FACULTY OF ENGINEERING

Scheme of Instruction & Examination

and

Syllabi

B.E. III-Semester & IV-Semester

of

Four Year Degree Programme

In

Electronics & Communication Engineering

(With effect from the academic year 2017 – 2018)
(As approved in faculty meeting held on 26 July 2017)

Issued by
Dean, Faculty of Engineering
Osmania University, Hyderabad
July 2017

SCHEME OF INSTRUCTION & EXAMINATION
B.E. III – Semester
(ELECTRONICS AND COMMUNICATION ENGINEERING)

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	Pr/ Drg	Contact Hrs/Wk	CIE	SEE	Duration in Hrs	
Theory Courses										
1.	BS 301MT	Engineering Mathematics - III	3	1	-	4	30	70	3	3
2.	ES 965ME	Elements of Mechanical Engineering	3	-	-	3	30	70	3	3
3.	PC 302 EC	Electronic Devices	3	1	-	4	30	70	3	3
4.	PC 303 EC	Switching Theory and Logic Design	3	1	-	4	30	70	3	3
5.	PC 304 EC	Signal Analysis and Transform Techniques	3	1	-	4	30	70	3	3
6.	PC 305 EC	Network Analysis and Synthesis	3	1	-	4	30	70	3	3
Practical / Laboratory Courses										
7.	ES 361 EE	Electrical Engg. Lab	-	-	2	2	25	50	3	1
8.	PC 351 EC	Electronic Devices and Logic Design Lab	-	-	2	2	25	50	3	1
			18	**5**	**4**	**27**	**230**	**520**		**20**

Engineering Service Courses offered to other Departments

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	Pr/ Drg	Contact Hrs/Wk	CIE	SEE	Duration in Hrs	
Theory Courses										
1.	ES 322EC	Electronic Engineering –II (For EEE & EIE)	3	-	-	3	30	70	3	3
2.	ES 934EC	Basic Electronics (For CSE)	3	-	-	3	30	70	3	3
Practical /Laboratory Courses										
3.	ES 362EC	Electronic Engineering Lab (For EEE & EIE)	-	-	2	2	25	50	3	1
4.	ES 955EC	Basic Electronics Lab (For CSE)	-	-	2	2	25	50	3	1

BS: Basic Sciences ES: Engineering Sciences MC: Mandatory Course
PC: Professional Course HS: Humanities and Sciences
L: Lectures T: Tutorials Pr : Practicals Drg: Drawing
CIE: Continuous Internal Evaluation **SEE:** Semester End Examination (Univ. Exam)

Note: 1) Each contact hour is a Clock Hour
2) The practical class can be of two and half hour (clock hours) duration as per the requirement of a particular laboratory.
3) Students admitted into B.E./B.Tech. courses under lateral entry scheme (through ECET) from the academic year 2017-18 should undergo the following bridge course subjects at III Semester (CBCS).
(1) ES 154 CS Computer Programming Lab
(2) MC 156 EG Engineering English Lab

Course Code	Course Title						Core / Elective
BS 301 MT	**Engineering Mathematics – III** (Common to all branches)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	1	-	-	**30**	**70**	**3**

Course Objectives

- To introduce the concept of functions of complex variables and their properties
- To formulate partial differential equations and to introduce a few methods to solve first order linear and non-linear partial differential equations
- To study Fourier series and its applications to partial differential equations

Course Outcomes

- Determine the analyticity of a complex functions and expand functions as Taylor and Laurent series
- Evaluate complex and real integrals using residue theorem
- Expand function as a Fourier series
- Find solutions of first order and second order partial differential equations

UNIT-I

Functions of Complex Variables: Limits and continuity of function, differentiability and analyticity, necessary & sufficient conditions for a function to be analytic, Cauchy-Reimann equations in polar form, harmonic functions, complex integration, Cauchy's integral theorem, extension of Cauchy's integral theorem for multiply connected regions, Cauchy's integral formula, Cauchy's formula for derivatives and their applications.

UNIT - II

Residue Calculus: Power series, Taylor's series, Laurent's series, zeros and singularities, residues, residue theorem, evaluation of real integrals using residue theorem, bilinear transformation, conformal mapping.

UNIT - III

Fourier Series: Fourier series, Fourier series expansions of even and odd functions, convergence of Fourier series, Fourier half range series.

UNIT - IV

Partial Differential Equations: Formation of first and second order partial differential equations, solution of first order equations, Lagrange's equation, Nonlinear first order equations, Charpit's method, higher order linear equations with constant coefficients.

UNIT - V

Fourier Series Applications to Partial Differential Equations: Classification of linear second order partial differential equations, separation of variables method

(Fourier method), Fourier series solution of one dimensional heat and wave equations, Laplace's equation.

Suggested Reading:

1. R.K. Jain, S.R.K Iyengar, **Advanced Engineering Mathematics**, Narosa Publication , 4th Edition, 2014.
2. B.S. Grewal, **Higher Engineering Mathematics**, Khanna Publications , 43rd Edition, 2014.
3. Gupta, Kapoor, **Fundamentals of Mathematical statistics**, Sultan Chand & sons, New Delhi, *2014.*
4. Erwin Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, 2012.
5. James Brown, Ruel Churchill, **Complex variables and Applications**, 9th Edition, 2013.

Course Code	Course Title						Core / Elective
ES965ME	**ELEMENTS OF MECHANICAL ENGINEERING**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	-	-	-	**30**	**70**	**3**

Course Objectives

- To learn certain fundamental topics related to Mechanical Engineering
- To understand basic concepts and applications of thermodynamics
- To understand the working principles of I.C.Engines, Reciprocating Compressors
- To familiarize the design and working principles of transmission systems and various manufacturing processes.

Course Outcomes

- Knowledge to understand the concept of Heat & Energy
- Knowledge of applications of Mechanical Engineering
- Ability to understand Heat Transfer processes
- Knowledge of various manufacturing processes

UNIT-I

Thermodynamics: Concept of system, process and properties, laws of thermodynamics, Second law statements, concept of Heat Engine, Heat pump & refrigerator. Concept of entropy and clausius inequality, steady flow energy equation for an open system.

UNIT-II

I.C.Engines: Working of four stroke and two stroke petrol and diesel engine with P-V diagrams, valve timing diagrams, calculation of Indicated Power, Brake power, Specific fuel consumption, mechanical and thermal efficiencies.

Reciprocating Air Compressors: Working principle of single stage compressor. Work done and efficiency calculations. Effect of clearance volume.

UNIT-III

Heat Transfer: Basic modes of heat transfer, Fourier's law of conduction, Newton's law of cooling, Stefan-Boltzmann law of radiation. One dimensional steady state condition heat transfer through plane walls without heat generation .

Heat exchangers : classification and application of heat exchangers in industry , derivation of LMTD in parallel and counter-flow heat exchangers and problems**.**

UNIT-IV
Power Transmission Elements :

Gears: Definitions and uses of spur, helical & bevel gears. **Gear Trains:** Classifications and simple problems on Simple Compound & Reverted.
Belt drives: Definitions of velocity ratio, creep and slip, derivations on length of open and cross belt, ratio of tensions of flat belt, condition for maximum power transmission for flat belt.

UNIT-V
Basic Manufacturing Processes:

Welding: Definitions and method of soldering, brazing and welding and differences. Brief description of Arc welding and Oxy-Acetylene welding **.**

Casting: Principles and applications of sand casting and die casting. **Forming:** Basic concepts of forming processes: Extrusion, rod/wire drawing and Rolling.

Machining: Working mechanism of Lathe, Milling and grinding machines. Principles of WJM, USM, EDM, LBM and EBM.

Suggested Reading:

1. R.K. Rajput "**Thermal Engineering**", Laxmi Publications, 2005
2. C. Sachdeva "**Fundamentals of Engineering Heat and Mass Transfer**", Willey Eastern Ltd, 2004.
3. P. N. Rao " **Manufacturing Technology**", Vol. 1 & 2, Tata McGraw Hill publishing co, 2010.
4. S. S. Rattan,"**Theory of Machines**", Tata Mc Graw Hill, Tata Mc Grawn Education Pvt. Ltd., New Delhi 2010.
5. PK Mishra, " **Non Conventional Machining**" Narosa Publishing House, New Delhi, 2007.

Course Code	Course Title						Core / Elective
PC302EC	**ELECTRONIC DEVICES**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	1	-	-	**30**	**70**	**3**

Course Objectives:

- Analyze the behavior of Semiconductor diodes in Forward and Reverse bias
- Develop Half wave and Full wave rectifiers with L,C,LC & CLC Filters
- Explain V-I characteristics of Bipolar Junction Transistor (BJT) in CB,CE & CC configurations
- Design Biasing techniques for BJT in Amplifier Applications
- Explore V-I characteristics of FETs and MOSFETs

Course Outcomes

- Explain VI characteristics of Semiconductor diode, BJT, FET and MOSFET
- Design and develop biasing techniques of BJT, FET and MOSFETs
- Calculate ripple factor, efficiency and % regulation of rectifier circuits

UNIT I

Junction Diode : Different types of PN Junction formation techniques, PN Junction Characteristics, biasing- band diagrams and current flow, Diode current equations under forward bias and reverse bias conditions, Junction breakdown in diodes and breakdown voltages, effect of temperature on diode characteristics, Diode as a circuit element, small signal diode models, Junction capacitance under forward bias and reverse bias, Diode switching characteristics, Zener Diodes, Zener voltage regulator and its limitation.

UNIT II

PN Diode Applications: Half wave, Full wave and Bridge rectifiers - their operation, performance characteristics, and analysis; Filters (L, C, LC and CLC filters) used in power supplies and their ripple factor calculations, design of Rectifiers with and without Filters.

Specials Diodes: Elementary treatment on the functioning of Tunnel/Backward, Varactor, Photo, Light Emitting diodes.

UNIT III

Bipolar Junction Transistor : Transistor Junction formation (collector-base, base-emitter Junctions) Transistor biasing-band diagram for NPN and PNP transistors, current components and current flow in BJT, Modes of transistor operation, Early effect, BJT input and output characteristics in CB, CE CC configurations, BJT as an amplifier, BJT biasing techniques, Thermal runway, heat sinks and thermal stabilization, operating point stabilization against temperature and device variations, stability factors, Bias stabilization and compensation techniques, Biasing circuit design.

UNIT IV

Small Signal Transistors equivalent circuits : Small signal low frequency h-parameter model of BJT, Determination of h parameters, analysis of BJT amplifiers using h-

parameter, comparison of CB, CE and CC amplifier configurations, Analysis of BJT amplifier with approximate model. Introduction to low frequency Π and T models
Special Devices: working of UJT, SCR, DIAC, TRIAC and CCD.

UNIT V

Junction Field Effect Transistors (JFET): JFET formation, operation & current flow, pinch-off voltage, V-I characteristics of JFET. JFET biasing-zero current drift biasing, biasing against device variations. Low frequency small signal model of FETs. Analysis of CS, CD and CG amplifiers and their comparison. FET as an amplifier and as a switch. MOSFETs: MOSFETs, Enhancement & Depletion mode MOSFETs, V-I characteristics. MOSFET as resistance, Biasing of MOSFETs, MOSFET as a switch

Suggested Readings:

1. Jacob Millman, Christos C. Halkias, and Satyabrata Jit, **Electronic Devices and Circuits**, 3rd ed., McGraw Hill Education, 2010.
2 David A. Bell, **Electronic Devices and Circuits,** 5th ed., Oxford University Press, 2009.
3 Robert Boylestad and Louis Nashelsky, **Electronic Devices and Circuit Theory,** 11th ed., Pearson India Publications, 2015.
3. S Salivahanan, N Kumar, and A Vallavaraj, **Electronic Devices and Circuits,** 2nd ed., McGraw Hill Education, 2007.
4. J.B.Gupta, **Electronic Devices and Circuits**, SK Kataria and sons, 2013.

Course Code	Course Title						Core / Elective
PC303EC	**SWITCHING THEORY AND LOGIC DESIGN**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	1	-	-	**30**	**70**	**3**

Course Objectives

- To classify different number systems and understand their conversion.
- To analyze the given logic equation and simplify using K-map and Tabular method.
- To study different combinational circuits and implement them with IC's.
- To understand the operation of Flip flop and convert one flip flop to the other.
- To analyze the sequential circuits and design counter for a given sequence.

Course Outcomes

- Represent and convert different number systems
- Simplify Boolean equations using K-map and tabular method.
- Design combinational and sequential logic functions

UNIT I

Number system and Codes: Binary, Octal, Hexa Decimal numbers, Number base conversion, Signed binary numbers: 1's Complement, 2's complement, Types of codes: Weighted, Un Weighted code, BCD, Excess -3 code, Development of Gray code, Parity code

Boolean Algebra: Properties of Boolean algebra, Basic Laws and Theorems, DeMorgan's theorem, Switching Functions, definitions, simplifications, Canonical and Standard Forms, Logic Gates, Functional Properties.

UNIT II

Minimization of Switching Functions: The Map Method (K-Map), 5-variable map, Minimal Functions and their properties. Prime implicants, Essential Prime Implicants, Quine-McCluskey Tabular Method, Don't – care combinations

Logic Design and realization: Design with basic logic gates, Single Output and Multiple Output Combinational Logic Circuit Design, AND-OR, OR-AND and NAND/NOR Realizations, Exclusive-OR and Equivalence Functions.

UNIT III

Combinational Logic Design: Comparators, Multiplexer and its applications, demultiplexers, Code Conversion, Parity generator and checker, Full Adder and Subtractor, Serial adder, Ripple carry adder and Carry-look ahead adder. Two's complement ADD/ Subtractor, Decimal adder;

Implementing Boolean functions with IC 74151, IC 74153.

Contact Networks, Hazards: Static Hazards, Design of Hazard-Free Switching Circuits.

UNIT IV

Combinational Logic Design:

Decoders, priority encoders, BCD to seven segment decoder; ROM as a combination of decoder with encoder; Implementing Boolean functions with IC 74138.

Flip Flops and Conversions: Memory element, S-R, J-K and D Latch operation, Race around condition, Master Slave J-K Flip Flop, Flip-Flop types: S-R, J-K, D, T, State table, State diagram, Characteristic equation and excitation table, Set-up and hold time, Flip flop conversions.

UNIT V

Sequential Logic Design: Classification, state diagram, state table, Asynchronous and Synchronous counters, Skipping state counter, Counter Lock – out, Shift registers and applications. Implementing counters with IC 7476, IC 7474, IC 7490, IC 7492, IC 7493.
Finite state machine – Moore, Melay, Design of a sequence detector.

Suggested Readings:

1. Mano M**., Digital Design,** Prentice Hall, New Delhi, 2008.
2. Zvi Kohavi, **Switching and Finite Automata Theory**, 3rd ed., Cambridge University Press-New Delhi, 2011.
3. R. P Jain**, Modern Digital Electronics,**4th ed., McGraw Hill Education (India) Private Limited, 2003

Course Code	Course Title						Core / Elective
PC304EC	**SIGNAL ANALYSIS AND TRANSFORM TECHNIQUES**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	1	-	-	**30**	**70**	**3**

Course Objectives:

- Analyze basic concepts related to continuous time signals and systems, mathematical representation of periodic signals.
- Familiarize with basic operations on signals and mathematical representation of aperiodic signals using Fourier and Laplace transform.
- Analyze basic concepts related to discrete time signals and systems, mathematical representation discrete time signals.
- Describe the concept of Z- Transform and its properties and illustrate their applications to analyze systems.
- Define convolution, correlation operations on continuous and discrete time signals.

Course Outcomes

- Apply Fourier series, Fourier transform, Laplace transform and Z-transform on signals and systems
- Apply linear convolution and discrete convolution on signals
- Explain discrete Fourier transform on signals and systems

UNIT-I

Definitions and classifications : Classification of continuous time signals. Basic operations on continuous-time signals and classification of continuous-time systems.

Representation of Continuous-time signals: Analogy between vectors and signals, signal representation by a discrete- set of orthogonal functions, orthogonality and completeness.

Fourier series – Trigonometric and Exponential Fourier series, computational formulae, symmetry conditions, the complex Fourier spectrum.

UNIT-II

Fourier Transform (FT): The direct and inverse FT, existence of FT, Properties of FT, The Frequency Spectrum.

Laplace Transform (LT): The direct LT, Region of convergence, existence of LT, properties of LT. The inverse LT, Solution of differential equations, system transfer function.

UNIT III

Z-Transform: The direct Z transform, Region of convergence, Z-plane and S-plane correspondence. Inverse Z transform, Properties of Z-transforms. Solution to linear difference equations, Linear constant coefficient systems, System transfer function

UNIT IV

Linear Convolution of continuous time signals: Graphical interpretation, properties of convolution, Correlation between continuous-time signals: Auto and Cross correlation, graphical interpretation, properties of correlation.

Linear Convolution of discrete time signals: Graphical interpretation, properties of discrete convolution

UNIT V

Discrete-time signals and systems: Sampling, Classification of discrete-time signals, Basic operations on discrete time signals, Classification of discrete time systems, properties of systems.

Representation of Continuous-time signals: Discrete Fourier series, Frequency domain Representation of discrete-time systems and signals. Sampling the z-transform.

Suggested Reading:

1. B.P. Lathi, **Signals, Systems and Communication**, 1st ed., BS Publications, 2011.
2. Alan V. Oppenheim, Alan S. Wilsky and S. Hamid Nawab, **Signals and Systems,** 2nd ed., PHI, 2009.
3. P. Ramakrishna Rao, **Signals and Systems**, 2nd ed., McGraw Hill Education (India) Private Limited, 2013.

Course Code	Course Title						Core / Elective
PC305EC	**NETWORK ANALYSIS AND SYNTHESIS**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	1	-	-	**30**	**70**	**3**

Course Objectives

- To analyze concepts of symmetrical and assymetrical networks.
- To realize the basic T and Pi Networks and Design the various filters.
- To design Attenuators and Equalizers which are employed in the communications systems
- To study the response of the RLC circuits and construct the network.
- To realize the RL and RC networks by synthesis

Course Outcomes

- Design assymetrc, symmetric, filter, attenuator and equalizer networks
- Estimate step and impulse responses of RL and RC networks
- Synthesize RL and RC networks

UNIT-1

Asymmetrical networks, Image and Iterative impedances. Image transfer constant and iterative transfer constant. Symmetrical networks, characteristic impedance and propagation constant. Properties of L, T and Pi section types, Bridged T-Network.

UNIT-II

Filter Characteristics, Constant K-filters – low pass, high pass, band pass, band elimination filter design, m-derived - low pass, high pass, band pass, band elimination filter design and composite filter design. Notch filter.

UNIT-III

Attenuators- Attenuation, Types of Attenuators, Symmetrical T-Type, Pi-Type Attenuator, Symmetrical Bridged T-Type, Lattice-Type Attenuator, Asymmetrical L-Type Attenuator, Symmetrical T-Type Attenuator, Symmetrical Pi-Type Attenuator.
Equalizers- Inverse Impedance, Two-Terminal Equalizers, Four-Terminal Equalizers: Full Series Equalizer, Full Shunt Equalizer, Bridged T Equalizer, Lattice Equalizer.

UNIT-IV

Network Functions: Driving Point Impedance and Admittance, Transfer Impedance and Admittance, Concept of poles and zeroes in a network function, Necessary conditions for driving point functions and transfer functions.
Application of Laplace Transforms: Resistance Element, Inductance Element, Capacitance Element, Step Response of RL, RC and RLC circuits, Impulse Response of Series RL, RC circuits.

UNIT-V

Network synthesis: Hurwitz polynomials, positive real functions, Basic Philosophy of Synthesis, L-C Immitance functions, RC impedance functions and RL admittance functions. RL impedance functions and RC admittance functions. Cauer And Foster's forms of RL impedance and RC admittance

Suggested Reading:

1. M.E. Van Valkenburg, **Network Analysis**, PHI, 3rd edition, 2009.
2. S.P. Ghosh and A.K. Chakraborty**, Network Analysis and Synthesis**, McGraw Hill, 1st edition, 2009.
3. Smarjit Ghosh, **Network Theory : Analysis and Synthesis**, PHI, 2005.

Course Code	Course Title						Core / Elective
ES361EE	**ELECTRICAL ENGINEERING LAB**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	-	-	-	2	**25**	**50**	**1**

Course Objectives

- To learn practical electric AC & DC circuits.
- To learn operation and performance characteristics of electrical machines by conducting various tests practically.

Course Outcomes

- Awareness about various electric safety rules to be followed while working with electrical equipments
- Explore themselves in designing basic electric circuits
- Identify requirements for electric machines for domestic and industrial purpose

List of Experiments:

1. Verification of Kirchhoff's Laws.
2. Verification of Thevinin's and Norton's Theorems.
3. Study of Three-Phase Balanced Circuits.
4. Measurement of Power by Two-Wattmeter Method.
5. Study of Single-Phase RLC Series Circuits.
6. Magnetization Curve of a Separately Excited DC Generator.
7. Load Characteristics of Shunt Generator.
8. Performance Characteristics of Shunt Motor.
9. Speed Control of DC Shunt Motor.
10. O.C and S.C Tests on Single-Phase Transformer.

1 1. Load Test on Single-Phase Transformer.

12. Load Test on Three-Phase Induction Motor.

Note: Atleast ten experiments should be conducted in the Semester..

Course Code	Course Title						Core / Elective
PC351EC	**ELECTRONICS DEVICES AND LOGIC DESIGN LAB**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	0	0	0	2	**25**	**50**	**1**

Course Objectives:

- Plot characteristics of PN diode, BJT in CE, CB and CC configurations and FET in CS and CD configurations.
- Measure parameters of BJT and FET amplifiers.
- Verify the truth tables of combinational and sequential circuits
- Realize combinational and sequential circuits
- Design adder/subtractor

Course Outcomes:

- Conduct experiments, take measurements and analyze the data through hands-on experience in order to demonstrate understanding of the theoretical concepts of **Electronic Devices and Logic Design**, while working in small groups
- Demonstrate writing skills through clear laboratory reports
- Compare the experimental results with those introduced in lecture, draw relevant conclusions and substantiate them satisfactorily

Part A - List of Experiments for Electronic Devices

1. V-I Characteristics of Silicon and Germanium diodes and measurement of static and dynamic resistances
2. Zener diode characteristics and its application as voltage regulator
3. Design, realization and performance evaluation of half wave and full wave rectifiers without filters and with LC & p section filters
4. Plotting the characteristics of BJT in Common Emitter and measurement of h-parameters
5. Plotting the characteristics of JFET in CS configurations and measurement of Transconductance and Drain resistance
6. BJT biasing circuits - Fixed Bias, Collector to Base Bias, Self Bias
7. Common Emitter BJT Amplifier and measurement of Gain, bandwidth, input and output impedances
8. Common Source FET Amplifier and measurement of Gain, bandwidth, input and output impedances

Part B - List of Experiments for Logic Design

9. Verification of truth tables of Logic gates and realization of Binary to Gray and Gray to Binary code converter
10. Realization of Half adder/sub and full adder/sub using universal logic gates.
11. Realization of Full adder/Sub using MUX and Decoder

12. Design 2's complement Adder/subtractor using IC 74283 and verify experimentally.
13. Verification of truth tables of Flip Flops and Flip flop conversions form one form to the other.
14. Realization of 3-bit asynchronous (Ripple) and synchronous counters.

Suggesting Reading:

1. Paul B. Zbar, Albert P. Malvino, **Michael A. Miller, Basic Electronics, A Text - Lab Manual,** 7th Edition, TMH 2001.

Note: A minimum of 6 experiments in part-A and 4 experiments in part-B should be performed

Course Code	Course Title						Core / Elective
ES322EC	**ELECTRONIC ENGINEERING-II**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	-	-	-	**30**	**70**	**3**

Course Objectives

- Identify the components that effect the frequency response and analyze the single and multi stage amplifiers
- Recognize the type of feedback and analyze its effect on amplifier's characteristics
- Calculate the frequency of oscillation for different types of oscillator circuits suited for various applications using Barkhausen's criterion
- Identify the importance of power amplifiers and calculate the efficiencies of class -A, B, AB and examine the effect on distortion. Identify the linear and non-linear wave shaping circuits for various waveforms & analyze their response

.**Course Outcomes**

- Ability to design feedback amplifiers circuit with its applications
- Ability to analyze and design various oscillators
- Ability to design power amplifier for various applications
- Ability to design various filters required
- Ability to design clipping and clamping circuits and various multi-vibrators

UNIT-I

Multistage amplifiers: Classification of amplifiers, Low, mid and high Frequency response of single stage RC coupled amplifiers, step response of amplifier. Cascading of amplifier. Interacting and non interacting amplifiers, effect of cascading on gain and Bandwidth.

UNIT-II

Feedback Amplifiers: The feedback concept, General characteristics of negative feedback amplifier, Effect of negative feedback on input and output impedances, Voltage and current, series and shunt feedbacks. Stability considerations, Local Versus global feedback.

UNIT-III

Oscillators: Barkhausen's Criterion, RC oscillator, Weinbridge, Phase shift, LC Hartley and colpitts oscillator, Crystal controlled oscillator, (Analysis oscillators using BJTs only) frequency stability of oscillator.

UNIT-IV

Large Signal Amplifiers: BJTas large signal audio amplifiers. Classes of operation, Harmonic distortion, power dissipation, efficiency calculations. Design considerations of transformer coupled and transform less push-pull audio power amplifiers under Class-A. Class-B, Class D and Class-AB operations

UNIT-V

Wave-Shaping Circuits: RC Low Pass and High Pass circuit, response to Step, Pulse, Ramp and square wave inputs, Differentiating and Integrating circuits using diode, Clipping Circuits for Single level and two levels, Clamping Circuits.

Suggested Reading:

1. Jacob Millman, Christos Halkias, Satyabrata jit**, Electronics Devices and circuits** 3rd ed.,McGra\v Hill Education (India) Private Limited, 2010.

2. Jacob Millman, Christos Halkias, Chetan Parikh, **Integrated Electronics**, 2nd ed., McGraw Hill Education (India) Private Limited, 2011.

3.Donald L Schilling & Charles Belove, **Electronics Circuits, Discrete & Integrated**, 3rd ed., McGraw Hill Education (India) Private Limited, 2002.

4. Jacob Millman and Herbert Taub, **Pulse, Digital and Switching waveforms**, 3rd ed., McGraw Hill Education (India) Private Limited, 2011.

Course Code	Course Title						Core / Elective
ES934EC	**BASIC ELECTRONICS (For CSE)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	-	-	-	**30**	**70**	**3**

Course Objectives

- Analyze the behavior of semiconductor diodes in Forward and Reverse bias.
- Design of Half wave and Full wave rectifiers with L, C, and LC & CLC Filters.
- Explore V-I characteristics of Bipolar Junction Transistor n CB, CE & CC configurations.
- Explain feedback concept and different oscillators.
- Analyze Digital logic basics and Photo Electric devices.

Course Outcomes

- Explain VI characteristics of Semiconductor diode, BJT, FET and MOSFET
- Calculate ripple factor, efficiency and % regulation of rectifier circuits
- Analyze feedback amplifiers, BJT oscillator circuits, Opamp, basic digital logic gates and data acquisition system

UNIT-I

Semi Conductor Theory: Energy Levels, Intrinsic and Extrinsic Semiconductors, Mobility, Diffusion and Drift current. Hall Effect, Characteristics of P-N Junction diode, Parameters and Applications

Rectifiers: Half wave and Full wave Rectifiers (Bridge, center tapped) with and without filters, ripple regulation and efficiency. Zener diode regulator.

UNIT-II

Bipolar Junction Transistor: BJT, Current components, CE, CB, CC configurations, characteristics, Transistor as amplifier. Analysis of CE, CB, CC Amplifiers (qualitative treatment only).

JFET: Construction and working, parameters, CS, CG, CD Characteristics, CS amplifier.

UNIT-III

Feedback Concepts – Properties of Negative Feedback Amplifiers, Classification, Parameters.

Oscillators – Barkhausen Criterion, LC Type and RC Type Oscillators and Crystal Oscillators. (Qualitative treatment only)

UNIT-IV

Operational Amplifiers – Introduction to OP Amp, characteristics and applications – Inverting and Non-inverting Amplifiers, summer, Integrator, Differentiator, Instrumentation Amplifier.

Digital Systems: Basic Logic Gates, half, Full Adder and Subtractors.

UNIT-V

Data Acquisition systems: Study of transducer (LVDT, Strain gauge, Temperature, Force).

Photo Electric Devices and Industrial Devices: Photo diode, Photo Transistor, LED, LCD, SCR, UJT Construction and Characteristics only.

Display Systems: Constructional details of CRO and Applications.

Suggested Reading:

1. Jocob Millman, Christos C. Halkias and Satyabrata Jit**, Electronics Devices and Circuits,** 3rd edition, McGraw Hill Education(India) Private Limited, 2010.
2. Rama Kanth A. Gaykward, **Op-AMPS and Linear Integrated Circuits** 4th Edition Prentice Hall of India, 2000.
3. M. Morris Mano, **Digital Design**, 3rd Edition, Prentice Hall of India, 2002.
4. William D Cooper, and A.D. Helfrick, **Electronic Measurements and Instrumentations Techniques,** 2nd ed., Prentice Hall of India, 2008.
5. S. Shalivahan, N. Suresh Kumar, A. Vallava Raj, **Electronic Devices and Circuits**, 2nd ed., McGraw Hill Education(India) Private Limited, 2007.

Course Code	Course Title						Core / Elective
ES362EC	**ELECTRONIC ENGINEERING LAB (Common for EEE & EIE)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	-	-	-	2	**25**	**50**	**1**

Course Objectives

- Design basic circuits of rectification with and without filters using diodes
- Design wave shaping circuit using diodes.
- Design single and multistage amplifier circuits.
- Demonstrate negative feedback in amplifier circuits and positive feedback in Oscillators
- Design Class Power Amplifiers.

Course Outcomes

- Calculate ripple factor, efficiency and % regulation of rectifier circuits
- Analyze feedback amplifiers and BJT oscillator circuits
- Design single, multi-stage, wave shaping and power amplifier circuits

List of Experiments:

1. Characteristics of Silicon, Germanium and Zener Diode in forward bias and reverse bias
2. Application of diode as a full wave rectifier with and without filters. Calculation of Ripple factor, voltage regulation and efficiency with various loads
3. Static characteristics of BJT in CE configuration
4. Static characteristics of JFET in CS configuration
5. Frequency response of Single and two stage BJT amplifier in CE configuration
6. Voltage series amplifier without and with feedback
7. Voltage shunt amplifier without and with feedback.
8. Current shunt amplifier without and with feedback.
9. LC Oscillators: Hartley Oscillator and Colpitts Oscillator.
10. RC Phase Oscillator and Wein Bridge Oscillator.
11. Power Amplifier
12. Clipping circuits
13. Clamping Circuits.

NOTE: *Atleast ten experiments should be conducted in the Semester*..

Suggested Reading:

Paul B. Zbar, Albert P. Malvino, Michael A. Miller, **Basic Electronics, A text- Lab Manual,** 7th Edition. Mc- Graw- Hill Higher Education 2001

Course Code	Course Title						Core / Elective
ES955EC	**BASIC ELECTRONICS LAB (For CSE)**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	-	-	-	2	**25**	**50**	**1**

Course Objectives

- Demonstrate the characteristics of Semiconductor diodes
- Realize the filters and Rectifiers.
- Verify the characteristics of different transistor Configurations.
- Design of Biasing Circuits for BJT and FET Amplifiers.
- Design different circuits using Operational Amplifiers.

Course Outcomes

- Plot characteristics of diode and transistor
- Calculate ripple factor, efficiency and % regulation of rectifier circuits
- Analyze feedback amplifiers and BJT oscillator circuits
- Demonstrate Opamp, data converter and strain gauge measurement

List of Experiments:

1. CRO-Applications, Measurements of R, L and C using LCR meter, Colour code method soldering practice.
2. Characteristics of Semiconductors diode (Ge, Si and Zener).
3. Static characteristics of BJT-Common Emitter.
4. Static characteristics of BJT-Common Base.
5. Static characteristics of FET.
6. RC-Phase Shift Oscillator.
7. Hartley and Colpitt's Oscillators.
8. Common Emitter Amplifier.
9. Astable Multivibrator.
10. Full-wave rectifier with and without filters using BJT.
11. Operational Amplifier as Amplifier, Integrator.
12. Strain Gauge Measurement.
13. Analog-to-Digital and Digital to Analog Converters.

NOTE: *Atleast ten experiments should be conducted in the Semester*..

Suggested Reading:

1. David Bell A., **Operational Amplifiers and Linear** ICS, Prentice Hall of India, 2005.
2. David Bell A., **Laboratory for Electronic Devices and Circuits**, Prentice Hall of India, 2007.