Course Name : Electronics Engineering Group

Course Code : ET/EN/EX/EJ/IE/IS/IC/DE/EV/MU/IU/ED/EI

Semester : Sixth for ET/EN/EX/EJ/IE/IS/IC/DE/EV/MU and Seventh for IU/ED/EI

Subject Title : Simulation Software

Subject Code : 17807

Teaching and Examination Scheme:

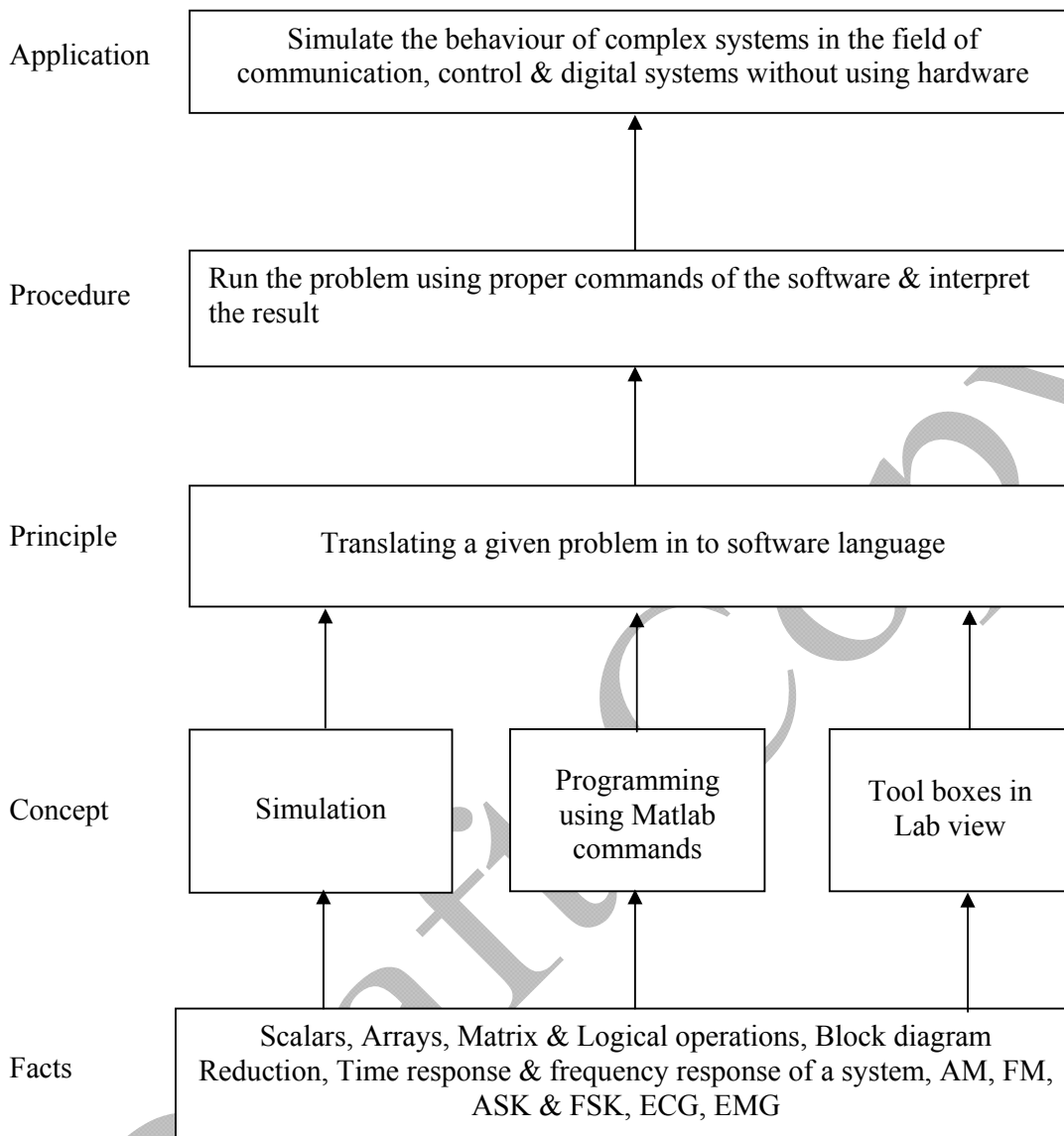| Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
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Rationale:

Recent development in technology has put a lot of emphasis on awareness of analytical tools available in the market. The ready to use library functions available in different simulation software enable the user to design circuits without knowing the complex mathematical details. Under this subject students will be taught softwares like Labview & MATLAB which are commonly used by electronics engineers, worldwide.

**General Objectives:**

Students will be able to:

1. Learn the use of various library functions available in the software.
2. Construct given circuit diagram using these library functions.
3. Study the working of the circuit for various inputs.

Learning Structure:

Application	Simulate the behaviour of complex systems in the field of communication, control & digital systems without using hardware

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Procedure	Run the problem using proper commands of the software & interpret the result

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Principle	Translating a given problem in to software language

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Concept	Simulation	Programming using Matlab commands	Tool boxes in Lab view

↑ ↑ ↑

Facts	Scalars, Arrays, Matrix & Logical operations, Block diagram Reduction, Time response & frequency response of a system, AM, FM, ASK & FSK, ECG, EMG

List of Experiments

1. Verify simple mathematical operations of all elements in row/column vector. Using MATLAB
   a. Sum
   b. Mean
   c. Length
   d. Max
   e. Min
   f. Prod
   g. Sign
   h. Round
   i. Sort
   j. Fix

2. Use commands to
   a. convert centigrade to Fahrenheit
   b. Given the radius of circle. Find the circumference & its area

3. Calculate the output for all the eight conditions of A,B,C
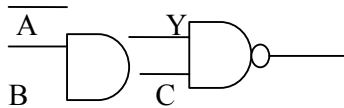
4. Use of commands to
   a. Find the determinant, inverse & transpose of the given 2X2 matrix
   b. Evaluate the following expression

$$Y = 1 + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \frac{x^5}{3}$$

5. Calculate the natural frequency of oscillators for the given RLC circuit. Assume L=0.01mH, R=100Ω & C varying from 0.1 to 0.5 in steps of 0.1 µF using following equation

$$F = \sqrt{\frac{1}{LC} - \frac{R^2}{4C^2}}$$

6. A series R-L-C circuit connected across 100V peak, 50 Hz supply, consists of R=10Ω, L=0.2H, C=100µF. Write a MATLAB script to determine the resonant frequency & current at resonance

   [hint: $f = \frac{1}{2\pi\sqrt{LC}}$; $I = \frac{V}{R}$; Vrms= $\frac{V_{pp}}{\sqrt{2}}$]

7. Connect three sine wave sources of given amplitude and frequency but with a phase shift of 0, $2\pi/3$, and $-2\pi/3$ to a 3X1 multiplexer and observe the waveforms on scope. Also, de multiplex these waveforms and observe on the scope.

8. Create a VI that produces a sine wave with a specified frequency and displays the data on a Waveform chart until stopped by the user.

9. Simulation of amplitude and frequency modulation

10. Design a low pass filter with R= 1 K Ω and C = 0.1 μF and calculate the cut off frequency.

Course Specific Simulation Programs (using either Matlab / Labview / Open source free downloadable software)
For Instrumentation Course
1. Observe step & impulse response of first & second order system & calculate time response parameters- t_d, t_r, t_p, M_p, t_s, e_{ss}
2. Characteristics equation of a system is given by $S^5+2S^4+4S^3+8S^2+3^S+1$ Check their stability with routh Hurwitz criterion
3. Observe the characteristics of linear, equal percentage and quick opening control valves

For Electronics and Industrial Electronics Course
1. Simulation of R-L-C series circuit
2. Single phase half wave phase controlled converter
3. Observe step & impulse response of first & second order system

For Medical Electronics Course
1. Calculate Body Mass Index, given the height and weight
2. Given the Heart Rate and display whether the person is having trachicardia and bradicardia
3. Design a scope for patient monitoring with at least four different parameters and observe the waveform by changing these parameters.

For EJ/ET/EX/EV Courses
1. Simulation of Sampling theorem
2. Simulation of Amplitude shift keying
3. Simulation of TDM