Department of Mechanical Engineering
School of Engineering
University of Management and Technology, Lahore

Course Outline

Course Code: CS312 **Course Title: Computer Simulations**

Program	BS(IE)
Credit Hours	2
Duration	One semester – Fall 2023
Prerequisites	None
Resource Person	Dr. Ali Ahmad
Counseling Timing	Open door
Contacts	ali.ahmad@umt.edu.pk

Chairman/Director signature…….

Dean's signature……

Date…….

Course Learning Outcomes (CLOs)

Upon successful completion of this course students will have acquired the ability to:

CLO1. Develop an in-depth knowledge on basic system concepts, and functional modeling method to model the activities of a system. (C3)

CLO2. Build a simple simulation model, Random Number Generation, Random Variate Generation. (C3)

CLO3. Classify the Input Data Collection for Statistical Analysis. (C4)

CLO4. Develop various simulation models of practical nature, with each version adding complexity and new modelling concepts. (C6)

(The references within parentheses are domain and level in the Bloom's Revised Taxonomy)

Mapping of CLOs to Program Learning Outcomes (PLOs)

Semester	Course Code	Title	Course Learning Outcomes	PLO 1 Engg. Knowledge	PLO 2 Problem Analysis	PLO 3 Solution Design	PLO 4 Investigation	PLO 5 Mod. Tool Usage	PLO 6 Engr. & Society	PLO 7 Env. & Sust.	PLO 8 Ethics	PLO 9 Team Work	PLO 10 Communication	PLO 11 Proj. Mgmt.	PLO 12 Lifelong Learning
Fifth	CS 312	Computer Simulations	CLO1	✓											
			CLO2			✓									
			CLO3		✓										
			CLO4				✓					✓			

Learning Methodology

Classroom lectures, problem solving exercises.

Grade Evaluation Criteria

Component	Marks
Quizzes	25
Midterm examination	25
Final examination	50
Total	**100**

Textbooks

Discrete-Event System Simulation by Jerry Banks et al. 5th edition, Pearson.

Simulation with Arena by David Kelton et al. 6th edition, McGraw-Hill.

Simulation Modeling Handbook: A Practical Approach. Editor: Christopher A. Chung, CRC Press

Calendar of Course Contents

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Weeks	Topics	Textbook Chapter	CLO#
1-2	**Introduction to simulation:** 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.	1	1
3	**Simulation examples in a spreadsheet:** The basics of spreadsheet simulation, simulating randomness, a coin tossing game, queueing simulation in a spreadsheet, inventory simulation in a spreadsheet, other examples of simulation.	2	1
4-5	**General principles:** Concepts in discrete-event simulation, the event scheduling/time advance algorithm, world views, manual simulation using event scheduling.	3	2
6	**Statistical models in simulation:** Review of terminology and concepts, useful statistical models, discrete distributions, continuous distributions, empirical distributions.	5	2
7-8	**Random-number generation:** Properties of random numbers. Generation of pseudo-random numbers, techniques for generating random numbers, tests for random numbers.	7	2
Midterm Examination			
9	**Random-variate generation:** Inverse-transform technique, acceptance-rejection technique.	8	2
10-11	**Input modeling:** Data collection, identifying the distribution with data, parameter estimation, goodness-of-fit tests.	9	3
12-13	**Monte Carlo Simulations:** Coin tossing, estimation of lead time demand, comparison of replacement policies (reliability problem), hitting a target, project simulation.	2	4
14-15	**Simulation examples and exercises**		4
Final Examination			

Mapping of CLOs to Direct Assessments

CLOs▼	Quiz 1	Quiz 2	Assignment 1	Quiz 3	Quiz 4	Midterm Exam	Final Exam
1	✓					✓	✓
2		✓	✓			✓	✓
3				✓			✓
4					✓		✓