SIMULATION AND MODELLING (420 عال)

Course Description

This subject provides students with

1. The basic system concept and definitions of system.
2. Techniques to model and to simulate various systems.
3. The ability to analyze a system and to make use of the information to improve the performance.

Course Objective

Upon completion of this course, students will:

1. Understand the basic concepts and how simulation works.
2. Understand the benefits and limitations of applying computer simulation in industry.
3. Use simulation software to examine the performance of a system.
4. Understand the system concept and apply functional modeling method to model the activities of a static system.
5. Understand the behavior of a dynamic system and create an analogous model for a dynamic system.
6. Simulate the operation of a dynamic system and make improvement according to the simulation results.

References

Required:

1. System Modelling and Simulation, V.P. Singh, ISBN (13): 978-81-224-2924-4
2. Gordon G., "System simulation", Prentice Hall

Recommended:

1. Gregory L. Fenves, Frank McKenna Axel rod, R. (1997) 'Data Model for Simulation
2. N. Deo, "System Simulation", Prentice Hall of India
3. Averill M Law " Simulation Modelling and Analysis", TMH
4. Sella ,Ceric and Tadikamalla " Applied Simulation Modelling", Cengage Learning

Prerequisite: Discrete Mathematics (207 ريض), and Programming – II (213 عال)

Evaluation Method

1. Mid Term -1 : 20 Marks
2. Mid Term -2 : 20 Marks
3. Class Work (Attendance / Lab Work/ Quiz) : 20 Marks
4. Final Exam (End Term) : 40 Marks

Weeks	Topic Name	*Sub Topic*	*Reading Chapter*
1	**Objective / Introduction**	What is System? Components, Definitions, Examples of systems.	Chapter – 1 (Pg. 1- 7)
2	**Modelling and Simulation**	Physical Models, Mathematical Models, Computer Models, Monte Carlo Simulation.	Chapter – 1 (Pg. 10 - 24)
3	**Probability in Simulation**	Basics, Discrete Random Variables, Probability Functions, Expected Values and outcomes parameter.	Chapter – 2 (Pg. 28 - 36)
4	**Probability in Simulation Advance**	Distribution Functions, Random Variables, Exponential Distribution, Mean Variance Distribution, CEP and PE.	Chapter – 2 (Pg. 39 - 60)
5	**Discrete Simulation**	Generation of Random Numbers, Testing of Random Numbers, Normal Random Number Generator, Application of Random No.	Chapter – 4 (Pg. 79- 108)
6	**MID TERM – I**		
7	**Continuous System Simulation**	Continuous System basics, Modelling the fluid flow, Dynamic Car Wheel Model, Shock Wave model, Pursuit Evasion Problem, Autopilot Problem.	Chapter – 5 (Pg. 109 - 130)
8	**Simulation for Aircraft Model**	Mathematical Model, Probability Analysis, Vulnerabilities in system design.	Chapter – 6 (Pg. 131- 140)
9	**Aircraft Vulnerability Simulation**	Probability Analysis of Landing Issue, Aircraft Vulnerability, Penetration Laws, Cumulative Kill Probability, Data Use.	Chapter – 6 (Pg. 140- 149)
10	**Queuing System Simulation**	Symbolization, Kendal's Notation, Queuing of requests at server.	Chapter – 7 (Pg. 159 - 165)

Weeks	Topic Name	*Sub Topic*	*Reading Chapter*
11	**Queuing System II**	Queuing Arrival Service Model, Single Server Queues, Simulation.	Chapter – 7 (Pg. 165 - 196)
12	**MID TERM – II**		
13	**System Dynamics**	Growth Models, Decay models, Logistics Models, Multi-segment Models, Delay Model, biological Models.	Chapter – 8 (Pg. 197 - 208)
14	**Inventory Control Models**	Finite – Infinite Delivery Rate Models, Probabilistic Inventory models.	Chapter – 9 (Pg. 209 - 228)
15	**Cost Effectiveness Model**	Life Cycle, Cost Effective Aircraft and Missile Model, Ground target model.	Chapter – 10 (Pg. 229 - 239)