ENGINEERING MATHEMATICS I
SH 401

Lecture: 3 **Year: I**
Tutorial: 2 **Part: I**
Practical : 0

Course Objective:
To provide students a sound knowledge of calculus and analytic geometry to apply them in their relevant fields.

1. Derivatives and their Applications (14 hours)
- 1.1. Introduction
- 1.2. Higher order derivatives
- 1.3. Mean value theorem
  - 1.3.1. Rolle's Theorem
  - 1.3.2. Lagrange's mean value theorem
  - 1.3.3. Cauchy's mean value theorem
- 1.4. Power series of single valued function
  - 1.4.1. Taylor's series
  - 1.4.2. Maclaurin's series
- 1.5. Indeterminate forms; L'Hospital rule
- 1.6. Asymptotes to Cartesian and polar curves
- 1.7. Pedal equations to Cartesian and polar curves; curvature and radius of curvature

2. Integration and its Applications (11 hours)
- 2.1. Introduction
- 2.2. Definite integrals and their properties
- 2.3. Improper integrals
- 2.4. Differentiation under integral sign
- 2.5. Reduction formula; Beta Gama functions
- 2.6. Application of integrals for finding areas, arc length, surface and solid of revolution in the plane for Cartesian and polar curves

3. Plane Analytic Geometry (8 hours)
- 3.1. Transformation of coordinates: Translation and rotation
- 3.2. Ellipse and hyperbola; Standard forms, tangent, and normal
- 3.3. General equation of conics in Cartesian and polar forms

4. Ordinary Differential Equations and their Applications (12 hours)
- 4.1. First order and first degree differential equations
- 4.2. Homogenous differential equations
- 4.3. Linear differential equations
- 4.4. Equations reducible to linear differential equations; Bernoulli's equation
- 4.5. First order and higher degree differential equation; Clairaut's equation
- 4.6. Second order and first degree linear differential equations with constant coefficients.
- 4.7. Second order and first degree linear differential equations with variable coefficients; Cauchy's equations
- 4.8. Applications in engineering field

References:

1. Erwin Kreyszig, "Advance Engineering Mathematics" , John Wiley and Sons Inc
2. Thomas,Finney, "Calculus and Analytical Geometry" Addison- Wesley
3. M. B. Singh, B. C. Bajrachrya, "Differential Calculus", Sukunda Pustak Bhandar,Nepal
4. M. B. Singh, S. P. Shrestha, "Applied Mathematics", RTU, Department of Engineering Science and Humanities.
5. G.D. Pant, G. S. Shrestha, "Integral Calculus and Differential Equations", Sunila Prakashan, Nepal
6. M. R. Joshi, "Analytical Geometry", SukundaPustak Bhandar,Nepal
7. S. P. Shrestha, H. D. Chaudhary, P. R. Pokharel, "A Textbook of Engineering Mathematics - Vol I", Vidyarthi Pustak Bhandar.
8. Santosh Man Maskey, "Calculus", Ratna Pustak Bhandar, Nepal

Evaluation Scheme:

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Unit	Chapter	Topics	Marks
1	1	1.1 to 1.5	16
2	1	1.6 to 1.7	16
	2	2.1 to 2.3	
3	2	2.4 to 2.6	16
4	3	3.1 to 3.3	16
5	4	4.1 to 4.8	16
Total			80

COMPUTER PROGRAMMING
CT 401

Lecture : 3 **Year : I**
Tutorial : 0 **Part : I**
Practical : 3

Course Objective:
To familiarize the student with computer software and high level programming languages and to develop the programming skill using C language

1. Overview of computer software & programming languages (3 hours)
- 1.1. System software
- 1.2. Application software
- 1.3. General software features and recent trends
- 1.4. Generation of programming languages
- 1.5. Categorization of high level languages

2. Problem solving using Computer (3 hours)
- 2.1. Problem analysis
- 2.2. Algorithm development and Flowchart
- 2.3. Compilation and Execution
- 2.4. Debugging and Testing
- 2.5. Programming Documentation

3. Introduction to 'C' programming (4 hours)
- 3.1. Character set, Keywords, and Data types
- 3.2. Preprocessor Directives
- 3.3. Constants and Variables
- 3.4. Operators and statements

4. Input and Output (3 hours)
- 4.1. Formatted input/output
- 4.2. Character input/output
- 4.3. Programs using input/output statements

5. Control statements (6 hours)
- 5.1. Introduction
- 5.2. The goto, if, if … … else, switch statements
- 5.3. The while, do … while, for statements

6. User-Defined Functions (4 hours)
- 6.1. Introduction
- 6.2. Function definition and return statement
- 6.3. Function Prototypes
- 6.4. Function invocation, call by value and call by reference, Recursive Functions

7. Arrays and Strings (5 hours)
- 7.1. Defining an Array
- 7.2. One-dimensional Arrays
- 7.3. Multi-dimensional Arrays
- 7.4. Strings and string manipulation
- 7.5. Passing Array and String to function

8. Structures (4 hours)
- 8.1. Introduction
- 8.2. Processing a Structure
- 8.3. Arrays of Structures
- 8.4. Arrays within Structures
- 8.5. Structures and Function

9. Pointers (4 hours)
- 9.1. Introduction
- 9.2. Pointer declaration
- 9.3. Pointer arithmetic
- 9.4. Pointer and Array
- 9.5. Passing Pointers to a Function
- 9.6. Pointers and Structures

10. Data Files (5 hours)
- 10.1. Defining opening and closing a file
- 10.2. Input/Output operations on Files
- 10.3. Error handling during input/output operations

11. Introduction to other Programming Languages (4 hours)
- 11.1. FORTRAN
- 11.2. C++
- 11.3. Java
- 11.4. C#

Practical

- Minimum 7 lab works on programming with C should be done individually which should include at least followings: (30 marks out of 50 marks)
  1. Input/output operations
  2. Control statements
  3. User defined functions
  4. Arrays & strings
  5. Pointers
  6. Structure and union
  7. Data files
- Student (maximum 4 persons in a group) should submit a mini project at the end of course. (20 marks out of 50 marks)

References:

1. Kelly & Pohl, "A Book on C", Benjamin/Cumming
2. Brian W. Keringhan & Dennis M. Ritchie, "The 'C' Programming Language", PHI
3. Daya Sagar Baral, Diwakar Baral and Sharad Kumar Ghimire "The Secrets of C Programming Language", Bhundipuran Publication
4. Bryons S. Gotterfried, "Programming with C", TMH
5. Yashavant Kanetkar, "Let Us C", BPB
6. Alexis Leon, Mathews Leon, "Fundamentals of Information Technology", Leon Press and Vikas Publishing House

Evaluation Scheme

There will be questions covering all the chapters in the syllabus. The evaluation scheme for the course is as indicated in the table below:

Unit	Chapter	Topics	Marks
1	1, 2 & 3	all	**16**
2	4 & 5	all	**16**
3	6 & 7	all	**16**
4	8 & 9	all	**16**
5	10 & 11	all	**16**
Total			**80**

ENGINEERING DRAWING I
ME 401

Lectures : 1 **Year : I**
Tutorial : 0 **Part : I**
Practical : 3

Course Objective:
To develop basic projection concepts with reference to points, lines, planes and geometrical solids. Also to develop sketching and drafting skills to facilitate communication.

1. Instrumental Drawing, Technical Lettering Practices and Techniques (2 hours)
- 1.1. Equipment and materials
- 1.2. Description of drawing instruments, auxiliary equipment and drawing materials
- 1.3. Techniques of instrumental drawing
- 1.4. Pencil sharpening, securing paper, proper use of T- squares, triangles, scales dividers, compasses, erasing shields, French curves, inking pens
- 1.5. Lettering strokes, letter proportions, use of pencils and pens, uniformity and appearance of letters, freehand techniques, inclined and vertical letters and numerals, upper and lower cases, standard English lettering forms

2. Dimensioning (2 hours)
- 2.1. Fundamentals and techniques
- 2.2. Size and location dimensioning, SI conversions
- 2.3. Use of scales, measurement units, reducing and enlarging drawings
- 2.4. Placement of dimensions: aligned and unidirectional

3. Applied Geometry (6 hours)
- 3.1. Plane geometrical construction: Proportional division of lines, arc & line tangents
- 3.2. Methods for drawing standard curves such as ellipses, parabolas, hyperbolas, involutes, spirals, cycloids and helices (cylindrical and conical)
- 3.3. Techniques to reproduce a given drawing (by construction)

4. Basic Descriptive Geometry (14 hours)
- 4.1. Introduction to Orthographic projection, Principal Planes, Four Quadrants or Angles
- 4.2. Projection of points on first, second, third and fourth quadrants

4.3. Projection of Lines: Parallel to one of the principal plane, Inclined to one of the principal plane and parallel to other, Inclined to both principal planes
4.4. Projection Planes: Perpendicular to both principal planes, Parallel to one of the principal planes and Inclined to one of the principal planes, perpendicular to other and Inclined to both principal planes
4.5. True length of lines: horizontal, inclined and oblique lines
4.6. Rules for parallel and perpendicular lines
4.7. Point view or end view of a line
4.8. Shortest distance from a point to a line
4.9. Edge View and True shape of an oblique plane
4.10. Angle between two intersecting lines
4.11. Intersection of a line and a plane
4.12. Angle between a line and a plane
4.13. Dihedral angle between two planes
4.14. Shortest distance between two skew lines
4.15. Angle between two non- intersecting (skew) lines

5. Multi view (orthographic) projections (18 hours)

5.1. Orthographic Projections
- 5.1.1. First and third angle projection
- 5.1.2. Principal views: methods for obtaining orthographic views, Projection of lines, angles and plane surfaces, analysis in three views, projection of curved lines and surfaces, object orientation and selection of views for best representation, full and hidden lines
- 5.1.3. Orthographic drawings: making an orthographic drawing, visualizing objects (pictorial view) from the given views
- 5.1.4. Interpretation of adjacent areas, true-length lines , representation of holes, conventional practices

5.2. Sectional Views: Full, half, broken revolved, removed (detail) sections, phantom of hidden section, Auxiliary sectional views, specifying cutting planes for sections, conventions for hidden lines, holes, ribs, spokes

5.3. Auxiliary views: Basic concept and use, drawing methods and types, symmetrical and unilateral auxiliary views. Projection of curved lines and boundaries, line of intersection between two planes, true size of dihedral angles, true size and shape of plane surfaces

6. Developments and Intersections (18 hours)

6.1. Introduction and Projection of Solids

6.2. Developments: general concepts and practical considerations, development of a right or oblique prism, cylinder, pyramid, and cone, development of truncated pyramid and cone, Triangulation method for approximately developed surfaces, transition pieces for connecting different shapes, development of a sphere

6.3. Intersections: lines of intersection of geometric surfaces, piercing point of a line and a geometric solid, intersection lines of two planes, intersections of -prisms and pyramids, cylinder and an oblique plane. Constructing a development using auxiliary views, intersection of - two cylinders, a cylinder & a cone

Practical:

1. Drawing Sheet Layout, Freehand Lettering, Sketching of parallel lines, circles, Dimensioning
2. Applied Geometry(Sketch and Instrumental Drawing)
3. Descriptive Geometry I: Projection of Point and Lines (4.1 to 4.3)(Sketch and Instrumental Drawing)
4. Descriptive Geometry II: Projection of Planes (4.4) (Sketch and Instrumental Drawing)
5. Descriptive Geometry III: Applications in Three dimensional Space (4.5 to 4.15) (Sketch and Instrumental Drawing)
6. Multiview Drawings (5.1) (Sketch and Instrumental Drawing)
7. Multiview, Sectional Drawings and Dimensioning I (5.2)(Sketch and Instrumental Drawing)
8. Multiview, Sectional Drawings and Dimensioning II (5.2) (Sketch and Instrumental Drawing)
9. Auxiliary View, Sectional Drawings and Dimensioning (5.3) (Sketch and Instrumental Drawing)
10. Projection of Regular Geometrical Solids (Sketch and Instrumental Drawing)
11. Development and Intersection I (6.1) (Sketch and Instrumental Drawing)
12. Development and Intersection II (6.2) (Sketch and Instrumental Drawing)
13. Development and Intersection III (6.3) (Sketch and Instrumental Drawing)

References:

1. W. J. Luzadder, "Fundamentals of Engineering Drawing", Prentice Hall.
2. T. E. French, C. J. Vierck, and R. J. Foster, "Engineering Drawing and Graphic Technology", Mc Graw Hill Publishing Co.
3. A . Mitchell, H. C. Spencer and J. T. Dygdone, "Technical Drawing", F. E. Giescke, Macmillan Publishing Co.
4. N. D. Bhatt, "Elementary Engineering Drawing", Charotar Publishing House, India.
5. P. S. Gill, "A Text Book of Engineering Drawing", S. K. Kataria and Sons, India
6. R. K. Dhawan, "A Text Book of Engineering Drawing", S. Chand and Company Limited, India

Evaluation Scheme:

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Unit	Chapter	Topics	Marks
1	3	all	4
2	4	all	8
3	1, 2 & 5	all	14
4	6	all	14
Total			40

ENGINEERING CHEMISTRY
SH 403

Lecture : 3 **Year : I**
Tutorial : 1 **Part : I**
Practical : 3

Course Objective:
To develop the basic concepts of Physical Chemistry, Inorganic Chemistry and Organic Chemistry relevant to problems in engineering.

1. Electro-chemistry and Buffer **(6 hours)**
- 1.1. Electro-chemical cells
- 1.2. Electrode Potential and Standard Electrode Potential
- 1.3. Measurement of Electrode Potential
- 1.4. Nernst equation
- 1.5. EMF of Cell
- 1.6. Application of Electrochemical and Electrolytic cells
- 1.7. Electrochemical Series and its Application
- 1.8. Buffer: its type and mechanism
- 1.9. Henderson's equation for pH of buffer and related problems
- 1.10. Corrosion and its type
- 1.11. Factors influencing corrosion
- 1.12. Prevention of corrosion

2. Catalyst **(4 hours)**
- 2.1. Introduction
- 2.2. Action of Catalyst (Catalytic Promoters and Catalytic Poisons)
- 2.3. Characteristics of Catalyst
- 2.4. Types of Catalyst
- 2.5. Theories of Catalysis
- 2.6. Industrial Applications of Catalysts

3. Environmental Chemistry **(5 hours)**
- 3.1. Air Pollution
- 3.2. Air Pollutants i) gases SO_x,NO_x,CO,CO_2,O_3 and hydrocarbons ii)particulates dust, smoke and fly ash
- 3.3. Effects of Air Pollutants on human beings and their possible remedies
- 3.4. Ozone depletion and its photochemistry
- 3.5. Water Pollution (Ref of surface water and pound water)
- 3.6. Water Pollutants (Ref of surface water) their adverse effect and remedies
- 3.7. Soil pollution
- 3.8. Pollutants of soil their adverse effects and possible remedies

4. Engineering Polymers **(6 hours)**

4.1. Inorganic polymers
4.2. General properties of inorganic polymers
4.3. Polyphosphazines
4.4. Sulpher Based Polymers
4.5. Chalcogenide Glasses
4.6. Silicones
4.7. Organic Polymers
4.8. Types of Organic Polymers
4.9. Preparation and application of
i) Polyurethane ii) Polystyrene iii) Polyvinylchloride iv) Teflon
v) Nylon 6,6 and vi) Bakelite vii) Epoxy Resin viii) Fiber Reinforced Polymer
4.10. Concept of bio-degradable, non-biodegradable and conducting polymers

5. 3-d Transition elements and their applications **(5 hours)**

5.1. Introduction
5.2. Electronic Configuration
5.3. Variable oxidation states
5.4. Complex formation tendency
5.5. Color formation
5.6. Magnetic properties
5.7. Alloy formation
5.8. Applications of 3-d transition elements

6. Coordination Complexes **(5 hours)**

6.1. Introduction
6.2. Terms used in Coordination Complexes
6.3. Werner's Theory Coordination Complexes
6.4. Sidgwick's model and Sidgwick's effective atomic number rule
6.5. Nomenclature of coordination compounds (Neutral type, simple cation and complex anion and complex cation and simple anion type)
6.6. Valence Bond Theory of Complexes
6.7. Application of valence bond theory in the formation of i) Tetrahedral Complexes
ii) Square planar Complexes and iii) Octahedral Complexes
6.8. Limitations of Valence Bond Theory
6.9. Applications of Coordination Complexes

7. Explosives **(3 hours)**

7.1. Introduction
7.2. Types of explosives: Primary, Low and High explosives
7.3. Preparation and application of TNT, TNG, Nitrocellulose and Plastic explosives

8. Lubricants and Paints **(2 hours)**

8.1. Introduction
8.2. Function of Lubricants
8.3. Classification of Lubricants (Oils, Greases and Solid)
8.4. Paints
8.5. Types of Paint
8.6. Application of Paints

9. Stereochemistry **(4 hours)**

9.1. Introduction
9.2. Geometrical Isomerism (Cis Trans Isomerism) Z and E concept of Geometrical Isomerism
9.3. Optical Isomerism with reference to two asymmetrical carbon center molecules
9.4. Terms Optical activity, Enantiomers, Diastereomers, Meso structures, Racemic mixture and Resolution

10. Reaction Mechanism in Organic reactions **(4 hours)**

10.1. Substitution reaction
10.2. Types of substitution reaction SN^1 and SN^2
10.3. Elimination reaction
10.4. Types of elimination reaction El and E2
10.5. Factors governing SN^1, SN^2, El and E2 reaction mechanism path

References:

1. Jain and Jain, "Engineering Chemistry", Dhanpat Rai Publishing Co.
2. Shashi Chawala, "A Text Book of Engineering Chemistry", Dhanpat Rai Publishing Co.
3. J. D. Lee, "A New Concise Inorganic Chemistry", Wiley India Pvt. Limited.
4. Marron and Prutton, "Principles of Physical Chemistry", S. Macmillan and Co. Ltd.
5. Bahl and Tuli, "Essential of Physical Chemistry", S. Chand and Co. Ltd.
6. Satya Prakash and Tuli, "Advanced Inorganic Chemistry Vol 1 and 2", S. Chand and Co. Ltd
7. Morrison and Boyd, "Organic chemistry", ...
8. Moti Kaji Sthapit, "Selected Topics in Physical Chemistry", Taleju Prakashan, Kathmandu.
9. Peavy, Rowe and Tchobanoglous, "Environmental Engineering", McGraw-Hill, New York.
10. R. K. Sharma, B. Panthi and Y. Gotame, "Textbook of Engineering Chemistry", Athrai Publication.

Practical:

1. Compare the alkalinity of different water samples by double indicator method
2. Determine the temporary and permanent hardness of water by EDTA Complexo-metric method
3. Determine residual and combined chlorine present in the chlorinated sample of water by Iodometric method
4. Prepare organic polymer nylon 6,6/ Bakelite in the laboratory
5. Determine the pH of different sample of buffer solution by universal indicator method
6. Prepare inorganic complex in the laboratory
7. Determine surface tension of the given detergent solution and compare its cleansing
   power with other detergent solutions
8. Construct an electrochemical cell in the laboratory and measure the electrode potential of it
9. Estimate the amount of iron present in the supplied sample of ferrous salt using standard potassium permanganate solution (redox titration)

Evaluation Scheme:

There will be questions covering all the chapters in the syllabus. The evaluation scheme for the question will be as indicated in the table below:

Unit	Chapter	Topics	Marks
1	1 & 7	all	**16**
2	2 & 3	all	**16**
3	4 & 8	all	**16**
4	5 & 6	all	**16**
5	9 & 10	all	**16**
Total			**80**

BASIC ELECTRICAL ENGINEERING
EE 401

Lecture : 3 **Year : I**
Tutorial : 1 **Part : I**
Practical : 3/2

Course Objectives:

To provide the fundamental concept of DC, AC & 3-phase electrical circuits

1. General Electric System **(6 hours)**
- 1.1. Constituent parts of an electrical system (source, load, communication & control)
- 1.2. Current flow in a circuit
- 1.3. Electromotive force and potential difference
- 1.4. Electrical units
- 1.5. Ohm's law
- 1.6. Resistors, resistivity
- 1.7. Temperature rise & temperature coefficient of resistance
- 1.8. Voltage & current sources

2. DC circuits **(4 hours)**
- 2.1. Series circuits
- 2.2. Parallel networks
- 2.3. Krichhhof's laws
- 2.4. Power and energy

3. Network Theorems **(12 hours)**
- 3.1. Application of Krichhof's laws in network solution
  - 3.1.1. Nodal Analysis
  - 3.1.2. Mesh analysis
- 3.2. Star-delta & delta-star transformation
- 3.3. Superposition theorem
- 3.4. Thevninn's theorem
- 3.5. Nortan's theorem
- 3.6. Maximum power transfer theorem
- 3.7. Reciprocity theorem

4. Inductance & Capacitance in electric circuits **(4 hours)**
- 4.1. General concept of capacitance
  - 4.1.1. Charge & voltage
  - 4.1.2. Capacitors in series and parallel
- 4.2. General concept of inductance
  - 4.2.1. Inductive & non-inductive circuits
  - 4.2.2. Inductance in series & parallel

5. Alternating Quantities **(3 hours)**
- 5.1. AC systems
- 5.2. Wave form, terms & definitions
- 5.3. Average and rms values of current & voltage
- 5.4. Phasor representation

6. Single-phase AC Circuits **(6 hours)**
- 6.1. AC in resistive circuits
- 6.2. Current & voltage in an inductive circuits
- 6.3. Current and voltage in an capacitive circuits
- 6.4. Concept of complex impedance and admittance
- 6.5. AC series and parallel circuit
- 6.6. RL, RC and RLC circuit analysis & phasor representation

7. Power in AC Circuits **(4 hours)**
- 7.1. Power in resistive circuits
- 7.2. Power in inductive and capacitive circuits
- 7.3. Power in circuit with resistance and reactance
- 7.4. Active and reactive power
- 7.5. Power factor, its practical importance
- 7.6. Improvement of power factor
- 7.7. Measurement of power in a single-phase AC circuits

8. Three-Phase Circuit Analysis **(6 hours)**
- 8.1. Basic concept & advantage of Three-phase circuit
- 8.2. Phasor representation of star & delta connection
- 8.3. Phase and line quantities
- 8.4. Voltage & current computation in 3-phase **balance & unbalance** circuits
- 8.5. Real and reactive power computation
- 8.6. Measurements of power & power factor in 3-phase system

Practical:

1. Measurement of Voltage, current& power in DC circuit
   Verification of Ohm's Law
   Temperature effects in Resistance
2. Krichoff's Voltage & current Law
   Evaluate power from V & I
   Note loading effects of meter
3. Measurement amplitude, frequency and time with oscilloscope
   Calculate & verify average and rms value
   Examine phase relation in RL & RC circuit
4. Measurements of alternating quantities
   R, RL,RC circuits with AC excitation
   AC power, power factor, VARs, phasor diagrams
5. Three-phase AC circuits
   Measure currents and voltages in three-phase balanced AC circuits
   Prove Y-Δ transformation
   Exercise on phasor diagrams for three-phase circuits
6. Measurement of Voltage, current & power in a three-phase circuit
   Two-wattmeter method of power measurement in R, RL and RC three phase circuits
   Watts ratio curve

References:

1. J. R. Cogdell, " Foundations of Electrical Engineering", Prentice Hall, Englewood Chiffs, New Jersy, 1990.
2. L M. Smith," Haughes Electrical Technology", Addison-Wesley, ISR Rprint,2000

Evaluation Scheme

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Unit	Chapter	Topics	Marks
1	1 & 2	all	**16**
2	3	all	**16**
3	4, 5 & 7	all	**16**
4	6	all	**16**
5	8	all	**16**
Total			**80**

BASIC ELECTRONICS ENGINEERING
EX 402

Lecture : 3 **Year** : I
Tutorial : 1 **Part** : I
Practical : 3/2

Course Objectives:
To understand the electronics elements and their functionality, basic understanding of analog and digital systems and their applications

1. Basic Circuits Concepts **(4 hours)**

1.1 Passive components: Resistance, Inductance, Capacitance; series, parallel combinations; Kirchhoff's law: voltage, current; linearity
1.2 Signal sources: voltage and current sources; nonideal sources; representation under assumption of linearity; controlled sources: VCVS, CCVS, VCCS, CCCS; concept of gain, transconductance, transimpedance.
1.3 Superposition theorem; Thevenin's theorem; Norton's theorem
1.4 Introduction to filter

2. Diodes **(6 hours)**

2.1 Semiconductor diode characteristics
2.2 Modeling the semiconductor diode
2.3 Diode circuits: clipper; clamper circuits
2.4 Zener diode, LED, Photodiode, varacters diode, Tunnel diodes
2.5 DC power supply: rectifier-half wave, full wave (center tapped, bridge), Zener regulated power supply

3. Transistor **(8 hours)**

3.1 BJT configuration and biasing, small and large signal model
3.2 T and μ model
3.3 Concept of differential amplifier using BJT
3.4 BJT switch and logic circuits
3.5 Construction and working principle of MOSFET and CMOS
3.6 MOSFET as logic circuits

4. The Operational Amplifier and Oscillator **(7 hours)**

4.1 Basic model; virtual ground concept; inverting amplifier; non-inverting amplifier; integrator; differentiator, summing amplifier and their applications
4.2 Basic feedback theory; positive and negative feedback; concept of stability; oscillator
4.3 Waveform generator using op-amp for Square wave, Triangular wave Wien bridge oscillator for sinusoidal waveform

5. Communication System **(4 hours)**

- 5.1 Introduction
- 5.2 Wired and wireless communication system
- 5.3 EMW and propagation, antenna, broadcasting and communication
- 5.4 Internet / intranet
- 5.5 Optical fiber

6. Digital Electronics **(11 hours)**

- 6.1 Number systems, Binary arithmetic
- 6.2 Logic gates: OR, NOT, AND NOR, NAND, XOR, XNOR gate; Truth tables
- 6.3 Multiplexers; Demux, Encoder, Decoder
- 6.4 Logic function representation
- 6.5 Combinational circuits: SOP, POS form; K-map;
- 6.6 Latch, flip-flop: S-R flip-flop; JK master slave flip-flop; D-flip flop
- 6.7 Sequential circuits: Generic block diagram; sift registers; counters

7. Application of Electronic System **(5 hours)**

- 7.1 Instrumentation system: Transducer, strain gauge, DMM, Oscilloscope
- 7.2 Regulated power supply
- 7.3 Remote control, character display, clock, counter, measurements, date logging, audio video system

Practical:

1. Familiarization with passive components, function generator and oscilloscope
2. Diode characteristics, rectifiers, Zener diodes
3. Bipolar junction transistor characteristics and single stage amplifier
4. Voltage amplifiers using op-amp, Comparators, Schmitt
5. Wave generators using op-amp
6. Combinational and sequential circuits

References

1. Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" PHI
2. Thomas L. Floyd, "Electronic Devices" Pearson Education, Inc., 2007
3. A.S. Sedra and K.C. Smith, "Microelectronic Circuits", Oxford University Press, 2006

Evaluation Scheme

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Unit	Chapter	Topics	Marks
1	1 & 2	all	**16**
2	3	all	**16**
3	4	all	**16**
4	5 & 7	all	**16**
5	6	all	**16**
Total			**80**