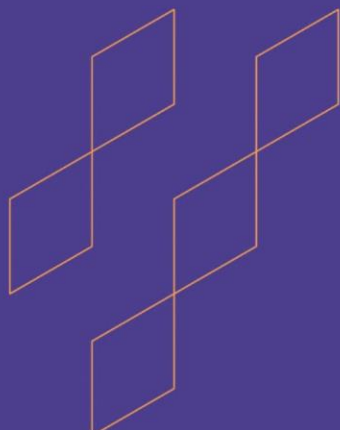




Course Specification

(Postgraduate Programs)

Course Title: Geospatial database
Course Code: GIS5009
Program: Diploma in Geographical Information Systems
Department: Geography
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)

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:

This course provides a comprehensive introduction to Geospatial databases, emphasizing the principles, techniques, and tools required to store, manage, and analyze spatial data effectively. It bridges the gap between geographic information systems (GIS) and database management systems (DBMS), enabling students to handle complex spatial datasets in various fields.

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 principles of spatial data structures and geographic data representation.
- To develop skills in designing and implementing spatial databases using relational and NoSQL database systems.
- To learn the fundamentals of spatial indexing, query optimization, and spatial data retrieval.
- To explore data integration techniques and interoperability between GIS and databases.
- To address challenges in managing large-scale spatial data and ensuring data quality.

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	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	30
2.	Laboratory/Studio	45
3.	Field	
4.	Tutorial	
5.	Others (specify).....	
	Total	75

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

Methods:

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	To learn the concepts and theories related to Geospatial databases	K1	Lectures Lab.work	Written exams Assignments Lab exams
1.2	To explore different geospatial data and tools	K2	Lectures Lab.work	Written exams Assignments Lab exams
2.0	Skills			
2.1	To analyze different geospatial databases	S1	Lectures Lab.work	Written exams Assignments Lab exams
2.2	To develop and manage different geospatial datasets	S2	Lectures Lab.work	Written exams Assignments Lab exams
2.3	To utilize geospatial databases to address real-world challenges.	S3	Lectures Lab.work	Written exams Assignments Lab exams

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
3.0	Values, autonomy, and responsibility			
3.1	To show the ability for dealing with geospatial databases.	V1	Lectures Lab.work	Written exams Assignments Lab exams
3.2	To be able to apply the analytical and evaluated tools for geodatabase analysis	V2	Lectures Lab.work	Written exams Assignments Lab exams

C. Course Content:

No	List of Topics	Contact Hours
1	Introduction to Geospatial databases: - Overview of GIS and spatial data. - Role of databases in geographic data management. - Differences between conventional and spatial databases.	5
2	Spatial Data Models and Structures: - Vector and raster data formats. - Topological relationships and their representation.	10
3	Database Design for Spatial Data: - Entity-relationship modeling for spatial data. - Normalization and schema design principles. - Design of spatial indexing structures (e.g., R-trees, Quadrees).	10
4	Spatial Querying and Analysis: - SQL for spatial data (PostGIS extensions, spatial joins, buffer analysis). - Advanced spatial operations (e.g., nearest neighbor, overlays).	15
5	Data Integration and Interoperability: - Importing/exporting data between GIS and databases. - Use of OGC standards like WMS, WFS, and GeoJSON.	10
6	Big Data and Cloud GIS: - Managing large-scale geographic data. - Introduction to cloud-based GIS platforms.	15
7	Working with Topology: - Working with map topology. - Working with geodatabase topology.	10
Total		75

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	13	5
2.	Mid Exam	7	20
3.	Minor project	14	10
4.	Practical Exam	15	15
5.	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	Ferrara, V. (2020). Review of Focus on Geodatabases in ArcGIS Pro. <i>Cartographic Perspectives</i>, (96), 98-100. Allen, D. W., & Coffey, J. M. (2019). <i>Focus on geodatabases in ArcGIS Pro</i>. Redlands, CA, USA: Esri Press. Nasser, H. (2014). <i>Learning ArcGIS Geodatabases</i>. Packt Publishing Ltd. MacDonald, A. (1999). <i>Building a geodatabase</i>. Environmental Research Inst. Arctur, D., & Zeiler, M. (2004). <i>Designing Geodatabases: case studies in GIS data modeling</i>. ESRI, Inc..
Supportive References	Applied Geomatics (Springer - ISSN: 1866-9298 (Print) 1866-928X (Online)). Journal of Geographical Systems (Springer - ISSN: 1435-5949 (electronic version)) International Journal of Geographical Information Science (Taylor and Francis Online)
Electronic Materials	Saudi Digital Library King Abdullah Digital library
Other Learning Materials	Computers Digital Image processing software GIS software GIS datasets from different sources and different formats. Spread sheets Application software for each geomorphic process if available.

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities	A Lecture room appropriate for maximum 25 students with a personal computer, a data show and a smart board.

Items	Resources
(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	A Lab room appropriate for maximum 15 students with a personal computer, a data show and a smart board.
Technology equipment (Projector, smart board, software)	Lab materials and required software
Other equipment (Depending on the nature of the specialty)	Printers and laptops for staff members with required computer software programs are required.





F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty members who teach this course and the lab staff associated with the course.	- Both written and verbal, through presentations. - Analysis of students' marks - Regular feedback of the students about the course and the teaching methods
Effectiveness of students' assessment	Faculty members who teach this course and those teaching other courses relevant to this course.	- Regular revising and improving of the course contents and consulting the faculty member - Teaching faculty and lab staff associated with the course are also available for personal consultation.
Quality of learning resources	Faculty members who teach this course	- Frequent improvement in teaching and learning techniques. - Frequent survey for latest references. - Encouraging the students in teamwork cooperation and writing reports.
The extent to which CLOs have been achieved	Independent member(s) teaching staff	A sample of students answer sheets is revised by a specified committee of the department.
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	

