Course specification

(3106 Computer modeling & simulation)

Faculty:	*HICIT- **Higher Institute for Computers & Information Technology**-El Shorouk Academy*
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	1/8/2022

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 Aims:

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. Define The basic concept of simulation[A14].
a2. Explain the queuing theory [A14]
a3. Explain the principles, concepts and practical design of simulated systems[A14]
a4. Explain Input modeling, and random numbers generators[A21]

b. Intellectual Skills:

b1. Analyze a comprehensive and state-of-the-art treatment of all the important aspects of a simulation study[B1,B2].
b2. Differentiate between model verification and validation[B2, B4].
b3. Interpret statistical design and analysis of simulation experiments[B4,B7]

c- Professional and practical skills

c1. Implement 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	Lec.	Exc/Lab
1 Basic concepts and terminology • Concepts of a system • System Methodology • Advantages and disadvantages of simulation terminology	6	3	3
2 Probability and distribution theory • Probability • Set theory, compound events • Conditional probability, independent events • Discrete distributions	12	6	6

• Continuous distributions • Function of a random variable • Moments Some common distributions			
3 Estimation and statistical tests • Empirical distributions • Estimation • Tests of hypotheses • The Chi-Squire goodness-of-fit test • The Kolmogorive-Smirnov test	12	6	6
4 Generation of Random Numbers • Pseudo random numbers • Congruential generators • Testing and validating Pseudo random numbers	6	3	3
5 Introduction to queuing theory • 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
6 Discrete system simulation • Examples • Time management methods, • Collecting and recording simulation data • Analysis of simulation results • Evaluation of the simulation model	12	6	6
7Languages for discrete system simulation • Language characteristics • Use multipurpose languages • Special-purpose languages: 1. GPSS 2. SIMSCRIPT II.5 3. SLAM II	9	3	6
8 Introduction to continuous system simulation. • Models of continuous systems • Solution of linear differential equations • Analog computing • Digital simulation of continuous systems Continuous system simulation languages	6	3	3
Selected Topics	3	3	-

5- Teaching and learning methods

Teaching and learning methods	Used
Active Learning	
Lectures(blending learning – online learning using virtual classroom)	√
Tutorial Exercises (hybrid learning – online learning)	√
Practical Lab(blending learning– online learning)	√
Exercises	-
Discussions.	√
Self – Learning strategy	
Reading material	
Websites search	√
Research and reporting	√
Self-studies	
Experimental strategy	√
Group work	
Presentation	
Problem solving strategy	
Problem solving/problem solving learning based	√
Case study	√
Synchronous E-Learning	
Virtual lab	-
Virtual class	-
Chat Room	√
Video lectures	√
Asynchronous E-Learning	
E-Learning	√

6- Student assessment methods

Methods	Assessment	Used
Electronic Midterm Exam	To assess the knowledge and understanding achieved by the student during the previous weeks. (online on e-learning hub)	√
Pencil-to-Paper 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.	√
Electronic Course Work & Quizzes	To keep the student always in the course, and to evaluate knowledge, understanding, intellectual, and transferable skills. (online on e-learning hub)	√
participation	To assess the knowledge and understanding achieved by the student during the previous weeks.	√

Assessment Schedule

Assessment	Week #
Participation	**3-14**
Electronic Mid Term Exam	**8**
Final Exam	**16**
Electronic/ hard copy Course Work &Quizzes	**2-14**

Assessment Weight

Assessment	Weight %
Participation	**10%**
Electronic Mid Term Exam	
Final Exam	**80%**
Electronic/ hard copy Course Work &Quizzes	**10%**
Total	**100**

- Course Work &Quizzes:
  - Short Exams, Assignments, Researches, Reports, Presentations on e-learning hub

7- List of references

Essential books (text books)	Abdul Karim, Samsul Ariffin, editor. *Intelligent Systems Modeling and Simulation II: Machine Learning, Neural Networks, Efficient Numerical Algorithm and Statistical Methods*. Springer, 2022. Law. *Simulation Modeling and Analysis*. 2015.

Course notes	- **https://www.studocu.com/row/document/kenya-methodist-university/computer-science/introduction-simulation-and-modeling-notes/16379738**
Periodicals,website	**Powerpoint presentations of all course materials** **All labs material** **[https://moodle.sha.edu.eg/course/view.php?id=1367]**

8- Required Facilities

To assess professional and practical skills given the following facilities:

a. Tools & SW (Technologies facilities):

- **Visual studio c# for simulate programs**
- **Data show and PC computer.**
- **Microsoft TEAMS to create virtual classrooms for lectures, discussions for project**
- **portal(MOODLE) to make electronic quizzes and electronic midterm exam**
- **portal(MOODLE) to upload project deliverable and assignment**
- **academy portal(MOODLE) to upload electronic material**

b. Teaching facilities:

	Lecture	*class*	*Lab*
Whiteboard	used	-	used
Pc/laptop	used	-	used
Data show	used	-	used
Webinars	MS TEAMS	-	MS TEAMS
SocialMedia	Facebook Page for 3rd year	-	Facebook Page for 3rd year
ChatRoom	ChatTeams	-	ChatTeams
Videos	Stream-MOODLE	-	Stream-MOODLE
Website	MOODLE	-	MOODLE

9- Course Matrices

9.1- Course Content/ILO Matrix

Course Contents	Knowledge & understanding				Intellectual skills			Professional and practical skills			General	
	a1	**a2**	**a3**	**a4**	**b1**	**b2**	**b3**	**c1**	**c2**	**c3**	**d1**	**d2**
1 Basic concepts and terminology	√					√						
2 Probability and distribution theory	√								√			
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			√		√	√	√	√		√		
Selected Topics												

9.2- Learning Method /ILOs Matrix

Learning methods	Knowledge and understanding				Intellectual skills			Professional and practical skills			General	
	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2
Lectures	x	x	x	x	x	x	x	x	x	x		
Tutorial Exercises					x	x	x	x	x	x		
Reading material	x	x	x	x	x	x	x	x	x	x		
Websites search	x	x	x	x	x	x	x		x		x	x
Research and reporting	x	x	x	x							x	x
Problem solving/problem solving learning based							x					
Group work								x	x	x	x	x
Practical Lab					x	x	x	x	x	x		
Discussions.					x	x	x	x	x	x	x	x

9.3 Assessment Methods /ILOs Matrix

Assessment Methods	Knowledge & understanding				Intellectual skills			Professional and practical skills			General	
	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2
Electronic Mid Term Exam	√	√	√	√	√	√	√					
Final Exam	√	√	√	√	√	√	√	√	√	√		
Electronic Course Work &Quizzes	√	√	√	√	√	√	√	√	√	√	√	√

10. Course ILOs Vs Program ILOs

Course ILOs \ Prog ILOs		Knowledge & understanding		Intellectual skills							Professional and practical skills		General
		A14	A21	B1	B2	B4	B7	B8	B13	B15	C6	C16	D11
k&u	**a1**												
	a2	√											
	a3	√											
	a4		√										
int.	**b1**			√	√								
	b2				√	√							
	b3					√	√						
p. &p.	**c1**									√		√	
	c2										√		
	c3												
general	**d1**												
	d2												√

Course Coordinator: DR: Farouk shabaan ( )
Head of Department: Dr. Ahmed El-Abbassy **( )**
Date: 1/8/2022