



Course Specification

Diploma

Course Title: **Geographic Information Systems**

Course Code: **APMQ3217**

Program: **Mining and Quarrying**

Department: **Diploma Department**

College: **The Applied College**

Institution: **Umm Al-Qura University**

Version: **1**

Last Revision Date: **20 February 2025**



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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 ☐ Others
B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (2)
(2nd. Level)

4. Course General Description:

This course is to introduce students to the fundamentals of Geographic Information Systems (GIS) including basic cartographic principles, map scales coordinate systems and map projections. Students learn how to use GIS software tools to perform basic GIS tasks such as accessing, displaying, querying, and editing geographic data. In the course, students will learn the applications in prospection of ore and minerals deposits and petroleum interpretations.

The course focus on giving the students basic understanding for representation and analysis of spatial elements through a theoretical and practical approach. The course covers topics like definitions of GIS as a tool, projections and geographical reference systems, digital geographical data (maps, images and tables), basic analysis of data in vector and raster format, presentation of geographical data in map format using applications at regional and local scales.

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

None

6. Co-requisites for this course (if any):

None

7. Course Main Objective(s):

1. Apply fundamental GIS concepts and tools to analyze and manage geospatial data.
2. Discuss the applications of GIS in a variety of fields especially in mining exploration.
3. Interpret and analyze geospatial data using a variety of analytical techniques and methods.





4. Collect, process, troubleshoot and integrate geospatial data from multiple sources into a cohesive GIS project.
5. Use GIS to solve real-world problems in a variety of fields.
6. Compare of different map projections, coordinate systems, and geodesic reference systems.
7. Develop fundamental GIS skills in a variety of areas such as data conversion and map symbology.
8. Design maps using GIS.
9. Develop leadership and teamwork skills in the implementation of the GIS works.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> 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	30
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		60

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

1.0	Knowledge and understanding
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1.1	Apply fundamental GIS concepts and tools to analyze and manage geospatial data.	K1	Lectures and Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes.
1.2	Discuss the applications of GIS in a variety of fields especially in mining exploration.	K2	Lectures and Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes.
1.3	Interpret and analyze geospatial data using a variety of analytical techniques and methods.	K4	Lectures and Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes.
1.4	Collect, process, troubleshoot and integrate geospatial data from multiple sources into a cohesive GIS project.	K5	Lectures and Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes.
1.5	Use GIS to solve real-world problems in a variety of fields.	K6	Lectures and Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes.
2.0	Skills			
2.1	Compare of different map projections, coordinate systems, and geodesic reference systems.	S1	Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes
2.2	Develop fundamental GIS skills in a variety of areas such as data conversion and map symbology.	S2	Interactive Discussions	Written Exams (Mid-Term and Final Exams), Quizzes
3.2	Design maps using GIS.	S3	Interactive Discussions	Written Exams (Mid-Term and Final Exams),
3.0	Values, autonomy, and responsibility			
3.1	Develop leadership and teamwork skills in the implementation of the GIS works.	V1	Individual and Group Presentations	Presentations

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction: Introduction to Geographic Information and GIS.	2
2.	Data Models: Data models, map basics, vector data – point, line and area	2
3.	Geodesy: Basic geodesy, datums.	2
4.	Map Projections: coordinate systems, map projections.	2
5.	Remote Sensing	2
6.	Relational Database Management Systems	2
7.	Spatial Database Management and Integration	2
8.	Data Entry and Editing: Data sources, entry and editing, metadata, map transformations.	2



9.	GIS & Remote Sensing in applications in ore deposits	2
10.	Digital image processing	2
11.	Tables and Relational Databases.	2
12.	Basic Spatial Analysis.	2
13.	Landsat Image Classification (Supervised classification, Unsupervised)	2
14.	Integrated Image Analysis and GIS	2
15.	Database management concepts	2
Total		30

C.2 Experimental Content

No	List of Topics	Contact Hours
1.	introduction to ore deposits and their economic significance	2
2.	Classification of ore deposits: Metallic and industrial minerals	2
3.	Geological processes of ore formation: Magmatic origins	2
4.	Geological processes of ore formation: Hydrothermal origins	2
5.	Sedimentary and metamorphic processes in ore formation	2
6.	Geological evolution of the Arabian Shield	2
7.	Major ore provinces in Saudi Arabia	2
8.	Midterm Exam	2
9.	Case Study: Gold deposits (e.g., Mahd Adh Dhahab, Al Amar)	2
10.	Case Study: Phosphate and bauxite deposits in northern Saudi Arabia	2
11.	Case Study: Copper and zinc deposits (e.g., Jabal Sayid, Al Masane)	2
12.	Industrial minerals: Feldspar, kaolin, gypsum, and silica sand	2
13.	Techniques for ore exploration and analysis	2
14.	Future trends and opportunities in mineral resource development in Saudi Arabia	2
Total		28

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	5	10
2.	Mid-Term Exam	8	20
3.	Presentations	12	10
4.	Homework	All weeks	10
5.	Final Exam	16	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	<ul style="list-style-type: none"> Chang Kang-tsung, "Introduction to geographic information systems", Book, Mc-Graw Hill companies, 3rd edition, ISBN 0-07-060629-3, 2016. Building a GIS: System Architecture Design Strategies for Managers, Second Edition, by Dave Peter.
Supportive References	<ul style="list-style-type: none"> Introduction to Geographic Information Systems by Chang Kang-tsung (Karl), 2016. An Introduction to Geographical Information Systems (4th Edition) by Ian Heywood, Sarah Cornelius and Steve Carver, 2012.
Electronic Materials	<ul style="list-style-type: none"> http://www.esri.com/what-is-gis/learn-gis http://ocw.mit.edu/courses/urban-studies-and-planning/11-521-spatial-database-management-and-advanced-geographic-information-systems-spring-2003/index.htm
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	Data show
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty	Direct (project, HW, Quiz, midterm and final exam)
Effectiveness of Students assessment	Students	Indirect (Student Survey)
Quality of learning resources	Program Coordinator	Direct analysis





Assessment Areas/Issues	Assessor	Assessment Methods
The extent to which CLOs have been achieved	Program Coordinator	Direct analysis
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Umm Al-Qura University Council
REFERENCE NO.	851110214476/195605
DATE	18/2/1447

