

Course Code	Course Name	Teaching Scheme (Hrs./Week)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/Oral	Tutorial	Total
BEITC803	Computer Simulation and Modeling	04	02	---	04	01	---	05

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
BEITC803	Computer Simulation and Modeling	20	20	20	80	25	25	---	150

### Course Objectives:

This course presents an introduction to discrete event simulation systems. Emphasis of the course will be on modeling and the use of simulation languages/software to solve real world problems in the manufacturing as well as services sectors. The course discusses the modeling techniques of entities, queues, resources and entity transfers in discrete event environment. The course will teach the students the necessary skills to formulate and build valid models, implement the model, perform simulation analysis of the system and analyze results properly.

The “theory” of simulation involves probability and statistics, thus a good background in probability and statistics is a required prerequisite

### Course Outcomes:

- Understand the meaning of simulation and its importance in business, science, engineering, industry and services
- Identify the common applications of discrete-event system simulation.
- Practice formulation and modeling skills.

- Understand simulation languages
- Ability to analyze events and inter-arrival time, arrival process, queuing strategies, resources and disposal of entities
- An ability to perform a simulation using spreadsheets as well as simulation language/package
- Ability to generate pseudorandom numbers using the Linear Congruential Method
- Ability to perform statistical tests to measure the quality of a pseudorandom number generator
- Ability to define random variate generators for finite random variables
- Ability to analyze and fit the collected data to different distributions

#### DETAILED SYLLABUS:

Sr. No.	Module	Detailed Content	Hours
1	UNIT - I Introduction to simulation	Introduction to Simulation. Simulation Examples. General Principles	15
2	UNIT - II Mathematical & Statistical Models in Simulation	Statistical Models in simulation. Queuing Models	8
3	UNIT - III Random Numbers	Random Number Generation. Testing random numbers (Refer to Third edition) Random Variate Generation: Inverse transform technique, Direct Transformation for the Normal Distribution, Convolution Method, Acceptance-Rejection Technique (only Poisson Distribution).	9
4	UNIT – IV Analysis of simulation data	Input Modeling Verification, Calibration and Validation of Simulation Models Estimation of absolute performance.	12
5	UNIT V	Case study	

	Application	<ul style="list-style-type: none"> <li>• Processor and Memory simulation</li> <li>• Manufacturing &amp; Material handling</li> </ul>	<b>4</b>
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**Text Books:**

Discrete Event System Simulation; Third Edition, Jerry Banks, John Carson, Barry Nelson, and David M. Nicol, Prentice-Hall

Discrete Event System Simulation; Fifth Edition, Jerry Banks, John Carson, Barry Nelson, and David M. Nicol, Prentice-Hall

**References:**

1. System Modeling & Analysis; Averill M Law, 4<sup>th</sup> Edition TMH.
2. Principles of Modeling and Simulation; Banks C M , Sokolowski J A; Wiley
3. System Simulation ; Geoffrey Gordon ; EEE
4. System Simulation with Digital Computer; Narsing Deo, PHI

**Term work:**

Laboratory work: 10 marks

Mini Simulation Project presentation: 10 marks

Attendance / Quiz: 5 marks

**Suggested Practical List (If Any):**

Perform simulation exercises given in the text book (third edition) using spreadsheets and/or simulation language/package

- Queue- single server, multi-server, classic case- dump truck
- Inventory – Lead time=0, lead time fixed, lead time probabilistic
- Reliability problem
- Tutorials on statistical models
- Random number generate and test
- Goodness of fit test
- Output analysis – Point estimate and Confidence Interval

Simulation: Real World Examples – can be in the field of business, transportation, medical, computing, manufacturing and material handling- Presentation to be taken.

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.