



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**  
**KAKINADA – 533 003, Andhra Pradesh, India**  
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

<b>II Year-I Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
<b>ELECTRONIC DEVICES AND CIRCUITS</b>					

### Course Objectives:

The main objectives of this course are

- To learn and understand the basic concepts of semiconductor physics.
- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
- To learn and understand the purpose of transistor biasing and its significance.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations.

**UNIT-I: Review of Semiconductor Physics:** Hall effect, continuity equation, law of junction, Fermi-Dirac function, Fermi level in intrinsic and extrinsic Semiconductors

**Junction Diode Characteristics :** energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction  
 Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.

### UNIT-II:

**Special Semiconductor Devices:** Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT, PN-PN Diode, SCR. Construction, operation and V-I characteristics.

**Rectifiers and Filters:** Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter (Series inductor), Capacitor filter (Shunt inductor),  $\pi$ - Filter, comparison of various filter circuits in terms of ripple factors.

### UNIT-III: Transistor Characteristics:

**BJT:** Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/reach through, Photo transistor, typical transistor junction voltage values.

**FET:** FET types, construction, operation, characteristics  $\mu$ ,  $g_m$ ,  $r_a$  parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.



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**UNIT- IV: Transistor Biasing and Thermal Stabilization :** Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias,

self bias, Stabilization against variations in  $V_{BE}$ ,  $I_c$ , and  $\beta$ , Stability factors,  $(S, S', S'')$ , Bias compensation, Thermal runaway, Thermal stability.

FET Biasing- methods and stabilization.

**UNIT-V: Small Signal Low Frequency Transistor Amplifier Models:**

**BJT:** Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

**FET:** Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

**Text Books:**

1. Electronic Devices and Circuits-J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition, 2007
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, Fourth Edition, 2016.
3. Electronics devices & circuit theory-Robert L. Boylestad and Loui Nashelsky, Pearson / Prenticehall, tenth edition, 2009

**References:**

1. Integrated Electronics-J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition, 2009
2. 2. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha , Pearson publications
3. 3. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, 4<sup>th</sup> Edition, 2008.

**Course Outcomes:**

At the end of this course the student will be able to

- Apply the basic concepts of semiconductor physics.
- Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
- Know the construction, working principle of rectifiers with and without filters with the relevant expressions and necessary comparisons.
- Understand the construction, principle of operation of transistors, BJT and FET with their  $V-I$  characteristics in different configurations.
- Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
- Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations



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<b>SWITCHING THEORY AND LOGIC DESIGN</b>					

**Course Objectives:**

- To solve a typical number base conversion and analyze new error coding techniques.
- Theorems and functions of Boolean algebra and behavior of logic gates.
- To optimize logic gates for digital circuits using various techniques.
- Boolean function simplification using Karnaugh maps and Quine-McCluskey methods.
- To understand concepts of combinational circuits.
- To develop advanced sequential circuits.

**UNIT – I****REVIEW OF NUMBER SYSTEMS & CODES:**

Representation of numbers of different radix, conversion from one radix to another radix,  $r-1$ 's complements and  $r$ 's complements of signed members. Gray code, 4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

**BOOLEAN THEOREMS AND LOGIC OPERATIONS:**

Boolean theorems, principle of complementation & duality, De-morgan theorems. Logic operations ; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404,7408,7432,7486.

**UNIT – II****MINIMIZATION TECHNIQUES:**

Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method (Quine-mccluskey method) with only four variables and single function.

**COMBINATIONAL LOGIC CIRCUITS DESIGN:**

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-ahead adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

**UNIT – III****COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI & LSI :**

Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits . Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder. . Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154.



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**INTRODUCTION OF PLD's :**

PLDs:PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

**UNIT – IV**

**SEQUENTIAL CIRCUITS I:**

Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip-flop. Design of 5 ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register.

Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121.

**UNIT – V**

**SEQUENTIAL CIRCUITS II :**

Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping).

**TEXT BOOKS:**

1. Switching and finite automata theory Zvi.KOHAVI,Niraj.K.Jha 3<sup>rd</sup> Edition,Cambridge University Press,2009
2. Digital Design by M.Morris Mano,Michael D Ciletti,4<sup>th</sup> edition PHI publication,2008
3. Switching theory and logic design by Hill and Peterson,Mc-Graw Hill TMH edition, 2012.

**REFERENCES:**

1. Fundamentals of Logic Design by Charles H. Roth Jr,Jaico Publishers,2006
2. Digital electronics by R S Sedha.S.Chand & company limited,2010
3. Switching Theory and Logic Design by A. Anand Kumar,PHI Learning pvt ltd,2016.
4. Digital logic applications and design by John M Yarbough, Cengage learning,2006.
5. TTL 74-Series data book.

**Course Outcomes:**

- Classify different number systems and apply to generate various codes.
- Use the concept of Boolean algebra in minimization of switching functions
- Design different types of combinational logic circuits.
- Apply knowledge of flip-flops in designing of Registers and counters
- The operation and design methodology for synchronous sequential circuits and algorithmic state machines.
- Produce innovative designs by modifying the traditional design techniques.



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<b>SIGNALS AND SYSTEMS</b>					

### Course Objectives:

The main objectives of this course are given below:

- To study about signals and systems.
- To analyze the spectral characteristics of signal using Fourier series and Fourier transforms.
- To understand the characteristics of systems.
- To introduce the concept of sampling process
- To know various transform techniques to analyze the signals and systems.

**UNIT- I: INTRODUCTION:** Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function, signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Related problems.

### UNIT-II: FOURIER SERIES AND FOURIER TRANSFORM:

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform, Related problems.

**UNIT-III: ANALYSIS OF LINEAR SYSTEMS:** Introduction, Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

### UNIT-IV:

**CORRELATION:** Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

**SAMPLING THEOREM:** Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling –Aliasing, Introduction to Band Pass sampling, Related problems.



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#### UNIT–V:

**LAPLACE TRANSFORMS:** Introduction, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

**Z–TRANSFORMS:** Concept of Z-Transform of a discrete sequence. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z transforms.

#### TEXTBOOKS:

1. Signals, Systems & Communications-B.P.Lathi, BS Publications, 2003.
2. Signals and Systems-A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn, 1997
3. Signals & Systems-Simon Haykin and Van Veen, Wiley, 2nd Edition, 2007

#### REFERENCEBOOKS:

1. Principles of Linear Systems and Signals–B.P.Lathi, Oxford University Press, 2015
2. Signals and Systems–TK Rawat, Oxford University press, 2011

**Course Outcomes:** At the end of this course the student will be able to:

- Differentiate the various classifications of signals and systems
- Analyze the frequency domain representation of signals using Fourier concepts
- Classify the systems based on their properties and determine the response of LTI Systems.
- Know the sampling process and various types of sampling techniques.
- Apply Laplace and z-transforms to analyze signals and Systems (continuous & discrete).



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<b>RANDOM VARIABLES AND STOCHASTIC PROCESSES</b>					

**Course Objectives:**

- To give students an introduction to elementary probability theory, in preparation to learn the concepts of statistical analysis, random variables and stochastic processes.
- To mathematically model the random phenomena with the help of probability theory Concepts.
- To introduce the important concepts of random variables and stochastic processes.
- To analyze the LTI systems with stationary random process as input.

**UNIT I**

**THE RANDOM VARIABLE:** Introduction, Review of Probability Theory, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

**UNIT II**

**OPERATION ON ONE RANDOM VARIABLE-EXPECTATIONS:** Introduction,

Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable.

**UNIT III**

**MULTIPLE RANDOM VARIABLES:** Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions.

**OPERATIONS ON MULTIPLE RANDOM VARIABLES:** Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

**UNIT IV**

**RANDOM PROCESSES –TEMPORAL CHARACTERISTICS:** The Random Process Concept, Classification of Processes, Deterministic and Non deterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order

Stationary Processes, Second-order and Wide-Sense Stationarity, Nth-order and Strict-Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.



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**UNITY**

**RANDOM PROCESSES -SPECTRAL CHARACTERISTICS:** The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Auto correlation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function.

**LINEAR SYSTEMS WITH RANDOM INPUTS:** Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, Auto correlation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectra of Input and Output, Bandpass, Band-Limited and Narrow band Processes, Properties.

**TEXTBOOKS:**

1. Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4<sup>th</sup> Edition, 2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S. Unnikrishna, PHI, 4<sup>th</sup> Edition, 2002.
3. Probability and Random Processes with Applications to Signal Processing, Henry Stark and John W. Woods, Pearson Education, 3<sup>rd</sup> Edition, 2001.

**REFERENCE BOOKS:**

1. Schaum's Outline of Probability, Random Variables, and Random Processes, 1997.
2. An Introduction to Random Signals and Communication Theory, B.P. Lathi, International Textbook, 1968.
3. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill, 2015.

**Course Outcomes:**

After completion of the course, the student will be able to

- Mathematically model the random phenomena and solve simple probabilistic problems.
- Identify different types of random variables and compute statistical averages of the random variables.
- Characterize the random processes in the time and frequency domains.
- Analyze the LTI systems with random inputs.



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<b>MATHEMATICS-III</b>					

**Course Objectives:**

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

**Course Outcomes:** At the end of the course, the student will be able to

- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to arrange of non-periodic wave forms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

**Unit–I: Vector calculus: (10hrs)**

Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.  
 Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

**Unit–II: Laplace Transforms: (10hrs)**

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

**Unit–III: Fourier series and Fourier Transforms: (10hrs)**

Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.



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**Unit–IV: PDE of first order:**

**(8hrs)**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lag range) equation and nonlinear (standard types) equations.

**UNIT V: Second order PDE and Applications:**

**(10hrs)**

Second order PDE: Solutions of linear partial differential equations with constant coefficient – RHS term of the type  $e^{ax+by}$ ,  $\sin(ax + by)$ ,  $\cos(ax + by)$ ,  $x^m y^n$ .

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

**Text Books:**

1. B.S.Grewal, **Higher Engineering Mathematics, 43<sup>rd</sup> Edition, Khanna Publishers.**
2. **B.V.Ramana**, Higher Engineering Mathematics, 2007 Edition, Tata Mc.Graw Hill Education.

**Reference Books:**

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10<sup>th</sup> Edition, Wiley-India.
2. **Dean. G. Duffy**, Advanced Engineering Mathematics with MATLAB, 3<sup>rd</sup> Edition, CRC Press.
3. **Peter O'Neil**, Advanced Engineering Mathematics, Cengage.
4. **Srimantha Pal, SCBhunia**, Engineering Mathematics, Oxford University Press.



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<b>OOPS THROUGH JAVA LAB</b>					

**Course Outcomes:** At the end of the course, students will be able to

		Knowledge Level (K)#
<b>CO1</b>	Identify classes, objects, members of a class and the relationship among them needed for a specific problem	K3
<b>CO2</b>	Implement programs to distinguish different forms of inheritance	K4
<b>CO3</b>	Create packages and to reuse them	K3
<b>CO4</b>	Develop programs using Exception Handling mechanism	K3
<b>CO5</b>	Develop multithreaded application using synchronization concept.	K6
<b>CO6</b>	Design GUI based applications using Swings and AWT.	K6

**List of programs to be executed:**

1. The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1, 1. Every subsequent value is the sum of the 2 values preceding it. Write a Java Program that uses both recursive and non-recursive functions to print the nth value of the Fibonacci sequence.
2. Write a Java Program that prompts the user for an integer and then prints out all the prime numbers up to that integer.
3. Write a Java program to implement call by value and call by reference mechanisms.
4. Write a Java Program that checks whether a given string is a palindrome or not.
5. Write a Java Program to check the compatibility for multiplication, if compatible multiply two matrices and find its transpose.
6. Write a Java program to implement constructor overloading and method overloading.
7. Write a Java Program that illustrates how runtime polymorphism is achieved.
8. Write a Java Program that illustrates the use of super keyword.
9. Write a Java Program to create and demonstrate packages.
10. Write a Java Program, using String Tokenizer class, which reads a line of integers and then displays each integer and the sum of all integers.
11. Write a Java Program that reads a file name from the user then displays information about whether the file exists, whether the file is readable/ writable, the type of file and the length of the file in bytes and displays the content of the file using FileInputStream class.
12. Write a Java Program that displays the number of characters, lines and words in a text/text file.
13. Write a Java Program to implement a Queue, using user defined Exception Handling (also make use of throw, throws).



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14. Write a Java Program that creates 3 threads by extending Thread class. First thread displays “Good Morning” every 1 sec, the second thread displays “Hello” every 2 seconds and the third displays “Welcome” every 3 seconds. (Repeat the same by implementing Runnable).
15. Write a Java Program demonstrating the lifecycle of a thread.
16. Write an Applet that displays the content of a file.
17. Write a Java Program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, \*, % operations. Add a text field to display the result
18. Write a Java Program for handling mouse events, keyboard events.
19. Write a Java Program that allows user to draw lines, rectangles and ovals.
20. Write a Java Program that lets users create Pie charts. Design your own user interface (with Swings & AWT).



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<b>ELECTRONIC DEVICES AND CIRCUITS LAB</b>					

**Note:** The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

**List of Experiments: (Minimum of Ten Experiments has to be performed)**

1. P-N Junction Diode Characteristics
  - Part A: Germanium Diode (Forward bias & Reverse bias)
  - Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics
3. Part A: V-I Characteristics
  - Part B: Zener Diode as Voltage Regulator
4. Rectifiers (without and with c-filter)
  - Part A: Half-wave Rectifier
  - Part B: Full-wave Rectifier
5. BJT Characteristics (CE Configuration)
  - Part A: Input Characteristics
  - Part B: Output Characteristics
6. FET Characteristics (CS Configuration)
  - Part A: Drain Characteristics
  - Part B: Transfer Characteristics
7. SCR Characteristics
8. UJT Characteristics
9. Transistor Biasing
10. CRO Operation and its Measurements
11. BJT-CE Amplifier
12. Emitter Follower-CC Amplifier
13. FET-CS Amplifier



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**Equipmentrequired:**

1. Regulated Power supplies
2. Analog/Digital Storage Oscillo scopes
3. Analog/Digital Function Generators
4. Digital Multi-meters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analogor Digital)
8. Voltmeters (Analogor Digital)
9. Active & Passive Electronic Components



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<b>SWITCHING THEORY AND LOGIC DESIGN LAB</b>					

**List of Experiments:** (Minimum of Twelve Experiments has to be performed)

1. Verification of truth tables of Logic gates  
Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR  
(vi) Exclusive NOR
2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit
3. Verification of functional table of 3 to 8 line Decoder/De-multiplexer
4. 4 variable logic function verification using 8 to 1 multiplexer.
5. Design full adder circuit and verify its functional table.
6. Verification of functional tables of  
(i) JK Edge triggered Flip-Flop (ii) JK Master Slave Flip-Flop (iii) D Flip-Flop
7. Design a four bit ring counter using D Flip-Flops/JK Flip Flop and verify output
8. Design a four bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output
9. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T- Flip-Flops and Test it with a low frequency clock and Sketch the output wave forms.
11. Design MOD-8 synchronous counter using T Flip-Flop and verify the result and Sketch the output wave forms.
12. (a) Draw the circuit diagram of a single bit comparator and test the output  
(b) Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and test it.

**ADDOn Experiments:**

1. Design BCD Adder Circuit and Test the Same using Relevant IC
2. Design Excess-3 to 9-Complement convertor using only four Full Adders and test the Circuit.
3. Design an Experimental model to demonstrate the operation of 74154 De-Multiplexer using LEDs for outputs.



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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

<b>II Year - I Semester</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>PYTHON LAB (SKILL ORIENTED COURSE)</b>					

**COURSE OUTCOMES:**

At the end of the course the student shall be able to

CO1: Know comprehensions, generators in python. CO2: Know exception handling in python

CO3: Know file I/O

CO4: Understand various data types like lists, tuples, strings etc

CO5: Know the usage of various pre-defined functions on the above data types

**PROGRAMMES:**

1. a. Write a program to get the list of even numbers upto a given number.
- b. Write a program to get the ASCII distance between two characters.
- c. Write a program to get the binary form of a given number.
- d. Write a program to convert base 36 to octal.
2. a. Write a program to get the number of vowels in the input string (No control flow allowed)
- b. Write a program to check whether a given number has even number of 1's in its binary representation (No control flow, thenumbercanbein any base)
- c. Write a program to sort given list of strings in the order of their vowel counts.
3. a. Write a program to return the top 'n' most frequently occurring chars and their respective counts. E.g. aaaaaabbbbcccc, 2 should return [(a5) (b 4)]
- b. Write a program to convert a given number into a given base.

Note: Convert the given number into a string in the given base. Valid base is  $2 \leq \text{base} \leq 36$

Raise exceptions similar to how `int("XX", YY)` does (play in the console to find what errors it raises). Handle negative numbers just like `bin` and `oct` do.

4. a. Write a program to convert a given iterable into a list. (Using iterator)
- b. Write a program to implement user defined `map()` function.

Note: This function implements a map. It goes through the iterable and applies function on each of the elements and returns a list of results.

Don't use a for loop or the built-in map function. Use exceptions, while loop and iter.

- c. Write a program to generate an infinite number of even numbers (Use generator)
- d. Write a program to get a list of even numbers from a given list of numbers. (use only comprehensions)



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5. Write a program to implement round robin. Note: This routine to take a variable number of sequences and return elements from them in round robin till each sequence is exhausted. If one of the input sequences is infinite, this is also infinite.

e.g if input is [1,2,3], (4,5) -> yield 1,4,2,5,3 one after the other. Use exception control and comprehensions to write elegant code.

Hint: This requires you to use understand variable arguments, lists, listcopy, comprehensions, iterators, generators, exception handling, control flow etc.

6. a. Write a program to sort words in a file and put them in another file. The output file should have only lower case words, so any upper case words from source must be lowered.

(Handle exceptions)

b. Write a program return a list in which the duplicates are removed and the items are sorted from a given input list of strings.

7. a. Write a program to test whether given strings are anagrams or not.

b. Write a program to implement left binary search.

Note: Left binary search returns the left most element when a search key repeats.

For eg input is [1,2,3,3,4,4,5] and I search 3, it should return 2 as index 2 is the left most occurrence of 3.

8. a. Write a class Person with attributes name, age, weight (kgs), height (ft) and takes them through the constructor and exposes a method get\_bmi\_result() which returns one of "underweight", "healthy", "obese"

b. Write a program to convert the passed in positive integer number into its prime factorization form.

Note: If number =  $a_1^{p_1} * a_2^{p_2} \dots$  where  $a_1, a_2$  are primes and  $p_1, p_2$  are powers  $\geq 1$

then were present that using lists and tuples in python as [(a1,p1),(a2,p2), ...]

e.g. [(2,1),(5,1)] is the correct prime factorization of 10

**Text book:**

1. Mark Lutz & David Ascher, "Learning Python", O'Reilly Publications, 5<sup>th</sup> edition

**Web reference:**

1. docs.python.com