#  **23EC21P2-DIGITAL DESIGN & SIGNAL SIMULATION LAB**

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| **CourseCategory:** | ProfessionalCore | **Credits:** | 1.5 |
| **CourseType:** | Practical | **Lecture-Tutorial-****Practical:** | 0-0-3 |
| **Prerequisite:** | Digital Circuit Design, Signals & Systems , Stochastic Processes. | **Sessional Evaluation:Univ.ExamEvaluation:****TotalMarks:** | 3070100 |
| **CourseObjectives** | 1. Verify the truth tables of various logic circuits.
2. Design sequential /combinational circuits using Hardware Description Language and verify their functionality.
3. Simulate various Signals and Systems through MATLAB
4. Analyze the output of a system when it is excited by different types of deterministic and random signals.
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| **CourseOutcomes** | Upon successful completion of the course,the students will be able to: |
| CO1 | Verify the truth tables of various logic circuits. (L2) |
| CO2 | Understand how to simulate different types of signals and system responses.(L2) |
| CO3 | Design sequential and combinational logic circuits and verify their functionality.(L3,L4) |
| CO4 | Analyze the response of different systems when they are excited by different signals and plot power spectral densityofsignals.(L4) |
| CO5 | Generate different random signals for the given specifications.(L5) |
| **CourseContent** | **PARTA**1. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.
2. Verification of functional table of 3 to 8- line Decoder / De-multiplexer
3. 4 variable logic function verification using 8to1 multiplexer.
4. Design full adder circuit and verify its functional table.
5. Design a four-bi tring counter using DFlip–Flops /JK FlipFlop and verify output.
6. Design a four-bit Johnson’s counter using DFlip-Flops /JK FlipFlops and verify output
7. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
8. 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 waveforms.
9. Design MOD–8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms.
10. (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. |

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|  | **PARTB**1. Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse ,Unit Step, Square ,Sawtooth, Triangular ,Sinusoidal , Ramp, Sinc function.
2. Perform operations on Signals and Sequences :Addition ,Multiplication ,Scaling ,Shifting ,Folding, Computation of Energy and Average Power.
3. Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings- Plot the discrete spectrum of the signal.
4. Write a program to find Fourier transform of a given signal .Plot its amplitude and phase spectrum.
5. Write a program to convolve two discrete time sequences.Plot all the sequences.
6. Write a program to find auto correlation and cross correlation of given sequences.
7. Write a program to verify Linearity and Time Invariance properties of a given Continuous System.
8. Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquistrate, aliasing occurs while reconstructing the signal.
9. Write a program to find magnitude and phase response of first order low pass and high pass filter.Plot the response sin logarithmic scale.
10. Write a program to generate Complex Gaussian noise and find its mean,variance, Probability Density Function (PDF) and Power Spectral Density(PSD).
11. Generate a Random data (with bipolar) for a given data rate (say10kbps). Plot the same for a time period of 0.2sec.
12. To plot pole-zero diagram in S-plane of given signal/sequence and verify its stability.

**References Books:**1. M.MorrisMano,“DigitalDesign”,3rdEdition,PHI
2. StephenJ.Chapman,“MATLABProgrammingforEngineers”,Cengage,November2012.
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| Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low) |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | - | - | 3 | - | - | - | 2 | - | - | - | 3 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 3 | - | - | - | 2 | - | - | - | 3 | 3 |
| CO5 | 3 | 3 | - | - | 3 | - | - | - | 2 | - | - | - | 3 | 3 |