

**Faculty of Computers & Information Technology**

**Modeling and Simulation**

**Information :**

**Course Code :** ISY 251

**Level :** Undergraduate

**Course Hours :** 3.00- Hours

**Department :** Faculty of Computers & Information Technology

**Instructor Information :**

Title	Name	Office hours
Professor	Howida Abdel Fattah Saber Shedeed	1
Professor	Howida Abdel Fattah Saber Shedeed	1
Teaching Assistant	Amany Hussein Hassan Mohamed Abou elnaga	7
Teaching Assistant	Amany Hussein Hassan Mohamed Abou elnaga	7

**Area Of Study :**

The aim of the course is to have students understand the general theoretical concepts of computer modeling and simulation applied to discrete simulation for decision support.  
The course will also provide students with thorough understanding of the sequence of activities related to computer simulation (problem statement, data acquisition, model design, simulation experiment, verification, techniques and methods in different industrial and research applications.  
Additionally, the course introduces mathematical and statistical models, simulation languages.

**Description :**

An introduction to simulation languages. Advantages and disadvantages of using simulation languages. Comparison of important features for a number of simulation packages (e.g., modeling flexibility, animation, and statistical capabilities), characteristics of the most popular continuous, discrete, combined and object-oriented simulation languages. Statistical output evaluation, optimization tools, parallel and distributed simulation tools, special purpose simulation languages and tools, visual modeling tools, multimedia, visualization and animation tools, interfaces for coupling with external tools. A more thorough treatment of one of the most popular simulation languages. Main features of the simulation language, practical application example systems in different areas like finance, industry, production, services, and other fields

**Course outcomes :**

**a.Knowledge and Understanding: :**

1 -	- Explain basic paradigms in system modeling.
2 -	- Recognize different simulation concepts and tools.
3 -	- Explain concepts of verification and validation.
4 -	- Apply simple queuing theory to estimate discrete system behavior.
5 -	- Illustrate mathematical derivation of models and link this understanding to simulation results and real systems.

6 -	- Understand limitations of models and simulations compared to actual physical system and closed form analytical techniques
7 -	- Explain input, output, and operating variables as appropriate in various units
8 -	- Understand how to validate a simulation against a real system
9 -	- Understand the essential mathematics relevant to computer science.

**b. Intellectual Skills :**

1 -	- Conclude discrete simulation programs utilizing event and process oriented approach with a time scheduling mechanism.
2 -	- Analyze statistical data and generate random numbers of a required distribution and parameters.
3 -	- Estimate data inputs and outputs needed for adequate definition of a model and to compare a simulation to real system.
4 -	- Use modeling and simulation techniques to identify technical relationships between the inputs, output and variables and using the relationships to predict mutual changes.
5 -	- Define traditional and nontraditional problems, set goals towards solving them, and. observe results.
6 -	- Perform comparisons between (algorithms, methods, techniques...etc).
7 -	- Create and/or justify designs to satisfy given requirements (synthesis, evaluation, application).
8 -	- Interpret ways in which mathematics is being applied in motion dynamics
9 -	- Distinguish the different types of algorithm paradigms and evaluate when an algorithmic design situation calls for it.
10 -	- Criticize performance and analyze suitable usage cases.

**c. Professional and Practical Skills :**

1 -	- Establish system simulations and models appropriate to efficient scientific practices.
2 -	- Communicate effectively by oral, written and visual means.
3 -	- Perform independent information acquisition and management, using the scientific literature.
4 -	- Specify, design, and implement computer-based systems.
5 -	- Apply the principles of human-computer interaction to the evaluation and construction of a wide range of materials.

**d. General and Transferable Skills :**

1 -	- Present simulation and modeling tools to assist in finding graphical, numerical, statistical and analytic solutions to practical problems.
2 -	- Work in stressful environment and within constraints.
3 -	- Manage tasks and resources.
4 -	- Search for information and adopt life-long self-learning.
5 -	- Apply improved problem solving skills to basic real world situations
6 -	- Present a timeline for the project plan.
7 -	- Discuss the problem and how to deal with it as a data to be processed.

**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction to Simulation	3	2	2

**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Simulation Examples	3	2	2
General Principles and Simulation Software	3	2	2
Statistical Models	3	2	2
Queuing Systems	3	2	2
Mid Term 1	2	1	2
Random-Number Generation	3	2	2
Input Modeling	3	2	2
Verification and Validation of Simulation Models	3	2	2
Output Analysis for a Single Model	3	2	2
Comparison and Evaluation or Alternative System Designs	3	2	2
Mid Term 2	2	1	2
Applications Simulation of Computer Networks: OPNET	3	2	2
Project discussion	3	2	2
Revision	3	2	2
Final Exam	3	2	2

**Teaching And Learning Methodologies :**

Lectures
Exercises
Open Discussion
E. Learning
Self Studies
Practical training
Presentation
Projects
Web-Site searches
Case Study

**Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Final Exam	40.00	16	To assess knowledge, understanding, intellectual and professional skills.

---

Mid-Term Exam 1	20.00	6	To assess following up and understanding the first part of the studied topics
Mid-Term Exam 2	20.00	12	To assess following up and understanding the second part of the studied topics
Practical Exam	10.00	15	To assess the participation of the student during the tutorial, professional and general skills.
Projects	10.00	12	To assess professional and general skills