SH. A.

أكاديميــة الشــروق

المعهد العالى للحاسبات وتكنولوجيا المعلومات
مدينة الشروق ـ القاهرة
شعبة علوم الحاسب

Course specification

Course Code: CS 405

Course Title: Geographic Information System

Academic Year: /

Course specification
(CS 405 - Geographic Information System)

Course Outline	
Faculty:	*HICIT- (Higher Institute for Computers & Information Technology-El Shorouk Academy)*
Programme(s) on which the course is given:	Undergraduate program in Computer Science
Major or minor element of programme:	Compulsory
Department offering the program	Department of Computer Science
Department offering the course:	Department of Computer Science
Level	Fourth Level
Date of specification approval	DD/MM/YYYY

Basic Information			
Code: CS 405	**Title:**	Geographic Information System	
Prerequisites:	CS 323 Intro to databases		
Weekly Hours:			
Lecture: 2	**Exercise: -**	**Practical : 2**	**Total: 3** credit hours

Professional Information
Course Aims:

The objective of CS 405 is to Introduce the fundamental concepts and theories of geographic information systems including remote sensing. Combine an overview of the general principles of GIS with a theoretical treatment of the nature and analytical use of spatial information. Use basic mathematics and science in computing of geographic information systems. Use the needed knowledge and skills in the computing and information market. Define the operational, strategic and practical issues in geographic information systems currently relevant to small, medium and large enterprises. Deal with environmental and economic implications of GIS applications in industry. Use effectively communication skills.

After completing this course, the student should be able to:

a. Build and manipulate with classes.

b. using objects.

c. Implement the inheritance and polymorphism concepts.

Program Intended learning outcomes (ILOs)

a2	Deep understanding the concepts of the different high-level programming languages.

a11	Select advanced topics to provide a deeper understanding of some aspects of object-oriented analysis and design, and software engineering.
a13	Demonstrate strong knowledge of fundamentals of programming and the construction of computer-based systems.
a20	Describe the principals of generating tests which investigate the functionality of computer programs and computer systems and evaluating their results.
b3	Perform classifications of (data, results, methods, techniques, algorithms, etc.).
b4	Identify attributes, components, relationships, patterns, main ideas, and errors.
c1	Use appropriate programming languages and design methodologies.
c5	Specify, design, and implement and manage computer-based systems.
c10	Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.
c16	Apply tools and techniques for the design and development of applications.
d5	Demonstrate efficient IT capabilities.

Program ILOs Covered by Course

Knowledge and understanding	Intellectual Skills	Professional and practical skills	General and Transferable skills
A2, A11, A13, A20	B3, B4	**C1, C5, C10, C16**	D5

Intended learning outcomes of course (ILOs)

a. Knowledge and Under-Standing:
   a1. Describe basic concepts of spatial analysis (raster and vector data) and GIS data management.
   a2. Identify data such as roads network analysis, natural hazard, culture resources, land cover and land ownership.
   a3. Explain vector and raster spatial data.

b. Intellectual Skills:
   b1. Analyze proficiency in communicating objectives and results of research and production conducted with GIS
   b2. Use GIS software to become competent in solving problems with spatial analysis.
   b3. Evaluate the solutions of different problems using GIS mapping software.

c. Professional and practical skills
   c1. Use geographic information system software ArcGIS 10.4 to become competent in solving problems with spatial analysis.
   c2. Manipulate spatial data to make an informed decision.
   c3. Solve geographic problems with GIS software.

d. General and transferable skills
   d1. Work the course project in a team effectively and efficiently considering time and stress management.
   d2. Apply communication skills and techniques to solve a real world problems using GIS technology.
   d3. Search for information about the relation between map and different databases

Contents		
Topic	**Contact Hours**	
	lecture	**Lab**
Introduction to remote sensing and Spatial data source.	2	2
Characteristics of satellite raster data	2	2
The most important GIS data capture	2	2
Geographic information science, use of GIS for scientific purposes.	2	2
Geographic information definition, why it is important and what is specific about it.	2	2
Vector and raster data structures.	2	2
Geospatial data, its representation vector model and its topology (join and relate database).	2	2
Georeferencing, projection and coordinate system.	2	2
Mid-Term Exam		
Geographic data model (raster data model)	2	2
Vector data model	2	2
Database management systems	2	2
Final project discussion	2	2
Final Exam	2	2

Teaching and learning methods	
Teaching and learning methods	**Used**
Lectures	√
Tutorial Exercises	√
Practical Lab	√
Discussions.	√
Self – Learning (Reading material, Websites search,)	√
Self-studies	√
Group work	√
Presentation	√
Problem solving/problem solving learning based	√
Case study	√
Synchronous E-Learning	√
Video lectures	√
Asynchronous E-Learning	√

Student assessment methods & Schedule		
Methods	**Used**	**Week#**
Midterm Exam	√	**8**
Final Exam	√	**16**
Course Project	√	**3-14**
Course Work & Quizzes	√	**2-14**
Practical Exam	√	**15**

Assessment Weight	
Assessment	Weight %
Mid Term Exam	10%
Practical Exam	10%
Final Exam	60%
Course Project	10%
Course Work &Quizzes	10%
Total	100

Course Work &Quizzes
Short Exams, Assignments, Research, Reports, Presentations
Class/Project discussion

List of references	
Essential books (textbooks)	GIS Fundamentals A First Text on Geographic Information Systems, Sixth Edition Paul Bolstad |2019
Course notes	E-Learning Portal
Recommended books	https://webapps.itc.utwente.nl/librarywww/papers_2009/general/principlesgis.pdf An Introduction To Geographical Information Systems. Ian Heywood - 2011
Periodicals, website	https://www.esri.com/en-us/home
Videos link	-

Required Facilities	
Tools & SW (Technology facilities):	– Visual Studio – Microsoft TEAMS to create virtual classrooms for lectures, discussions for project. – Academy Portal (MOODLE) to make electronic quizzes and electronic midterm exam. – Academy Portal (MOODLE) to upload project deliverable and assignment. – Academy portal (MOODLE) to upload electronic material.
Teaching facilities:	Whiteboard √
	Computer Lab √
	Data show √
	E-Learning √
	Videos √
	Website √

Course Content/ILO Matrix												
Course Contents	Knowledge & understanding			Intellectual skills			Professional and practical skills			General		
	a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3
Introduction to remote sensing and Spatial data source.	√											
Characteristics of satellite raster data	√											
The most important GIS data capture	√						√	√	√			
Geographic information science, use of GIS for scientific purposes.	√	√		√	√		√	√	√			
Geographic information definition, why it is important and what is specific about it.	√	√					√	√	√			
Vector and raster data structures.	√		√	√	√	√	√	√	√			
Geospatial data, its representation vector model and its topology (join and relate database).	√		√	√	√	√	√	√	√			
Georeferencing, projection and coordinate system.	√	√	√	√	√	√	√	√	√			
Mid-Term Exam	√	√	√	√	√	√						
Geographic data model (raster data model)	√		√	√	√	√	√	√	√			
Vector data model			√	√	√	√	√	√	√			
Database management systems	√		√	√	√	√	√	√	√			
Final project discussion										√	√	√
Final Exam	√	√	√	√	√	√						

Learning Method /ILO Matrix

Learning Methods	Knowledge & understanding			Intellectual skills			Professional and practical skills			General		
	a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3
Lectures	√	√	√	√	√	√	√					
Tutorial Exercises				√	√	√	√					
Reading material				√	√	√	√	√	√			
Websites search				√	√	√	√	√	√			
Research and reporting				√	√	√	√	√	√			
Problem solving			√	√	√	√	√	√	√			
Group work										√	√	√
Case study				√	√	√	√	√	√			
Practical Lab							√	√	√			
Discussions.				√	√	√	√	√	√	√	√	√

Assessment Methods /ILO Matrix

Assessment Methods	Knowledge & understanding			Intellectual skills			Professional and practical skills			General		
	a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3
Mid Term Exam	√	√	√	√	√	√						
Final Exam	√	√	√	√	√	√						
Course Project										√	√	√
Course Work &Quizzes	√	√	√	√	√	√	√	√	√			
Practical Exam				√	√	√	√	√	√			

Course ILOs Vs Program ILOs

Course ILOs		Knowledge & understanding				Intellectual skills		Professional and practical skills				General
Prog ILOs		A2	A11	A13	A20	B3	B4	C1	C5	C10	C16	D5
Knowledge and Understanding	a1	√		√								
	a2		√									
	a3				√							
Intellectual skills	b1					√	√					
	b2					√	√					
	b3					√	√					
Professional and practical skills	c1							√	√			
	c2								√	√	√	
	c3								√	√	√	
General skills	d1											√
	d2											√
	d3											√

Course Coordinator   : Dr. Eng. Mohamed A. Hussein **(   )**

Head of Department : Dr. Ahmed El-Abbassy   **(   )**

Date: --/--/2023