INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

SYSTEM SIMULATION AND MODELLING

IV Semester: ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AECD12	Core	3	-	-	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisite: Applied Physics								

I. COURSE OVERVIEW:

System simulation and modeling involve creating computer-based representations of real-world systems to understand, analyze, and predict their behavior. This process helps in gaining insights into the system's dynamics, making informed decisions, and optimizing system performance.

II. COURSES OBJECTIVES:

The students will try to learn

I. The functional knowledge on simulation, queueing theory, and random number generation.
II. How to analyze statistical models, queueing systems, and simulation data.

III. COURSE OUTCOMES:

At the end of the course students should be able to:

CO 1 Gain knowledge on functional modeling of system design

CO 2 Analyze the performance of queueing systems in real-world applications

CO 3 Design dynamic system operations using simulation results.

CO 4 Explore the randomness and the practical applications of random numbers across different disciplines.

CO 5 Simulate the operation of a dynamic system and make improvement according to the simulation result

CO 6 Develop a comprehensive understanding of the types of output generated by simulations, including raw data, statistical summaries, and visualizations.

IV. COURSE CONTENT:

MODULE - I: INTRODUCTION TO DISCRETE EVENT SIMULATION (10)

Simulation of queueing systems, Simulation of inventory systems, Concepts in discrete-event simulation, List processing, Selection of simulation software

MODULE –II: STATISTICAL MODELS (09)

Review of terminology and concepts, Useful statistical models, discrete distributions, Continuous distributions, Poisson process, and Empirical distributions.

MODULE –III: QUEUEING MODELS (10)

Characteristics of queueing systems, Queueing notation, Long-run measures of performance of queueing systems.
Steady-state behavior of infinite-population Markovian models, Steady-state behavior of finite-population models, Networks of queues.

MODULE –IV: RANDOM NUMBERS (09)

Properties of random numbers, Generation of pseudo-random numbers, Techniques for generating random

numbers, Tests for random numbers, Inverse-transform technique, Acceptance-rejection technique, Special properties

MODULE –V: ANALYSIS OF SIMULATION DATA (10)
Data collection, Identifying the distribution with data, Parameter estimation, Goodness-of-fit tests, Fitting a nonstationary Poisson process, Selecting input models without data, Multivariate and time series input models. Types of simulations with respect to output analysis, Stochastic nature of output data, Measures of performance and their estimation, Output analysis of terminating Simulations and steady state simulations.

V. TEXT BOOKS:
1. Jerry Banks, John S. Carson II, Barry L.Nelson and David M.Nicol, "Discrete-Event System Simulation", PHI Learning Private Ltd. New Delhi, 4th Edition, 2009.

VI. REFERENCE BOOKS:
1. Geoffrey Gordon, "System Simulation," PHI, 2nd edition, 2006.
2. Averill M. Law, "Simulation Modeling and Analysis,", McGraw Hill Education (India) Private Limited,4th Edition, 2007

VII. ELECTRONICS RESOURCES:
1. https://www.tutorialspoint.com/modelling_and_simulation/index.htm
2. https://ebooks.lpude.in/computer_application/mca/term_5/DCAP601_SIMULATION_AND_MODELIN G.pdf

VIII. MATERIALS ONLINE
1. Course template
2. Tutorial question bank
3. Definition and terminology
4. Tech-talk topics
5. Assignments
6. Model question paper - I
7. Model question paper - II
8. Lecture notes
9. Early learning readiness videos (ELRV)
10. Power point presentations