

GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL (ADVANCE MANUFACTURING SYSTEM) (50)

SIMULATION MODELING OF MANUFACTURING SYSTEM

SUBJECT CODE: 2725010

SEMESTER: II

Type of course: Engineering Science

Prerequisite: None

Rationale: This course is designed to provide an insight into how simulation modeling can aid in effective decision-making. Simulation model building aspects of discrete systems (such as Queuing, Inventory and manufacturing) are covered in detail. It is also demonstrated how computer simulation can be used to successfully model, analyze and improve systems under study. It also looks into the statistical analysis of simulation model output.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2#	0	4	70	30	30	0	10	10	150

Content:

Sr. No.	Content	Total Hrs.	% Weightage
1	<p>Introduction to Simulation</p> <ul style="list-style-type: none"> • When Simulation Is the Appropriate Tool • When Simulation 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 • Steps in a Simulation Study 	6	15%
2	<p>Simulation Software</p> <ul style="list-style-type: none"> • Introduction • Comparison of Simulation Packages with Programming Languages • Classification of Simulation Software • Desirable Software Features • General-Purpose Simulation Packages 	4	10%

3	Basic Probability and Statistics <ul style="list-style-type: none"> • Introduction • Random Variables and Their Properties • Simulation Output Data and Stochastic Processes • Estimation of Means, Variances, and Correlations • Confidence Intervals and Hypothesis Tests for the Mean • The Strong Law of Large Numbers • The Danger of Replacing a Probability Distribution by its Mean 	6	15%
4	Random Variate Generation <ul style="list-style-type: none"> • Inverse-Transform Technique <ul style="list-style-type: none"> ○ Exponential Distribution ○ Uniform Distribution ○ Weibull Distribution ○ Triangular Distribution ○ Empirical Continuous Distributions ○ Discrete Distributions • Acceptance—Rejection Technique <ul style="list-style-type: none"> ○ Poisson Distribution ○ Nonstationary Poisson Process ○ Gamma Distribution 	6	20%
5	Verification and Validation of Simulation models <ul style="list-style-type: none"> • Model-Building, Verification, and Validation • Verification of Simulation Models • Calibration and Validation of Models <ul style="list-style-type: none"> ○ Face Validity ○ Validation of Model Assumptions ○ Validating Input—Output Transformations ○ Input—Output Validation 	6	15%
6	Output data analysis <ul style="list-style-type: none"> • Types of Simulation w.r.t output data analysis — Warmup period- Welch algorithm — Approaches for Steady State Analysis — Replication & Batch means methods. 	6	10%
7	Application of Simulation <ul style="list-style-type: none"> • Simulation of queuing system, Simulation of Inventory system, Simulation of manufacturing and material handling system 	8	15%

Reference Books:

1. Simulation Modelling and Analysis / Law, A.M.& Kelton / McGraw Hill, Edition, New York,1991.
2. Discrete Event System Simulation / Banks J. & Carson J.S., PH/Englewood Cliffs, NJ, 1984.
3. Simulation of Manufacturing Systems/Carrie A. /Wiley, NY, 1990.
4. A Course in Simulation /Ross, S.M., McMillan, NY, 1990.

Course Outcome:

The students learn the basic concepts of simulation and how to model and to analyze complex systems using standard simulation software.

List of Tutorials/Presentations:

Simulation of Single Server Queuing System, Simulation of manufacturing shop , Simulation of supply chain Inventory System, Simulation of Multiple Servers Queuing System, Simulation of batch shop manufacturing process, Simulation of multi machine assignment system, Simulation of Manufacturing and material handling systems, Simulation of supply chain inventory system, Simulation of Job shop System, Simulation of queuing System.

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.