# **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:** | 30  70  100 |
| **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. | | | |
| **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 |