Semester III

Digital Electronics

1.1 Course Number: EIE201
1.2 Contact Hours: 3-0-0 Credits:9
1.3 Semester-offered: 2nd Year –Odd
1.4 Pre-requisite: Fundamental of Electrical and Electronics Engineering
1.5Syllabus Committee Members: Dr. Chinmayee Hazarika, Dr. M. Chakkarapani & Dr. S. K. Verma

2. **Objective:**

i) To present a problem oriented introductory knowledge of Digital circuits and its applications.
ii) To help in understanding for future subjects like microprocessor and embedded systems.

3**. Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction to Digital System**	Conversion of number from one number system to another including decimal points, Binary addition, subtraction, multiplication, division, Binary Coded Decimal (BCD) numbers and their limitations, addition of BCD coded numbers, conversion of BCD to decimal and vice-versa, Excess-3 code, gray code, binary to gray and gray to binary conversion.	7
2	**Logic Gates and Simplification**	Positive and negative logic, pulse waveform, definition, symbols, truth tables, pulsed operations of NOT, OR, AND, NAND, NOR, EX-OR, EX-NOR gates, Sum of products form (minterm), Product of sum form (maxterms), simplification of Boolean expressions with the help of laws of Boolean algebra Karnaugh mapping techniques up to 4 variables and their applications.	7
3	**Combinational Circuits, Decoders, Encoders and their Applications**	Half adder, full adder circuits and their operation, Parallel binary adder, 2-bit binary full adder, symbols and logic diagrams of 2×1 and 4×1 multiplexers. Realization of Boolean expression using multiplexer/ demultiplexers (design of 4×1 mux using 2×1 and1×4 demux using 1×2 demux) Basic Binary decoder, 4-line to 16-line decoder circuit BCD to decimal decoder, BCD to 7-segmentdecoder/driver, LED/LCD display, Encoder, decimal to BCD encoder, decimal to BCD priority encoder, Magnitude comparators.	9
4	**Latches and Flip-flop**	Latches, SR Latch, Flip-flops, difference between latch and flip-flop, Conversion from one flip flop to another. Race around condition, JK flip-flop, master slave and	6

		their operation using waveform and truth tables.	
5	**Sequential circuits: Shift Registers and Counters**	Shift registers functions, serial-in-serial out, serial-in-parallel-out, parallel-in serial-out, parallel-in-parallel out, Universal shift register,4-bit Asynchronous counter, 4-bit Synchronous binary counter, Up/down Asynchronous counters, divided by N-counter MOD-3, MOD-5, Counters, Ring counter, Johnson's Counter, and applications.	9
Total			**38**

4. Readings

4.1 Textbooks:

1. Digital Electronics by KS Jamwal, Dhanpat Rai & Co., New Delhi
2. Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala
3. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi
4. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
5. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi

4.2 Reference Books:

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

5. Outcome of the Course:

1) Use digital electronics in the present contemporary world
2) Design various combinational digital circuits using logic gates
3) Do the analysis and design procedures for synchronous and asynchronous sequential circuits

Analog Electronics

1.1 Course Number: EIE202
1.2 Contact Hours: 3-0-0 Credits: 9
1.3 Semester-offered: 2nd Year –Odd
1.4 Pre-requisite: Fundamental of Electrical and Electronics Engineering
1.5Syllabus Committee Members: Dr. Chinmayee Hazarika, Dr. M. Chakkarapani& Dr. S. K.Verma

2. Objective:

i) To expose the students about semiconductor materials, device, performance characteristics and their application.
ii) To introduce basic principles, operation and applications of the various analog electronic circuits and devices like: BJT, and FETs.
iii) To expose the basic principle of operations and application of various electronic circuits like: Rectifiers, Clippers, Clampers, Filters and Waveform Generators.

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Semiconductor Diode**	PN junction diode, mechanism of current flow in PN junction, Drift and diffusion current, depletion layer, forward and reverse biased PN junction, potential barrier, Concept of junction capacitance in forward and reverse bias condition. V-I characteristics, static and dynamic resistance and their calculation from diode characteristics. Types of diodes, characteristics and applications of zener diodes. Zener and avalanche breakdown.	8
2	**Introduction to Bipolar Transistor**	Bipolar junction transistor: Construction of PNP and NPN transistor, their symbols and mechanism of current flow; Current relations in transistor; concept of leakage current; CB, CE, CC configuration of the transistor; Input and output characteristics in CB and CE configurations; input and output dynamic resistance in CB and CE configurations; Current amplification factors. Comparison of CB CE and CC Configurations; Transistors as an amplifier in CE Configurations.	9
3	**Field Effect Transistors**	Construction, operation and characteristics of FET and its application. Construction, operation and characteristics of MOSFET in depletion and enhancement modes and its applications. CMOS –advantages and applications. Comparison of JFET, MOSFET and BJT.	7

4	**Rectifiers and Switched Mode Power Supplies**	Diode as half wave, full wave and bridge rectifier. PIV, rectification efficiencies and ripple factor calculations, Introduction to filters. Transistor-based voltage regulator: Introduction to shunt and series voltage regulator.	7
5	**RC Circuits**	Response of high pass and low pass RC circuits to sine, step, pulse and square wave inputs, Low-pass, High-pass, Band-stop and Band-pass filters.	7
Total			**38**

4. Readings

4.1 Textbooks:

1. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
2. Electronics Devices and Circuits-I by Naresh Gupta, JyoteshMalhotra and harish C Saini, Eagle Prakashan, Jalandhar
3. Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi.

4.2 Reference Books

1. Basic Electronics and linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. Electronic Components and Materials by SM Dhir, Tata McGraw Hil, New Delhi.
3. Electronic Devices and Circuits by Millman and Halkias; McGraw Hill.
4. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill, New Delhi

5. Outcome of the Course:

After the completion of this course the student will be able to:

1) Demonstrate an understanding about semiconductor materials, device, performance characteristics and their application.

2) Demonstrate the basic principle of operation and applications of the various analog electronic circuits and devices like: BJT, and FETs. and solve the numerical problems related to these circuits.

3)Demonstrate the basic principle of operations and application of various electronic circuits like: Rectifiers, Clippers, Clampers, Filters and Waveform Generators.

Linear Integrated Circuits

1.1 Course Number: EIE203
1.2 Contact Hours: 2-1-0 Credits: 8
1.3 Semester-offered: 2nd Year –Odd
1.4 Pre-requisite: Fundamental of Electrical and Electronics Engineering, Analog Electronics
1.5 Syllabus Committee Members: Dr. Chinmayee Hazarika, Dr. M. Chakkarapani, Dr. S.K. Verma

2. Objective:

i) To establish the basic knowledge of Ideal and Practical Op-Amp, related circuits and their application.
ii) To introduce basic principles, operation and applications of the various Op-Amp circuits like: Convertors, ADC, DAC and Function Generators.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Basics of Operational Amplifiers**	Basic information about op-amps– Ideal Operational Amplifier– General operational amplifier stages and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.	6
2	**Applications of Operational Amplifiers**	Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, Integrator, Differentiator, Instrumentation amplifier, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Active filters.	7
3	**Analog Multiplier and PLL**	Analog Multiplier, their ICs and their applications, Operation of the basic PLL, Closed-loop analysis, Voltage controlled oscillator	6
4	**Analog to Digital and Digital to Analog Conver ters**	Analog and Digital Data Conversions, D/A converter – specifications – weighted resistor type, R-2 Ladder type, Voltage Mode and Current-Mode R – 2R Ladder types – switches for D/A converters high speed sample-and-hold circuits, A/D Converters – specifications – Flash type – Successive Approximation type – Single Slope type – Dual Slope.	7
5	**Waveform Generators and Special Function ICs**	Sine-wave generators, Multi vibrators and Triangular wave generator, Saw-tooth wave generator, IC-L8038 function generator, IC 555, Introduction to IC Voltage regulators– Three terminal fixed and adjustable voltage regulators– IC-723.	7
Total			**33**

4. Readings

4.1 Textbooks:

1. Sergio Franco, 'Design with operational amplifiers and analog integrated circuits', McGraw-Hill, 1997.
2.D. Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2000.

4.2 Reference Books:

1. Gray and Meyer, 'Analysis and Design of Analog Integrated Circuits', Wiley International, 1995.
2. J. Michael Jacob, 'Applications and Design with Analog Integrated Circuits', Prentice Hall of India, 1996.
3. Ramakant A. Gayakwad, 'OP-AMP and Linear IC's', Prentice Hall / Pearson Education, 1994.
4. Taub and Schilling, Digital Integrated Electronics, McGraw-Hill, 1997.
5. William D. Stanely, 'Operational Amplifiers with Linear Integrated Circuits'. Pearson Education, 2004.

5. Outcome of the Course:

After the completion of this course the students will be able to:

1) Demonstrate the basic concepts Ideal and Practical Op-Amp, related circuits and also solve their application related problems.
2) Demonstrate the working principal and application of various Op-Amp circuits like: Convertors, ADC, DAC and Function Generators.

Materials Science and Engineering

1.1 Course Number: ME203
1.2 Contact Hours: 3-0-0 Credits: 9
1.3 Semester-offered: 2nd Year –Odd
1.4 Pre-requisite: Class-XII Physics
1.5 Syllabus Committee Members: Dr. M. Chakkarapani, Dr. S. K. Verma & Dr. Naveen Mani Tripathi

2. Objective:

i) To Understand the classification of materials, bonding and the crystal structure.
ii) To understand the Properties of conducting, insulating, semiconducting, dielectric and semiconductor materials.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Introduction**	Introduction and historical importance of Materials, Classification of Materials, Engineering Materials, Advanced Materials and Future Materials like ceramics, polymers, composites, Dielectric etc. Bravais Lattices, Crystal Structures, Crystalline, Quasi Crystalline and Non-Crystalline Materials, Miller Indices, Miller-Bravais Indices for Planes and Directions of Cubic and Non-Cubic Structures, structure of ceramics, polymers, and composites materials. Classical theory of electrical and thermal conduction in solids, temperature dependence of resistivity, skin effect, Hall effect.	7
2	**Diffusion and Heat treatment**	Phase Diagrams: Phase Rule, Equilibrium Phase Diagrams, Phase Systems - Isomorphous, Eutectic with No and Limited Solid Solubility and Peritectic, Iron-Carbon Phase Diagram, TTT Diagram. Imperfections in Solids and Strengthening Mechanisms: Point Defects, Line Defects and Dislocations, Interfacial Defects and Bulk or Volume Defects, Recovery, Recrystallization and Grain Growth. Alteration of properties by heat treatment, Heat treatment method, Quantification of altered material properties by heat treatments.	8
3	**Mechanical behavior of Metals and Alloys**	Types of Loading, Stress-Strain Curves for Brittle and Ductile Materials, Theoretical and Observed Shear Stress, Critical Resolved Shear Stress, Deformation – Elastic, Anelastic, Plastic and Super Plastic, Yield Criteria,	8

		Macroscopic Aspects of Plastic Deformation, Toughness Measurements by S-S Curve, Impact Testing and Fracture Toughness Testing. Types of Mechanical Loading and Failures: Ductile and Brittle Fracture, Modes of Fracture Toughness, Impact Fracture, Ductile-Brittle Transition, Types of Impact Testing, Fatigue, Crack Initiation and Propagation, Fatigue Testing, Creep, Stages of Creep Curve, Stress and Temperature Effects.	
4	**Dielectric and Magnetic Property of Materials**	Introduction, polarization of dielectric material, dielectric constant of monatomic gases, frequency dependence of permittivity, dielectric losses, frequency and temperature dependence of the dielectric constant, dielectric properties of polymeric system, ionic conductivity in insulators, insulating materials, ferroelectricity, piezoelectricity. Introduction, Classification of magnetic materials, diamagnetism, paramagnetism, ferromagnetism, magnetization curve, the hysteresis loop, factors affecting permeability and hysteresis loss, common magnetic materials, magnetic resonance.	8
5	**Properties of Metals and Semiconductors**	Energy band in Metals, Semiconductors and Insulators, types of semiconductors, Intrinsic and Extrinsic semiconductors, Effect of temperature on the electrical conductivity of metals, insulator and semiconductor, thermal properties, thermal conductivity of metals and semiconductors, factors affecting the resistivity of electrical materials, electrical conductivity of doped materials, thermoelectric effects.	7
Total			**38**

4. Readings

4.1 Textbooks:

1. C.S.Indulkar and S. Thiruvengadam, S., “An Introduction to Electrical Engineering”.
2. P L Kapoor. A Textbook of Electrical and Electronics Engineering Materials: Khanna publishers
3. Kenneth G. Budinski, “Engineering Materials: Prentice Hall of India, New Delhi

5. Outcome of the Course:

After the completion of this course the student will be able to:
1) Describe the fundamentals of material science and concepts of unit cell & crystallography.
2) Classify materials based on their conducting, insulating, semiconducting, dielectric properties.
3) Know the practical uses of various materials in different electrical engineering field.

Instrumentation and Transducers

1.1 Course Number: EIE204
1.2 Contact Hours: 3-0-0 Credits: 9
1.3 Semester-offered: 2nd Year –Odd
1.4 Pre-requisite: Fundamental of Electrical and Electronics Engineering
1.5 Syllabus Committee Members: Dr. Chinmayee Hazarika, Dr. M. Chakkarapani & Dr. S. K. Verma.

2. Objective:

i) To introduce the student to principles and theory of instruments analysis and their operation.
ii) To introduce the student to the techniques of troubleshooting instruments in the electronics laboratory for the safety instruments.
iii) To teach the student to solve problems related to instruments to apply for instrumental analysis.
iv) To understand the active and passive transducers.
v) To understand and describe the operation of variable resistance, variable inductive and capacitive transducers.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Basic Building Blocks of Any Instrumentation Systems**	Scope and necessity of instrumentation, Important process variables and their units, Building blocks of instrumentation system, Measurement, method of measurement, types of instruments. Static and dynamic characteristics of instruments. Errors in measurement, sources of errors, limiting errors and loading effect.	8
2	**Display and Recording Devices**	Operating mechanism in indicators and recording devices, Various indicating. Integrating and recording methods and their combination, Merits and demerits of circular chart and strip chart recorder.	8
3	**Instrument Selection**	Factors affecting instrument selection, accuracy, precision, linearity, resolution, sensitivity, hysteresis, reliability, serviceability, loading effect, range advantage and limitation, cost-effectiveness and availability, Environmental effects, and Calibration tools.	7
4	**Transducers-I**	Definition, working principle, classification (active, passive, primary, secondary, mechanical, electrical, inverse, analog, digital) and selection criteria. Resistive transducer: Principle of operation. Strain gauge, load cell, strain measuring circuit.	8
5	**Transducers-II**	Inductive transducer- working principle and types, LVDT-working, advantages and disadvantages. Capacitive transducer: Principle of operation, linear displacement and	8

		angular displacement measurement, advantages and disadvantages.	
Total			**39**

4. Readings

4.1 Textbooks:

1. Mechanical and Industrial Measurement of by RK Jain, Khanna Publishers, New Delhi
2. Electrical and Electronics Measurement of by AK Shawney, Dhanpat Rai and Company, New Delhi
3. Advanced Instrumentation and Control by MF Kureshi
4. Electrical and Electronics Measurement and Instrumentation by A. K. Shawney, Dhanpat Rai and Co., New Delhi
5. Mechanical and industrial measurement by R.K.Jain, Khanna Publishers, New Delhi

4.2 Reference Books:

1. Industrial Instrumentation by Donald P Eickrman

2.Transducers by Peter Norton

5. Outcome of the Course:

After the completion of this course the student will be able to:

1) Select the required instruments for general application and analysis.
2) Demonstrate the techniques of troubleshooting techniques for instrument safety.
3) Solve problems related to various instruments and their sub elements like: Bridges, and Q-meter etc.
4) Classify different types of transducers and explain its characteristics.
5) Demonstrate the operation of resistive, inductive and capacitive transducers.

Transform Calculus

1.1 Course Number: MA201
1.2 Contact Hours: 3-1-0 Credits:11
1.3 Semester-offered: 2nd Year –Odd
1.4 Pre-requisite: Class 12th level Mathematics
1.5 Syllabus Committee Members: Dr. Rupjit Saikia, Dr. Satish Kumar Tiwari & Dr. M. Chakkarapani

2. Objective:

i) To apply Laplace Transforms to find the solutions of ordinary differential equations.
ii) To apply Fourier Transforms to solve the boundary value problems.
iii) To introduce Z-transform concepts and its applications in solving difference equations.

3. Course Content:

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-Topic	Lectures
1	**Laplace Transforms-I**	Laplace transform, Properties of Laplace transform, Laplace transform of Unit Step functions, Dirac delta function, Laplace transform of derivatives and integrals.	10
2	**Laplace Transforms-II**	Inverse Laplace transform, Convolution Theorem, Laplace transform of Periodic functions, Evaluation of integrals by L.T and Solutions of ODE.	7
3	**Z - Transforms**	Definition of Z-Transform and its properties, Evaluation of Inverse Z- Transform, Convolution theorem and Application to difference equation.	8
4	**Fourier Transforms-I**	Fourier Transform: Fourier Integral formula, Fourier Transform, Fourier sine and cosine transforms. Linearity, Scaling, frequency shifting and time shifting properties.	9
5	**Fourier Transforms-II**	Inverse Fourier Transform, Self-reciprocity of Fourier Transform. Convolution theorem. Application to boundary value problems.	8
Total			**42**

4. Readings

4.1 Textbooks:

1. Grewal. B.S., “Higher Engineering Mathematics”, 42nd Edition, Khanna Publishers, Delhi, 2012.
2. Veerarajan. T., “Transforms and Partial Differential Equations”, Tata McGraw Hill

Education Pvt. Ltd., New Delhi, Second reprint, 2012.
3. Murray R. Spiegel, Schaum's Outline of Laplace Transforms, McGraw Hill, 1965.

4.2 Reference Books:

1. Erwin Kreyszig, “Advanced Engineering Mathematics”, 8th Edition, Wiley India, 2007.
2. Ray Wylie. C and Barrett.L.C, “Advanced Engineering Mathematics” Tata Mc Graw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012.

5. Outcome of the Course:

1) Apply Laplace Transform techniques for solving the different engineering represented by differential equations.
2) Use Fourier Transform for solving different boundary value problems.
3) Apply Z-Transforms for solving the difference equations.

Digital Electronics Laboratory

1.1 Course Number: EIE201L
1.2 Contact Hours: 0-0-2 Credits:2
1.3 Semester-offered: 2nd Year –Odd
1.4 Pre-requisite: NA
1.5 Syllabus Committee Members: Dr. Chinmayee Hazarika, Dr. M. Chakkarapani& Dr. S. K.Verma.

1. Verification of the truth tables of basic logic gates.
2. Verify the NAND and NOR gates as universal logic gates.
3. Design and verification of the truth tables of Half and Full adder circuits.
4. Verification of the truth table of the Multiplexer.
5. Verification of the truth table of the Demultiplexer.
6. Verify the truth table of a J-K flip-flop.
7. Verify the truth table of a T flip-flop and D flip-flop.
8. Verify the Operate the counters.
9. Design of 4-bit shift register (shift right).
10. Design of 4-bit shift register (shift left).

Recommended Books:

1. Digital Electronics and Applications by Malvino leach, Tata McGral Hill, New Delhi
2. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
3. Digital Fundamentals by Thomas Floyds, Universal Book Stall
4. Digital Electronics by RP Jain, Tata McGraw Hill, New Delhi
5. Digital Electronics by KS Jamwal, DhanpatRai& Co., New Delhi
6. Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala
7. Digital Electronics by BR Gupta, DhanpatRai& Co., New Delhi
8. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
9. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi

Analog Electronics Laboratory

1.1 Course Number: EIE202L
1.2 Contact Hours: 0-0-2 Credits: 2
1.3 Semester-offered: 2nd Year –Odd
1.4 Pre-requisite: NA
1.4 Syllabus Committee Members: Dr. Chinmayee Hazarika, Dr. M. Chakkarapani, Dr. S. K.Verma.

1. Study of VI characteristics of zener diode.
2. Half wave and full wave rectifier with and without filters.
3. To plot and study the input and output characteristics of BJT in common emitter configuration.
4. To plot and study the input and output characteristics of BJT in common base configuration.
5. To plot and study the input and output characteristics of BJT in common collector configuration.
6. To obtain DC and AC load line for fixed bias circuit.
7. Study of Positive/negative clippers with and without positive/negative bias.
8. Study of Positive/negative clamper circuits.
9. Study of Feedback amplifier.
10. Study of Voltage regulator.

Recommended books:

1. Basic Electronics and linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
3. Electronic Components and Materials by SM Dhir, Tata McGraw Hil, New Delhi.
4. Electronic Devices and Circuits by Millman and Halkias; McGraw Hill.
5. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill, New Delhi
6. Electronics Devices and Circuits-I by Naresh Gupta, JyoteshMalhotra and harish C Saini, Eagle Prakashan, Jalandhar
7. Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi.

Linear Integrated Circuits Laboratory

1.1 Course Number: EIE203L
1.2 Contact Hours: 0-0-2 Credits: 2
1.3 Semester-offered: 2nd Year –Odd
1.4 Pre-requisite: Fundamental of Electrical and Electronics Engineering, Analog Electronics
1.5Syllabus Committee Members: Dr. Chinmayee Hazarika, Dr. M. Chakkarapani & Dr. S. K. Verma.

1. To design and setup a voltage follower circuit with OPAMP IC 741C and observe the waveforms.
2. To design and setup an inverting amplifier circuit with OP AMP 741C for a gain of 10, plot the waveforms, observe the phase reversal, and measure the gain.
3. To design and setup a non-inverting amplifier circuit with OPAMP IC 741C for a gain of 11, plot the waveform, observe the phase reversal, and measure the gain.
4. To design and setup a summing amplifier circuit with OP AMP 741C for a gain of 2 and verify the output.
5. To design and setup a difference amplifier circuit with OPAMP IC 741C for a gain of 2 and verify the output.
6. To design and setup a zero-crossing detector circuit with OP AMP 741C and plot the waveforms.
7. To design and setup a Schmitt trigger, plot the input-output waveforms and measure VUT and VLT.
8. To design and setup a Differentiator circuit using OP AMP 741C and plot their pulse response.
9. To design and setup an Integrator circuit using OP AMP 741C and plot its pulse response.
10. To design and setup symmetrical and asymmetrical astable multivibrators using Op-Amp 741, plot the waveforms and measure the frequency of oscillation.
11. To design and setup a monostable multivibrator using Op-amp 741 andPlot the waveforms.
12. To Design and setup a RC phase shift oscillator using Op-Amp 741 and (i) Plot the output waveform (ii) Measure the frequency of oscillation
13. To design and setup symmetrical and asymmetrical astable multivibrators using IC 555 and **(**i) Plot the output waveform (ii) Measure the frequency of oscillation
14. To design and setup symmetrical and asymmetrical monostable multivibrators using IC 555 and **(**i) Plot the output waveform (ii) Measure the frequency of oscillation.
15. To set up voltage-controlled oscillator using IC566 and plot the waveforms.

Recommended Books:

1. Sergio Franco, 'Design with operational amplifiers and analog integrated circuits', McGraw-Hill, 1997.
2.D. Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2000.
3. Ramakant A. Gayakwad, 'OP-AMP and Linear IC's', Prentice Hall / Pearson Education, 1994.