

## Modeling & Simulation

<b>Course Code</b>	<b>Credit Hours</b>
<b>CE-323</b>	<b>1-1</b>

### Course Description

Introduction to fundamental concepts, techniques, and tools for creating mathematical models and conducting simulations to analyze complex systems. Covers mathematical modelling principles, simulation techniques, model validation, optimization, and real-world applications. Hands-on experience with simulation software. Ideal for engineering students seeking to enhance problem-solving skills and decision-making in engineering domains.

### Text Book:

1. Introduction to Matlab for Engineering Students by David Houcque, Northwestern University latest edition.
2. <https://www.mathworks.com/help/simulink/simulation.html>
3. <https://www.mathworks.com/help/simulink/modeling.htm>

### Reference Book:

### Prerequisites:

Nil.

### ASSESSMENT SYSTEM FOR THEORY

	<b>Without Project (%)</b>	<b>With Project/Complex Engineering Problems (%)</b>
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

## ASSESSMENT SYSTEM FOR LAB

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assessment/ Viva	20%

### Teaching Plan

<b>Week No</b>	<b>Topics/Learning Outcomes</b>
1	Prepare Model Inputs and Outputs
2	Configure Simulation Conditions
3	Run Simulations
4	View and Analyze Simulation Results
5	Test and Debug Simulations
6	Optimize Performance
7-8	Simulation Guidelines & Best Practices
9	<b>MSE</b>
10	Design Model Architecture
11	Manage Design Data
12	Design Model Behavior
13	Configure Signals, States, and Parameters
14	Configure Inputs and Visualizations
15	Analyze and Remodel Design, Test Model Components
16	Modeling Guidelines & Best Practices
17-18	<b>End Semester Exam</b>

## Practical

<b>Experiment No</b>	<b>Description</b>
1	Introductions to programming with MATLAB
2	Find the response of a lumped variable model expressed in terms of transfer function using MATLAB for input of (i) unit step function (ii) unit impact function and (iii) unit ramp function
3	Use of Simulink in MATLAB for engineering problems
4	Introduction to Abaqus software for civil engineering applications
5	How to model structural members such as beams, columns and trusses etc. for different loading & boundary conditions using Abaqus FEM software.
6	Introduction to Visual Basic (VB) for civil engineering applications.
7	Application of Visual Basic in automating repetitive tasks, data analysis & visualization.