

<b>SYSTEM MODELLING AND SIMULATION</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2016 -2017)</b> <b>SEMESTER – VIII</b>			
Subject Code	15CS834	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
<b>CREDITS – 03</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Explain the basic system concept and definitions of system;</li> <li>• Discuss techniques to model and to simulate various systems;</li> <li>• Analyze a system and to make use of the information to improve the performance.</li> </ul>			
<b>Module – 1</b>			<b>Teaching Hours</b>
<b>Introduction:</b> When simulation is the appropriate tool and when it is not appropriate, Advantages and disadvantages of Simulation; Areas of application, Systems and system environment; Components of a system; Discrete and continuous systems, Model of a system; Types of Models, Discrete-Event System Simulation Simulation examples: Simulation of queuing systems. <b>General Principles, Simulation Software:</b> Concepts in Discrete-Event Simulation. The Event-Scheduling / Time-Advance Algorithm, Manual simulation Using Event Scheduling			<b>10 Hours</b>
<b>Module – 2</b>			
<b>Statistical Models in Simulation :</b> Review of terminology and concepts, Useful statistical models, Discrete distributions. Continuous distributions, Poisson process, Empirical distributions. <b>Queuing Models:</b> Characteristics of queuing systems, Queuing notation, Long-run measures of performance of queuing systems, Long-run measures of performance of queuing systems cont..., Steady-state behavior of M/G/1 queue, Networks of queues,			<b>10 Hours</b>
<b>Module – 3</b>			
<b>Random-Number Generation:</b> Properties of random numbers; Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for Random Numbers, <b>Random-Variate Generation:</b> Inverse transform technique Acceptance-Rejection technique.			<b>10 Hours</b>
<b>Module – 4</b>			
<b>Input Modeling:</b> Data Collection; Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, Fitting a non-stationary Poisson process, Selecting input models without data, Multivariate and Time-Series input models. <b>Estimation of Absolute Performance:</b> Types of simulations with respect to output analysis, Stochastic nature of output data, Measures of performance and their estimation, <b>Contd..</b>			<b>10 Hours</b>
<b>Module – 5</b>			
Measures of performance and their estimation, Output analysis for terminating simulations Continued..., Output analysis for steady-state simulations. <b>Verification, Calibration And Validation:</b> Optimization: Model building, verification and validation, Verification of simulation models, Verification of			<b>10 Hours</b>

simulation models, Calibration and validation of models, Optimization via Simulation.	
<b>Course outcomes:</b> The students should be able to:	
<ul style="list-style-type: none"> <li>• Explain the system concept and apply functional modeling method to model the activities of a static system</li> <li>• Describe the behavior of a dynamic system and create an analogous model for a dynamic system;</li> <li>• Simulate the operation of a dynamic system and make improvement according to the simulation results.</li> </ul>	
<b>Question paper pattern:</b> The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.	
<b>Text Books:</b>	
1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 5 th Edition, Pearson Education, 2010.	
<b>Reference Books:</b>	
1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson Education, 2006. 2. Averill M. Law: Simulation Modeling and Analysis, 4 th Edition, Tata McGraw-Hill, 2007	