EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. SECOND YEAR

ELECTRONICS AND COMPUTER ENGINEERING

AS PER

AICTE MODEL CURRICULUM

[Effective from the Session: 2020-21]
## B.TECH. (ELECTRONICS AND COMPUTER ENGINEERING)
### Semester III & IV

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Periods</th>
<th>Evaluation Scheme</th>
<th>End Semester</th>
<th>Total</th>
<th>Credits</th>
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<td>4.</td>
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<td>5.</td>
<td>KCS303</td>
<td>Discrete Structures &amp; Theory of Logic</td>
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<td>KCS353</td>
<td>Discrete Structures &amp; Logic Lab</td>
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<td>9.</td>
<td>KEC354</td>
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<td>11.</td>
<td>MOOCs (Essential for Hons. Degree)</td>
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</table>

**TOTAL** 950 22

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.*
Text /Reference Books:

Course Outcomes: At the end of this course students will demonstrate the ability to:
1. Understand the principles of semiconductor Physics.
2. Understand and utilize the mathematical models of semiconductor junctions.
3. Understand carrier transport in semiconductors and design resistors.
4. Utilize the mathematical models of MOS transistors for circuits and systems.
5. Analyse and find application of special purpose diodes.
<table>
<thead>
<tr>
<th>Unit</th>
<th>Topics</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Logic simplification and combinational logic design: Binary codes, code conversion, review of Boolean algebra and Demorgans theorem, SOP &amp; POS forms, Canonical forms, Karnaugh maps up to 6 variables, tabulation method.</td>
<td>8</td>
</tr>
<tr>
<td>II</td>
<td>MSI devices like comparators, multiplexers, encoder, decoder, driver &amp; multiplexed display, half and full adders, subtractors, serial and parallel adders, BCD adder, barrel shifter and ALU.</td>
<td>8</td>
</tr>
<tr>
<td>III</td>
<td>Sequential logic design: Building blocks like S-R, JK and Master-Slave JK FF, edge triggered FF, state diagram, state reduction, design of sequential circuits, ripple and synchronous counters, shift registers, finite state machines, design of synchronous FSM, algorithmic state machines charts. Designing synchronous circuits like pulse train generator, pseudo random binary sequence generator, clock generation.</td>
<td>8</td>
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<tr>
<td>IV</td>
<td>Logic families and semiconductor memories: TTL NAND gate, specifications, noise margin, propagation delay, fan-in, fan-out, tristate TTL, ECL, CMOS families and their interfacing, memory elements, concept of programmable logic devices like FPGA, logic implementation using programmable devices.</td>
<td>8</td>
</tr>
<tr>
<td>V</td>
<td>Digital-to-Analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. analog-to-digital converters (ADC): single slope, dual slope, successive approximation, flash etc. switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.</td>
<td>8</td>
</tr>
</tbody>
</table>

Text/Reference Books:

Course outcomes: At the end of this course students will demonstrate the ability to:
1. Design and analyze combinational logic circuits.
2. Design and analyze modular combinational circuits with MUX / DEMUX, Decoder & Encoder
3. Design & analyze synchronous sequential logic circuits
4. Analyze various logic families.
5. Design ADC and DAC and implement in amplifier, integrator, etc.
**Course Outcome (CO)**

At the end of course, the student will be able to understand

<table>
<thead>
<tr>
<th>CO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Write an argument using logical notation and determine if the argument is or is not valid.</td>
</tr>
<tr>
<td>2</td>
<td>Understand the basic principles of sets and operations in sets.</td>
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<tr>
<td>3</td>
<td>Demonstrate an understanding of relations and functions and be able to determine their properties.</td>
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<tr>
<td>4</td>
<td>Demonstrate different traversal methods for trees and graphs.</td>
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<tr>
<td>5</td>
<td>Model problems in Computer Science using graphs and trees.</td>
</tr>
</tbody>
</table>

**DETAILED SYLLABUS**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Proposed Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields.</td>
<td>08</td>
</tr>
<tr>
<td>IV</td>
<td>Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. (8) Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.</td>
<td>08</td>
</tr>
</tbody>
</table>

**Text books:**

8. Deo, 7.Narsingh, “Graph Theory With application to Engineering and Computer Science.”, PHI.
SUGGESTIVE LIST OF EXPERIMENTS

1. Study of Lab Equipment and Components: CRO, multimeter, and function generator, power supply- active, passive components and bread board.

2. P-N Junction diode: Characteristics of PN junction diode - static and dynamic resistance measurement from graph.


4. Characteristics of Zener diode: V-I characteristics of Zener diode, graphical measurement of forward and reverse resistance.

5. Characteristics of Photo diode: V-I characteristics of photo diode, graphical measurement of forward and reverse resistance.


8. Characteristic of BJT: BJT in CE configuration- graphical measurement of h-parameters from input and output characteristics. Measurement of Av, Al, Ro and Ri of CE amplifier with potential divider biasing.

9. Field Effect Transistors: Single stage common source FET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.

10. Metal Oxide Semiconductor Field Effect Transistors: Single stage MOSFET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.

11. Simulation of amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

Course outcomes: At the end of this course students will demonstrate the ability to:

1. Understand working of basic electronics lab equipment.

2. Understand working of PN junction diode and its applications.

3. Understand characteristics of Zener diode.

4. Design a voltage regulator using Zener diode.

5. Understand working of BJT, FET, MOSFET and apply the concept in designing of amplifiers.
SUGGESTIVE LIST OF EXPERIMENTS
1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.

Course outcomes: At the end of this course students will demonstrate the ability to:
1. Design and analyze combinational logic circuits.
2. Design & analyze modular combinational circuits with MUX/DEMUX, decoder, encoder.
3. Design & analyze synchronous sequential logic circuits.
4. Design & build mini project using digital ICs.
Discrete Structure & Logic Lab (KCS353)

Programming Language/Tool Used: C and Mapple

1. Write a program in C to create two sets and perform the Union operation on sets.
2. Write a program in C to create two sets and perform the Intersection operation on sets.
3. Write a program in C to create two sets and perform the Difference operation on sets.
4. Write a program in C to create two sets and perform the Symmetric Difference operation.
5. Write a program in C to perform the Power Set operation on a set.
6. Write a program in C to Display the Boolean Truth Table for AND, OR, NOT.
7. Write a C Program to find Cartesian Product of two sets
8. Write a program in C for minimum cost spanning tree.
9. Write a program in C for finding shortest path in a Graph

Note: Understanding of mathematical computation software Mapple to experiment the followings (Exp. 10 to 25):

10. Working of Computation software
11. Discover a closed formula for a given recursive sequence vice-versa
12. Recursion and Induction
13. Practice of various set operations
14. Counting
15. Combinatorial equivalence
16. Permutations and combinations
17. Difference between structures, permutations and sets
18. Implementation of a recursive counting technique
19. The Birthday problem
20. Poker Hands problem
22. Baseball: Binomial Probability
23. Expected Value Problems
24. Basketball: One and One
25. Binary Relations: Influence
Write C Programs to illustrate the concept of the following:

2. Sorting Algorithms-Recursive.
4. Implementation of Stack using Array.
5. Implementation of Queue using Array.
7. Implementation of Stack using Linked List.
8. Implementation of Queue using Linked List.
10. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
11. Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.
Semester-IV

<table>
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<tr>
<th>KEC403</th>
<th>Signal System</th>
<th>3L:1T:0P</th>
<th>4 Credits</th>
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<tbody>
<tr>
<td>Unit</td>
<td>Topics</td>
<td></td>
<td>Lectures</td>
</tr>
<tr>
<td>I</td>
<td>Signals and systems as seen in everyday life, and in various branches of engineering and science, energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals, system properties: linearity, additivity and homogeneity, shift-invariance, causality, stability, realizability.</td>
<td></td>
<td>8</td>
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<tr>
<td>II</td>
<td>Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, characterization of causality and stability of linear shift invariant systems, system representation through differential equations and difference equations, Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response</td>
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<tr>
<td>III</td>
<td>Fourier series representation, Fourier transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality, Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier transform (DFT), Parseval's Theorem, the idea of signal space and orthogonal bases, the Laplace transform, notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behaviour.</td>
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<tr>
<td>IV</td>
<td>The z-Transform for discrete time signals and systems-Eigen functions, region of convergence, z-domain analysis.</td>
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<tr>
<td>V</td>
<td>The sampling theorem and its implications- spectra of sampled signals, reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on, aliasing and its effects, relation between continuous and discrete time systems.</td>
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</table>

Text/Reference books:
<table>
<thead>
<tr>
<th>Unit</th>
<th>Topics</th>
<th>Lectures</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>Diode circuits, amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.</td>
<td>8</td>
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<tr>
<td>II</td>
<td>High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier, various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues, feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.</td>
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<tr>
<td>III</td>
<td>Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators.</td>
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<tr>
<td>IV</td>
<td>Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load, differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR, Op-Amp design: Design of differential amplifier for a given specification, design of gain stages and output stages, compensation.</td>
<td>8</td>
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<tr>
<td>V</td>
<td>Op-Amp applications: Review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications, active filters: Low pass, high pass, band pass and band stop, design guidelines.</td>
<td>8</td>
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</table>

Text/Reference Books:

Course Outcomes: At the end of this course students will demonstrate the ability to:
1. Understand the characteristics of diodes and transistors.
2. Design and analyze various rectifier and amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
5. Design LPF, HPF, BPF, BSF.
<table>
<thead>
<tr>
<th>KCS401</th>
<th>Operating systems</th>
<th>3L:0T:0P</th>
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**Course Outcome (CO)**

<table>
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<tr>
<th>CO 1</th>
<th>Understand the structure and functions of OS</th>
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<tr>
<td>CO 2</td>
<td>Learn about Processes, Threads and Scheduling algorithms.</td>
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<tr>
<td>CO 3</td>
<td>Understand the principles of concurrency and Deadlocks</td>
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<td>CO 4</td>
<td>Learn various memory management scheme</td>
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<tr>
<td>CO 5</td>
<td>Study I/O management and File systems.</td>
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</table>

**DETAILED SYLLABUS**

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<tr>
<th>Unit</th>
<th>Topic</th>
<th>Proposed Lecture</th>
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</thead>
<tbody>
<tr>
<td>II</td>
<td>Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker’s solution, Peterson’s solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.</td>
<td>08</td>
</tr>
<tr>
<td>IV</td>
<td>Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.</td>
<td>08</td>
</tr>
<tr>
<td>V</td>
<td>I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.</td>
<td>08</td>
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</tbody>
</table>

**Text books:**

3. Harvey M Dietel, “An Introduction to Operating System”, Pearson Education
SUGGESTIVE LIST OF EXPERIMENTS

1. Characteristic of BJT: Study of BJT in various configurations (such as CE/CS, CB/CG, CC/CD).
2. BJT in CE configuration: Graphical measurement of h-parameters from input and output characteristics, measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
4. Feedback topologies: Study of voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc.
7. Field effect transistors: Single stage common source FET amplifier –plot of gain in dB vs frequency, measurement of bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
8. Oscillators: Study of sinusoidal oscillators- RC oscillators (phase shift, Wien bridge etc.).
9. Study of LC oscillators (Hartley, Colpitt, Clapp etc.).
10. Study of non-sinusoidal oscillators.
11. Simulation of amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.
12. ADC/DAC: Design and study of Analog to Digital Converter.

Course Outcome: At the end of this course students will demonstrate the ability to:
1. Understand the characteristics of transistors.
2. Design and analyze various configurations of amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
5. Design ADC and DAC.
SUGGESTIVE LIST OF EXPERIMENTS

1. Introduction to MATLAB
   a. To define and use variables and functions in MATLAB.
   b. To define and use Vectors and Matrices in MATLAB.
   c. To study various MATLAB arithmetic operators and mathematical functions.
   d. To create and use m-files.

2. Basic plotting of signals
   a. To study various MATLAB commands for creating two and three dimensional plots.
   b. Write a MATLAB program to plot the following continuous time and discrete time signals.
      i. Step Function
      ii. Impulse Function
      iii. Exponential Function
      iv. Ramp Function
      v. Sine Function

3. Time and Amplitude transformations
   Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.

4. Convolution of given signals
   Write a MATLAB program to obtain linear convolution of the given sequences.

5. Autocorrelation and Cross-correlation
   a. Write a MATLAB program to compute autocorrelation of a sequence x(n) and verify the property.
   b. Write a MATLAB program to compute cross-correlation of sequences x(n) and y(n) and verify the property.

6. Fourier Series and Gibbs Phenomenon
   a. To calculate Fourier series coefficients associated with Square Wave.
   b. To Sum the first 10 terms and plot the Fourier series as a function of time.
   c. To Sum the first 50 terms and plot the Fourier series as a function of time.

7. Calculating transforms using MATLAB
   a. Calculate and plot Fourier transform of a given signal.
   b. Calculate and plot Z-transform of a given signal.

8. Impulse response and Step response of a given system
   a. Write a MATLAB program to find the impulse response and step response of a system from its difference equation.
   b. Compute and plot the response of a given system to a given input.

9. Pole-zero diagram and bode diagram
   a. Write a MATLAB program to find pole-zero diagram, bode diagram of a given system from the given system function.
   b. Write a MATLAB program to find, bode diagram of a given system from the given system function.
10. Frequency response of a system
   Write a MATLAB program to plot magnitude and phase response of a given system.

11. Checking linearity/non-linearity of a system using SIMULINK
   a. Build a system that amplifies a sine wave by a factor of two.
   b. Test the linearity of this system using SIMULINK.

Course outcomes: At the end of this course students will demonstrate the ability to:
   1. Understand the basics operation of MATLAB.
   2. Analysis the time domain and frequency domain signals.
   3. Implement the concept of Fourier series and Fourier transforms.
   4. Find the stability of system using pole-zero diagrams and bode diagram.
   5. Design frequency response of the system.
1. Study of hardware and software requirements of different operating systems (UNIX, LINUX, WINDOWS XP, WINDOWS 7/8)
2. Execute various UNIX system calls for
   i. Process management
   ii. File management
   iii. Input/output Systems calls
3. Implement CPU Scheduling Policies:
   i. SJF
   ii. Priority iii. FCFS
   iv. Multi-level Queue
4. Implement file storage allocation technique:
   i. Contiguous(using array)
   ii. Linked –list(using linked-list)
   iii. Indirect allocation (indexing)
5. Implementation of contiguous allocation techniques:
   i. Worst-Fit
   ii. Best- Fit iii. First- Fit
6. Calculation of external and internal fragmentation
   i. Free space list of blocks from system
   ii. List process file from the system
7. Implementation of compaction for the continually changing memory layout and calculate total movement of data
8. Implementation of resource allocation graph RAG)
9. Implementation of Banker’s algorithm
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solution for Bounded Buffer (producer-consumer) problem using inter process communication techniques-Semaphores
12. Implement the solutions for Readers-Writers problem using inter process communication technique -Semaphore