



Course Specification

(Postgraduate Programs)

Course Title: **Geographic Information Systems**

Course Code: **GIS5000**

Program: **Higher Diploma in Geographic Information System**

Department: **Geography Department**

College: **Social Sciences**

Institution: **Umm Al-Qura University**

Version: **V1**

Last Revision Date: **7 December 2024**

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A. General information about the course:

1. Course Identification:

1. Credit hours: (3 hours)

2. Course type

A. ☐ University ☐ College ☒ Department ☐ Track

B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (Level 1/ First year)

4. Course general Description:

The course introduces the concepts, fundamentals, and theories of GIS and GIScience, emphasizing the nature of spatial information, data models and structures for geographic data storage, data manipulation, and basic spatial analysis and modeling techniques. It includes two components: lectures and labs.

5. Pre-requirements for this course (if any):

N/A

6. Pre-requirements for this course (if any):

N/A

7. Course Main Objective(s):

- To understand the fundamental structures, concepts, theories, and applications of GIS.
- To gain hands-on experience with various GIS operations.
- To effectively perform spatial and statistical analyses using GIS software.

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)





No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify).....	
	Total	45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	To understand basic GIS theory and principles.	K1	Lectures	Written Exam. Assignments.
1.2	To explain the types of GIS data models and related processes.	K2	Lectures	Written Exam. Assignments.
1.3	To explore the integration between Geographic Information Systems (GIS) and Remote Sensing.	K3	Lectures	Written Exam. Assignments.
2.0	Skills			
2.1	To analyze the spatial data with GIS environment.	S1	Lectures	Final project. Assignments.
2.2	To manage various geospatial data.	S2	Lectures	Final project. Assignments
3.0	Values, autonomy, and responsibility			
3.1	To Design and complete a GIS project.	V1	project	Final project
3.2	To demonstrate the ability to apply	V2	Lectures Project	Final project Assignments



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	analytical and evaluative GIS tools effectively.			

C. Course Content:

No	List of Topics	Contact Hours
1.	Introduction to GIS - Definition and history of GIS. - Components of GIS: hardware, software, data, people, and methods. - Applications of GIS in various fields.	3
2.	Spatial Data and Geographic Information - Types of spatial data: vector and raster - Concepts of scale, resolution, and extent - Geographic vs. projected coordinate systems	3
3.	Data Models and Structures - Vector data: points, lines, polygons - Raster data: grids and cell structures - Data formats: shapefiles, geodatabases, GeoJSON	3
4.	Data Sources and Collection Methods - Primary data collection: GPS, remote sensing - Secondary data: digitizing maps, open data sources - Data quality, accuracy, and uncertainty	3
5.	Map Design and Cartography - Principles of cartographic design: scale, symbols, and layouts - Types of maps: thematic, reference, choropleth - Map projections and their implications	3
6.	GIS Software and Tools - Introduction to popular GIS software: ArcGIS, QGIS - Navigating the user interface and basic functionalities - Overview of open-source tools and web GIS	6
7.	Data Preparation and Management - Data cleaning, editing, and validation - Attribute tables and data querying - Geodatabases and data organization	3
8.	Spatial Analysis: Fundamentals - Basic spatial operations: overlay, buffering, and clipping - Proximity analysis - Data classification and summarization	3
9.	Raster Analysis - Raster data processing - Digital elevation models (DEM): slope, aspect, and hillshade - Raster calculator for spatial modeling	6



10.	Statistical Analysis in GIS - Descriptive statistics in GIS - Spatial autocorrelation and regression - Hotspot and cluster analysis	3
11.	Remote Sensing and GIS Integration - Basics of remote sensing: sensors, platforms, and imagery - Image classification and interpretation - Integrating remote sensing data into GIS	3
12.	Advanced Topics in GIS and future trends 3D GIS and visualization - Time-series analysis - Web GIS and cloud-based platforms - Discussion on future trends in GIS	6
Total		45

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	2, 5, 9	15%
2.	Midterm exam	8	15%
3.	Final project	10	20%
4.	Final exam	16-17	50%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	Chang, Kang-Tsung (2019) Introduction to Geographic Information Systems. 9th edition, Mc Graw Hill education. Heywood, Ian, Cornelius Sarah and Carver, Steve (2015) An introduction to Geographic Information Systems. 4th edition, Prentice Hall.
Supportive References	Wilson, John P. (2024) Spatial Data Science, Esri Press.
Electronic Materials	- International journal of Geographic Information Science. - Journal of Geographical Systems. - GeoInformatica. - Applied Geography.
Other Learning Materials	- King Abdullah Library - Saudi Digital Library (SDL)

2. Educational and Research Facilities and Equipment Required:



Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom, GIS lab
Technology equipment (Projector, smart board, software)	ArcGIS, GPS, Projector
Other equipment (Depending on the nature of the specialty)	GPS

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Program leader	direct
Effectiveness of students assessment	Lecturers, Students, Faculty	direct
Quality of learning resources	Lecturers, Students, Faculty	indirect
The extent to which CLOs have been achieved		
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	