Program : **Diploma in Electronics Engineering / Electronics & Communication Engineering / Biomedical Engineering**	
Course Code : **6047**	Course Title: **Simulation Lab with Numerical Software**
Semester : **6**	Credits: **1.5**
Course Category: **Program Core**	
Periods per week: **3 (L:0, T:0, P:3)**	Periods per semester:**45**

Course Objectives:

- To simulate and test mathematical and functional aspects of electronics, analog and digital communication schemes and digital electronic circuits using the available numerical computing software. (eg: MATLAB/SIMULINK, SCILAB/XCOS, GNU OCTAVE)

Course Prerequisites:

Topic	Course code	Course name	Semester
Working of transistor and its characteristics		Electronic Circuits Lab	3
Combinational logic circuits		Digital Electronics Lab	3
Various analog modulation schemes		Electronics Communication Lab	4
Digital modulation schemes		Digital Communication Lab	5

Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive level
CO1	Develop programs to perform basic matrix operations, solve equations and plot basic signals	9	Applying
CO2	Develop simulations to demonstrate basic electronic circuits and study their characteristics	9	Applying
CO3	Develop simulation models to illustrate analog and pulse modulation schemes	9	Applying
CO4	Develop simulation models to implement various combinational logic circuits	12	Applying
	Lab Exam	6	

CO-PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3			3			
CO2	3	3	3	3			
CO3	3	3	3	3			
CO4	3	3	3	3			

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Name of Experiment	Duration (Hours)	Cognitive Level
CO1	**Develop programs to perform basic matrix operations, solve equations and plot basic signals**		
M1.01	Perform basic matrix operations – addition, subtraction, multiplication, division and inverse(Verify mathematically)	3	Applying
M1.02	Solution of linear constant coefficient differential equation(Verify mathematically)	1	Applying
M1.03	Determine eigen values and eigen vectors of a square matrix(Verify mathematically)	1	Applying
M1.04	Determine roots of a polynomial (Verify mathematically)	1	Applying
M1.05	Generation of various signals and sequences (Periodic and Aperiodic), such as Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp signal	1.5	Applying
M1.06	Plot different types of plots 3D, surface plot, polar plot	1.5	Applying
CO2	**Develop simulations to demonstrate basic electronic circuits and study their characteristics**		
M2.01	Plot input output characteristics of diode.	1.5	Applying
M2.02	Plot input output characteristics of npn transistor.	1.5	Applying
M2.03	Plot input output characteristics of MOSFET.	1.5	Applying
M2.04	Simulate single Phase Full Wave Diode Bridge Rectifier with LC Filter	1.5	Applying

M2.05	Solve node, mesh and loop equations of simple electrical/network circuits	1.5	Applying
M2.06	Simulate an R-L-C circuit to determine time response	1.5	Applying
	Lab Exam – I	3	
CO3	**Develop simulation models to illustrate analog and pulse modulation schemes**		
M3.01	Plot amplitude modulated wave by giving carrier, modulating signal and depth of modulation	2	Applying
M3.02	Plot frequency modulated wave by giving carrier, modulating signal and depth of modulation	2	Applying
M3.03	SimulatePAM, PPM and PWM modulation schemes.	3	Applying
M3.04	Simulate Pulse Coded Modulation model	2	Applying
CO4	**Develop simulation models to implement various combinational logic circuits**		
M4.01	Simulate AND, OR, NAND,NOR, XOR , NOT Gates using blocks	3	Applying
M4.02	Develop a model of Full adder and full subtractor	3	Applying
M4.03	Develop a model of 3 bit multiplexer and demultiplexer	3	Applying
M4.04	Develop a model of D, T and JK Flipflop using NAND gates	3	Applying
	Lab Exam II	3	

Text / Reference:

T/R	Book Title/Author
T1	AgamkumarTyagi, MATLAB and Simulink for Engineers, Oxford Higher Education,2011
T2	Anil Kumar Verma ,Scilab A Beginner'S Approach , Cengage India, 2021
R1	Cleve Moler, Experiments with MATLAB ,2011
R2	Sandeep Nagar, Introduction to Scilab: For Engineers and Scientists Kindle Edition, Apress, 2017
R3	Bansal/Goel/Sharma, MATLAB and its applications in engineering, Pearson, 2016
R4	Rohan Verm, NUMERICAL METHODS KIT: FOR MATLAB, SCILAB AND OCTAVE USERS , Notion Press, 2020

Online Resources:

Sl.No	Website Link
1	https://www.mathworks.com/content/dam/mathworks/mathworks-dot-com/moler/exm/book.pdf
2	https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf
3	https://www.scilab.org
4	https://scilab.in/spoken-tutorial
5	https://scilab.in/lab_migration/generate_lab/125/1
6	https://www.gnu.org/software/octave/
7	https://octave.org/octave.pdf

Suggested Open-ended Experiments:

I. Develop a code to do the following operations on any colour image
   a. Read an image
   b. Show an image
   c. Convert colour image to gray scale
   d. Display the histogram
   e. Convert grayscale image to binary image

II. Develop a code to read an audio signal, denoise it by passing through a filter and play the processed signal