

Course specification

(3106 Computer modeling & simulation)

Faculty: HICIT- Higher Institute for Computers & Information Technology

Programme(s) on which the course is given: Under graduate program in Computer Science

Major or minor element of programme: Compulsory

Department offering the programme: Department of Computer Science

Department offering the course: Department of Computer Science

Year / Class: 3rd Year – 1st semester

Date of specification approval: 22/9/2015

A- Basic Information

Title: Elective Course(Computer modeling & simulation)

Code: 3106

Weekly Hours:

Lecture: 3

Exercise: -

Practical: 3

Total: 6

B- Professional Information

1- Course Objectives:

This course (CS3106) introduces the student to Computer modeling & simulation. During the study of this course, the Basic concepts and terminology of simulation, probability and distribution theory, estimation and statistical tests, and generation of random numbers are discussed. This Course introduces queuing theory, discrete system simulation, and examples such as M/M/1. Then this course discusses the time management methods such as time driven and event driven simulation . This Course explains the Simulation languages, introduction to continuous systems simulation and examples.

2- Program ILOs Covered by Course

Program Intended Learning Outcomes			
Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
a14, a21	b1, b2, b4, b7, b8, b13, b15	c6, c16	d11

3 - Intended Learning Outcomes of course (ILOs)

a. Knowledge and Under-Standing:

- a1. Understand The basic concept of simulation.
- a2. explain the queuing theory
- a3. Explain the principles, concepts and practical design of simulated systems.
- a4. Explain Input modeling, and random numbers generators

b. Intellectual Skills:

- b1. Analyze a comprehensive and state-of-the-art treatment of all the important aspects of a simulation study.
- b2. Differentiate between model verification and validation.
- b3. Interpret statistical design and analysis of simulation experiments.

c- Professional and practical skill

- c1. design and implement of a several simulation experiments.
- c2. Measure the values of Simulation parameters and indicate their advantages and disadvantages.
- c3. Discuss various Simulations techniques.

d- General and transferable skills

- d1. Work effectively as an individual and as a member of a team.
- d2. Write technical Report.

4- Contents and Course Outline

Topic	Hours	Lecture	Practical
<u>1 Basic concepts and terminology</u> <ul style="list-style-type: none"> • Concepts of a system • System Methodology • Advantages and disadvantages of simulation terminology 	6	3	3
<u>2 Probability and distribution theory</u> <ul style="list-style-type: none"> • Probability • Set theory, compound events • Conditional probability, independent events • Discrete distributions • Continuous distributions • Function of a random variable • Moments Some common distributions 	12	6	6
<u>3 Estimation and statistical tests</u> <ul style="list-style-type: none"> • Empirical distributions • Estimation • Tests of hypotheses • The Chi-Squire goodness-of-fit test • The Kolmogorive-Smirnov test 	12	6	6
<u>4 Generation of Random Numbers</u> <ul style="list-style-type: none"> • Pseudo random numbers • Congruential generators • Testing and validating Pseudo random numbers 	6	3	3
<u>5 Introduction to queuing theory</u> <ul style="list-style-type: none"> • Review of the Poisson and Exponential distributions • The M/M/1/∞/FIFO system • Summary measures for the M/M/1/∞/FIFO system • The M/M/1/k/FIFO system • M/M/C/∞/FIFO system 	12	6	6
<u>6 Discrete system simulation</u> <ul style="list-style-type: none"> • Examples, • Time management methods, 	12	6	6

<ul style="list-style-type: none"> Collecting and recording simulation data Analysis of simulation results Evaluation of the simulation model 			
<u>7 Languages for discrete system simulation</u> <ul style="list-style-type: none"> Language characteristics Use multipurpose languages Special-purpose languages: <ol style="list-style-type: none"> GPSS SIMSCRIPT II.5 SLAM II GASP IV 	12	6	6
<u>8 Introduction to continuous system simulation.</u> <ul style="list-style-type: none"> Models of continuous systems Solution of linear differential equations Analog computing Digital simulation of continuous systems Continuous system simulation languages 	6	3	3

5 -Teaching and learning methods

- 5.1 Lectures
- 5.2 Tutorial Exercises
- 5.3 Practical Lab
- 5.4 Discussions.

6 -Student assessment methods

- 6.1 Midterm Exam: To assess the knowledge and understanding achieved by the student during the previous weeks.
- 6.2 Final Exam: To evaluate what the student gain at the end of the course, and to assess: the knowledge and understanding, general skills, and intellectual skills.
- 6.3 Course Work & Quizzes: To keep the student always in the course, and to evaluate knowledge, understanding, intellectual, and transferable skills.

Assessment Schedule

Assessment	Week #
Mid Term Exam	8
Final Exam	16
Course Work & Quizzes	2-14

Assessment Weight

Assessment	Weight %
Mid Term Exam	10%
Final Exam	80%
Course Work & Quizzes	10%

Total	100
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Course Work & Quizzes: (Short Exams, Assignments, Researches, Reports, Presentations, Class/Project discussion)

7 -List of references

7.1 Text Books **Text**

Simulation Principles and Methods By WAYNE J. GRAYBEAL United states Air Force Academy

UDOW W. POOCH Texas A&M University Winthrop Publisher Inc. 1980.

7.2 Simulation Modeling and Analysis 4th edition by Averill M. Law, W. David Kelton McGraw Hill International series, 2007

7.3 Simulation Modeling and Analysis 5TH EDITION By Averill Law

7.4 Internet Location : <http://en.wikipedia.org/wiki/Simulation> & Modeling

8- Required Facilities

- Simulation Software laboratory.
- Data show and PC computer.

9-Course Matrices

9.1-Course Content/ILOs Matrix

Course Contents	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2
1 <u>Basic concepts and terminology</u>	√					√						
2 <u>Probability and distribution theory</u>	√								√			
3 Estimation and statistical tests	√				√				√			
4 Generation of Random Numbers		√		√		√	√	√	√			
5 Introduction to queuing theory			√			√	√	√	√	√		
6 Discrete system simulation			√		√	√	√	√	√	√		
7 Languages for discrete system simulation			√		√	√	√	√	√	√		
8 Introduction to continuous system simulation			√		√	√	√	√		√		

9.2-Learning Method /ILOs Matrix

Learning Methods	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2
Lectures	√	√	√	√	√	√	√	√	√	√		
Tutorial Exercises					√	√	√	√	√	√		
Practical Lab					√	√	√	√	√	√		
Discussions.					√	√	√	√	√	√	√	√

9-3 Assessment Methods /ILOs Matrix

Assessment Methods	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2
Mid Term Exam	√	√	√	√	√	√	√	√	√	√		
Final Exam	√	√	√	√	√	√	√	√	√	√		
Course Work & Quizzes	√	√	√	√	√	√	√	√	√	√	√	√

Course Coordinator: Dr. Farouk Shabaan ()

Head of Department: Dr. Farouk Shabaan ()

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