

**SCHEME OF INSTRUCTION**  
**BE (ELECTRONICS & COMMUNICATION ENGINEERING)**  
**Proposed from the Academic year 2017-18**

**BE: SEMESTER – III**

S.No.	Course Code	Course Title	L	T	P	Hrs/ Wk	Scheme of Examination		Credits
							CIE	SEE	
1.	PC 301 EC	Electronic Devices	3	1	-	4	30	70	3
2.	PC 302 EC	Switching Theory and Logic Design	3	1	-	4	30	70	3
3.	PC 303 EC	Signal Analysis & Transform Techniques	3	1	-	4	30	70	3
4.	PC 304 EC	Network Analysis and Synthesis	3	1	-	4	30	70	3
5.	BS 305 MT	Mathematics – III	3	1	-	4	30	70	3
6.	MC 306ME	Elements of Mechanical Engineering	3	-	-	3	30	70	3
<b>PRACTICALS</b>									
7.	PC 351 EC	Electronic Devices and Logic design Lab	-	-	2*	2	25	50	1
8.	ES 352 EE	Electrical Engineering Lab	-	-	2*	2	25	50	1
<b>Total</b>			<b>18</b>	<b>5</b>	<b>4</b>	<b>27</b>	<b>230</b>	<b>520</b>	<b>20</b>

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 the particular Laboratory.

Course Code	Course Title				Core/Elective		
<b>PC 301 EC</b>	<b>ELECTRONIC DEVICES</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
<b>NIL</b>	<b>3</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>30</b>	<b>70</b>	<b>3</b>
Purpose: To learn electronic device fundamentals							
Course Objectives: <ul style="list-style-type: none"> <li>• Analyze the behavior of Semiconductor diodes in Forward and Reverse bias</li> <li>• Develop Half wave and Full wave rectifiers with L,C,LC &amp; CLC Filters</li> <li>• Explain V-I characteristics of Bipolar Junction Transistor in CB,CE &amp; CC configurations</li> <li>• Design Biasing techniques for BJT in Amplifier Applications</li> <li>• Explore V-I characteristics of FETs and MOSFETs</li> </ul>							

### 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/Back ward, 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 runaway, 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  $\Pi$  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*, 3<sup>rd</sup> ed., McGraw Hill Education, 2010.
2. David A. Bell, *Electronic Devices and Circuits*, 5<sup>th</sup> ed., Oxford University Press, 2009.
3. Robert Boylestad and Louis Nashelsky, *Electronic Devices and Circuit Theory*, 11<sup>th</sup> ed., Pearson India Publications, 2015.
3. S Salivahanan, N Kumar, and A Vallavaraj, *Electronic Devices and Circuits*, 2<sup>nd</sup> ed., McGraw Hill Education, 2007.
4. J.B.Gupta, *Electronic Devices and Circuits*, SK Kataria and sons, 2013.

*With effect from academic year 2016-2017*

Course Code	Course Title				Core/Elective		
PC 302 EC	SWITCHING THEORY AND LOGIC DESIGN				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	1	-	-	30	70	3
Purpose: To learn digital logic design fundamentals							
Course Objectives: <ul style="list-style-type: none"> <li>➤ To classify different number systems and understand their conversion.</li> <li>➤ To analyze the given logic equation and simplify using K-map and Tabular method.</li> <li>➤ To study different combinational circuits and implement them with IC's.</li> <li>➤ To understand the operation of Flip flop and convert one flip flop to the other.</li> <li>➤ To analyze the sequential circuits and design counter for a given sequence.</li> </ul>							

### 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*, 3<sup>rd</sup> ed., Cambridge University Press-New Delhi, 2011.
3. R. P Jain, *Modern Digital Electronics*, 4<sup>th</sup> ed., McGraw Hill Education (India) Private Limited, 2003

*With effect from academic year 2017-2018*

Course Code	Course Title				Core/Elective		
PC 303 EC	SIGNAL ANALYSIS AND TRANSFORM TECHNIQUES				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	1	-	-	30	70	3
Purpose: To learn signal analysis							
<b>Course Objectives:</b> <ol style="list-style-type: none"> <li>1. Analyze basic concepts related to continuous time signals and systems, mathematical representation of periodic signals.</li> <li>2. Familiarize with basic operations on signals and mathematical representation of aperiodic signals using Fourier and Laplace transform.</li> <li>3. Analyze basic concepts related to discrete time signals and systems, mathematical representation discrete time signals.</li> <li>4. Describe the concept of Z- Transform and its properties and illustrate their applications to analyze systems.</li> <li>5. Define convolution, correlation operations on continuous and discrete time signals.</li> </ol>							

### 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 Readings:**

1. B.P. Lathi, *Signals, Systems and Communication*, 1<sup>st</sup> 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.

*With effect from academic year 2017-2018*

Course Code	Course Title				Core/Elective		
PC 304 EC	<b>NETWORKS ANALYSIS AND SYNTHESIS</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	<b>3</b>	<b>1</b>	-	-	<b>30</b>	<b>70</b>	<b>3</b>
Purpose: To learn analysis and synthesis of networks							
Course Objectives:							
<ol style="list-style-type: none"> <li>1. Analyze concepts of symmetrical and asymmetrical networks.</li> <li>2. To realise the basic T and Pi Networks and Design the various filters.</li> <li>3. To design Attenuators and Equalizers which are employed in the communications systems</li> <li>4. To Study the response of the RLC circuits and construct the network.</li> <li>5. Realize the RL and RC networks by synthesis</li> </ol>							

### 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, 3<sup>rd</sup> edition, 2009.
2. S.P. Ghosh and A.K. Chakraborty, *Network Analysis and Synthesis*, McGraw Hill, 1<sup>st</sup> edition, 2009.
3. Smarjit Ghosh, *Network Theory : Analysis and Synthesis*, PHI, 2005.

Course Code	Course Title				Core/Elective		
BS 305 MT	MATHEMATICS – III				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	1	-	-	30	70	3
Purpose: To learn complex variables and Fourier Series.							
Course Objectives: <ul style="list-style-type: none"> <li>• To introduce the concept of functions of complex variables and their properties</li> <li>• To formulate partial differential equations and to introduce a few methods to solve first order linear and non-linear partial differential equations</li> <li>• To study Fourier series and its applications to partial differential equations</li> </ul>							

### 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, Two dimensional Laplace's equation.

#### Suggested Readings:

1. R.K.Jain & S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publications, 4<sup>th</sup> Edition, 2014.
2. B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43<sup>rd</sup> Edition, 2014.

*With effect from academic year 2017-2018*

3. Gupta & Kapoor, *Fundamentals of Mathematical statistics*, Sultan chand & sons, New Delhi, 2014.
4. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 9<sup>th</sup> Edition, 2012.
5. James Brown and Ruvel Churchill, *Complex variables and Applications*, McGraw-Hill Education, 9<sup>th</sup> Edition, 2013.

## ELECTRONIC DEVICES AND LOGIC DESIGN LAB – III SEM(CBCS)

Course Code	Course Title				Core/Elective		
PC 351 EC	<b>ELECTRONIC DEVICES AND LOGIC DESIGN LAB</b>				<b>Core</b>		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
<b>EDC &amp; STLD</b>	-	-	-	<b>2</b>	<b>25</b>	<b>50</b>	<b>1</b>
Purpose: To acquaint with various Electronic Devices circuits and Logic Design implementation							
<b>Course Outcomes:</b> On successful completion of the course, the student will acquire the ability to: <ol style="list-style-type: none"> <li>1. Conduct experiments, take measurements and analyze the data through hands-on experience in order to demonstrate understanding of the theoretical concepts of <b>Electronic Devices and Logic Design</b>, while working in small groups</li> <li>2. Demonstrate writing skills through clear laboratory reports</li> <li>3. Employ graphics packages for drawing of graphs and use computational software for statistical analysis of data</li> <li>4. Compare the experimental results with those introduced in lecture, draw relevant conclusions and substantiate them satisfactorily</li> <li>5. Transfer group experience to individual performance of experiments and demonstrate effective oral communication skills</li> </ol>							

**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*, 7<sup>th</sup> Edition, TMH 2001.

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