ANALOG ELECTRONICS [As per Choice Based Credit System (CBCS) scheme] SEMESTER – III (EC/TC)			
Subject Code	15EC32	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Course objectives: This course will enable students to:

- Recall and explain various BJT parameters, connections and configurations.
- Explain and Demonstrate BJT Amplifier, Hybrid Equivalent and Hybrid Models.
- Recall and Explain construction and characteristics of JFETs and MOSFETs.
- Explain various types of FET biasing, and Demonstrate the use of FET amplifiers.
- Demonstrate and Construct Frequency response of BJT and FET amplifiers at various frequencies.
- Define, Demonstrate and Analyze Power amplifier circuits in different modes of operation.
- Demonstrate and Apply Feedback and Oscillator circuits using FET.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
BJT AC Analysis: BJT AC Analysis: BJT Transistor Modeling, The re transistor model, Common emitter fixed bias, Voltage divider bias, Emitter follower configuration. Darlington connection-DC bias; The Hybrid equivalent model, Approximate Hybrid Equivalent Circuit-Fixed bias, Voltage divider, Emitter follower configuration; Complete Hybrid equivalent model, Hybrid π Model.	**10 Hours**	**L1, L2,L3**

Module -2		
Field Effect Transistors: Construction and Characteristics of JFETs, Transfer Characteristics, Depletion type MOSFET, Enhancement type MOSFET. **FET Amplifiers:** JFET small signal model, Fixed bias configuration, Self bias configuration, Voltage divider configuration, Common Gate configuration. Source-Follower Configuration, Cascade configuration.	**10 Hours**	**L1, L2, L3**
Module -3		
BJT and JFET Frequency Response: Logarithms, Decibels, Low frequency response – BJT Amplifier with RL, Low frequency response-FET Amplifier, Miller effect capacitance, High frequency response – BJT Amplifier, High frequency response-FET Amplifier, Multistage Frequency Effects.	**10 Hours**	**L1, L2, L3**
Module -4		
Feedback and Oscillator Circuits: Feedback concepts, Feedback connection types, Practical feedback circuits, Oscillator operation, FET Phase shift oscillator, Wein bridge oscillator, Tuned Oscillator circuit, Crystal oscillator, UJT construction, UJT Oscillator.	**10 Hours**	**L1,L2, L3, L4**
Module -5		
Power Amplifiers: Definition and amplifier types, Series fed class A amplifier, Transformer coupled class A amplifier, Class B amplifier operation and circuits, Amplifier distortion, Class C and Class D amplifiers. **Voltage regulators:** Discrete transistor voltage regulation - Series and Shunt Voltage regulators.	**10 Hours**	**L1, L2, L3**

Course outcomes:

After studying this course, students will be able to:

- Acquire knowledge of
  - Working principles, characteristics and basic applications of BJT and FET.
  - Single stage, cascaded and feedback amplifier configurations.
  - Frequency response characteristics of BJT and FET.
  - Power amplifier classifications such as Class A, Class B, etc.
- Analyse the performance of
  - FET amplifier in CS configuration.
  - Power Amplifiers and Oscillator circuits.
- Interpretation of performance characteristics of transistors amplifiers, frequency Response and Oscillators.
- Apply the knowledge gained in the design of transistorized circuits, amplifiers and Oscillators.

Graduate Attributes (as per NBA):

- Engineering Knowledge.
- Problem Analysis.
- Design / development of solutions (partly).
- Interpretation of data.

Question paper pattern:

- The question paper will have ten questions.
- **Each full question consists of 16marks.**
- **There will be 2 full questions (with a maximum of four sub questions) from each module.**
- **Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.**

Text Books:

Robert L. Boylestad and Louis Nashelsky, "Electronics devices and Circuit theory", Pearson, 10th Edition, 2012, ISBN: 978-81-317-6459-6.

Reference Books:

1. Adel S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits Theory And Applicatication," 5th Edition ISBN:0198062257
2. Fundamentals of Microelectronics, Behzad Razavi, John Weily ISBN 2013 978-81-265-2307-8
3. J.Millman & C.C.Halkias—Integrated Electronics, 2nd edition, 2010, TMH. ISBN 0-07-462245-5
4. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424.

DIGITAL ELECTRONICS
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – III (EC/TC)

Subject Code	15EC33	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to:

- Describe, Illustrate and Analyze Combinational Logic circuits, Simplification of Algebraic Equations using Karnaugh Maps and Quine McClusky Techniques.
- Define and Describe Decoders, Encoders, Digital multiplexers, Adders and Subtractors, Binary comparators, Latches and Master-Slave Flip-Flops.
- Describe, Demonstrate, Analyze and Design of Mealy and Moore Models, Synchronous Sequential Circuits, State diagrams and Registers and Counters.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module – 1		
Principles of combination logic: Definition of combinational logic, canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3,4,5 variables, Incompletely specified functions(Don't care terms) Simplifying Max term equations, Quine-McCluskey minimization technique, Quine-McCluskey using don't care terms, Reduced prime implicants Tables. **(Text 1, Chapter 3)**	**10 Hours**	**L2, L3**
Module -2		
Analysis and design of combinational logic: General approach to combinational logic design, Decoders, BCD decoders, Encoders, digital multiplexers, Using multiplexers as Boolean function generators, Adders and subtractors, Cascading full adders, Look ahead carry, Binary comparators. **(Text 1, Chapter 4)**	**10 Hours**	**L1, L2, L3**
Module -3		
Flip-Flops: Basic Bistable elements, Latches, Timing considerations, The master-slave flip-flops(pulse-triggered flip-flops): SR flip-flops, JK flip-flops, Edge triggered flip-flops, Characteristic equations. **(Text 2, Chapter 6)**	**10 Hours**	**L1,L2**

Module -4		
Simple Flip-Flops Applications: Registers, binary ripple counters, synchronous binary counters, Counters based on shift registers, Design of a synchronous counters, Design of a synchronous mod-n counter using clocked T , JK , D and SR flip-flops. **(Text 2, Chapter 6)**	**10 Hours**	**L1,L2**
Module -5		
Sequential Circuit Design: Mealy and Moore models, State machine notation , Synchronous Sequential circuit analysis, Construction of state diagrams, counter design. **(Text 1, Chapter 6)**	**10 Hours**	**L2, L3,L4**

Course outcomes:

After studying this course, students will be able to:

- Acquire knowledge of
  - Combinational Logic.
  - Simplification Techniques using Karnaugh Maps, Quine-McClusky Technique.
  - Operation of Decoders, Encoders, Multiplexers, Adders and Subtractors.
  - Working of Latches, Flip-Flops,
  - Designing Registers, Counters.
  - Mealy, Moore Models and State Diagrams
- Analyse the performance of
  - Simplification Techniques using Karnaugh Maps, Quine-McClusky Technique.
  - Synchronous Sequential Circuits.
- Design and Develop Mealy and Moore Models for digital circuits.
- Apply the knowledge gained in the design of Counters and Registers.

Graduate Attributes (as per NBA):

- Engineering Knowledge.
- Problem Analysis.
- Design / development of solutions (partly).
- Interpretation of data.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.

Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Digital Logic Applications and Design, John M Yarbrough, Thomson Learning, 2001. ISBN 981-240-062-1.
2. Donald D. Givone, “Digital Principles and Design”, Mc Graw Hill, 2002. ISBN 978-0-07-052906-9.

Reference Books:

1. D. P. Kothari and J. S Dhillon, “Digital Circuits and Design”, Pearson, 2016, ISBN:9789332543539.
2. Morris Mano, *—Digital design,* Prentice Hall of India, Third Edition.
3. Charles H Roth, Jr., “Fundamentals of logic design”, Cengage Learning.
4. K. A. Navas, “Electronics Lab Manual”, Volume I, PHI, 5th Edition, 2015, ISBN: 9788120351424.

NETWORK ANALYSIS [As per Choice Based Credit System (CBCS) scheme] **SEMESTER – III (EC/TC)**			
Subject Code	15EC34	IA Marks	20
Number	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Course objectives: This course enables students to:

- Describe, Apply and Analyze basic network concepts emphasizing Series and Parallel Combination of Passive Components, Source Transformation and Shifting.
- Describe, Apply and Analyze use of mesh and nodal techniques for Formulating the Transfer Function of Networks.
- Apply and Analyze various network theorems in solving the problems related to Electrical Circuits.
- Describe and Analyze two port networks and methods of analyzing the Electrical Networks.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh.	**10 Hours**	**L1, L2,L3,L4**
Module -2		
Network Theorems: Superposition, Reciprocity, Millman‘s theorems, Thevinin‘s and Norton‘s theorems, Maximum Power transfer theorem and Millers Theorem.	**10 Hours**	**L1, L2, L3,L4**
Module -3		
Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations. **Laplace Transformation & Applications** : Solution of networks, step, ramp and impulse responses, waveform Synthesis.	**10 Hours**	**L1, L2, L3,L4**

Module -4		
Resonant Circuits: Series and parallel resonance, frequency- response of series and Parallel circuits, Q–Factor, Bandwidth.	**10 Hours**	**L1, L2, L3,L4**

Module -5		
Two port network parameters: Definition of z, y, h and transmission parameters, modeling with these parameters, relationship between parameters sets.	**10 Hours**	**L1, L2, L3,L4**

Course outcomes:

Acquire knowledge for solving problems related to

- Series and Parallel combination of Passive Components, Source Transformation and Source Shifting.
- Network Theorems and Electrical laws to reduce circuit complexities and to arrive at feasible solutions.
- Various Two port Parameters and their Relationship for finding Network Solutions.
- Analyze the Performance of various Types of Networks Using different concepts and principles.

Graduate Attributes (as per NBA)

- Engineering Knowledge.
- Problem Analysis.
- Design / development of solutions.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. M.E. Van Valkenberg (2000), “Network analysis”, Prentice Hall of India, 3rd edition, 2000, ISBN: 9780136110958.

2. Roy Choudhury, “Networks and systems”, 2nd edition, New Age International Publications, 2006, ISBN: 9788122427677.

Reference Books:

1. Hayt, Kemmerly and Durbin “Engineering Circuit Analysis”, TMH 7th Edition, 2010.
2. J. David Irwin /R. Mark Nelms, “Basic Engineering Circuit Analysis”, John Wiley, 8th ed, 2006.
3. Charles K Alexander and Mathew N O Sadiku, “ Fundamentals of Electric Circuits”, Tata McGraw-Hill, 3rd Ed, 2009.

ELECTRONIC INSTRUMENTATION

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – III (EC/TC)

Subject Code	15EC35	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to:

- Define and Describe accuracy and precision, types of errors, statistical and probability analysis.
- Describe basic functional concepts of various analog and digital measuring instruments.
- Describe basic concepts of microprocessor based instruments.
- Describe and discuss functioning and types of oscilloscopes and signal generators, AC and DC bridges.
- Recognize and describe significance and working of different types of transducers.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
Measurement and Error: Definitions, Accuracy, Precision, Resolution and Significant Figures, Types of Errors, Measurement error combinations, Basics of Statistical Analysis. **(Text 2)** **Ammeters:** DC Ammeter, Multirange Ammeter, The Ayrton Shunt or Universal Shunt, Requirements of Shunt, Extending of Ammeter Ranges, RF Ammeter (Thermocouple), Limitations of Thermocouple. **(Text 1)** **Voltmeters and Multimeters:** Introduction, Basic Meter as a DC Voltmeter, DC Voltmeter, Multirange Voltmeter, Extending Voltmeter Ranges, Loading, AC Voltmeter using Rectifiers. Transistor Voltmeter, Differential Voltmeter, True RMS Voltmeter, Considerations in Choosing an Analog Voltmeter, Multimeter. **(Text 1)**	**10 Hours**	**L1, L2, L3**
Module -2		
Digital Voltmeters: Introduction, RAMP technique, Dual Slope Integrating Type DVM, Integrating Type DVM, Most Commonly used principles of ADC, Successive Approximations, Continuous Balance DVM, $3\frac{1}{2}$-Digit, Resolution and Sensitivity of Digital Meters, General Specifications of DVM, Microprocessor based Ramp type DVM. **(Text 1)**	**10 Hours**	**L1, L2, L3**

Digital Instruments: Introduction, Digital Multimeters, Digital Frequency Meter, Digital Measurement of Time, Universal Counter, Digital Tachometer, Digital pH Meter, Digital Phase Meter, Digital Capacitance Meter, Microprocessor based Instruments. **(Text 1)**		
Module -3		
Oscilloscopes: Introduction, Basic principles, CRT features, Block diagram of Oscilloscope, Simple CRO, Vertical Amplifier, Horizontal Deflecting System, Sweep or Time Base Generator, Storage Oscilloscope, Digital Readout Oscilloscope, Measurement of Frequency by Lissajous Method, Digital Storage Oscilloscope. **(Text 1)** **Signal Generators:** Introduction, Fixed and Variable AF Oscillator, Standard Signal Generator, Laboratory Type Signal Generator, AF sine and Square Wave Generator, Function Generator, Square and Pulse Generator, Sweep Generator. **(Text 1)**	**10 Hours**	**L1, L2, L3**
Module -4		
Measuring Instruments: Output Power Meters, Field Strength Meter, Stroboscope, Phase Meter, Vector Impedance Meter, Q Meter, Megger, Analog pH Meter. **(Text 1)** **Bridges:** Introduction, Wheatstone's bridge, Kelvin's Bridge; AC bridges, Capacitance Comparison Bridge, Inductance Comparison Bridge, Maxwell's bridge, Wein's bridge, Wagner's earth connection. **(Text 1)**	**10 Hours**	**L1, L2, L3**
Module -5		
Transducers: Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer, Differential output transducers, LVDT, Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Semiconductor photo diode and transistor, Temperature transducers-RTD. **(Text 1)**	**10 Hours**	**L1, L2, L3**

Course outcomes:

After studying this course, students will be able to:

- Acquire knowledge and solve problems related to
  - Accuracy and precision
  - Functioning of various types of analog and digital measuring instruments.
  - Different types of quantization, resolution and sensitivity in digital instruments such as frequency meters, tachometers, pH meters etc.
  - Microprocessor based instrumentation
  - Functioning of various types of Oscilloscopes and signal generators.
  - Different types of transducers in various applications.

- Apply the knowledge of passive component measurement
- Interpretation of performance characteristics of analog and digital measuring instruments.
- Understand the importance of life-long learning in the field of electronic instrumentation.

Graduate Attributes (as per NBA)

- Engineering Knowledge.
- Problem Analysis (partly).
- Life-long learning.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. H. S. Kalsi, "Electronic Instrumentation", McGraw Hill, 3rd Edition, 2012, ISBN:9780070702066.

2. David A. Bell, "Electronic Instrumentation & Measurements", Oxford University Press PHI 2nd Edition, 2006 ISBN 81-203-2360-2.

Reference Books:

1. A. D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measuring Techniques", Pearson, 1st Edition, 2015,ISBN:9789332556065.
2. A. K. Sawhney, "Electronics and Electrical Measurements", Dhanpat Rai &Sons. ISBN -81-7700-016-0

ENGINEERING ELECTROMAGNETICS [As per Choice Based Credit System (CBCS) scheme] SEMESTER – III (EC/TC)			
Subject Code	15EC36	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Course objectives: This course will enable students to:

- Define and Describe Coluomb's law and electric field intensity.
- Define and Explain electric flux density, Gauss's law and divergence.
- Describe energy and potential along with concepts of current and conductors.
- Describe Poisson's and Laplace's Equations, and Uniqueness Theorem.
- Define and Describe basic concepts of Magnetostatics by studying the various laws, Stoke's Theorem and scalar and vector magnetic flux density.
- Explain Magnetic Forces, Materials and Inductance.
- Describe the concepts of time varying fields and Develop Maxwell's equations in Point and Integral Forms.
- Describe and Compare different Types of Wave Propagation.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module - 1		
Coulomb's Law, Electric Field Intensity and Flux density Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge, Electric flux density.	**10 Hours**	**L1, L2**
Module -2		
Gauss's law and Divergence Gauss' law, Divergence. Maxwell's First equation (Electrostactics), Vector Operator ▼ and divergence theorem. **Energy, Potential and Conductors** Energy expended in moving a point charge in an electric field, The line integral, Definition of potential difference and potential, The potential field of point charge, Current and Current density, Continuity of current.	**10 Hours**	**L1, L2**
Module -3		
Poisson's and Laplace's Equations Derivation of Poisson's and Laplace's Equations, Uniqueness theorem, Examples of the solution of Laplace's equation. **Steady Magnetic Field** Biot-Savart Law, Ampere's circuital law, Curl, Stokes' theorem, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic Potentials.	**10 Hours**	**L1, L2**

Module -4		
Magnetic Forces Force on a moving charge, differential current elements, Force between differential current elements. **Magnetic Materials** Magnetisation and permeability, Magnetic boundary conditions, Magnetic circuit, Potential Energy and forces on magnetic materials.	**10 Hours**	**L1, L2**
Module -5		
Time-varying fields and Maxwell's equations Farday's law, displacement current, Maxwell's equations in point form, Maxwell's equations in integral form. **Uniform Plane Wave** Wave propagation in free space and good conductors. Poynting's theorem and wave power, Skin Effect.	**10 Hours**	**L1, L2, L3**

Course outcomes:

After studying this course, students will be able to:

- Acquire knowledge and solve problems related to
  - Basic Concepts of Electric Fields, Magnetic Fields and Electromagnetic Waves.
  - Basic Concepts to Solve Complex Problems in Electric Fields, Magnetic Fields and Electromagnetic Waves.
  - Time-varying fields and Maxwell's equations.
  - Wave propagation in free space and dielectrics.
- Analyze
  - Different Charge and Current Configurations to derive Electromagnetic Field Equations.
  - Poisson's and Laplace's Equations, Uniqueness theorem, and solution of Laplace's equation.
  - Time-varying fields, Maxwell's equations, wave propagation in free space and dielectrics.
- Interpretation of
  - Gradient, Divergence and Curl Operators.
  - Maxwell's Equations in differential and integral forms.
  - Wave propagation in free space and dielectrics.
- Apply the knowledge gained in the design of Electric and Electronic Circuits, Electrical Machines and Antenna's and Communication Systems.

Graduate Attributes (as per NBA)

- Engineering Knowledge
- Problem Analysis
- Design / development of solutions (partly)

Question paper pattern:

- The question paper will have ten questions.
- Each full question consisting of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Book:

W.H. Hayt and J.A. Buck, "Engineering Electromagnetics", 7th Edition, Tata McGraw-Hill, 2009, ISBN-978-0-07-061223-5.

Reference Books:

1. John Krauss and Daniel A Fleisch, " Electromagnetics with applications", Mc Graw-Hill.
2. N. Narayana Rao, "Fundamentals of Electromagnetics for Engineering", Pearson.

ANALOG ELECTRONICS LABORATORY [As per Choice Based Credit System (CBCS) scheme] **SEMESTER – III (EC/TC)**			
Laboratory Code	15ECL37	IA Marks	20
Number of Lecture Hours/Week	01Hr Tutorial (Instructions) + 02 Hours Laboratory	Exam Marks	80
		Exam Hours	03
CREDITS – 02			

Course objectives: This laboratory course enables students to get practical experience in design, assembly, testing and evaluation of

- Rectifiers and Voltage Regulators.
- BJT characteristics and Amplifiers.
- JFET Characteristics and Amplifiers.
- MOSFET Characteristics and Amplifiers
- Power Amplifiers.
- RC-Phase shift, Hartley, Colpitts and Crystal Oscillators.

Laboratory Experiments: **NOTE:** The experiments are to be carried using discrete components only.	**Revised Bloom's Taxonomy (RBT) Level**
1. Design and set up the following rectifiers with and without filters and to determine ripple factor and rectifier efficiency: (a) Full Wave Rectifier (b) Bridge Rectifier	**L1, L2, L3, L4**
2. Conduct experiment to test diode clipping (single/double ended) and clamping circuits (positive/negative).	**L1, L2, L3, L4**
3. Conduct an experiment on Series Voltage Regulator using Zener diode and power transistor to determine line and load regulation characteristics.	**L2, L3, L4**
4. Realize BJT Darlington Emitter follower with and without bootstrapping and determine the gain, input and output impedances.	**L2, L3, L4**
5. Design and set up the BJT common emitter amplifier using voltage divider bias with and without feedback and determine the gain-bandwidth product from its frequency response.	**L2, L3, L4, L5**
6. Plot the transfer and drain characteristics of a JFET and calculate its drain resistance, mutual conductance and amplification factor.	**L1, L2, L3, L4**
7. Design, setup and plot the frequency response of Common Source JFET/MOSFET amplifier and obtain the bandwidth.	**L2, L3, L4, L5**

8. Plot the transfer and drain characteristics of n-channel MOSFET and calculate its parameters, namely; drain resistance, mutual conductance and amplification factor.	**L1, L2, L3, L4**
9. Set-up and study the working of complementary symmetry class B push pull power amplifier and calculate the efficiency.	**L2, L3, L4, L5**
10. Design and set-up the RC-Phase shift Oscillator using FET, and calculate the frequency of output waveform.	**L2, L3, L4, L5**
11. Design and set-up the following tuned oscillator circuits using BJT, and determine the frequency of oscillation. (a) Hartley Oscillator (b) Colpitts Oscillator	**L2, L3, L4, L5**
12. Design and set-up the crystal oscillator and determine the frequency of oscillation.	**L2, L3, L4, L5**

Course outcomes: On the completion of this laboratory course, the students will be able to:

- Design and Test rectifiers, clipping circuits, clamping circuits and voltage regulators.
- Compute the parameters from the characteristics of JFET and MOSFET devices.
- Design, test and evaluate BJT amplifiers in CE configuration.
- Design and Test JFET/MOSFET amplifiers.
- Design and Test a power amplifier.
- Design and Test various types of oscillators.

Graduate Attributes (as per NBA)

- Engineering Knowledge.
- Problem Analysis.
- Design/Development of solutions.

Conduct of Practical Examination:

- All laboratory experiments are to be included for practical examination.
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
- Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

DIGITAL ELECTRONICS LABORATORY [As per Choice Based Credit System (CBCS) scheme] SEMESTER – III (EC/TC)			
Laboratory Code	15ECL38	IA Marks	20
Number of Lecture Hours/Week	01Hr Tutorial (Instructions) + 02 Hours Laboratory	Exam Mark	50
		Exam Hour	03
CREDITS – 02			

Course objectives: This laboratory course enables students to get practical experience in design, realisation and verification of

- Demorgan's Theorem, SOP, POS forms
- Full/Parallel Adders, Subtractors and Magnitude Comparator
- Multiplexer using logic gates
- Demultiplexers and Decoders
- Flip-Flops, Shift registers and Counters

Laboratory Experiments: **NOTE:** Use discrete components to test and verify the logic gates. The IC numbers given are suggestive; any equivalent ICs can be used.	**Revised Bloom's Taxonomy (RBT) Level**
1. Verify (a) Demorgan's Theorem for 2 variables. (b) The sum-of product and product-of-sum expressions using universal gates.	**L1, L2, L3**
2. Design and implement (a) Full Adder using basic logic gates. (b) Full subtractor using basic logic gates.	**L3, L4**
3. Design and implement 4-bit Parallel Adder/ subtractor using IC 7483.	**L3, L4, L5**
4. Design and Implementation of 4-bit Magnitude Comparator using IC 7485.	**L3, L4, L5**
5. Realize (a) 4:1 Multiplexer using gates. (b) 3-variable function using IC 74151(8:1MUX).	**L2, L3, L4**
6. Realize 1:8 Demux and 3:8 Decoder using IC74138.	**L2, L3, L4**
7. Realize the following flip-flops using NAND Gates. (a) Clocked SR Flip-Flop (b) JK Flip-Flop.	**L2, L3**
8. Realize the following shift registers using IC7474 (a) SISO (b) SIPO (c) PISO (d)PIPO.	**L2, L3**
9. Realize the Ring Counter and Johnson Counter using IC7476.	**L2, L3**
10. Realize the Mod-N Counter using IC7490.	**L2, L3**
11. Simulate Full- Adder using simulation tool.	**L2, L3, L4**
12. Simulate Mod-8 Synchronous UP/DOWN Counter using simulation tool.	**L2, L3, L4**

Course outcomes: On the completion of this laboratory course, the students will be able to:

- Demonstrate the truth table of various expressions and combinational circuits using logic gates.
- Design, test and evaluate various combinational circuits such as adders, subtractors, comparators, multiplexers and demultiplexers.
- Construct flips-flops, counters and shift registers.
- Simulate full adder and up/down counters.

Graduate Attributes (as per NBA)

- Engineering Knowledge.
- Problem Analysis.
- Design/Development of solutions.

Conduct of Practical Examination:

- All laboratory experiments are to be included for practical examination.
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
- Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

NOTE:

For experiment 11 and 12 any open source or licensed simulation tool may be used.