

Modern Academy for Engineering & Technology

Computer Engineering and Information Technology Department

Course Specification

CMP 524: Computer Modeling and Simulation

A- Affiliation

Relevant program: Computer Engineering and Information Technology BSc Program
Department offering the program: Computer Engineering and Information Technology Department
Department offering the course: Computer Engineering and Information Technology Department
Date of specifications approval: September 2015

B - Basic information

Title: Computer Modeling and Simulation **Code:** CMP 524 **level:** Senior 2, second Semester
Credit Hours: 3 **Lectures:** 2 **Tutorial:** 2 **Practical:** -
Pre-requisite: CMP 110

C - Professional information

1 – Course Learning Objectives:

By the end of this course the students should demonstrate the knowledge and understanding of the different types of systems, and their interconnections to drive the suitable mathematical model . Specify the elements of modeling and simulation to develop their mathematical models. The student will be able to solve problems using simulation techniques, and achieve the suitable method to test the performance.

2 - Intended Learning Outcomes (ILOS)

a – Knowledge and understanding:

By the end of this course the student should have the following Knowledge of:

- a1- Basic concepts of systems, models and simulation (A1, A2).
- a2- Types of simulation, Different steps in Simulation Study (A4,A5).
- a3- Theoretical background of probabilities and Statistics needed to build a valid and credible Simulation Models (A1,A3,A13)
- a4- Fundamentals of Queuing theory, stochastic Model, and Discrete-Event Simulation(A1,A5).
- a5- Different aspects of Single – Server Queuing System Simulation(A5)
- a6- Basics of estimation and statistical tests as a tools for Estimation of Means, Variance And Correlation(A1)
- a7- Principles of Mont Carlo simulation(A2)
- a8- Basics of Random Number Generators, Linear Congruent Generators (LCG), Mixed Generator, Multiplicative Generator (A1, A2, A5).
- a9- Basics of Sensitivity Analysis, Inspection Approach, and Confidence Interval Approach based on Independent data(A11)

b – Intellectual Skills:

On successful completion of the course, the student should be able to:

- b1- Investigate on the appropriate mathematical and computer-based methods for modeling and analyzing different simulation problems (B1).
- b2- Solve problem for creating models of simulation (B3)
- b3- Suggest different solutions for the problem solving , then select appropriate solutions for engineering problems based on analytical thinking (B2).
- b4- Select and appraise appropriate ICT tools to a variety of simulation problems (B8).
- b5- Solve simulation problems, often on the basis of limited and possibly contradicting information (B7).
- b6- Choose the appropriate mathematical tools, computing methods, design techniques for modeling and analyzing computer systems (B13)

- b7- Synthesize, and apply suitable IT tools to computer engineering problems(B14).
b8-Innovate solutions based on non-traditional thinking and the use of latest technologies(B17)
b9- Create systematic and methodic approaches when dealing with new and advancing technology(B12)

c - Professional and practical skills:

On successful completion of the course, the student should be able to:

- c1- Use the mathematics, science, information technology, design, and engineering practice integrally to solve and to build a valid and credible Simulation Models(C1)
c2- Improve and create different models of simulation (C2)
c3- Develop simulation programs of Mont Carlo simulation through a wide range of analytical tools, techniques, and software packages pertaining to required (C6)
c4- Apply numerical modeling methods to the Single – Server Queuing System Simulation problems(C7)
c5- Utilize the computational facilities and techniques, to design experiments about Random Number Generators, and Linear Congruent Generators (LCG).collect, analyze and interpret results(C5).

d - General and transferable skills:

On successful completion of the course, the student should be able to:

- d1- Work in a team and involve in group discussion and seminars(D1, D3).
d2- Communicate effectively and present data and results orally and in written form(D3,D4).
d3- Use ICT facilities in presentations, and manage resources efficiently (D4,D5).
d4- Search for information's in references, journals and in internet(D7).
d5- Practice self-learning(D7, D9).

Course Contribution in the Program ILO's

ILO's		Program ILO's
A	Knowledge and understanding	A1, A2,A3,A4, A5, A11, A13
B	Professional and practical skills	B1, B2, B3,B7,B8,B12, B13, B14, B17
C	Intellectual skills	C1, C2,C5,C6,C7,
D	General and transferable skills	D1, D3, D4, D5,D7, D9

3 – Contents

Topic	Lecture hours	Tutorial hours	Practical hours
➤ Basic concepts and terminologies of systems , models, and simulation: -fundamentals of a systems and their terminologies --fundamentals of models and simulation and their terminologies -Advantages and disadvantages of simulation	1 1 1	3	
➤ Review of basic probabilities, Statistics and distribution theory : -Set theory, Conditional probability ,compound events and , independent events -Discrete and Continuous distributions -Function of a random variable - Estimation of Means, Variance And Correlation.	1 1 1 1	4	
➤ Mont Carlo simulation -Case Study	2	2	
➤ Selecting appropriate Probability Distributions specifying a physical phenomena-Case study	2	2	
➤ Introduction to Queuing Theory , and Simulation of Single – Server Queuing System-case study	4	4	
➤ Building Valid and Credible Simulation Models	2	2	
➤ Sensitivity Analysis, Inspection Approach, Confidence Interval Approach	4	4	

Based on Independent Data Testing , Null Hypothesis, Paired t Approach, case study .			
➤ Random Number Generators, Mid Square Method, -case study	4	4	
➤ Linear Congruent Generators (LCG), Mixed Generator, Multiplicative Generator	2	2	
➤ Seminar	2	2	
Total hours	30	30	

4 - Teaching and Learning and Assessment methods:

Course ILO's		Teaching Methods								Learning Methods				Assessment Method							
		Lecture	Presentations and Movies	Discussions and seminars	Tutorials	Problem solving	Laboratory & Experiments				Researches and Reports	Modeling and Simulation	Site visits		Written Exam	Practical Exam	Quizzes	Term papers	Assignments		
Knowledge & Understanding	a1	1	1	1	1						1				1		1		1		
	a2	1			1										1		1	1	1		
	a3	1			1							1	1		1		1		1		
	a4	1	1	1	1							1									
	a5	1			1	1						1			1		1		1		
	a6	1			1	1					1	1	1		1			1	1		
	a7	1	1	1	1	1					1	1	1		1			1	1		
	a8	1	1	1	1	1					1	1	1								
	a9	1	1	1	1	1					1	1	1								
Intellectual Skills	b1	1			1							1			1		1		1		
	b2	1	1		1							1			1		1		1		
	b3	1		1	1						1	1	1		1				1		
	b4	1			1						1		1		1		1		1		
	b5	1	1		1	1						1			1		1		1		
	b6	1			1	1						1									
	b7	1			1	1							1								
	b8	1			1	1						1	1								
	b9	1			1							1	1								
Applied Professional Skills	c1	1			1	1						1			1		1				
	c2	1	1												1		1				
	c3	1		1		1					1	1	1								

	Teaching Methods										Learning Methods				Assessment Method							
	Lecture	Presentations and Movies	Discussions and seminars	Tutorials	Problem solving	Laboratory & Experiments					Researches and Reports	Modeling and Simulation	Site visits		Written Exam	Practical Exam	Quizzes	Term papers	Assignments			
General Tran. Skills	c4	1	1		1	1							1	1								
	c5	1	1		1									1								
	d1			1		1						1										
	d2		1	1								1	1									
	d3	1	1									1										
	d4	1	1	1								1										
	d5			1								1	1									

5- Assessment Timing and Grading:

Assessment Method	Timing	Grade (Degrees)
Semester Work: seminars, quizzes assignments and reports	Bi-Weekly	10
Mid-Term Exam	6-th Week	20
Written Exam	Sixteenth week	70
Total		100

6- List of references:

6-1 Course notes:

Lecture notes and handouts

6-2 Required books

D, Kelton , second edition. Simulation Modeling and Analysis, Averill M. L, W, , McGraw-Hill, Inc.1998.

Derry Banks , John S. Carson, Barry L. Nelson David M. Nicol , Discrete-event System Simulation, person education,2005.

M.M. Wooltson ,G J. Pert, An Introduction to Computer Simulation, Oxford University Press,1999

6-3 Recommended books:

C. M Harris, Ross D.,second edition, Fundamental of Queuing Theory, John Wiley. 1990.

6-4 Periodicals, Web sites, etc.: Non

<http://www.howstuffworks.com/> .

<http://www.GenLib.org/> .

<http://www.talkthecold.com/bizgoogle/> .

<http://www.SCI-hub.org/> .

<http://www.scrius.com/> .

<http://www.Merlot.org/> .

<http://www.Vlab.co.in/> .

<http://www.W3schools.com/>

7- Facilities required for teaching and learning:

- Computer Lab.
- Computer, Data show and Computer package.

Course coordinator: Dr. AbdElmoneim Fouda

Head of the Department: Prof. Dr. Said Gawisha

Date: September 2015