COMPUTER TECHNOLOGY

SCHEME OF STUDY

1st Year

		T	P	C	Page
Gen 111	Islamiat/Pakistan Studies	1	0	1	1
Eng 112	English	2	0	2	10
Math 123	Applied Mathematics	3	0	3	13
Phy 132	Applied Physics	1	3	2	20
Ch 132	Applied Chemistry	1	3	2	27
Comp 114	Electrical Essentials & Networks	3	3	4	34
Comp 123	Electronic Devices & Circuits I 44	2		3	3
Comp 131	Electrical Drawing	0	3	1	58
Comp 141	General Engineering Workshop 60	0		3	1
Comp 152	Computer Application Lab	0	6	2	62
	T o t a l:	**13**	**24**	**21**	

2nd Year

Gen 211	Islamiat/Pakistan Studies	1	0	1	69
Math 233	Applied Mathematics	3	0	3	76
Comp 214	Computer Organizations & Basic Programming	2	6	4	82
Comp 223	Electronic Devices & Circuits II	2	3	3	92
Comp 232	Motors & Power Supplies	1	3	2	97
Comp 243	Digital Electronics & Microprocessor	2	3	3	103
Comp 253	Measuring Instruments	2	3	3	110
Comp 262	Controls and Automation	1	3	2	123
	T o t a l:	**14**	**21**	**21**	

3rd Year

Gen 311	Islamiat/Pakistan Studies	1	0	1	134
Mgm 331 141	Industrial Management & Human Relations	1	0	1	
Mgm 221	Business Communication	1	0	1	147
Comp 314	Computer Maintenance & Servicing 151	1		6	4
Comp 323	Computer Peripherals & interfacing 157	2		3	3
Comp 332	Data Communication and Computer Network	1	3	2	164
Comp 344	Operating Systems and C-Language	2		6	4

Comp 353	Computer Hardware	1	3	3	176
Comp 362	Microprocessor Programming	1	3	2	182
	T o t a l:	**15**	**24**	**23**	

Eng-112ENGLISH

Total contact hours

Theory	64	T	P	C
Practical	0	2	0	2

AIMSAt the end of the course, the students will be equipped with cognitive skill to enable them to present facts in a systematic and logical manner to meet the language demands of dynamic field of commerce and industry for functional day-to-day use and will inculcate skills of reading, writing and comprehension.

COURSE CONTENTS

ENGLISH PAPER "A"

1 PROSE/TEXT **16 hours**

1.1First eight essays of Intermediate English Book-II

2 CLOZE TEST **4 hours**

2.1A passage comprising 50-100 words will be selected from the text. Every 11th word or any word for that matter will be omitted. The number of missing word will range between 5-10. The chosen word may or may not be the one used in the text, but it should be an appropriate word.

ENGLISH PAPER "B"

3GRAMMAR **26 hours**

3.1Sentence Structure.
3.2Tenses.
3.3Parts of speech.
3.4Punctuation.
3.5 Change of Narration.
3.6 One word for several
3.7 Words often confused

4. COMPOSITION **8 hours**

4.1 Letters/Messages
4.2Job application letter
4.3For character certificate/for grant of scholarship
4.4Telegrams, Cablegrams and Radiograms, Telexes, Facsimiles
4.5Essay writing
4.6Technical Education, Science and Our life, Computers, Environmental Pollution, Duties of a Student.

4 hours

5. TRANSLATION **6 hours**

5.1 Translation from Urdu into English.

For Foreign Students: A paragraph or a dialogue.

RECOMMENDED BOOKS

1.Intermediate English Book-II.
2.An English Grammar and Composition of Intermediate Level.
3.A Hand Book of English Students By Gatherer.

Eng-112ENGLISH

INSTRUCTIONAL OBJECTIVES

PAPER-A

1. DEMONSTRATE BETTER READING, COMPREHENSION AND VOCABULARY

1.1 Manipulate, skimming and scanning of the text.
1.2 Identify new ideas.
1.3 Reproduce facts, characters in own words
1.4Write summary of stories

2. UNDERSTAND FACTS OF THE TEXT

2.1 Rewrite words to fill in the blanks recalling the text.
2.2 Use own words to fill in the blanks.

PAPER-B

3. APPLY THE RULES OF GRAMMAR IN WRITING AND SPEAKING

3.1Use rules of grammar to construct meaningful sentences containing a subject and a predicate.
3.2State classification of time, i.e present, past and future and use verb tense correctly in different forms to denote relevant time.
3.3 Identify function words and content words.
3.4 Use marks of punctuation to make sense clear.
3.5 Relate what a person says in direct and indirect forms.
3.6Compose his writings.
3.7 Distinguish between confusing words.

4.APPLY THE CONCEPTS OF COMPOSITION WRITING TO PRACTICAL SITUATIONS

4.1Use concept to construct applications for employment, for character certificate, for grant of scholarship.
4.2Define and write telegrams, cablegrams and radiograms, telexes, facsimiles
4.3 Describe steps of a good composition writing.
4.4 Describe features of a good composition.
4.5 Describe methods of composition writing
4.6Use these concepts to organize facts and describe them systematically in practical situation.

5. APPLIES RULES OF TRANSLATION

5.1 Describe confusion.

5.2 Describe rules of translation.

5.3Use rules of translation from Urdu to English in simple paragraph and sentences.

Math-123APPLIED MATHEMATICS - I

Total Contact Hours			T	P
	C			
Theory	96	3	0	3
Practical	Nil			

AIMS After completing the course, the students will be able to solve problems of Algebra, Trigonometry, Vectors, Boolean Algebra, Complex numbers and Analytic Geometry, develop skills in the use of mathematical instruments and acquire mathematical clarity and insight in the solution of technical problems.

COURSE CONTENTS

1. QUADRATIC EQUATIONS **6 hours**

- 1.1 Standard Form
- 1.2 Solution
- 1.3 Nature of roots
- 1.4 Sum and product of roots
- 1.5 Formation
- 1.6 Problems

2. BINOMIAL THEOREM **6 hours**

- 2.1 Factorials
- 2.2 Binomial expression
- 2.3 Binomial co-efficient
- 2.4 Statement
- 2.5 The general term
- 2.6 The binomial series
- 2.7 Problems.

3. PARTIAL FRACTIONS **6 hours**

- 3.1 Introduction
- 3.2 Linear distinct factors case I
- 3.3 Linear repeated factors case II
- 3.4 Quadratic distinct factors case III
- 3.5 Quadratic repeated factors case IV
- 3.6 Problems

4. FUNDAMENTALS OF TRIGONOMETRY **6 hours**

- 4.1 Angles
- 4.2 Quadrants
- 4.3 Measurements of angles

4.4 Relation between sexagesimal and circular system
4.5Relation between length of a circular arc and the radian measure of its central angle
4.6 Problems

5. TRIGONOMETRIC FUNCTIONS AND RATIOS **6 hours**

5.1 Trigonometric functions of any angle
5.2 Signs of trigonometric functions
5.3 Trigonometric ratios of particular angles
5.4 Fundamental identities
5.5 Problems

6. GENERAL IDENTITIES **6 hours**

6.1 The Fundamental Law
6.2 Deductions
6.3 Sum and difference formulae
6.4 Double angle identities
6.5 Half angle identities
6.6 Conversion of sum or difference to products
6.7 Problems

7. SOLUTION OF TRIANGLES **6 hours**

7.1 The law of Sines
7.2 The law of Cosines
7.3 Measurement of heights and distances
7.4 Problems

8. VECTORS AND PHASORS **12 hours**

8.1 Scalars and Vectors
8.2 The unit Vectors i, j, k
8.3 Direction Cosines
8.4 Dot product
8.5 Cross product
8.6 Analytic expressions for dot and cross products
8.7 Phasors
8.8 Significance of j operator
8.9 Different forms
8.10 Algebraic operations
8.11 Problems

9. COMPLEX NUMBERS **9 hours**

9.1 Introduction and properties
9.2 Basic operations

9.3 Conjugate
9.4 Modulus
9.5 Different forms
9.6 Problems

10. BOOLEAN ALGEBRA AND GATE NETWORKS **15 hours**

10.1 Concept and basic laws
10.2 Sums of product and product of sums
10.3Binary, decimals and octals, presentation of decimal numbers in BCD
10.4 Interconversion of numbers
10.5 OR Gates and AND Gates
10.6Logical Expressions and their simplification
10.7Demorgan's theorems
10.8NAND Gates and NOR Gates
10.9Problems

11. PLANE ANALYTIC GEOMETRY AND STRAIGHT LINE **6 hours**

11.1 Coordinate system
11.2 Distance formula.
11.3 Ratio formulas.
11.4 Inclination and slope of line.
11.5 Slope formula.
11.6 Problems.

12. EQUATIONS OF THE STRAIGHT LINE **6 hours**

12.1 Some important forms
12.2 General form
12.3 Angle formula.
12.4 Parallelism and perpendicularity
12.5 Problems

13. EQUATIONS OF THE CIRCLE. **6 hours**

13.1 Standard and Central forms of equation.
13.2 General form of equation.
13.3 Radius and coordinates of center.
13.4 Problems

RECOMMENDED BOOKS

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

Board, Lahore.

Math-123 APPLIED MATHEMATICS-I

INSTRUCTIONAL OBJECTIVES

1.2USE DIFFERENT METHODS FOR THE SOLUTION OF QUADRATIC EQUATION

1.1 Define a standard quadratic equation.

1.2Use methods of factorization and method of completing the square for solving the equations.

1.3 Derive quadratic formula.

1.4 Write expression for the discriminant.

1.5 Explain nature of the roots of a quadratic equation.

1.6 Calculate the sum and product of the roots.

1.7 Form a quadratic equation from the given roots.

1.8 Solve problems involving quadratic equations.

2.APPLY BINOMIAL THEOREM FOR THE EXPANSION OF BINOMIAL AND EXTRACTION OF ROOTS.

2.1 State binomial theorem for positive integral index.

2.2 Explain binomial coefficients:
(n,0), (n,1).....(n,r)....., (n,n)

2.3 Derive expression for the general term.

2.4 Calculate the specified terms.

2.5 Expand a binomial of a given index.

2.6 Extract the specified roots.

2.7 Compute the approximate value to a given decimal place.

2.8 Solve problems involving binomials.

3.APPLY DIFFERENT METHODS FOR RESOLVING A SINGLE FRACTION INTO PARTIAL FRACTIONS USING DIFFERENT METHODS

3.1 Define a partial fraction, a proper and an improper fraction.

3.2 Explain all the four types of partial fractions.

3.3 Set up equivalent partial fractions for each type.

3.4 Explain the methods for finding constants involved.

3.5 Resolve a single fraction into partial fractions.

3.6 Solve problems involving all the four types.

4.UNDERSTAND THE SYSTEMS OF MEASUREMENT OF ANGLES.

4.1 Define angles and the related terms.

4.2 Illustrate the generation of an angle.

4.3 Explain sexagesimal and circular systems for the measurement of angles.

4.4 Derive the relationship between radian and degree.
4.5 Convert radians to degrees and vice versa.
4.6 Derive a formula for the circular measure of a central angle.
4.7 Use this formula for solving problems.

5.UNDERSTAND BASIC CONCEPTS AND PRINCIPLES OF TRIGONOMETRIC FUNCTIONS.

5.1Define the basic trigonometric functions/ratios of an angle as ratios of the sides of a right triangle.
5.2 Derive fundamental identities.
5.3 Find trigonometric ratios of particular angles.
5.4 Draw the graph of trigonometric functions.
5.5 Solve problems involving trigonometric functions.

6.USE TRIGONOMETRIC IDENTITIES IN SOLVING TECHNOLOGICAL PROBLEMS.

6.1 List fundamental identities.
6.2 Prove the fundamental law.
6.3 Deduce important results.
6.4 Derive sum and difference formulas.
6.5 Establish half angle,double and tripple angle formulas.
6.6 Convert sum or difference into product and vice versa.
6.7 Solve problems.

7.USE CONCEPT, PROPERTIES AND LAWS OF TRIGONOMETRIC FUNCTIONS FOR SOLVING TRIANGLES.

7.1 Define angle of elevation and angle of depression.
7.2 Prove the law of sines and the law of cosines.
7.3 Explain elements of a triangle.
7.4Solve triangles and the problems involving heights and distances.

8.UNDERSTAND PRINCIPLES OF VECTORS AND PHASORS

8.1 Define unit vectors i, j, k.
8.2 Express a vector in the component form.
8.3Explain magnitude, unit vector, direction cosines of a vector.
8.4 Explain dot product and cross product of two vector.
8.5 Deduce important results from dot and cross product.
8.6 Define phasor and operator j.
8.7 Explain different forms of phasors.
8.8 Perform basic Algebraic operation on phasors.
8.9 Solve problems on phasors.

9.USE PRINCIPLES OF COMPLEX NUMBERS IN SOLVING TECHNOLOGICAL

PROBLEMS.

9.1 Define a complex number and its conjugate.
9.2 State properties of complex numbers.
9.3 Give different forms of complex numbers.
9.4Perform basic algebraic operations on complex numbers.
9.5 Solve problem involving complex numbers.

10.SOLVE TECHNICAL PROBLEMS USING PRINCIPLES OF BOOLEAN ALGEBRA

10.1Explain fundamental concepts of boolean algebra
10.2Explain binary numbers, octal numbers, decimal numbers and their interconversion.
10.3Explain digital addition and multiplication and its applications to OR gates and AND Gates
10.4Illustrate complimentation and inversion
10.5Evaluate logical expression
10.6 List basic Laws of Boolean Algebra
10.7Explain De-Morgan's theorem
10.8Explain basic duality of boolean algebra
10.9Derive boolean expression
10.10Explain combination of GATES
10.11Illustrate sum of products and product of sum
10.12Derive product of sum expression
10.13Explain NAND Gates and NOR Gates
10.14Use the map methods for simplifying expressions
10.15Explain sub-cubes and covering

11.UNDERSTAND THE CONCEPT OF PLANE ANALYTIC GEOMETRY 11.1 Explain the rectangular coordinate system.
11.2 Locate points in different quadrants.
11.3 Derive distance formula.
11.4 Describe the ratio formula
11.5Derive slope formula
11.6Solve problems using the above formulae.

12.USE EQUATIONS OF STRAIGHT LINE IN SOLVING PROBLEMS.

12.1 Define equation of a straight line.
12.2Derive slope intercept and intercept forms of equations of a straight line.
12.3 Write general form of equations of a straight line.
12.4 Derive an expression for angle between two straight lines.
12.5Derive conditions of perpendicularity and parallelism of two straight lines.
12.6 Solve problems using these equations/formulae.

13. SOLVE TECHNOLOGICAL PROBLEMS USING EQUATIONS OF CIRCLE

13.1 Define a circle.

13.2 Describe standard, central and general forms of the equation of a circle.
13.3Convert general form to the central form of equation of a circle.
13.4Deduce formula for radius and coordinates of the center of a circle.
13.5Derive equation of the circle passing through three points.
13.6 Solve problems involving these equations.

Phy-132APPLIED PHYSICS

Total Contact Hours

		T	P	C
Theory	32			
Practicals	96	1	3	2

AIMS:The students will be able to understand the fundamental principles and concept of physics, use these to solve problems in practical situations/technological courses and understand concepts to learn advance physics/technical courses.

COURSE CONTENTS

1**MEASUREMENTS.** **2 Hours.**

1.1Fundamental units and derived units
1.2Systems of measurement and S.I. units
1.3Concept of dimensions, dimensional formula
1.4Conversion from one system to another
1.5Significant figures

2**SCALARS AND VECTORS.** **4 Hours.**

2.1Revision of head to tail rule
2.2Laws of parallelogram, triangle and polygon of forces
2.3Resolution of a vector
2.4Addition of vectors by rectangular components
2.5Multiplication of two vectors, dot product and cross product

3**MOTION** **4 Hours.**

3.1Review of laws and equations of motion
3.2Law of conservation of momentum
3.3Angular motion
3.4Relation between linear and angular motion
3.5Centripetal acceleration and force
3.6Equations of angular motion

4**TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA.** **4 Hours.**

4.1Torque
4.2Centre of gravity and centre of mass
4.3Equilibrium and its conditions
4.4Torque and angular acceleration
4.5Rotational inertia

5**SOUND.** **5 Hrs**

5.1Longitudinal waves

5.2Intensity, loudness, pitch and quality of sound
5.3Units of Intensity of level and frequency response of ear
5.4Interference of sound waves silence zones, beats
5.5Acoustics
5.6Doppler effect.

6**LIGHT.** **5 Hours**
6.1Review laws of reflection and refraction
6.2Image formation by mirrors and lenses
6.3Optical instruments
6.4Wave theory of light
6.5Interference, diffraction, polarization of light waves
6.6Applications of polarization in sunglasses, optical activity and stress analysis

7**OPTICAL FIBER.** **2 Hours**
7.1Optical communication and problems
7.2Review total internal reflection and critical angle
7.3Structure of optical fiber
7.4Fiber material and manufacture
7.5Optical fiber - uses.

8**LASERS.** **3 Hours**
8.1Corpuscular theory of light
8.2Emission and absorption of light
8.3Stimulated absorption and emission of light
8.4Laser principle
8.5Structure and working of lasers
8.6Types of lasers with brief description.
8.7Applications (basic concepts)
8.8Material processing
8.9Laser welding
8.10Laser assisted machining
8.11Micro machining
8.12Drilling, scribing and marking
8.13Printing
8.14Lasers in medicine

9**ELECTROMAGNETIC WAVES.** **3 Hours**
9.1Magnetic field around a current carrying conductor
9.2Electric field induced around a changing magnetic flux
9.3Moving fields
9.4Types of electromagnetic waves
9.5Generation of Radio Waves

9.6Spectrum of electromagnetic waves.

10**ARTIFICIAL SATELLITES.** **2 Hours**

10.1Review law of gravitation
10.2Escape velocity
10.3Orbital velocity
10.4Geosynchronous and geostationary satellites
10.5Use of satellites in data communication.

RECOMMENDED BOOKS

1Tahir Hussain, Fundamentals of Physics Vol-I and II
2Farid Khawaja, Fundamentals of Physics Vol-I and II
3Wells and Slusher, Schaum's Series Physics .
4Nelkon and Oyborn, Advanced Level Practical Physics
5Mehboob Ilahi Malik and Inam-ul-Haq, Practical Physics
6Wilson, Lasers - Principles and Applications
7M. Aslam Khan and M. Akram Sandhu, Experimental Physics Note Book

Phy-132APPLIED PHYSICS

INSTRUCTIONAL OBJECTIVES

1**USE CONCEPTS OF MEASUREMENT TO PRACTICAL SITUATIONS AND TECHNOLOGICAL PROBLEMS**.

1.1Write dimensional formulae for physical quantities
1.2Derive units using dimensional equations
1.3Convert a measurement from one system to another
1.4Use concepts of measurement and Significant figures in problem solving.

2**USE CONCEPTS OF SCALARS AND VECTORS IN SOLVING PROBLEMS INVOLVING THESE CONCEPTS.**

2.1Explain laws of parallelogram, triangle and polygon of forces
2.2Describe method of resolution of a vector into components
2.3Describe method of addition of vectors by rectangular components
2.4Differentiate between dot product and cross product of vectors
2.5Use the concepts in solving problems involving addition resolution and multiplication of vectors.

3**USE THE LAW OF CONSERVATION OF MOMENTUM AND CONCEPTS OF ANGULAR MOTION TO PRACTICAL SITUATIONS.**

3.1Use law of conservation of momentum to practical/technological problems.
3.2Explain relation between linear and angular motion
3.3Use concepts and equations of angular motion to solve relevant technological problems.

4**USE CONCEPTS OF TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA TO PRACTICAL SITUATION/PROBLEMS.**

4.1Explain Torque
4.2Distinguish between Centre of gravity and centre of mass
4.3Explain rotational Equilibrium and its conditions
4.4Explain Rotational Inertia giving examples
4.5Use the above concepts in solving technological problems.

5**UNDERSTAND CONCEPTS OF SOUND.**

5.1Describe longitudinal wave and its propagation
5.2Explain the concepts: Intensity, loudness, pitch and quality of sound
5.3Explain units of Intensity of level and frequency response of ear
5.4Explain phenomena of silence zones, beats
5.5Explain Acoustics of buildings
5.6Explain Doppler effect giving mathematical expressions.

6**USE THE CONCEPTS OF GEOMETRICAL OPTICS TO MIRRORS and LENSES.**

6.1Explain laws of reflection and refraction

6.2Use mirror formula to solve problems

6.3Use the concepts of image formation by mirrors and lenses to describe working of optical instruments, e.g. microscopes, telescopes, camera and sextant.

7**UNDERSTAND WAVE THEORY OF LIGHT**

7.1Explain wave theory of light

7.2Explain phenomena of interference, diffraction, polarization of light waves

7.3Describe uses of polarization given in the course contents.

8**UNDERSTAND THE STRUCTURE, WORKING AND USES OF OPTICAL FIBER.**

8.1Explain the structure of the Optical Fiber

8.2Explain its principle of working

8.3Describe use of optical fiber in industry and medicine.

9**UNDERSTAND THE STRUCTURE, WORKING AND USES OF LASERS.**

9.1Explain the stimulated emission of radiation

9.2Explain the laser principle

9.3Describe the structure and working of lasers

9.4Distinguish between types of lasers

9.5Describe the applications of lasers in the fields mentioned in the course contents.

10**UNDERSTAND NATURE, TYPES, GENERATION AND SPECTRUM OF ELECTROMAGNETIC WAVES.**

10.1Explain magnetic field due to current and electric field due to changing magnetic flux

10.2Explain moving fields

10.3Describe types of electromagnetic waves

10.4Explain generation of Radio Waves

10.5Explain spectrum of electromagnetic waves.

11**UNDERSTAND TYPES AND USES OF ARTIFICIAL SATELLITES.**

11.1Explain escape velocity

11.2Explain orbital velocity

11.3Distinguish between geosynchronous and geostationary satellites

11.4Describe uses of artificial satellites in data communication.

Phy-132 APPLIED PHYSICS

LIST OF PRACTICALS.

1Draw graphs representing the functions:
a)y=mx for m=0, 0.5, 1, 2
b) $y=x^2$
c) $y=1/x$
2Find the volume of a given solid cylinder using vernier callipers.
3Find the area of cross-section of the given wire using micrometer screw gauge.
4Prove that force is directly proportional to (a) mass, (b) acceleration, using fletchers' trolley.
5Verify law of parallelogram of forces using Grave-sands apparatus.
6Verify law of triangle of forces and Lami's theorem
7Determine the weight of a given body using
a) Law of parallelogram of forces
b)Law of triangle of forces
c)Lami's theorem
8Verify law of polygon of forces using Grave-sands apparatus.
9Locate the position and magnitude of resultant of like parallel forces.
10Determine the resultant of two unlike parallel forces.
11Find the weight of a given body using principle of moments.
12Locate the centre of gravity of regular and irregular shaped bodies.
13Find Young's Modules of Elasticity of a metallic wire.
14Verify Hooke's Law using helical spring.
15Study of frequency of stretched string with length.
16Study of variation of frequency of stretched string with tension.
17Study resonance of air column in resonance tube and find velocity of sound.
18Find the frequency of the given tuning fork using resonance tube.
19Find velocity of sound in rod by Kundt's tube.
20Verify rectilinear propagation of light and study shadow formation.
21Study effect of rotation of plane mirror on reflection.
22Compare the refractive indices of given glass slabs.
23Find focal length of concave mirror by locating centre of curvature.
24Find focal length of concave mirror by object and image method
25Find focal length of concave mirror with converging lens.
26Find refractive index of glass by apparent depth.
27Find refractive index of glass by spectrometer.
28Find focal length of converging lens by plane mirror.
29Find focal length of converging lens by displacement method.
30Find focal length of diverging lense using converging lens.
31Find focal length of diverging lens using concave mirror.
32Find angular magnification of an astronomical telescope.

33Find angular magnification of a simple microscope (magnifying glass)
34Find angular magnification of a compound microscope.
35Study working and structure of camera.
36Study working and structure of sextant.
37Compare the different scales of temperature and verify the conversion formula.
38Determine the specific heat of lead shots.
39Find the coefficient of linear expansion of a metallic rod.
40Find the heat of fusion of ice.
41Find the heat of vaporization.
42Determine relative humidity using hygrometer.

Ch-132 APPLIED CHEMISTRY

Total Contact Hours		T	P	C
Theory	32	1	3	2
Practical	96			

Pre-requisite: The student must have studied the subject of elective chemistry at Secondary school level.

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.Becomes acquainted with the basic principles of chemistry as applied in the study of relevant Technology.
3.Knows the scientific methods for production, properties and use of materials of industrial & technological significance.
4. Gain skill for the efficient conduct of practicals in a chemistry lab.

1. INTRODUCTION **2 Hours**

1.1 The scope and significance of the subject.
1.2 Orientation with reference to Technology.
1.3 Terms used & units of measurements in the study of chemistry.

2. FUNDAMENTAL CONCEPTS OF CHEMISTRY **2 Hours**

2.1 Symbols, Valency, Radicals, formulas.
2.2 Chemical Reactions & their types.
2.3 Balancing of equations by ionic method.

3. ATOMIC STRUCTURE **2 Hours**

3.1 Sub-atomic particles.
3.2 Bohrs Atomic Model.
3.3 The periodic classification of elements and periodic law
3.4 General characteristics of a period and group.

4. CHEMICAL BOND **2 Hours**

4.1 Nature of chemical Bond.
4.2 Electrovalent bond with examples.
4.3 Covalent Bond(Polar and Non-polar, sigma & Pi Bonds with examples.
4.4 Co-ordinate Bond with examples.

5. SOLIDS AND LIQUIDS **3 Hours**

5.1 The liquid and Solids state.

5.2 The liquids and their general properties (Density, viscosity, surface tension capillary action etc).

5.3 Solids and their general properties.

5.4 Crystal structure of solids

5.5 Crystals of Si and Ge.

6. WATER **3 Hours**

6.1 Chemical nature and properties.

6.2 Impurities.

6.3 Hardness of water (types, causes & removal)

6.4 Scales of measuring hardness (Degress Clark, French, PPM, Mgm per litre).

6.5 Boiler feed water, scales and treatment.

6.6 Sea-water desalination, sewage treatment.

7. ACIDS, BASES AND SALTS **2 Hours**

7.1 Definitions with examples.

7.2 Properties, their strength, basicity & Acidity.

7.3 Salts and their classification with examples.

7.4 pH-value and scale.

8. OXIDATION & REDUCTION **2 Hours**

8.1 The process with examples.

8.2 Oxidizing and Reducing agents.

8.3 Oxides and their classifications.

9. NUCLEAR CHEMISTRY **2 Hours**

9.1 Introduction.

9.2 Radioactivity (Alpha, beta and gamma rays).

9.3 Half life process.

9.4 Nuclear reaction & transformation of elements.

9.5 Isotopes and their uses.

10. ALLOYS **2 Hours**

10.1 Introduction with need.

10.2 Preparation and properties.

10.3 Some important alloys and their composition.

11. CORROSION **2 Hours**

11.1 Introduction with causes.

11.2 Types of corrosion.

11.3 Rusting of Iron

11.4 Protective measures against corrosion.

12. ELECTRO CHEMISTRY **2 Hours**

12.1 Ionization and Arrhenius theory of Ionization.
12.2 Electrolytes and Electrolysis.
12.3 Faraday's Laws and numericals related to them.
12.4 Application of Electrolysis (Electron, lathing etc).
12.5 Electro Chemical cells.

13. ELECTRICAL INSULATING MATERIALS. **2 Hours**

13.1 Introduction.
13.2 Solid insulators with chemical nature.
13.3 Liquid insulators with chemical nature.
13.4 Gaseous insulators with chemical nature.
13.5 Uses and their classification.

14. SEMI CONDUCTORS. **2 Hours**

14.1 Introduction
14.2 Atomic structure of silicon and germanium.
14.3 Bonding & Conductivity.
14.4 Energy bands in a semiconductor.

15. ETCHING PROCESS. **2 Hours**

15.1 The process and its aims.
15.2 Etching reagents.
15.3 Applications of processors.

RECOMMENDED BOOKS

1. Intermediate Text-Books of chemistry I & II
2. ILMI Applied Science by SH. Ata Mohammed
3. Materials science by J.C.Anderson & Leaver.
4. Polytechnic Chemistry by G.N.Ready (ELBS & Nelson, Hong Kong).
5. Chemistry for engineers by Eric Gyngell.

Ch-132 APPLIED CHEMISTRY

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND THE SCOPE, SIGNIFICANCE AND ROLE OF THE SUBJECT.

1.1 Define chemistry and its terms.
1.2 Define the units of measurements in the study of chemistry.
1.3 Explain the importance of chemistry in various fields of specialization.
1.4 Explain the role of chemistry in this technology.

2. UNDERSTAND LANGUAGE OF CHEMISTRY AND CHEMICAL REACTIONS.

2.1 Define symbol, valency, radical, formula with examples of each.
2.2 Write chemical formula of common compounds.
2.3 Define chemical reaction and equations.
2.4 Describe types of chemical reactions with examples.
2.5 Explain the method of balancing the equation by ionic method.

3.UNDERSTAND THE STRUCTURE OF ATOMS AND ARRANGEMENT OF SUB ATOMIC PARTICLES IN THE ARCHITECTURE OF ATOMS.

3.1 Define atom.
3.2 Describe the fundamental sub atomic particles
3.3 Distinguish between atomic no. mass no. and between isotope and isobars.
3.4Explain the arrangements of electrons in different shells and sub energy levels and understand bohr's atomic model.
3.5Explain the grouping and placing of elements in the periodic table especially Si & germanium.
3.6 State the periodic law of elements.
3.7Explain the trend of properties of elements based on their position in the periodic table.
3.8 Explain general characteristics of a period and a group.

4. UNDERSTAND THE NATURE OF CHEMICAL BONDS.

4.1 Define chemical Bond.
4.2 State the nature of chemical bond.
4.3 Differentiate between electrovalent and covalent bonding.
4.4Explain the formation of polar and non polar, sigma and pi-bond with examples.
4.5 Describe the nature of coordinate bond with examples.

5.UNDERSTAND THE STATES OF MATTER AND DISTINGUISHES SOLIDS FROM GASES.

5.1 Describe the liquid and solid states of matter.
5.2 State the general properties of liquid.
5.3 State the general properties of solid.

5.4 Explain the formation of crystals and their types.
5.5 Describe the crystal structure of Si and Ge.

6. UNDERSTAND THE CHEMICAL NATURE OF WATER.

6.1 Describe the chemical nature of water with its formula.
6.2 Describe the general impurities present in water.
6.3 Explain the causes and methods to remove hardness of water.
6.4Express hardness in different units like mg/litre. p.p.m, degrees Clark and degrees French.
6.5 Describe the formation and nature of scales in boiler feed water.
6.6 Explain the method for the treatment of scales.
6.7 Explain the sewage treatment and desalination of sea water.

7. UNDERSTAND THE NATURE OF ACIDS, BASES AND SALTS.

7.1 Define acids, bases and salts with examples.
7.2 State general properties of acids and bases.
7.3Differentiate between acidity and basicity.
7.4 Define salts, give their classification with examples.
7.5 Explain pH value of solution and pH scale.

8. UNDERSTAND THE PROCESS OF OXIDATION AND REDUCTION.

8.1 Define oxidation.
8.2 Illustrate the oxidation process with examples.
8.3 Define reduction.
8.4 Explain reduction process with examples.
8.5 Define oxidizing and reducing agents and give at least six examples of each.
8.6 Define oxides.
8.7 Classify the oxides and give examples.

9. UNDERSTAND THE FUNDAMENTALS OF NUCLEAR CHEMISTRY.

9.1 Define nuclear chemistry and radio activity.
9.2 Differentiate between alpha, beta and gamma particles.
9.3 Explain half life process.
9.4Explain at least six nuclear reactions resulting in the transformation of some elements.
9.5 State the uses of isotopes.

10.UNDERSTAND THE NATURE OF ALLOYS USED IN THE RESPECTIVE TECHNOLOGY.

10.1 Define alloy.
10.2 Explain different methods for the preparation of alloys.
10.3 Explain important properties of alloys.
10.4 Explain the composition, properties and uses of alloys.

11.UNDERSTAND THE PROCESS OF CORROSION.

11.1 Define corrosion.
11.2 Describe different types of corrosion.
11.3 State the causes of corrosion.
11.4 Explain the process of rusting of iron.
11.5 Describe methods to prevent/control corrosion.

12.UNDERSTAND THE APPLICATION OF ELECTROCHEMISTRY IN DIFFERENT FIELDS OF INDUSTRIES.

12.1 Define ionization, electrolyte and electrolysis.
12.2 Describe Arrhenius theory of ionization.
12.3 State Faraday's laws of electrolysis.
12.4 Apply Faraday's laws of different fields of industry.
12.5 Solves numerical problem on Faraday's Laws.
12.6 Explain the construction and working of Daniel cell and lead accumulator.

13.KNOW THE USE OF INSULATING MATERIALS.

13.1 Define insulator, conductor.
13.2 Classify solid, liquid and gaseous insulators with their chemical nature.
13.3 Describe their uses.

14. UNDERSTAND THE NATURE AND CHEMISTRY OF SEMI CONDUCTORS.

14.1 Define semi conductors.
14.2 Draw the atomic structure of silicon and germanium.
14.3Describe the process of bonding and conductivity in conductors and semi conductors.
14.4 Explain energy bands in semi conductors.

15. USE ETCHING PROCESS IN DIFFERENT FIELDS OF TECHNOLOGY.

15.1 Define etching process and its aims.
15.2 Enlist the chemicals/reagents used in the process.
15.3 Explain the use of the process in the technology.

Ch-132APPLIED 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 vasomotor.
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 (Ag^{+} - Pb^{++} - 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 (hg^{++}, Pb^{++++}, Cu^{+}, Cd^{++}, Bi^{+++}).
16. To detect and confirm II-B radicals Sn^{+++}, Sb^{+++}, As^{+++}).
17. To get introduction with the scheme of III group radicals (Fe^{+++} - Al^{+++}, Cr^{+++})
18. To detect and confirm Fe^{+++}, Al^{+++} and Cr^{+++}.
19. To get introduction with he scheme of IV group radicals.
20. To detect and confirm An^{++} and Mn^{++} radicals of IV group.
21. To detect and conform Co^{++} and Ni^{++} radicals of IV group.
22. To get introduction with the Acid Radical Scheme.
23. To detect dilute acid group.
24. To detect and confirm CO''_3 and 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 HCO'_3 contents in water.
29.To find out the %age composition of a mixture solution of KNO_3 and KOH volumetrically.
30. To find the amount of chloride ions (Cl') in water volumetrically.

RECOMMENDED BOOKS

1. Text Book of Intermediate Chemistry (Part I and II)
2. Sh. Atta Mohammad, Ilmi Applied Science.
3. J.N. Reddy, Polytechnic Chemistry, Tata Mc-Graw Hill Co., New Delhi.

4. Qammar Iqbal, Chemistry for Engineers and Technologists.

Comp-114 ELECTRICAL ESSENTIALS AND NETWORKS

Total Contact Hours:	T	P	C
Theory: 96 Hours	3	3	4

Prerequisite: Mathematics & Physics

AIMSThis course is designed so that the student will be able to learn basic knowledge of electricity and electronics.

Understand the operation and application of electrical and electronic principles, devices and circuits.

1.Identify the different electrical/electronics component, devices and types of circuits.

2.Explain the principles of operations and applications of electrical and electronic components, devices and circuits.

3.Use different electrical/electronic components and devices in different circuits configuration.

4.Describe the ratings, tolerances, coding and troubles in different electrical and electronics components and circuits.

5.Calculate current, voltage, power and power factor using circuit laws and network theorems.

6. Use filters and coupling in electronics circuits.

COURSE CONTENTS.

1. BASIC PRINCIPLE OF ELECTRICITY 6 Hours

1.1 Electron Theory

1.1.1 Structure of atom, K, L and M shell, energy levels and valence electrons.

1.1.2 Energy bands with reference to conductors, insulators and semiconductor.

1.2 Electrical Quantities

1.2.1 Potential, current and resistance.

1.2.2 Units of potential, current and resistance.

1.2.3 Conventional and electron current

2. DC FUNDAMENTALS. 12 Hours

2.1 Ohm's Law

2.1.1 Definition of Ohm's law.

2.1.2 Problems on Ohm's Law.

2.2. Laws of Resistance

2.2.1 Specific Resistance, conductance and conductivity.

2.2.2 Effect of temperature on resistance and temp. Coefficient of

resistance.

2.2.3 Problems on R=Rho*L/A and Rt = Ro (1+xt)
2.2.4 Resistance in series, parallel and series-parallel
2.2.5 Calculations on combination of resistance and cells in series, parallel and series-parallel combinations.
2.2.6 Power and Energy their units and calculations.
2.2.7 Power dissipation in resistors.

2.3 Kirchhoff's Laws
2.3.1 Introduction of Kirchhoff's Laws.
2.3.2 Calculation using KVL and KCL by loop and node methods.

2.4 Resistors
2.4.1 Resistor construction and types.
2.4.2 Application of resistors.
2.4.3 Resistors, colour coding
2.4.4 Resistors, Power rating.
2.4.5 Resistor, troubles.

2.5 Batteries
2.5.1 Types of DC sources.
2.5.2Types of cells , Primary and secondary cells(Mercury, silver oxide, Nickel- cadmium, etc.)
2.5.3 Lead acid batteries.
2.5.4. Solar cell.
2.5.5 Internal resistance of a cell.
2.5.6 Application of cell as constant voltage and constant current source.

3. MAGNETISM AND ELECTROMAGNETISM. 18 Hours

3.1 Magnetism.
3.1.1Introduction to magnetism, magnetic line of force, flux, flux-density, permeability, Reluctance and their units.
3.1.2 Properties of magnetic lines of force.
3.1.3 Types of magnets.
3.1.4Magnetic properties of materials (ferro-, para- and dia- magnetic) magnetic induction.

3.2 Electromagnetism.
3.2.1Electromagnetism, M.M.F. (AT) field intensity (H=AT/L) ampere-turns/meter.
3.2.2. B-H curve and magnetic Hystersis.
3.2.3 Electromagnetic induction.
3.2.4Magnetic field around a current carrying conductor and solenoids cork screw and left hand rules.
3.2.5 Force between two magnetic fields and motor action.
3.2.6 Faraday's Law of Electromagnetic induction (R=Nd/dt.)
3.2.7 Lenz's Law.

4. ELECTROSTATICS. 15 Hours

4.1 Principle of electrostatic, positive and negative charges.

4.2 Laws of electrostatic.

4.3 Electrostatic induction and field strength.

4.4 Properties of electric lines of force and comparison with magnetic lines.

4.5.Dielectric, dielectric strength and its importance permittivity and break down voltage.

4.6 Capacitance and capacitors. Capacitance of parallel plate capacitor.

4.7 Types and uses of capacitors.

4.8Equivalent capacitance for series, parallel and series parallel combination of capacitors.

4.9 Energy stored in capacitors.

4.10 Colour code, tolerance and rating of capacitors.

4.11 Troubles in capacitors.

5. AC FUNDAMENTALS. 18 Hours

5.1 The simple AC generator.

5.1.1 Sine wave, cycle, wavelength, period, frequency and units.

5.1.2AC sine wave form and its characteristics. (Instantaneous, peak, average, rms or effective values and their inter relation).

5.1.3Audio and Radio frequencies, wavelengths and periods frequency spectrum.

5.1.4Types of alternating wave forms(sinusoidal and non-sinusoidal waves). Fundamental wave and harmonics.

5.2 AC Circuits

5.2.1 AC through pure resistance, Phaser quantities.

5.2.2Phase angle, in-phase, out of phase waves and phase lag & lead and power factor.

5.2.3 Calculation of V,I and W for resistive circuits through inductance.

5.2.4 Self inductance, and self induced voltage.

5.2.5 Inductive reactance (Xl=2iifL) Phase relation between V & I.

5.2.6 Phaser diagram and power for pure inductor.

5.2.7 AC through R-L series circuit.

5.2.8 Phaser diagram and power in a R-L series circuit.

5.2.9 Time constant ,t=L/R, and its effect.

5.2.10 Impedance, Impedance triangle.

5.2.11 AC through R-L parallel circuit.

5.2.12 Inductive reactance in series, parallel and series-parallel combination.

5.2.13 Q of coil and its effects on selectivity.

5.2.14 Skin effect, AF and RF chokes.

5.2.15 Troubles in chokes.

5.2.16 AC through pure capacitor. Phase relation between V&I and power.

5.2.17 Capacitive reactance

5.2.18 AC through R-C series circuit.

5.2.19 Time constant RC and its effect.

5.2.20 Impedance, Impedance triangle.

5.2.21 AC through R-C parallel circuit.
5.2.22 Capacitive reactance in series, parallel, and series parallel combination.
5.2.23 AC through RLC series circuit, phase relation and power calculation.
5.2.24 AC through RLC parallel circuit phase relation and power calculation.
5.2.25 Simple calculations for RLC circuits.
5.2.26 Concepts of real VI cos Q and apparent power (VA), power factor. simple calculations.

6. TRANSFORMER **6 Hours**

6.1 Principle of transformer, mutual inductance, coefficient of mutual inductance.
6.2 Turn ratio and e.m.f. equation
6.3 Construction, types of transformers, core materials.
6.4 Application of transformers in electronics.
6.5 Auto-transformers, principle, advantages, disadvantages and applications.
6.6 Poly phase transformers, star and delta connection.
6.7 Phase and line voltage and current their, inter-relation.
6.8 Transformer losses.
6.8.1 Core loss.
6.8.2 Hysteressis loss.

7. PHOTO-AND THERMO-ELECTRICITY. **6 Hours**

7.1 Photoelectric effects, Photo- emissive, conductive, and photovoltaic phenomena.
7.2 Application of photoelectric effects.
7.3 Thermoelectricity - Thompson and see back effects.
7.4 Thermocouple, construction, materials and applications
7.5 Incandescent lamp, construction, rating and application
7.6 Fluorescent tube light, construction, working, rating and applications.

8. NETWORK THEOREMS. **6 Hours**

8.1 Superposition theorem for complex circuits.
8.2 Calculation based on the superposition theorem.
8.3 Thevenin's Theorem circuits simplification.
8.4 Calculation base on the Thevenin's theorem.
8.5 Norton theorem and current source concept.
8.6 Calculation based on the Norton's Theorem.
8.7 Star and Delta transformation.
8.8 Calculation based on Star and Delta transformation.

9. RESONANCE. **3 Hours**

9.1 Condition of resonance and resonant circuit.
9.2 Relation between f, L and C at resonance.

9.3Series resonant circuit. Impedance of series resonant circuit.
9.4Current, voltage and impedance characteristic of series resonant circuit.
9.5 Parallel resonant circuit and its impedance
9.6Characteristics of impedance, current and voltage of a parallel resonant circuit
9.7Series and parallel resonance curve comparison and Bandwidth.
9.8Q of circuit, Effect of Q on the slope and width of the resonance curves.
9.9Relation between the slope of the resonance curve on selectivity.
9.10 Effect of the L.C. ratio on selectivity.
9.11 Use of resonance circuit in radio and TV receivers.

10. FILTER & COUPLING CIRCUITS **6 Hours**

10.1 Purpose and action of a filter circuit.
10.2 Principle of filter action.
10.3Types of filter circuit LPF, HPF, K filter and m drive filter.
10.4 Band Pass filter (BPF) Band Stop filter (BSF)
10.5 Power supply filter.
10.6 Purpose and action of coupling circuit.
10.7 Coefficient of coupling and coupled impedance.
10.8 Type of coupling, RC, Impedance transformer coupling.
10.9 Delay action circuits, R-L and R-C circuits.
10.10Time constant of R-L & R-C circuits and its importance in rise and fall of circuit current and voltage.

TEXT/REFERENCE BOOKS.

1. Grob, Bernard, Basic Electronics, Sixth Edition.
2. Slurzberg, Orested, Essentials of Electricity for Radio and TV.
3. Therja, B.L. Electrical Technology.
4. Slurzberg, Essentials of Radio.

Comp-114 ELECTRICAL ESSENTIALS AND NETWORKS

INSTRUCTIONAL OBJECTIVES

1. BASIC PRINCIPLE OF ELECTRICITY.

1.1 Understand electron theory.

1.1.1 Describe the structure of atom.

1.1.2 Describe the K, L, and M shells.

1.1.3 Describe energy level.

1.1.4 Describe valence electron.

1.1.5Explain energy bands with reference to conductors, insulators & semiconductors.

1.2 Understand Electrical Quantities

1.2.1 Describe potential, current & resistance

1.2.2Describe units of potential, current & resistance

1.2.3Differentiate between conventional current and electron current.

2. DC FUNDAMENTALS.

2.1 Understand Ohm's Law.

2.1.1 Define ohm's law

2.2.2 Solve problems on Ohm's law

2.2 Understand Laws of Resistance

2.2.1 Define specific resistance

2.2.2 Define conductor

2.2.3 Define conductivity

2.2.4Explain the effect of temperature on resistance

2.2.5 Explain coefficient of resistance

2.2.6 Solve problems on R=PL/A and Rt=Ro(1+xt).

2.2.7 Describe the resistance in series

2.2.8 Describe the resistance in parallel

2.2.9 Describe the resistance in series-parallel

2.2.10Calculate the combination of resistances and cells, Rt, I & V.

2.2.11Define power and energy

2.2.12Describe units of power and energy

2.2.13Explain the power dissipation in resistors

2.3 Understand Kirchhoffs' Laws

2.3.1 Define Kirchhoff's laws

2.3.2 Solve problems using Kirchhoff voltage law

2.3.3 Solve problems using kirchhoff current law

2.4 Understand Resistors

2.4.1 Define resistance and resistor

2.4.2 List types of resistors

2.4.3 Enlist use of resistors

2.4.4 Describe resistor colour codes

2.4.5 Describe power rating of resistor

2.5 Understand Batteries

2.5.1 Name types of D.C source

2.5.2Describe types of cells (Mercury, Silver oxide, Nickel cadmium)

2.5.3 Describe lead acid battery

2.5.4 Describe solar cells

2.5.5 Explain the internal resistance of cell

2.5.6Use cells in series and parallel of voltage and constant source of current

3. MAGNETISM & ELECTROMAGNETISM

3.1 Understand magnetism

3.1.1Describe lines of force, flux, flux density, permeability, reactance & their units

3.1.2 Explain properties of magnetic lines of force

3.1.3 Describe types of magnets

3.1.4 Explain magnetic properties of materials

3.1.5Define and list ferromagnetic, paramagnetic and diamagnetic materials.

3.1.6 Describe magnetic induction.

3.2 To understand electromagnetism

3.2.1 Describe electromagnetism

3.2.2 Describe magneto-motive force

3.2.3 Describe field intensity (HAT/L)

3.2.4 Draw B-H Curve

3.2.5 Explain B-H curve

3.2.6 Describe magnetic hystersis

3.2.7 Explain electromagnetic induction

3.2.8 Explain magnetic field around a current carrying conductor

3.2.9 Define inductor

3.2.10Write formula for inductance base on physical parameters of an inductor [L= Ur x (N)*2 x A / L]

3.2.11Solve problem using the above formula for inductor

3.2.12Describe solenoids

3.2.13Describe cork screw rule and left hand rule

3.2.14Explain force between two magnetic fields and motor action

3.2.15Define Faraday's law of electromagnetic induction (e = N dO/dt)

3.2.16Define Lenz's Law

4. UNDERSTAND ELECTROSTATICS

4.1 Describe principle of electrostatic charges

4.2 Explain the effect of negative & positive charges

4.3 Describe the laws of electrostatics

4.4 Describe electrostatic induction & field strength

4.5 Explain properties of electric lines of force

4.6Compare between electric lines of force and magnetic lines of force

4.7Describe dielectric & dielectric strength/dielectric constant
4.8Describe the importance of dielectric & dielectric strength
4.9 Describe capacitor and capacitance
4.10Describe breakdown voltage
4.11Describe the capacitance of parallel plate capacitor
4.12Describe types of capacitors
4.13Describe the use of capacitors
4.14Calculate the total capacitance in series in parallel and series-parallel combination
4.15Explain the energy stored in capacitor
4.16Describe the colour coding, tolerance and voltage rating of capacitors
4.17Describe the troubles in capacitors

5. AC FUNDAMENTALS.

5.1 Understand A.C Waveform

5.1.1Describe sine wave (cycle, wave length, period, frequency and their units)
5.1.2Draw AC sine waveform (sinusoidal, square, sawtooth)
5.1.3Describe Instantaneous value, peak value, average value, r.m.s. value, effective value and their inter-relation
5.1.4Describe Audio & Radio frequencies and their wavelengths
5.1.5 Draw the electromagnetic wave spectrum
5.1.6 Define harmonic and fundamental wave.

5.2 Understand AC circuits

5.2.1 Describe AC through resistors
5.2.2Describe phase angle, in phase & out of phase waves
5.2.3 Describe phase lag, lead & power factor
5.2.4Calculate voltage, current & power(v,i,w) for resistive circuit
5.2.5Describe AC through inductance using waveforms and phaser diagram
5.2.6 Define self inductance & self induced voltage
5.2.7Explain inductive reactance (Xl=211fl), phase relation between voltage & current
5.2.8 Draw its phaser diagram
5.2.9 Calculate power for pure inductor
5.2.10Explain AC through R-L series circuit
5.2.11Draw phaser diagram for R-L series circuit
5.2.12Calculate power factor for R-L series circuit
5.2.13Calculate time constant for L/R
5.2.14Define impedance
5.2.15Draw impedance triangle
5.2.16Explain AC through R-L parallel circuit
5.2.17Calculate inductive reactance for series, parallel and series-parallel inductor
5.2.18Describe skin effect
5.2.19Describe audio frequency chokes
5.2.20Describe radio frequency chokes
5.2.21Explain ac through pure capacitor

5.2.22Explain phase relation between voltage, current & power for AC through capacitors
5.2.23Calculate capacitive reactance (1/2 II f c)
5.2.24Explain AC through R-C series circuit
5.2.25Explain time constant for R-C series circuit
5.2.26Explain AC through R-C parallel circuit
5.2.27Calculate capacitive reactance for capacitor in series, in parallel and series parallel combination
5.2.28Explain AC through RLC series circuit
5.2.29Explain phase relation
5.2.30Calculate power for RLC series circuit
5.2.31Explain real power (VI Cos O), apparent power (VI)
5.2.32Calculate power factor

6. UNDERSTAND THE TRANSFORMERS

6.1 Explain the principle of transformer
6.2 Define mutual induction
6.3 Define coefficient of mutual induction
6.4 Describe turn ratio of transformer
6.5 Describe construction of transformer
6.6 Enlist the types of transformer
6.7 Enlist core material of transformer
6.8 Describe auto transformer

6.9Explain star, delta connections of three phase transformer
6.10Explain phase & line voltage for star and delta connection
6.11Explain phase & line current for star and delta connection of three phase system
6.12List the applications of transformer in electronics:

i) step down transformer,
ii) impedance matching
iii) coupling

6.13Explain transformer losses.
6.14Explain hysteresis loss and core loss.

7. UNDERSTAND PHOTO AND THERMO-ELECTRICITY

7.1Describe photo-electric effects (photo emissive ,photo conductive and photo voltaic effects)
7.2 Name the applications of photo electric effect
7.3Explain thermoelectric effect (Thompson & See-beck effects)
7.4 Explain thermocouple
7.5 Draw the diagram of incandescent lamp
7.6 Explain the working of incandescent lamp
7.7 Draw the diagram of fluorescent tube light
7.8 Explain the working of fluorescent tube light

8. UNDERSTAND SUPERPOSITION, THEVENIN & NORTON THEOREMS

8.1 Explain Superposition theorem
8.2 Solve problems based on superposition theorem
8.3 Explain Thevenin's theorem
8.4 Solve problems based on Thevenin's theorem
8.5 Explain Norton's theorem
8.6 Solve problems based on Norton's theorem
8.7Explain transformation of star to delta and delta to star networks
8.8 Solve problems based on star, delta transformation

9. UNDERSTAND RESONANCE

9.1 Explain resonance
9.2Explain the relation between frequency, inductance & capacitance at resonant
9.3 Draw the series resonant circuit
9.4 Explain series resonant circuit
9.5 Draw the characteristics of series resonant circuit
9.6Calculate current, voltage and impedance of series resonant circuit
9.7 Draw the diagram of parallel resonant circuit
9.8 Explain the parallel resonant circuit
9.9 Draw the characteristics of parallel resonant circuit
9.10Compare series and parallel resonant circuit
9.11Describe the band width of a resonant circuit
9.12Describe Q of a circuit
9.13Explain the effect of the L.C ratio on selectivity
9.14Enlist the use of resonant circuit in radio and TV receivers

10. UNDERSTAND FILTERS & COUPLING CIRCUITS

10.1Explain purpose & action of a filter circuit
10.2Enlist the types of filter circuits
10.3Explain low pass filter high pass filter, K-filter & m-derived filters
10.4Explain band pass filter & band stop filter
10.5Explain action & purpose of a coupling circuit
10.6Define coefficient of coupling
10.7Enlist types of coupling
10.8Explain RC, impedance, and transformer coupling
10.9Define time constant of R-L & R-C Circuits

TEXT/REFERENCE BOOKS:

1. Grob Bernard "Basic Electronics 6th Edition"
2. Slurzberg, Orested"Essentials of Electricity for radio & TV "
3. Therja B.L. "Electrical Technology"
4. Slurzberg "Essentials of radio"
5.R.B. Faber "Applied Electricity & Electronics for technicians"

Comp-123 ELECTRONIC DEVICES & CIRCUIT

T	P	C
3	3	4

Total contact hours:

Theory: 96 Hours
Practical: 96 Hours

Pre-requisite: Electrical Essentials and Networks (Comp-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.
1.4Cathode ray tube, construction, operation and application.

2. DIODES AND APPLICATIONS. 9 Hour

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.
2.3.2Voltage 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.

3.2Basic Transistor operation, Forward, Reverse Bias. Transistor current.

3.3 Transistor Parameters and Ratings

3.4. Transistor as a voltage amplifier.

3.5Transistor 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 Zanier Diodes.

4.1.1Zanier Diode as voltage Regulator, percentage of regulation.

- 4.1.2 Zanier 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.

4.4.1Schottky 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 Uni-Junction 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
8.2Supply 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

Comp-123 ELECTRONIC DEVICES & CIRCUITS

INSTRUCTIONAL OBJECTIVES.

1. VACUUM TUBES.

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

2. SEMICONDUCTOR DIODES.

2.1Understand principles, characteristics and application of various types of semiconductor diodes.
2.1.1Compare the energy band structure for conductors, insulators and semiconductors.
2.1.2 Explain semiconductor doping
2.1.3List donor and acceptor materials for silicon & germanium
2.1.4Define majority carries and minority charge carriers.
2.1.5Explain 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
2.2.2Define the terms depletion layer capacitance & diffusion capacitance.
2.2.3Sketch the voltage-current characteristics curve for a PN junction.
2.2.4Determine RF, rd, RR and Is from the diode characteristics curve.
2.2.5List 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.
2.3.2Explain half and full wave rectifier using a neat circuit diagram.
2.3.3 Define Ripple factor, surge current.
2.3.4Explain function of rectifier (L, PI, T filters)
2.3.5Define the terms limiter (clipper) and clamper.
2.3.6 Draw a diode limiter circuit.
2.3.7Explain 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.
2.3.11Explain its uses as voltage multiplier (doubler).

2.3.12Explain the working of a voltage doubler circuit.
2.3.13List 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).

3.1Understand bipolar junction and field effect transistors, its biasing and basic BJT circuits.
3.1.1Draw and label physical structure and symbols for NPN and PNP transistors.
3.1.2Show the four operation mode of BJT and application of each mode .
3.1.3Compute the values of IE, and Beta (dc) for given value of IB and IC.
3.1.4Explain the working of basic BJT voltage amplifier w.r.t. bias of junctions, flow of charge carriers and transistor currents.
3.1.5Define transistor cut off and breakdown voltages.
3.1.6List four maximum ratings specified by manufacturers parameters of transistors.
3.1.7Drive the expression for IC versus IB for CE. configuration in the active region
3.1.8Sketch 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.
3.1.12Draw and label the structure of epitaxial transistor.
3.1.13Name the advantages of MESA transistor over alloy transistor.
3.1.14Enlist the advantages of I.C. over conventional circuit
3.1.15List the three broad categories of BJTs with package types used for each
3.1.16Identify the high frequency limitations of BJT.

3.2 Understand BJT Biasing Techniques
3.2.1Explain the purpose of dc bias in a transistor circuit.
3.2.2 Show how bias effects the operation of BJT.
3.2.3Draw and label load line on the characteristic curves for CE configuration
3.2.4Locate the Q-point for linear operation of the amplifier.
3.2.5List the causes of Q-point thermal instability.

3.3 Understand Basic BJT Circuits
3.3.1Sketch the circuit for single ended CE amplifier
3.3.2Draw the h parameter approximate model for CE amplifier
3.3.3 Repeat 3.3.2 for CB and CC configuration.
3.3.4Write down the expressions for a CE circuit for (a) Ai, (b) Ri (c) Av (d) Ro (e) Ap and Gp.
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.
3.3.7Compute Ai., Ri, Av, Ro and Ap for CE, CB and CC configurations.

3.3.8 Compare the three BJT configurations.

3.3.9Draw 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

3.4.1Explain the principle of the n-channel JFET using illustrations.

3.4.2 Sketch the construction of n-channel JFET.

3.4.3Sketch & label a family of drain characteristics of a n-channel JFET.

3.4.4 Define the terms I Dss and Vp.

3.4.5Explain the effect of change in VGS the JFET characteristics.

3.4.6Explain above from 3.4.1 thu. 3.4.3 for p-channel JFET.

3.4.7Define the major data-sheet parameter of a JFET.

3.4.8Explain the principle of n-channel enhancement MOSFET.

3.4.9Sketch & label the family of drain characteristics of n-channel enhancement MOSFET

3.4.10Repeat 3.4.9 for n-channel depletion-enhancement MOSFET.

3.4.11Sketch 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.

3.5.2Draw DC load line and locate bias point on the family of drain characteristic curves of JFET.

3.5.3Draw 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

3.6.1List the three of configuration of FET amplifier.

3.6.2Sketch & label the circuit for CS-JFET amplifier.

3.6.3Write down expressions for Av and Zi and Zo for CS

3.6.4Repeat 3.6.1 thru 3.6.3 for common drain (CD) and common gate (CG) JFET amplifiers.

3.6.5Draw generalized MOSFET amplifier configuration .

3.7.6Define (i) transconductance, gm (ii) drain resistance, rd and (iii) amplification

factor of an FET.

4. SPECIAL DIODES.

4.1Understand the characteristics and applications of diode used for a special purposes Zanier Diode.

4.1.1Draw the V-I characteristic of a Zanier diode.

4.1.2Identify the characteristic features of Zanier diode.

4.1.3Explain the working of Zanier diode as voltage regulator.

4.1.4Define the terms line regulation, and load regulation for Zanier diode.

4.1.5Derive formulae to find the range of series resistor (Rs) and load resistor (RL) for a Zanier regulator for given variations in line voltage and current.

4.1.6Solve problems to find the values of Rs and RL for Zanier diode regulator.

4.1.7Use Zanier diode in a limiter / clipper circuit.

4.1.8List the other applications of Zanier diode.

4.2 Understand the characteristics if a Varactor diode.

4.2.1 Identify the key parameters of varactor diode.

4.2.2 Enlist the applications of varactor diode.

4.2.3Draw the circuit of electronic tuner of a receiver using varactor diode.

4.3Understand 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.

4.3.3Explain the electroluminescence process in LED.

4.3.4List 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.

4.3.8Explain 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.

4.3.12Name the materials used for photodiode with their colour sensitivity and characteristics

4.3.13 List the applications of photodiodes.

4.3.14Draw a circuit of photoelectric relay using a photodiode.

4.4Understand special diodes (Schottky, tunnel, PIN, LASER, IMPATT, Gunn)

4.4.1List main type of special diodes.

4.4.2Explain the basic internal structure and working of a schottky diode.

4.4.3Name the primary application areas of schottky diode

4.4.4Explain the principle of tunnel diode using energy level diagram.

4.4.5List the names of material used for making tunnel diode.

4.4.6Sketch the construction along with symbol for a tunnel diode.
4.4.7Compare the V-I characteristics of a tunnel diode with that of an ordinary diode.
4.4.8List the applications of tunnel diode.
4.4.9Sketch the basic parallel tunnel diode amplifier.
4.4.10Sketch the tunnel diode oscillator circuit.
4.4.11Explain briefly the working of circuit in 4.1.9 & 4.1.10
4.4.12Show & label the three regions of a PIN diode structure
4.4.13Explain the effect of bias on the resistance of PIN diode
4.4.14List the names of the materials used for making PIN diode
4.4.15Enlist the applications of PIN diode .
4.4.16Explain the term LASER.
4.4.17Differentiate between incoherent and coherent light
4.4.18Sketch the structure of double heterojunction semiconductor laser diode.
4.4.19List the names of the materials with field of application for laser diode.
4.4.20 List the application of lasers.
4.4.21Describe 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.
4.4.23List the names of material exhibiting Gunn effect.
4.4.24 Sketch a Gunn diode construction.
4.4.25Identify 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.
4.4.28Explain briefly the principle of IMPATT diode.
4.4.29 Sketch the structure of IMPATT diode.
4.4.30Explain 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.

5.1Understand 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
5.1.4Draw and label the forward v-i characteristics for a shockley diode
5.1.5List the methods to turn off and turn on shockley diode
5.1.6Explain the working of a shockley diode relaxation oscillator.
5.1.7 Compare an SCR with a shockley diode.
5.1.8Draw and label the schematic symbol for an SCR
5.1.9Explain 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 .

5.1.13Draw basic circuits for SCR used in the areas of

a) power control
b) switching and
c) protection

5.1.14Explain briefly the circuits drawn under 5.1.13.

5.1.15Compare 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)

5.1.17Sketch the transistor equivalent circuit for a triac

5.1.18Explain the phase-shift control of triac with a diac as a switching device as used in light for UJT.

5.2Understand Unijunction Transistor characteristics.

5.2.1Sketch the structure of a unijunction transistor (UJT).

5.2.2Sketch the equivalent circuit and symbol for UJT.

5.2.3Explain the working of UJT circuit of 5.2.2.

5.2.4Draw the V-I characteristic curve for UJT.

5.2.5Draw a circuit for UJT relaxation oscillator.

5.2.6List the three factors controlling the period of oscillation of a relaxation oscillator

5.2.7Sketch a UJT time delay circuit.

5.3Understand properties of Photo-sensitive Devices.

5.3.1Compare a photo-transistor with a conventional BJT.

5.3.2List the factors controlling collector current of a photo transistor.

5.3.3Draw the circuit for forward and reverse acting light operated relay using a phototransistor.

5.3.4 Sketch the circuit of a photo darlington pair

5.3.5List the requirements to turn-on and turn-off a light activated SCR (LASCR).

5.3.6List the types of input devices normally used in a opt-coupler

5.3.7List five types of output devices used in opto-coupler.

5.3.8 List the applications of opto-coupler.

6. OPERATIONAL AMPLIFIER (LINEAR INTEGRATED CIRCUIT).

6.1Understand the working and applications of operational amplifier.

6.1.1Draw the block diagram and symbol for an operational amplifier (OP AMP).

6.1.2Identify the function of each block of an OP AMP.

6.1.3List ten important OP AMP parameters.

6.1.4Define the terms (a) bias current (b) offset voltage for an OP AMP.

6.1.5Explain the method of bias current compensation for an OP AMP.
6.1.6 Draw inverting and non-inverting amplifier using op amp.
6.1.7Explain the inverting and non-inverting amplifier.
6.1.8Identify the virtual ground point of an OP AMP for calculating gain.
6.1.9Derive expression for voltage gain of both types of amplifiers discussed under 7.1.7.
6.1.10Sketch the four modes of operations of differential amplifier.
6.1.11Sketch a voltage follower circuit using an OP AMP.
6.1.12Explain the working of an OP AMP comparator.
6.1.13 List the applications of OP AMP (741 OP AMP).

7. INTEGRATED CIRCUITS (ICs).

7.1To understand and apply ICs & integrated components
7.1.1Define 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.
7.1.5Identify how the storage time is eliminated in a metal semiconductor diode.
7.1.6List 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.

8.1Understand logic gate circuits.
8.1.1Define a logic gate.
8.1.2List the types of logic gates with their symbols.
8.1.3Define positive & negative logic.
8.1.4Explain the working of diode OR and gates and draw their truth tables.
8.1.5Enlist the merits and demerits of diode logic.
8.1.6 Write Boolean expressions for OR and gates.
8.1.7Draw 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.
8.1.11Describe the working of RTL and HTL NAND gates.

8.2 Understand comparison of Logic Gates Performance.
8.2.1List 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.

8.5Understand methods of interfacing various logic families.

8.5.1 List the factors to be considered in interfacing logic families.

8.5.2Draw the circuit for the TTL driving 5-V CMOS and 15- V CMOS gates.

8.5.3Identify the need of the pull-up resistor in interfacing TTL and CMOS.

8.5.4Discuss 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"

Comp-123 ELECTRONIC DEVICES & CIRCUITS

LIST OF PRACTICALS **96 Hours**

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 Zanier diode as voltage regulator with diode rectifier.
9. Assemble a double side Zanier 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.

Comp-131ELECTRICAL DRAWING

T	P	C
0	3	1

Total Contact Hours

Practical: 96 Hours.

Description: Lettering, Numbering, Conventional lines and dimensioning. Drawing symbols, simple circuits (Electrical and Electronics).

Objectives: To help the students in understanding the basic methods of drawing.

COURSE CONTENTS

1. Use and care of drawing instruments.
2. Use of various grades of pencils.
3. Single stroke and inclined gothic letters.
4. Practice in numbering, vertical and inclined.
5. Practice of Alphabets of line.
6. Line values.
7. Tangency exercises.
8. One view drawing.
9. Dimensioning techniques.
10. System of dimensioning.

11.Kinds of dimensioning.

12.Preparation of multi-view drawing from the given models showing conventional placement of dimensions there upon.

13. Drawing tracing.
14. Simple pictorial drawings:
    a) ISOMETRIC
    b) OBLIQUE
    c) ONE POINT PERSPECTIVE.

15.Comparison of orthographic first angle and third angle methods of projection.

16.Production and use of simple standard working drawing.

17.Practice in the use of symbols. (Electrical & Electronics)

18.Schematic drawing of simple circuits.

19.Practice in single line diagram schematic drawing.

20.Practice in line and curve tracing.

21.Drawing light, fan and plug circuit.

22.Drawing tube light circuit

23. Drawing circuit diagram of a call bell system

24.Drawing Circuit diagram of half wave rectifier.

25.Drawing Circuit diagram of full wave rectifier.

26.Drawing Circuit diagram of common emitter amplifier.

27.Circuit diagram of common collector amplifier
28.Circuit diagram of common base amplifier.
29.Circuit diagram Audio frequency amplifier.
30.Circuit diagram of Radio frequency amplifier.
31.Circuit diagram of push pull power amplifier.
32.Circuit diagram of intercom apparatus.
33.Circuit diagram of thyristor, working as rectifier.
34.Block diagram of an Oscilloscope.
36.Block diagram of TV receiver.
37.Block diagram of a radio transmitter.
38.Flow chart symbol.
39.Flow chart for a program in Basic language.

Comp-141 GENERAL ENGINEERING WORKSHOP
(Soldering, PCB Fabrication & Electrical Wiring)

Total Contact Hours	**T**	**P**	**C**
Practicals 96 Hours	0	3	1

AIMS1.Students will apply soldering techniques PCB fabrication and assembly of electronic component.
2.Students will understanding the Basic methods and techniques of electric wiring.
3.Students will be able to assemble small projects.

COURSE CONTENTS

1 **SOLDERING** **11 to 20 weeks**

1.1Use of tools such as screw driver, pliers, cutters, notchers, stripper etc.
1.2Use of soldering iron, soldering guns, soldering and desoldering tools, solder sucker etc.
1.3Soldering technique and application.
1.4Different soldering tools such as soldering irons, guns, soldering and desoldering tools, suckers etc.
1.5Practices of soldering of components of PCB.

2**PCB FABRICATION** **11 to 20 weeks**

2.1Draw a circuit diagram of 5 volt regulated power supply.
2.2Preparation of a PCB for a 5 Volt regulated power supply.
2.3Selections of PCB according to required size.
2.4Cutting sheets according to drawing.
2.5Transfer of circuit on copper clad sheet.
2.6Chemical Etching process on PCB.
2.7Identification of components and their codes.
2.8Mounting of components on PCB (Punching, Drilling and other required process).
2.9Soldering of components on PCB.
2.10Testing of PCB with different methods (Inspection, resistance, testing, component test).

3**BASIC WIRING** **21 to 32 weeks**

3.1Introduction to Electrical Wiring.
3.2Wiring symbols.
3.3Types and sizes of wiring cables.
3.4Wiring system (batten and conduit wiring)
3.5Wiring accessories such as (fuses, switches, lamp holder, socket etc)
3.6Earthing and importance of earthing.

3.7Draw simple wiring circuits.
3.7.1Single lamp circuit
3.7.2Stair case wiring circuit
3.7.3Two lamps in parallel controlled by individual switches.
3.8To make straight, tee and duplex joints.
3.9Practice of wiring on the following circuits.
3.9.1Control single lamp circuit
3.9.2Stair case wiring
3.9.3Two lamps in parallel controlled by two individual switches
3.9.4Flourescent tube light circuit controlled by switch.
3.10Practice of batten wiring in the following circuits:
3.10.1Control simple lamp circuit
3.10.2Single lamp controlled by two way switches
3.10.3Simple lamp with 5A socket each controlled by single switch
3.10.4Wiring bell circuit.
3.11Practice of conduit wiring in the following circuits:
3.11.1?
3.11.2?
3.11.3?
3.11.4?

Comp-152 COMPUTER APPLICATION LAB.

Total Contact Hours	T	P	C
Practicals 192 Hours	0	6	2

COURSE CONTENTS

1. FUNDAMENTALS OF COMPUTER.
- 1.1 Introduction of computer.
- 1.2 Block diagram of computer.
- 1.3 Input/Output units.
- 1.4 Input/Output devices.
- 1.5 CUP.

2. STORAGE DEVICES.
- 2.1 Floppy Disk
- 2.2 Hard Disk
- 2.3 Magnetic Tape.

3. HARDWARE.

4. SOFTWARE.
- 4.1 System software.
- 4.2 Application software.
- 4.3 Languages.
- 4.4 High level.
- 4.5 Low level.

5. DOS.
- 5.1 Introduction to DOS.
- 5.2 Internal and external commands.

6. DIRECTORY COMMANDS.
- 6.1 DIR.
- 6.2 MD.
- 6.3 CD.
- 6.4 RD.

7. DISK COMMANDS.
- 7.1 FORMAT.
- 7.2 UNFORMAT.
- 7.3 Diskcopy.

12. BATCH FILES.

- 12.1 ECHO.
- 12.2 FOR.
- 12.3 GOTO.
- 12.4 IF
- 12.5 PAUSE.
- 12.6 REM
- 12.7 CAL2
- 12.8 CLS.

13. AUTOEXEC.BAT FILE.

14. CONFIG.SYS FILE.

15 USING DOSSHELL

16. PROGRAM MENU.

17. FILE MANAGEMENT SYSTEM.

18. WORD PERFECT.

- 18.1 Introduction to word perfect.
- 18.2 Adding and deleting text.
- 18.3 Curser movement.

19. USING FILE COMMANDS.

- 19.1 Save a doc
- 19.2 Retrieve a doc
- 19.3 Exit.
- 19.4 Copy.
- 19.5 Rename/Move.
- 19.6 Delete.
- 19.7 Look
- 19.8 Print.
- 19.9 Short/long display.
- 19.10 Find.
- 19.11 Name search.

20. WORKING IN TWO DOC.

- 20.1 Spell checking.
- 20.2 Thesaurus.

21. SEARCH

21.1 Forward search.
21.2 Backward search.
21.3 Find and replace.

22. USING CLOCK COMMANDS.

22.1 Copy.
22.2 Move.
22.3 Delete.
22.4 Append.
22.5 Underline.
22.6 Bold.
22.7 Centre.

23. FORMAT.

23.1 Line format.
23.2 Page format.
23.3 DOC format.
23.4 Others.

24. FONTS.

24.1 Size
24.2 Appearance
24.3 Fine
24.4 Bold
24.5 Small
24.6 Underline
24.7 Large
24.8 Italic
24.9 V.Large.
24.10 Double underline.

LOTUS:

1. INTRODUCTION TO LOTUS.

2. DIFFERENCE BETWEEN MANUAL AND COMPUTER LOTUS WORKSHEET.

3. HOW TO LOAD LOTUS.

4. HOW TO CREATE WORKSHEET.

5. ADJUSTING OF CELL WIDTH.

6. CREATE SIMPLE WORKSHEET.

7. SAVE AND RETRIEVE.

8. FUNCTION KEYS.

9. WORKSHEET MENU.

- 9.1 Global
- 9.2 Insert
- 9.3 Delete
- 9.4 Column
- 9.5 Title
- 9.6 Window
- 9.7 Page.
- 9.8 Status
- 9.9 Protection
- 9.10 Format
- 9.11 Label
- 9.12 Zero
- 9.13 Recalculation
- 9.14 Default.

10. @ FUNCTION.

- 10.1 @ Sum
- 10.2 MIN
- 10.3 MAX
- 10.4 COUNT
- 10.5 AVG
- 10.6 DATE
- 10.7 TIME
- 10.8 DATE VALUE
- 10.9 TIME VALUE
- 10.10 IF
- 10.11 TRUE
- 10.12 FALSE
- 10.13 ABS
- 10.14 INT
- 10.15 ROUND
- 10.16 TAN

10.17 SIN
10.18 COS

11. RANGE MENU.

11.1 Erase
11.2 Justify
11.3 Protect
11.4 Transpose
11.5 Value
11.6 Label
11.7 Name.

12. FILE MENU.

12.1 File
12.2 Retrieve
12.3 Save.
12.4 Combine
12.5 Erase.
12.6 Other
12.7 Xtract
12.8 Directory.
12.9 List
12.10 Worksheet
12.11 Print
12.12 Graph.
12.13 Other.

13. PRINT MENU.

13.1 Printer/File
13.2 Range
13.3 Line
13.4 Page.
13.5 Clear.
13.6 Align
13.7 GO
13.8 Quit
13.9 Option

14. GRAPH MENU

14.1 Type
14.2 Reset