



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Subject Code: ME02000921

Course / Subject Name: Modeling Simulation of Manufacturing System

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	Nil
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.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	learn the basic concepts of simulation	U/A
2	model complex systems using standard simulation software	A
3	analyze complex systems using standard simulation software	U/A

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Content	Total No.Hours	% of Weitage
Introduction to Simulation <ul style="list-style-type: none"> Simulation as tool, Advantages and Disadvantages of Simulation, areas of applications, 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 	09	16
Simulation Software <ul style="list-style-type: none"> Introduction, Comparison of Simulation Packages with Programming Languages, Classification of Simulation Software, Desirable Software 	6	14



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Features, General-Purpose Simulation Packages	6	14
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	14
Random Variate Generation <ul style="list-style-type: none"> • Inverse-Transform Technique, Exponential Distribution, Uniform Distribution, Weibull Distribution, Triangular Distribution, Empirical Continuous Distributions, Discrete Distributions, Acceptance—Rejection Technique, Poisson Distribution, Nonstationary Poisson Process, Gamma Distribution 	6	14
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, Face Validity, Validation of Model Assumptions, Validating Input—Output Transformations, Input—Output Validation, Dimensional Metrology for Micro/Mesoscale Manufacturing 	6	14
Output data analysis Types of Simulation w.r.t output data analysis — Warmup period- Welch algorithm — Approaches for Steady State Analysis — Replication & Batch means methods.	6	14
Application of Simulation Simulation of queuing system, Simulation of Inventory system, Simulation of manufacturing and material handling system	6	14
Total	45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	25	55	0	0	0

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

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.



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4. *A Course in Simulation /Ross, S.M., McMillan, NY, 1990.*

5. *Simulation Modelling and SIMNET/TahaHA./PH,Englewood Cliffs, NJ, 1987*

(b) Open-source software and website:

As per the course content and course outcome.

List of Laboratory/Learning Resources Required: Software Suggested Activities for Students: Any activity based on above syllabus content

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