advantages of DMA.
- 9.42 Illustrate a DMA data transfer.
- 9.43 Calculate the access time in an 8088 microcomputer system.
- 9.44 Define interrupt.
- 9.45 State the major type of interrupts.
- 9.46 Define BIOS.

## **10 UNDERSTAND THE CIRCUITRY AND SOFTWARE TO CONTROL COMPLEX MACHINES WITH A MICROPROCESSOR.**

- 10.1 Define the terms:
  - 10.1.1 Serial port
  - 10.1.2 Parallel port
- 10.2 Explain the term handshake.
- 10.3 Describe how phonemes are sent to a speech synthesizer on a handshake basis.
- 10.4 Describe how parallel data is sent to a printer on a handshake basis.
- 10.5 Show the hardware connections that can be used to interface keyboard to a microcomputer.
- 10.6 List the software that can be used to interface keyboard to a microcomputer.
- 10.7 Describe how an 8279 can be used to refresh a multiplexed LED display and scan a matrix keyboard.
- 10.8 Show the circuitry used to interface high power devices to microcomputer port.
- 10.9 Describe the hardware and software needed to control a stepper motor.
- 10.10 Describe the interfacing of several common sensors used to measure temperature, pressure, flow, etc.
- 10.11 Define D/A data sheet parameters
- 10.12 Describe how feedback is used to control variables such as pressure, temperature, flow, speed, voltage, and current.
- 10.13 Multiple microprocessor system.
- 10.14 List the actions of DMA controller on receiving data transfer request from a peripheral device to memory.
- 10.15 Describe the function of expansion slots into the motherboard.
- 10.16 Show a component layout for a IBM PC motherboard.
- 10.17 Explain the operation of dynamic RAM controller.
- 10.18 Describe hamming code for data error detection/correction.
- 10.19 Differentiate a standard microprocessor from a coprocessor.
- 10.20 Identify the working of 8087 with 8088.
- 10.21 List the advantages of multiple microprocessor commented to a common system bus
- 10.22 Name the two schemes to determine control of a microprocessor in multibus system.
- 10.23 Microcomputer system peripherals
- 10.24 Draw the block diagram of circuitry to produce dot-matrix character display on the monitor CRT with non-interlaced scanning.
- 10.25 Explain the operation of colour adapter board.
- 10.26 Describe how visual images are stored in computer memory from a CCD camera.
- 10.27 Explain the movement of read/write head of a disk drive into the desired position over a specified track.
- 10.28 Describe the purpose of CRC bytes record with each block of data recorded on floppy disk.
- 10.29 Identify the need of colour bits recorded along with data bits on floppy disks.
- 10.30 List the major types of information contained in the directory of disk formatted by DOS.
- 10.31 Define the term hierarchical file structure.
- 10.32 Explain the reason of mass data storage on hard disks (HD).
- 10.33 Identify the need of free working environment for hard disks.
- 10.34 Define the terms: cylinders and partition on a HD.
- 10.35 Describe how data is read from optical disk
- 10.36 Describe the operation of print mechanism for each of the following type of printer:

- 10.36.1 Dot matrix
- 10.36.2 Thermal
- 10.36.3 Laser
- 10.36.4 Inkjet
- 10.37 Describe the working of LPC and format speech synthesizer.
- 10.38 Describe the operation of direct digitization speech synthesizer.

## **11 UNDERSTAND THE COMMUNICATION DEVICES AND SOFTWARE NEEDED TO LINK UP COMPUTERS.**

- 11.1 Show the bit format used for sending asynchronous serial data.
- 11.2 Define the terms: baud, UART & USART and MODEM.
- 11.3 Identify the need of MODEM to send digital data over standard phone lines.
- 11.4 List logic high and logic low signal voltage ranges in the RS-232C standard.
- 11.5 Identify the function of RS-422 A for high speed data transmission over long distances.
- 11.6 Define synchronous serial data.
- 11.7 Differentiate between synchronous and asynchronous serial data communication
- 11.8 Describe the terms LAN, Electronic mail (E-mail) & Internet.
- 11.9 Define the terms GPIB & SCSI.
- 11.10 **AT MICROPROCESSOR & OPERATING SYSTEMS**
- 11.11 Explain the multi -user/multi -tasking system.
- 11.12 List two types of scheduling used in multi-user operating system.
- 11.13 Explain elimination of interference in time-share computer controlled printing .
- 11.14 Describe the UNIX operating system.
- 11.15 define the term "virtual memory".
- 11.16 Show the operation of memory management unit (MMU).

## **12 32-BIT MICROPROCESSORS.**

- 12.1 Define the terms: cache memory, complete processor, floating point processor, overdrive chip.
- 12.2 Sketch the internal block diagram of Intel 80486.
- 12.3 Explain briefly the function of each unit in the internal block of 80486.
- 12.4 Describe the instruction set for 80486.
- 12.5 List the CPU specification for 80286 through 80486.
- 12.6 Interpret the function of each pin of 80486 chip.

## TC-233 MEASURING INSTRUMENT

T	P	C
2	3	3

### TOTAL CONTACT HOURS:

Theory: 64 Hours

Practical: 96 Hours

**Prerequisite:** Telecom Essentials & Networks (TC. 114) and Mathematics (Math 113)

- AIMS**
1. To understand the working principle, types, and construction of different analog and digital instruments and their accessories.
  2. To Manipulate skills of proper selection, use, handling, maintaining and repairing of various electrical and electronic instruments.

### COURSE CONTENTS

1. Identify the different electrical meters.
2. Identify the various electronic instruments.
3. Describe the functions of each measuring instrument.
4. Use the most proper measuring instrument for a given job.
5. Perform measurements using test instruments.
6. Observe proper safety and care in using measuring instruments.
7. Calibrate measuring instruments.
8. Mend/ repair defective measuring instruments.

1. **MEASUREMENTS AND ERRORS.** **2 Hours**
  - 1.1 Precision of measurements.
  - 1.2 Types of errors.
  - 1.3 Accuracy rating of instruments.
  - 1.4 Application of the concepts .
2. **INDICATING INSTRUMENTS.** **4 Hours**
  - 2.1 Introduction to meters.
  - 2.2 D`Ansonval Meter movements
  - 2.3 Ammeters, millimeters, micrometer and shunts.
  - 2.4 Shunt calculations.
  - 2.5 Voltmeter, multiplier and sensitivity.
  - 2.6 Basic Ohmmeter (Conversion of ammeter into ohmmeter)
  - 2.7 Ac meters (rectifier, moving iron-vane, electro-dynamometer, thermocouple and clamp-on type)
3. **VOLT-OHM MILLIAMMETER (VOM).** **4 Hours**
  - 3.1 Basic requirements.
  - 3.2 Ranges and Subfunctions.
  - 3.3 Basic types of Volt-Ohm-Milliammeter.
  - 3.4 Application.

4. **TRANSISTOR VOLTMETER.** **06 Hours**
- 4.1 Advantages.
  - 4.2 Basic TVM, FET, MOSFET Test Methods.
  - 4.3 Tunnel Diode Test.
  - 4.4 PIN diode test configuration.
  - 4.5 Varactor diode test configuration.
  - 4.6 Gunn diodes Test Methods.
  - 4.7 Thyristors Test Methods.
  - 4.8 Curve tracer.
  - 4.9 Application.
5. **BRIDGES AND BRIDGE-TYPE EQUIPMENT.** **06 Hours**
- 5.1 Introduction.
  - 5.2 Whetstone bridge and Grounded whetstone bridge.
  - 5.3 AC bridges (magnitude and phase balancing).
  - 5.4 Maxwell bridge.
  - 5.5 Hay Wien bridge
  - 5.6 Scheming and Wien bridges.
  - 5.7 Universal bridge.
  - 5.8 Q-meter and LC meter.
6. **SIGNAL GENERATORS.** **08 Hours**
- 6.1 Review of oscillator circuit operation.
  - 6.2 AF generator.
  - 6.3 RF generator.
  - 6.4 AM generator.
  - 6.5 FM generator.
  - 6.6 Frequency synthesized signal generator.
  - 6.7 Sweep/Marker generator.
  - 6.8 Square and Pulse generator.
  - 6.9 Function generator.
  - 6.10 TV pattern generator.
7. **OSCILLOSCOPES.** **06 Hours**
- 7.1 Theory and operation.
  - 7.2 Single/dual trace ( general purposes).
  - 7.3 Triggered Sweep.
  - 7.4 Storage.
  - 7.5 Sampling
  - 7.6 Vector scope
  - 7.7 Curve tracer
  - 7.8 Recorders
8. **DIGITAL INSTRUMENTS.**
- 8.1 Review of signal conversion (ADC and DAC)
  - 8.2 Digital Voltmeter

8.3	Digital Multimeter	
8.4	Frequency Counter	
8.5	Digital LCR meter.	
8.6	Digital I.C. tester.	
<b>9.</b>	<b>ANALYZERS.</b>	<b>04 Hours</b>
9.1	Wave Analyzer	
9.2	Distortion Analyzer	
9.3	Logic Analyzer	
9.6	Signature Analyzer	
9.7	Application	
<b>10.</b>	<b>MISCELLANEOUS TEST INSTRUMENTS.</b>	<b>10 Hours</b>
10.1	Wattmeter, power, dynamometer type	
10.2	Energy meter, induction type	
10.3	Watt meter, RF	
10.4	V U meter	
10.5	Sound level meter	
10.6	Field strength meter	
10.7	Digital Volt meter	
10.8	Digital Multimeter	
10.9	Pulse counter	
10.10	Frequency counter	
<b>10.</b>	<b>DIGITAL LCR METER.</b>	
10.12	Single tracer	
10.13	X - Y recorder	
10.14	Digital IC Tester	
10.15	Q-meter	
10.17	Applications	
<b>11.</b>	<b>PROBES AND TRANSDUCERS.</b>	<b>04 Hours</b>
11.1	High Voltage probes	
11.2	Oscilloscope probes	
11.3	Logic probes	
11.4	Logic pulser	
11.5	Logic clip	
11.6	Application	
<b>12.</b>	<b>CALIBRATION OF INSTRUMENTS</b>	<b>04 Hours</b>
12.1	Standards of Calibration.	
12.2	Techniques of Calibration.	
12.3	Report of Calibration.	
<b>13.</b>	<b>DEFECTS IN INSTRUMENTS.</b>	<b>04 Hours</b>
13.1	Common defects in Analog meter	

- 13.2 Methods of repair of analog meter.
- 13.3 Common faults in curves tracer and their remedy
- 13.4 Major defects in A.C. bridges
- 13.5 Common faults in Oscilloscopes
- 13.6 Common faults in Signal generators
- 13.7 Common faults in Signal analyzer
- 13.8 Common faults in Digital Instruments.

#### **TEXT & REFERENCE BOOKS.**

- 1. Cycle N. Herrick Instruments & Measurement for Electronics.
- 2. Bernard Grob & Milton Kiver, Application of Electronics
- 3. Link G.D. Electronic Test Instruments,  
Hand book of meters - Theory and applications.  
Handbook of Oscilloscope - Theory and applications.
- 4. Cooper William Electronic Instruments Techniques
- 5. Malvino, Electronic Instrumentation Fundamentals
- 6. Higgins O Patrik J, Basic instrumentation - Industrial Measurements.
- 7. Jones & Chin, Electronics Instruments & Measurements
- 8. R.B. Gillies, Instrumentation & Measurements for Electronics Technicians

## TC-233 MEASURING INSTRUMENTS

### INSTRUCTIONAL OBJECTIVES.

#### 1. UNDERSTAND PURPOSE AND TERMINOLOGY OF MEASUREMENT.

- 1.1 Define the terms: Instrument, Accuracy, Precision, Sensitivity, Resolution and Error.
- 1.2 Differentiate accuracy from precision.
- 1.3 List four sources of errors in instruments.
- 1.4 Describe the three general classes of errors in measurements.

#### 2. TO UNDERSTAND THE CONSTRUCTION, WORKING AND USES OF DC AND AC METERS.

- 2.1 List the types of indicating instruments.
- 2.2 Draw and label the constructional elements of permanent magnet moving coil (PMMC) mechanism.
- 2.3 Explain the working of PMMC (D'Arsonval) movement.
- 2.4 Compare the external magnet construction with core magnet for PMMC mechanism.
- 2.5 Compare a taut band suspension with the jewel bearing mounting of moving coil
- 2.6 List the uses of each type of construction given under 2.1.4 and 2.1.5.
- 2.7 Identify the function of swamping resistor.
- 2.8 List the merits and demerits of PMMC mechanism.
- 2.9 Enlist the uses of PMMC mechanism.
- 2.10 Identify the constructional features and importance of zero-centered galvanometer movement.
- 2.11 Identify the function of PMMC galvanometer as dc micro-ammeter.
- 2.12 Explain the function of shunt resistor to extend the range of micro-ammeter to milli-ammeter and ammeter.
- 2.13 Derive the formula to find the value of shunt resistor,  $R_s = R_m I_m / (I - I_m)$ .
- 2.14 Compute the value of shunt resistance for a desired extension in range.
- 2.15 Draw the circuit of a multi-range ammeter using universal or Ayrton shunt.
- 2.16 List three precautions to be observed in using a DC ammeter.
- 2.17 Enlist the uses of DC ammeter.
- 2.18 Identify the function of multiplier resistor.
- 2.19 Derive the formula to find the value of multiplier resistance,  $R_m = (V - I_m R_m) / I_m$ .
- 2.20 Compute the value of multiplier resistor for a desired f.s.d. of DC volts.
- 2.21 Draw a circuit arrangement of a multi-range voltmeter using multiplier resistors.
- 2.22 Explain the sensitivity and load effect of a voltmeter.
- 2.23 List the precautions in using DC voltmeter.
- 2.24 List the uses of Dc voltmeter.
- 2.25 List the method of measuring a resistance.
- 2.26 Explain the voltmeter-ammeter method of measuring resistance.
- 2.27 Draw the circuit of a basic Ohmmeter.
- 2.28 Explain the working of a basic Ohmmeter.
- 2.29 List the uses of Ohmmeter.
- 2.30 List the classes of AC meters.
- 2.31 Name the type of instrument mechanism used for each class of AC meter.

- 2.32 Draw the schematic diagram a rectifier type AC meter.
- 2.33 Explain the working of rectifier type AC meter.
- 2.34 Describe the working principle of a clamp-on AC meter.
- 2.35 Explain the working principal of moving iron-vane mechanism.
- 2.36 Draw the schematic diagram of an electrodynamicometer movement.
- 2.37 Compare the rectifier, moving iron-vane and electrodynamicometer type AC meter.
- 2.38 Draw the schematic diagram of a basic thermocouple instrument.
- 2.39 Explain the working of thermocouple instrument.
- 2.40 List the uses of above four type of AC meters.

### **3.UNDERSTAND THE IMPORTANCE, TYPES AND CONSTRUCTION OF VOLT-OHM-MILLIAMMETER.**

- 3.1 Identify the importance of volt-ohm milliammeter (Multimeter)
- 3.2 Draw and label the block diagram showing three functions of multimeter (VOM).
- 3.3 List the types of volt-ohm-milliammeter
- 3.4 Describe the function of operating controls and scales of a typical VOM.
- 3.5 Identify the meter protection in an analog VOM.
- 3.6 Describe the use of VOM in making :
  - a) Voltage measurements ( AC, +/-, DC and decibel)
    - i) measuring AC in the presence of DC.
    - ii) measuring DC in the presence of AC.
  - b) Current measurement
    - i) High current range
    - ii) Low current range.
  - c) Decibel measurement

### **4. UNDERSTAND THE TYPES, CONSTRUCTION AND WORKING OF TVM, UNDERSTAND THE WORKING OF ELECTRONIC VOM.**

- 4.1 Draw the schematic diagram of basic BJT input TVM.
- 4.2 Explain the working of BJT input TVM.
- 4.3 Draw the schematic diagram of basic FET input TVM.
- 4.4 Explain the working of FET input TVM.
- 4.5 Compare the FET input TVM with the BJT input TVM.
- 4.6 Draw the schematic diagram of BJT bridge TVM.
- 4.7 Explain the working of BJT bridge TVM.
- 4.8 Draw the schematic diagram of FET bridge TVM.
- 4.9 Explain the working of FET bridge TVM.
- 4.10 Compare the BJT bridge TVM with FET bridge TVM.
- 4.11 List the applications of TVM.
- 4.12 List important considerations in choosing a voltmeter.
- 4.13 List the major elements of an electronic VOM.

### **5.UNDERSTAND THE CONSTRUCTION AND WORKING OF BRIDGE -TYPE TEST INSTRUMENTS.**

#### DC Bridges

- 5.1 Draw the circuit diagram of Whetstone bridge.
- 5.2 Explain the working of Whetstone bridge.
- 5.3 Identify the function of guard terminal in a guarded Whetstone bridge.
- 5.4 List the applications of Whetstone bridge

### **AC Bridges**

- 5.5 List the electrical quantities measured by an AC bridge.
- 5.6 Draw the general diagram of an AC bridge.
- 5.7 State the balance (magnitude & phase) equation for a general AC bridge.
- 5.8 Draw the schematic diagram of Maxwell bridge .
- 5.9 Describe the procedure of balancing Maxwell bridge
- 5.10 Derive the balance equation of Maxwell bridge to find the unknown inductance.
- 5.11 Draw the schematic diagram of Hay bridge.
- 5.12 Derive the equation to find the unknown inductance.
- 5.13 Compare Maxwell bridge with Hay bridge.
- 5.14 Draw the schematic diagram of Scheming bridge.
- 5.15 Derive the balance equation for Scheming bridge to find  $C_x$ , p.f, D and Q of series RC circuit.
- 5.16 Draw the schematic diagram of Wien bridge.
- 5.17 Describe the procedure of balancing Wien bridge to find the value of unknown frequency of a signal.
- 5.18 List the application of Wien bridge.

### **Q & LC meters and Universal Bridge**

- 5.19 Draw the schematic diagram of basic Q-meter.
- 5.20 Explain the working of Q-meter.
- 5.21 Draw a block diagram of LC meter.
- 5.22 Identify the function of each block of LC meter.
- 5.23 Describe a universal bridge.
- 5.24 Enlist the controls and scales of universal bridge.
- 5.25 List he merits and demerits of bridge-type test instrument.

## **6. SIGNAL GENERATORS.**

- 6.1 Understand the basics and need of a signal generators.**
  - 6.1.1 Describe the need and the basic requirements of a signal generator.
  - 6.1.2 List the major types of signal generators used for electronics testing and troubleshooting.
  - 6.1.3 List the desired characteristics common to all the signal generators.
- 6.2 Understand the construction and working of AF generator.**
  - 6.2.1 Identify the similarities and differences between an audio oscillator and audio generator.
  - 6.2.2 List the types of oscillators.
  - 6.2.3 Identify the merits of RC oscillator.
  - 6.2.4 Draw the schematic diagram of a RC Wien bridge oscillator.
  - 6.2.5 Explain the working of Wien bridge oscillator.
  - 6.2.6 Identify the function of controls and indicators of an AF generator.
  - 6.2.7 List the applications of AF generator
- 6.3 Understand the construction and working of AM & FM generators.**
  - 6.3.1 Draw the basic circuit of a shop type RF generator.

- 6.3.2 Explain the working of the RF generator.
- 6.3.3 Identify the function of each control and indicator of RF generator.
- 6.3.4 List the applications of RF generator.
- 6.3.5 Draw the schematic diagram of a dip meter.
- 6.3.6 Describe the working of a dip meter circuit.
- 6.3.7 List the applications of dip meter.
- 6.4 Understand the construction and working of sweep, marker and pulse generators.**
  - 6.4.1 Draw the block diagram of an AM generator.
  - 6.4.2 Identify the function of each block of an AM generator.
  - 6.4.3 Describe the function of each control and indicator of AM generator.
  - 6.4.4 List the applications of AM generator.
  - 6.4.5 Draw the block diagram of FM generator.
  - 6.4.6 Describe the function of each block of FM generator.
  - 6.4.7 Identify the function of each control & indicator of FM generator.
  - 6.4.8 List the applications of FM generator.
  - 6.4.9 List the two methods of frequency syntheses.
  - 6.4.10 Draw the block diagram of phase locked loop (PLL) or indirect method of frequency synthesis.
  - 6.4.11 Identify the function of each block of PLL frequency synthesizer.
  - 6.4.12 Draw the block diagram of the frequency divider type of signal generator.
  - 6.4.13 Describe the function of each block of frequency divider type signal generator.
- 6.5 Understand the construction of TV pattern and special effects generators.**
  - 6.5.1 Draw the block diagram of sweep generator.
  - 6.5.2 Describe the function of each block of sweep generator.
  - 6.5.3 List the types of voltage sweep generations.
  - 6.5.4 Enlist the applications of sweep generator.
  - 6.5.5 Draw the block diagram of marker generator.
  - 6.5.6 Describe the function of each block of the marker generator.
  - 6.5.7 Identify the purpose of marker generator controls and indicators.
  - 6.5.8 List the two basic methods for injection of marker signal into sweep generator.
  - 6.5.9 Enlist the applications of marker generator.
  - 6.5.10 List the methods of square wave generation.
    - 6.5.11 Draw the block diagram of a square wave generator.
    - 6.5.12 Explain the function of each block of the square wave generator.
    - 6.5.13 Draw the block diagram of pulse generator using square wave generator and monostable multivibrator.
    - 6.5.14 Explain the working of a pulse generator.
    - 6.5.15 Identify the function of controls and indicators of a square wave and pulse generator.
    - 6.5.16 List the applications of square wave and pulse generator.
    - 6.5.17 Draw the schematic diagram of an OP-AMP Function generator.
    - 6.5.18 Explain the working of the Function generator.
    - 6.5.19 Draw the functional diagram of IC function generator.
    - 6.5.20 Identify the function of each block of IC function generator.
- 6.6 TV Pattern and Special Effect Generators**
  - 6.6.1 Explain the need of TV pattern generator.
  - 6.6.2 Describe the working of TV pattern generator using a block diagram.

- 6.6.3 Enlist special effect generator.
- 6.6.4 State uses of special effect generator.

## 7. OSCILLOSCOPE (CRO).

### 7.1 Understand the working principle, types and applications of oscilloscope and recorders.

- 7.1.1 List the four fundamental parameters that may be represented by an oscilloscope.
- 7.1.2 Sketch a cathode ray tube (CRT) and label the most important parts.
- 7.1.3 Describe the function of each part of a CRT.
- 7.1.4 Sketch the control circuit of a CRT.
- 7.1.5 Explain the purpose of each control of CRT.

### 7.2 General Purpose Oscilloscope

- 7.2.1 Draw the block diagram of general purpose oscilloscope.
  - 7.2.2 Explain the function of each block of the oscilloscope.
  - 7.2.3 Explain the function of each control of the oscilloscope.
  - 7.2.4 Draw the block diagram of vertical section of an oscilloscope.
  - 7.2.5 Explain the function of each block of vertical section of CRO.
  - 7.2.6 Describe the purpose of delay line in the vertical section of a CRO.
  - 7.2.7 Draw the block diagram of the horizontal section of a CRO.
  - 7.2.8 Explain the function of each block of horizontal section of a CRO.
  - 7.2.9 Define the terms: fluorescence, phosphorescence, persistence, luminance, grativules and deflection sensitivity.
  - 7.2.10 Identify the function of a sweep generator in an oscilloscope.
  - 7.2.11 List the types of sweep generator used in oscilloscopes.
  - 7.2.12 Describe the function of differentiator circuit following a clipper in the sync section of a CRO.
  - 7.2.13 Explain the action of Schmitt trigger circuit in a triggered oscilloscope.
  - 7.2.14 List the application for which triggered sweep is superior to a recurrent type of sweep.

### 7.3 Dual Trace Oscilloscope

- 7.3.1 Describe the importance of dual trace oscilloscope.
- 7.3.2 Differentiate a dual beam CRO from a dual trace CRO.
- 7.3.3 single trace into a dual trace display.
- 7.3.4 Explain the working of electronic switch circuit for a dual trace display.
- 7.3.5 List the controls and connectors of a shop oscilloscope.
- 7.3.6 Describe the function of each control and connector of a shop CRO.
- 7.3.7 List the applications of CRO.

### 7.4 Storage Oscilloscope

- 7.4.1 Identify the purpose of storage oscilloscope.
- 7.4.2 List the types of storage CRT.
- 7.4.3 Draw and label the simplified diagram of a storage CRO.
- 7.4.4 Explain the function of each part of a storage CRT.
- 7.4.5 Identify the function of writing and flood guns in a storage oscilloscope.
- 7.4.6 Describe the method of erasing a target of a storage oscilloscope.
- 7.4.7 Describe the function of controls and connectors of a storage oscilloscope.

- 7.4.8 Enlist the advantages of storage oscilloscope.
- 7.5 Sampling Oscilloscope**
- 7.5.1 Identify the importance of sampling oscilloscope.
- 7.5.2 Sketch and label the block diagram of a random sampling oscilloscope.
- 7.5.3 Describe the function of each block of the above diagram.
- 7.6 Vectorscope**
- 7.6.1 Identify the function of vectorscope to check a colour TV receiver's response.
- 7.6.2 Describe the use of the conventional oscilloscope as a vectorscope.
- 7.7 Curve Tracer**
- 7.7.1 Identify the function of a modern curve tracer.
- 7.7.2 Draw the block diagram of a transistor curve tracer.
- 7.8 Recorders**
- 7.8.1 List the two basic types of recorders used as electronic test equipment.
- 7.8.2 Draw the block diagram of a basic strip or roll chart recorder system.
- 7.8.3 Describe the working of strip chart recorder.
- 7.8.4 Draw the block diagram of a basic X-Y recorder or plotter system.
- 7.8.5 Describe the function of each block of x-y recorder.
- 8. DIGITAL INSTRUMENTS.**
- 8.1 Understand the operation and applications of digital meters.**
- 8.1.1 List the major types of digital test instruments.
- 8.1.2 Enlist the types of digital voltmeter (DVM).
- 8.1.3 Illustrate the voltage-to-time conversion principle of ramp-type DVM.
- 8.1.4 Draw the block diagram of ramp-type DVM.
- 8.1.4 Identify the function of each block of the ramp-type DVM.
- 8.1.5 Draw the block diagram of staircase ramp type DVM.
- 8.1.6 Identify the function of its each block.
- 8.1.7 Draw the block diagram of dual-slope type DVM.
- 8.1.8 Explain the function of its each block.
- 8.1.9 Compare the above three types of DVMs.
- 8.1.10 Draw the block diagram of dual-slope type digital multimeter.
- 8.1.11 Identify the function of its each block.
- 8.1.12 Draw the block diagram of digital LCR meter.
- 8.1.13 Identify the function of its each block.
- 8.1.14 Identify the function of each control of DVM and digital multimeter
- 8.2 Understand the working and uses of electronic counters.**
- 8.2.1 Define the term "Electronic Counter"
- 8.2.2 Draw the block diagram of basic counter.
- 8.2.3 Identify the blocks of basic counter involved in frequency measurement operation.
- 8.2.4 Draw the basic counter block diagram for period measurement operation.
- 8.2.5 Explain the working of basic counter for frequency and period measurements.
- 8.2.6 Identify the function of panel controls and indicators of electronic counter.
- 9. WAVE AND LOGIC ANALYZERS.**
- 9.1 Understand the function of wave and distortion analyzers.

- 9.1.1 Draw the block diagram of wave analyzer.
  - 9.1.2 Explain the function of each block of wave analyzer.
  - 9.1.3 Identify the function of the controls and indicators of the analyzer.
  - 9.1.4 List the applications of wave analyzer.
  - 9.1.5 Draw the block diagram of distortion analyzer.
  - 9.1.6 Explain the operation of each block of distortion analyzer.
  - 9.1.7 Identify the function of the controls & indicators of the analyzer.
  - 9.1.8 List the applications of distortion analyzer.
  - 9.2 Understand the working of logic and signature analyzers.**
    - 9.2.1 Draw the block diagram of logic analyzer
    - 9.2.2 Explain the operation of each block of logic analyzer.
    - 9.2.3 Identify the function of the controls & indicators of the analyzer.
    - 9.2.4 List the application of logic analyzer
    - 9.2.5 Draw the block diagram of signature analyzer.
    - 9.2.6 Explain the function of each block of signature analyzer.
    - 9.2.7 Identify the function of the controls & indicators of the analyzer.
    - 9.2.8 List the application of signature analyzer
- 10. MISCELLANEOUS INSTRUMENTS.**
- 10.1 Understand electrical power & energy meters.**
    - 10.1.1 Draw the schematic diagram of electro-dynamometer type watt meter.
    - 10.1.2 Explain the working of the watt meter.
    - 10.1.3 Draw the circuit diagram of induction type energy meter.
    - 10.1.4 Explain the working of energy meter.
  - 10.2 Understand the working of RF power meter.**
    - 10.2.1 Draw the diagram of RF watt meter
    - 10.2.2 Explain the operation of RF watt meter
    - 10.2.3 List the uses of RF watt meter
  - 10.3 Understand the function of level and field strength meters.**
    - 10.3.1 Draw the block diagram of VU meter.
    - 10.3.2 Explain the operation of each block of VU Meter.
    - 10.3.3 List the applications of VU Meter.
    - 10.3.4 Draw the block diagram of sound level meter
    - 10.3.5 Explain the operation of each block of sound level meter
    - 10.3.6 Explain the application of sound level meter
    - 10.3.7 Draw the block diagram of field strength meter.
    - 10.3.8 Explain the operation of each block of field strength meter.
    - 10.3.3 List the applications of field strength meter.
  - 10.4 Understand the working of signal tracer/injector.**
    - 10.4.1 Draw the block diagram of signal tracer.
    - 10.4.2 Explain the operation of each block of signal tracer.
    - 10.4.3 List the uses of signal tracer.
  - 10.5 Understand the function of digital IC tester.**
    - 10.5.1 Draw the block diagram of digital IC tester.
    - 10.5.2 Explain the operation of each block of digital IC tester.
    - 10.5.3 Explain the application of digital IC tester.

- 10.6 Understand function of Q-meter.
  - 10.6.1 Describe working of a Q-meter using a block diagram
  - 10.6.2 List uses of Q-meter.

**11. PROBES AND TRANSDUCER.**

- 11.1 Understand the working of meter and scope probes.
  - 11.1.1 List the major types of meter and scope probes.
  - 11.1.2 Draw the circuit diagram of low capacitance probe.
  - 11.1.3 Explain the function of low capacitance probe.
  - 11.1.4 Draw the circuit diagram of high voltage probe (resistance & capacitance types).
  - 11.1.5 Explain the working of high voltage probe.
  - 11.1.6 List the applications of high voltage probe
  - 11.1.7 Draw the circuit diagram of RF probe .
  - 11.1.8 Explain the function of RF probe.
  - 11.1.9 Draw the block diagram of a basic logic probe. .
  - 11.1.10 Explain the working of basic logic probe.
  - 11.1.11 Draw the block diagram of a simple logic pulser.
  - 11.1.12 Explain the working of logic pulser.
  - 11.1.13 List the applications of logic probe and pulser.
  - 11.1.14 Explain the working of logic clip.
  
- 11.2 Understand the function of three types of traducers.
  - 11.2.1 List the three types of transducers.
  - 11.2.2 Explain the principle of resistance-changing transducer.
  - 11.2.3 Describe the working of self-generating transducer.
  - 11.2.4 Identify the function of inductance- and capacitance- changing transducers.

**12.UNDERSTAND THE NEED AND METHODS OF CALIBRATION OF MEASURING INSTRUMENTS.**

- 12.1 Explain standard of calibration of measuring instruments.
- 12.2 Explain the techniques of calibration of measuring instruments.
- 12.3 Describe report of calibration of measuring instruments.

**13.UNDERSTAND THE COMMON DEFECTS IN MEASURING INSTRUMENTS AND THE PROCESSES OF TROUBLESHOOTING.**

- 13.1.1 Describe common faults in analog meters.
- 13.1.2 Explain the method of fault tracing in an analog meter.
- 13.1.3 Explain the method of repair of an analog meter.
- 13.1.4 List the common-faults in curve tracers with their symptoms, causes & remedies.
- 13.1.5 List major faults in AC bridges with their symptoms, causes & remedies.
- 13.1.6 List common faults in oscilloscopes with their symptoms, causes & remedies.
- 13.1.7 Explain the common faults in signal generators with their symptoms, causes & remedies.
- 13.1.8 Explain the common faults in signal analyzer with their symptoms, causes & remedies.
- 13.1.9 Explain the common faults in digital instruments with their symptoms, causes & remedies.

## TC-243 RADIO COMMUNICATION SYSTEM - I

T	P	C
1	3	2

### Total contact hours

Theory: 32 Hours.

Practical: 96 Hours.

**Pre-requisite:** Electrical essentials and networks.

**AIMS**The subject has been designed so that the student will be able to understand the working of telegraphy, telephony and wireless communication.

1. Identify the necessity, types and application of codes in telegraphy.
2. Identify the elements of telegraphy.
3. Explain the working of teleprinter.
4. Describe the principle and working of automatic telephone system.
5. Explain the principle of pulse modulation and frequency division multiplexing.

### COURSE CONTENTS

1. **TELEGRAPH CODE.** (02 Hours)
  - 1.1. Introduction to telegraph code.
  - 1.2. Necessity of codes and their types (Morse code, double current, 5 unit and 7 1/2 unit codes).
  - 1.3. Comparison of telegraph codes.
  - 1.4. Line, machine and wireless telegraphy.
  - 1.5. Baud, character per second and words/ minute.
  - 1.6. Working principle, merits and demerits of machine telegraphy.
  - 1.7. Salient features of teleprinter.
  - 1.8. Application of teleprinter.
  - 1.9. Block diagram of wireless telegraph system.
  - 2.10. Point to point communication.
  - 2.11. Allocation of frequency for overseas telegraph transmission.
2. **TELEPHONY** (06 Hours)
  - 2.1. Introduction to automatic telephone system.
  - 2.2. Telephone Instrument - Receiver and transmitter.
  - 2.3. Side tone and antiside tone circuit.
  - 2.4. Telephone bell.
  - 2.5. Working, function and type of dials.
  - 2.6. Tone dialing.
  - 2.7. Step by step switching (Stronger system).
  - 2.8. Automatic telephone exchange
  - 2.9. Traffic and trunking principle.
  - 2.10. Principle of grading.
  - 2.11. Introduction to gate way exchange.
  - 2.12. NWD system (Block diagram)
  - 2.13. Function of each Block of NWD exchange.

- 2.14 Routing codes and signaling system.
  - 2.15 Mobile Telephone and Cordless Telephone.
- 3. INTRODUCTION TO DIGITAL TELEPHONE EXCHANGE. (04 Hours)**
- 3.1 Block Diagram of digital telephone exchange.
  - 3.2 Function of each unit.
  - 3.3 Multiplexing and demultiplexing, inhibit gate, ADC, DAC.
  - 3.4 Stored program control concept.
  - 3.5 Advantages of computer application in telephony.
  - 3.6 Matrix switches, PABXs.
  - 3.7 Pulse Code Modulation (PCM).
  - 3.8 PCM transmission system.
  - 3.9 Time Division Multiplexing (TDM)
  - 3.10 Space division Multiplexing (SDM) or Pulse Duration Multiplexing (PDM)
  - 3.11 Frequency Division Multiplexing (FDM).
  - 3.12 PCM based PABXs
  - 3.13 Digital Switching, time switching and space switching.
  - 3.14 Data Communication.
  - 3.15 Page, Modam, Fax Machine.
- 4. FIBER OPTICS. (02 Hours)**
- 4.1 Optical Fiber for light wave communication.
  - 4.2 Fiber optic transmission system.
  - 4.3 Video Telephone
  - 4.4 Video conference.
  - 4.5 Merits and Demerits of Fiber optic communication.
- 5. SATELLITE COMMUNICATION. (03 Hours)**
- 5.1 Block diagram of satellite communication system.
  - 5.2 Earth station.
  - 5.3 Geo-stationary satellites.
  - 5.4 Telephone Link via satellite.
  - 5.5 Television Link via satellite.
  - 5.6 Merits and demerits of satellite communication.
- 6. MICROWAVE COMMUNICATION. (04 Hours)**
- 6.1 Block Diagram for Microwave communication link.
  - 6.2 Microwave frequency.
  - 6.3 Microwave channel.
  - 6.4 Frequency Division Multiplexing (FDM)
  - 6.5 Demultiplexing FDM
  - 6.6 Interfacing Microwave station with telephone exchange.
  - 6.7 Merits and demerits of microwave communication.

**TEST AND REFERENCE BOOKS:**

1. N.N. Biswas "Principles of Telegraphy and Telephony"
2. Atkinson, J. "Telephony Volume I & II".
3. Howard W. Sams & Co. USA "Understanding Telecommunication System".
4. N Deshpanda & D.A Deshpanda & P.K. Rangole "Communication Electronics"
5. Kennedy George "Electronic Communication System"

## **TC-243 RADIO COMMUNICATION SYSTEM-I**

### **INSTRUCTIONAL OBJECTIVES.**

#### **1 UNDERSTAND THE TELEGRAPH CODES.**

- 1.1 Name the telegraph codes (Morse, double current, 5 unit, 7 1/2 unit).
- 1.2 Compare the telegraph codes
- 1.3 Enlist the types of telegraphy (Line and Machine telegraphy)
- 1.4 Explain the working principle of machine telegraphy.
- 1.5 Define Baud, characters/second and words/minute.
- 1.6 List the merits and demerits of machine telegraphy.
- 1.7 List the salient features of teleprinter.
- 1.8 List the applications of teleprinter.
- 1.9 Describe wireless telegraphy.
- 1.10 Draw the block diagram of wireless telegraph system.
- 1.11 Explain the function of its each block.
- 1.12 Explain point-to-point communication.
- 1.13 Identify the allocation of frequency for overseas telegraph transmission.

#### **2. UNDERSTAND THE LAYOUT AND WORKING OF TELEPHONE SYSTEM.**

- 2.1 Describe automatic telephone system.
- 2.2 Draw the block diagram of telephone receiver set.
- 2.3 Explain the working of its each block.
- 2.4 Draw the construction of telephone transmitter.
- 2.5 Explain the working of telephone transmitter.
- 2.6 Draw the schematic diagram of side tone and antiside tone circuit.
- 2.7 Explain side tone & antiside tone circuits.
- 2.8 Draw the diagram of magneto bell.
- 2.9 Explain the operation of magneto bell.
- 2.10 Enumerate types of dial.
- 2.11 Explain working of rotary/mechanical dial.
- 2.12 Describe tone dialing.
- 2.13 Explain step by step switching (stronger system).
- 2.14 Draw the block diagram of automatic telephone exchange.
- 2.15 Explain the working of automatic telephone exchange.
- 2.16 Describe merits & demerits of automatic telephone exchange
- 2.17 Describe the traffic principle.
- 2.18 Describe the principle of grading.
- 2.19 Describe the operation of gate way exchange.
- 2.20 Draw the block diagram of N.W.D. system.
- 2.21 Explain the function of each block of NWD system.
- 2.22 Explain the working of signaling system.
- 2.23 Explain the working of audio conference system.
- 2.24 Describe the working of cordless telephone..
- 2.25 Explain the working of mobile telephone system.

### **3.UNDERSTAND DIGITAL TELEPHONE EXCHANGE, MODULATION AND DEMOLITION, PCM, TDM, FDM, PAGE, MODAM, FAX.**

- 3.1 Draw the block diagram of digital telephone exchange.
- 3.2 Identify the function of each block of digital telephone exchange.
- 3.3 Describe the process of multiplexing and demultiplexing.
- 3.5 Identify the function of inhibit gate.
- 3.6 Describe the working of ADC & DAC.
- 3.7 Explain the stored program control concept in a digital telephone exchange.
- 3.8 Identify the application of computer in digital telephone exchange
- 3.9 Explain pulse & tone dialing.
- 3.10 Explain pulse code modulation transmission system.
- 3.11 Explain time division multiplexing (TDM).
- 3.12 Explain space division multiplexing (SDM).
- 3.13 Explain pulse duration multiplexing (PDM).
- 3.14 Explain frequency division multiplexing (FDM).
- 3.15 Draw the block diagram of PCM based PABX.
- 3.16 Identify the function of each block of PCM based PABX.
- 3.17 Explain the terms: digital switching and data communication.
- 3.18 Describe the working of page.
- 3.19 Describe the working of MODEM.
- 3.20 Describe the working of FAX machine.

### **4. UNDERSTAND THE FIBER OPTICS COMMUNICATION LINK.**

- 4.1 Explain the function of optical fiber for light wave communication .
- 4.2 Draw the block diagram of optical fiber transmission system
- 4.3 Identify the function of each block of optical fiber transmission system.
- 4.4 Draw the block diagram of video telephone system.
- 4.5 Describe the working of each block of video telephone system .
- 4.6 Draw the block diagram of video conference system.
- 4.7 Explain each block of video conference system.
- 4.8 List the merits & demerits of optical fiber communication system.

### **5. UNDERSTAND THE SATELLITE COMMUNICATION SYSTEM.**

- 5.1 Draw the block diagram of satellite communication system.
- 5.2 Explain the function of each block of satellite communication system
- 5.3 Draw the block diagram of earth satellite station.
- 5.4 Explain the function of each block of earth satellite station.
- 5.5 Describe the working of geo-stationery satellites.
- 5.6 Draw the block diagram of telephone link via satellite.
- 5.7 Identify the function of each block of telephone link via satellite.
- 5.8 Explain television link via satellite.
- 5.9 List the merits & demerits of satellite communication

### **6.UNDERSTAND THE WORKING OF MICROWAVE COMMUNICATION SYSTEMS.**

- 6.1 Draw the block diagram of microwave telecommunication link
- 6.2 Explain the function of each block of microwave telecommunication link.

- 6.3 Explain the frequency division multiplexing and demultiplexing of microwave frequency signal.
- 6.4 Identify the importance of microwave channel.
- 6.5 Explain interfacing microwave station with telephone exchange.
- 6.8 List the merits & demerits of microwave communication.

## TC-253 TELEPHONE & EXCHANGES

T	P	C
1	0	1

### Total contact hours

Theory: 32 Hours.

**Pre-requisite:** Electrical essentials and networks.

**AIMS**The subject has been designed so that the student will be able to understand the working of telephony and wireless communication.

1. Describe the principle and working of automatic telephone system.
2. Explain the principle of pulse modulation and frequency division multiplexing.

## COURSE CONTENTS

- 1 **TELEPHONY** (06 Hours)
  - 1.1 Introduction to automatic telephone system.
  - 1.2 Telephone Instrument - Receiver and transmitter.
  - 1.3 Side tone and antside tone circuit.
  - 1.4 Telephone bell.
  - 1.5 Working, function and type of dials.
  - 1.6 Tone dialing.
  - 1.7 Step by step switching (Stronger system).
  - 1.8 Automatic telephone exchange
  - 1.9 Traffic and trunking principle.
  - 1.10 Principle of grading.
  - 1.11 Introduction to gate way exchange.
  - 1.12 NWD system (Block diagram)
  - 1.13 Function of each Block of NWD exchange.
  - 1.14 Routing codes and signaling system.
  - 1.15 Mobile Telephone and Cordless Telephone.
- 2 **INTRODUCTION TO DIGITAL TELEPHONE EXCHANGE.** (04 Hours)
  - 2.1 Block Diagram of digital telephone exchange.
  - 2.2 Function of each unit.
  - 2.3 Multiplexing and demultiplexing, inhibit gate, ADC, DAC.
  - 2.4 Stored program control concept.
  - 2.5 Advantages of computer application in telephony.
  - 2.6 Matrix switches, PABXs.
  - 2.7 Pulse Code Modulation (PCM).
  - 2.8 PCM transmission system.
  - 2.9 Time Division Multiplexing (TDM)
  - 2.10 Space division Multiplexing (SDM) or Pulse Duration Multiplexing (PDM)
  - 2.11 Frequency Division Multiplexing (FDM).
  - 2.12 PCM based PABXs

- 2.13 Digital Switching, time switching and space switching.
- 2.14 Data Communication.
- 2.15 Page, Modam, Fax Machine.

**TEST AND REFERENCE BOOKS:**

- 1. N.N. Biswas "Principles of Telegraphy and Telephony"
- 2. Atkinson, J. "Telephony Volume I & II".
- 3. Howard W. Sams & Co. USA "Understanding Telecommunication System".
- 4. N Deshpanda & D.A Deshpanda & P.K. Rangole "Communication Electronics"
- 5. Kennedy George "Electronic Communication System"

## **TC-253 TELEPHONE & EXCHANGES**

### **INSTRUCTIONAL OBJECTIVES:**

#### **1 UNDERSTAND THE LAYOUT AND WORKING OF TELEPHONE SYSTEM.**

- 1.1 Describe automatic telephone system.
- 1.2 Draw the block diagram of telephone receiver set.
- 1.3 Explain the working of its each block.
- 1.4 Draw the construction of telephone transmitter.
- 1.5 Explain the working of telephone transmitter.
- 1.6 Draw the schematic diagram of side tone and antiside tone circuit.
- 1.7 Explain side tone & antiside tone circuits.
- 1.8 Draw the diagram of magneto bell.
- 1.9 Explain the operation of magneto bell.
- 1.10 Enumerate types of dial.
- 1.11 Explain working of rotary / mechanical dial.
- 1.12 Describe tone dialing.
- 1.13 Explain step by step switching (stronger system).
- 1.14 Draw the block diagram of automatic telephone exchange.
- 1.15 Explain the working of automatic telephone exchange.
- 1.16 Describe merits & demerits of automatic telephone exchange
- 1.17 Describe the traffic principle.
- 1.18 Describe the principle of grading.
- 1.19 Describe the operation of gate way exchange.
- 1.20 Draw the block diagram of N.W.D. system.
- 1.21 Explain the function of each block of NWD system.
- 1.22 Explain the working of signaling system.
- 1.23 Explain the working of audio conference system.
- 1.24 Describe the working of cordless telephone..
- 1.25 Explain the working of mobile telephone system.

#### **2 UNDERSTAND DIGITAL TELEPHONE EXCHANGE, MODULATION AND DEMOLITION, PCM, TDM, FDM, PAGE, MODAM, FAX.**

- 2.1 Draw the block diagram of digital telephone exchange.
- 2.2 Identify the function of each block of digital telephone exchange.
- 2.3 Describe the process of multiplexing and demultiplexing.
- 2.4 Identify the function of inhibit gate.
- 2.5 Describe the working of ADC & DAC.
- 2.6 Explain the stored program control concept in a digital telephone exchange.
- 2.7 Identify the application of computer in digital telephone exchange
- 2.8 Explain pulse & tone dialing.
- 2.9 Explain pulse code modulation transmission system.
- 2.10 Explain time division multiplexing (TDM).
- 2.11 Explain space division multiplexing (SDM).
- 2.12 Explain pulse duration multiplexing (PDM).
- 2.13 Explain frequency division multiplexing (FDM).

- 2.14 Draw the block diagram of PCM based PABX.
- 2.15 Identify the function of each block of PCM based PABX.
- 2.16 Explain the terms: digital switching and data communication.
- 2.17 Describe the working of page.
- 2.18 Describe the working of MODEM.
- 2.19 Describe the working of FAX machine.

## TC-262 POWER PLANT

<b>Total Contact Hours:</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory 32 Hours	1	3	2
Practical 96 Hours			

**Pre-requisite:** Electrical essentials and networks.

**AIMS.** After studying the subject the student will be able to understand the construction, working and application of DC and AC machines.

1. Define laws of electromagnetic induction.
2. Explain the function of dc generator.
3. Describe the principle of dc motor.
4. Identify the types of dc generators and dc motors.
5. List of applications of dc motors in the electronics field.
6. Describe the working of alternator.
7. Explain the function of three phase ac motor.
8. List of type of single phase ac motor.
9. Identify the working principle of various type of single phase ac motor.
10. Explain the function of synchronous and special ac motors.

1. **ELECTROMAGNETIC INDUCTION.** (01 Hour)
  - 1.1. Review of Faraday's Law and Lenz's Law
  - 1.2. Principle of simple loop generator.
2. **DC GENERATORS.** (03 Hours)
  - 2.1. Construction
  - 2.2. Field and armature winding and commutator.
  - 2.3. EMF Equation, Simple calculations.
  - 2.4. Types and brief description of dc generator, method of excitation and their characteristics.
3. **DC MOTORS.** (07 hours)
  - 3.1. Principle and construction of dc motor.
  - 3.2. Back emf, cause and effect.
  - 3.3. Equation of motor and simple problems.
  - 3.4. Types of dc motors, fractional h.p. & miniature dc motor
  - 3.5. Applications of each type of dc motor.
  - 3.6. Methods and need of motor starters.
  - 3.7. Methods of speed control of dc motors (electrical and electronic methods).
  - 3.8. Line diagram of motor starter and controller with brief description.
4. **ALTERNATORS.** (04 Hours)
  - 4.1. Construction of Alternator, Importance of stationary armature. Comparison with DC generator.
  - 4.2. Methods of field excitation.

- 4.3 Brief introduction to 3-phase ac generation
5. **THREE PHASE AC MOTORS.** (08 Hours)
- 5.1 Introduction to three phase rotating magnetic field.
  - 5.2 Principle and induction motors.
  - 5.3 Types of 3-phase induction motors.
  - 5.4 Methods of starting and speed control of three phase induction motors.
  - 5.5 Line diagram of induction motor starters and connection.
  - 5.6 Applications/uses of three phase induction motors.
6. **SINGLE PHASE AC MOTORS.** (06 Hours)
- 6.1 Classification of single phase ac motors.
  - 6.2 Single phase induction motor.
  - 6.3 Double field revolving concept.
  - 6.4 Split phase and capacitor start induction- run motors.
  - 6.5. Capacitor start and run motor, shaded pole motors.
  - 6.6 Repulsion motor.
  - 6.7 AC series motor.
  - 6.8 Synchronous motor.
7. **UNEXCITED SINGLE PHASE SYNCHRONOUS MOTOR.** (1 Hours)
- 7.1 Reluctance motor.
  - 7.2 Hyteresis motor.
8. **SPECIAL MOTOR.** (2 Hours)
- 7.1 Stepper motor
  - 7.2 Servo motor.

**TEXT/ REFERENCE BOOKS:**

1. B.L. Theraja "Electrical Technology"
2. Humpheries "Motors & Controls"

## **TC-262 POWER PLANT**

### **INSTRUCTIONAL OBJECTIVES.**

#### **1.UNDERSTAND FARADAY'S LAWS OF ELECTROMAGNETIC INDUCTION AND LENZ'S LAW.**

- 1.1 Describe Faraday's law of electromagnetic induction and Lenz's law.
- 1.2 Explain the principle of simple loop generator.

#### **2. UNDERSTAND THE CONSTRUCTION AND WORKING OF DC GENERATOR.**

- 2.1 Draw the construction of DC generators
- 2.2 Explain the working of field and armature winding
- 2.3 Draw the construction of commutator
- 2.4 Explain the operation of commutator
- 2.5 Derive the E.M.F. Equation for DC generator
- 2.6 Solve problems based on EMF equation
- 2.7 Enlist the types of DC generator
- 2.8 Explain the method of field excitation, and characteristics of each.

#### **3. UNDERSTAND THE WORKING OF D.C. MOTORS.**

- 3.1 Draw the construction of DC motor
- 3.2 Explain the working principle of d.c. motor
- 3.3 Explain back E.M.F ( cause and effect of back EMF)
- 3.4 Write and explain the equation of d.c. motor.
- 3.5 Solve simple problems based on the equation of d.c. motor
- 3.6 Enlist the types of d.c. motors
- 3.7 Enlist the applications of each type of d.c motor
- 3.8 Describe the starting methods for d.c. motors
- 3.9 Explain the methods of speed control of d.c. motor (Electrical & Electronics)
- 3.10 Draw line diagram of d.c. motor starter and speed controller.
- 3.11 Explain the line diagram of DC motor starter & speed controller.

#### **4.UNDERSTAND THE WORKING PRINCIPLE OF AN ALTERNATOR (AC GENERATOR).**

- 4.1 Introduction to an alternator.
- 4.2 Sketch the constructional view of an alternator.
- 4.3 Compare an alternator with dc generator
- 4.4 Explain three phase AC generation.

#### **5.UNDERSTAND THE WORKING PRINCIPLE , TYPES AND USES OF THREE PHASE AC MOTORS.**

- 5.1 Describe 3-phase rotating magnetic field
- 5.2 Explain the principle of induction motor
- 5.3 Enlist the types of 3-phase induction motors
- 5.4 Explain the methods of starting three phase induction motors.
- 5.5 Explain the speed control of induction motors.
- 5.6 Draw the line diagram of induction motor connected to a motor starter.

- 5.7 Explain the line diagram of induction motor connected to a starter.
- 5.8 List the uses of three phase induction motors.

#### **6.UNDERSTAND THE WORKING PRINCIPLES, CONSTRUCTION, TYPES AND USES OF SINGLE PHASE MOTORS.**

- 6.1 Classify single phase AC motor.
- 6.2 Draw the constructional view of single phase induction motor.
- 6.3 Explain the working of single phase induction motor.
- 6.4 Enlist the uses of single phase induction motor
- 6.5 Describe the uses of single phase induction motor.
- 6.6 Explain double field revolving concept (split phase rotating field).
- 6.7 Draw the construction of capacitor -start -run motor.
- 6.8 Explain the working of capacitor start run motor
- 6.9 Enlist the uses of capacitor start-run- motor.
- 6.10 Draw the construction of shaded pole motor.
- 6.11 Explain the working of shaded pole motor.
- 6.12 Enlist the uses of shaded pole motor.
- 6.13 Draw the construction of repulsion motor.
- 6.14 Explain the working of repulsion motor.
- 6.15 Enlist the uses of repulsion motor.
- 6.17 Draw the construction of AC series motor.
- 6.18 Explain the working of AC series motor.
- 6.19 List the uses of AC series motor.
- 6.20 Explain the construction and principle of operation of Synchronous motor.
- 6.21 Lists its uses.

#### **7.UNDERSTAND THE CONSTRUCTION & WORKING OF UNEXCITED SINGLE PHASE SYNCHRONOUS MOTOR.**

- 7.1 Draw the construction of reluctance motor.
- 7.2 Explain the working of reluctance motor.
- 7.3 List the uses of reluctance motor.
- 7.4 Draw the construction of Hysteresis motor.
- 7.5 Explain the operation of Hysteresis motor..

#### **8.UNDERSTAND THE TYPES, CONSTRUCTION , WORKING AND USES OF STEPPER AND SERVO MOTOR.**

- 8.1 Draw the construction of stepper motor.
- 8.2 Explain the working operation of stepper motor.
- 8.3 List the uses of stepper motor.
- 8.5 Draw the construction of servo motor.
- 8.6 Explain the working of servo motor.
- 8.7 List the uses of servo motor.

#### **TEXT/REFERENCE BOOKS.**

- 1. B.L. Therja "Electrical Technology"
- 2. Admiralty "Examples in electrical calculation"

3. Humpheries "Motors and Controls"

## TC-262 POWER PLANT

### LIST OF PRACTICAL:

1. Verify the Faraday's Laws of electromagnetic induction by using a simple loop generator.
2. Study of main part of a d.c. generator.
3. Plot the O.C.C. of a d.c. shunt generator.
4. Plot the load characteristics of d.c. shunt generators.
5. Study the effect of back e.m.f. of a d.c. motor.
6. Plotting of load characteristics of d.c. series motor.
7. Starting a d.c. series and shunt motors through starters.
8. Practice speed control of d.c. series and shunt motors.
9. Study the operation of an alternator (effect of variation field excitation and rotor speed).
10. Study of rotating magnetic field.
11. Study the operation of 3-phase squirrel cage induction motor.
12. Study the operation of 3-phases synchronous motor.
13. Practice reversal of direction of rotation of 3-phase induction motor.
14. Study the line diagram of direct-on 3-phase motor starter.
15. Connect a 3-phase induction motor to supply line through a direct-on starter.
16. Study the line and connection diagram of a starter-delta starter.
17. Connect a 3-phase squirrel cage induction motor to supply line through a star-delta starter.
18. Study operation of split-phase single phase a-c motor.
19. Study the operation of capacitor-start -and-run single phase a-c motor.
20. Study the operation of shaded pole single phase motor.
21. Study the operation of a-c series motor.
22. Study the speed control of a-c series motor.
23. Study the working of miniature (reluctance and hysteresis) single phase a-c motors.