**Network, Signals & Systems**

**Aftab Hussain and Prasad Krishnan**

**Name of the Program** **: B. Tech in ECE**

**Course Code : EC5.101**

**Credits : 4**

**L - T - P : 3-1-0**

(L - Lecture hours, T-Tutorial hours, P - Practical hours)

**Semester, Year : Monsoon, 2024**

(Ex: Spring, 2022)

**Pre-Requisites :** A prior knowledge of calculus and complex numbers is required.

**Course Outcomes :**

**CO-1** Describe various circuit elements (R, C, L), supply (current, voltage), devices (op amp, diode) and Explain the operation and characteristics of each circuit element, behavior in specific circuit configuration (DC, AC, series, parallel, mixed).

**CO-2** Calculate equivalent circuit parameters (Thevenin, Norton), node voltages, branch currents etc. using reduction, KCL, KVL and reduction techniques.

**CO-3** Calculate circuit response (steady state, transient) to various input stimulation. Calculate and understand the concept of time constant for RC, RL and RLC circuits.Demonstrate understanding of and calculate Power, Energy, Loss and phasors w.r.t. circuit.

**CO-4** Describe signals using various representations including Fourier series representation for periodic signals

**CO-5** Describe systems abstractly using block diagrams and differential equations and apply convolution operation and impulse responses for system analysis

**CO-6** Analyze signals and systems in time and s-domains.

**Course Topics :**

Unit 1: Signals, representation, sinusoids, and Fourier series

Unit 2: Systems and representations – differential equations, block diagram, operator, and functional form

Unit 3: Impulse Response and Transfer functions – Laplace transform, poles and zeros

Unit 4: Circuit elements and Network theorems

Unit 5: Transient and Steady state analysis

Unit 6: Sinusoidal input and phasors, two port network

**Preferred Textbooks :**

1. Engineering Circuit Analysis by Hyatt, Kimmerley & Durbin

2. Signals and Systems by A.V. Oppenheim, A.S. Willsky and S.H. Nawab (2015)

**Reference Books :**

**E-book Links**  **:**

**Grading Plan :**

(The table is only indicative)

|  |  |
| --- | --- |
| **Type of Evaluation [3 credit- lecture]** | **Weightage (in %)** |
| Quiz 1 | 10 |
| Quiz 2 | 10 |
| Mid | 25 |
| End Exam | 35 |
| Assignments | 20 |

**Mapping of Course Outcomes to Program Objectives:** (1 – Lowest, 2—Medium, 3 – Highest, or a ‘-’ dash mark if not at all relevant

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** | **PSO4** |
| **CO1** | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 |
| **CO2** | 1 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 1 | 1 | 1 |
| **CO3** | 2 | 2 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 1 | 1 |
| **CO4** | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 1 | 1 |
| **CO5** | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 1 | 1 |
| **CO6** | 3 | 3 | 2 | 3 | 1 | 3 | 1 | 1 | 3 | 3 | 1 | 3 | 3 | 3 | 1 | 1 |

**Teaching-Learning Strategies in brief (4-5 sentences):**

Students will be applying the lecture discussion to solve examples shared with them in the class. The assignments given will reinforce the concepts and to promote their application to difficult problems. Classroom learning will be done in interactive method as much as possible. A short question may be posted at beginning of class to gauge understanding of previous lecture. Occasionally self-assessment tests (1minute paper) will be given. In tutorial class, students will make simple circuits using basic components and solve problems. The course project is done in a way to encourage collaborative problem solving, team participation, and coming up with solution as a team.