



**University/Academy:** Arab Academy for Science and Technology & Maritime Transport

**Faculty/Institute:** College of Computing and Information Technology

**Program:** Information Systems

**Form No. (12)  
Course Specification**

**1- Course Data**

<b>Course Code:</b> IS 477	<b>Course Title: Geographic Information Systems</b>	<b>Academic Year/Level:</b> Year 3 / Semester 6
<b>Specialization:</b> Information Systems	<b>No. of Instructional Units:</b> 2 hrs lecture 2 hrs lab	<b>Lecture:</b>

<b>2- Course Aim</b>	This course introduces the fundamental concepts underlying computerized geographic information systems (GIS). It combines an overview of the general principles of GIS with a theoretical treatment of the nature and analytical use of spatial information. The course has a laboratory component, which introduces students to the GIS software package.
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**3- Intended Learning Outcome:**

<b>a- Knowledge and Understanding</b>	<p><b>Students will be able to demonstrate knowledge of:</b></p> <p>K14. The principles and techniques of database management systems, management, data mining, geographical information systems, multimedia, application development, business process management, enterprise systems, human-computer interaction, object-oriented analysis and design, e-technologies, multimedia, image processing, information and infrastructures security and computer graphics techniques.</p> <p>K20. Types and alternatives of global information systems architectures, and their differences in terms of service and cost consequences, and their implications for the organizational support needed.</p> <ul style="list-style-type: none"><li>• Define GIS and its components (K14,K20)</li><li>• Learn GIS Applications (K14,K20)</li><li>• Identify different model: Vector and Raster(K14,K20)</li><li>• Learn GIS Operations(K14,K20)</li><li>• Learn coordinate systems types and known standards(K14,K20)</li><li>• Learn Geodatabase, Shapefile, and Coverage for Software concepts(K14,K20)</li><li>• Understand the representation of simple features (K14,K20)</li><li>• Define Topology(K14,K20)</li><li>• Identify the Object-Based Data Model(K14,K20)</li><li>• Define ArcObjects(K14,K20)</li><li>• Learn the representation of composite features(K14,K20)</li><li>• Identify the elements of the Raster Data Model(K14,K20)</li></ul>
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	<ul style="list-style-type: none"> <li>• Learn the rules in determining a categorical cell value(K14,K20)</li> <li>• Identify the different source of existing GIS data(K14,K20)</li> <li>• Learn metadata standards(K14,K20)</li> <li>• Learn Geometric Transformation methods(K14,K20)</li> <li>• Understand resampling methods(K14,K20)</li> <li>• Identify location errors(K14,K20)</li> <li>• Understand Spatial Data Accuracy Standards(K14,K20)</li> <li>• Recognize Topological Errors and editing(K14,K20)</li> <li>• Learn Topological and Non-Topological Editing in GIS(K14,K20)</li> <li>• Recognize types of tables and attribute data (K14,K20)</li> <li>• Learn the Relational Data Model and its concepts: Joins, Relates, and Relationship Classes(K14,K20)</li> <li>• Identify the methods of data entry (K14,K20)</li> <li>• Understand manipulation of fields and attribute data (K14,K20)</li> <li>• Learn Cartographic Representation(K14,K20)</li> <li>• Define Typography(K14,K20)</li> <li>• Understand Data Visualization, Geovisualization, and Descriptive Statistics (K14,K20)</li> <li>• Learn Raster Data Query(K14,K20)</li> <li>• Identify variations in and applications of Buffering(K14,K20)</li> <li>• Understand Overlay methods in GIS(K14,K20)</li> <li>• Recognize error propagation in Overlay(K14,K20)</li> <li>• Understand Local Operations in GIS and its applicaitons(K14,K20)</li> <li>• Learn Neighborhood Operations in GIS(K14,K20)</li> <li>• Identify Zonal Operations in GIS and its applications(K14,K20)</li> <li>• Define other Raster Data Management: Extraction and Generalization(K14,K20)</li> </ul>
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<p><b>b- Intellectual Skills</b></p>	<p><b><u>By the end of the course, the student acquires high skills and an ability to understand:</u></b></p> <p>I12. Identify attributes, components, relationships, patterns, main ideas, and errors.</p> <p>I16. Solve IS problems with pressing commercial, time, and industrial constraints.</p> <p>I17. Suggest an innovative design to solve a problem containing a range of commercial and industrial constraints.</p> <ul style="list-style-type: none"> <li>• Differentiate between Projected and Geographic coordinate systems (I12)</li> <li>• Distinguish vector data model from raster data model(I12)</li> <li>• Distinguish Vectorization from Rasterization(I12)</li> <li>• Distinguish Vector Data Model from Raster Data Model (I12)</li> <li>• Distinguish Vectorization from Rasterization (I12)</li> <li>• Differentiate between the diverse transformation and resampling methods (I12)</li> <li>• Classify Types of Quantitative Maps (I12)</li> <li>• Apply Map Design (I16,I17)</li> <li>• Interpret query expressions and the different Query Methods in GIS (I16,I17)</li> <li>• Perform pattern analysis and map manipulation (i16, I17)</li> <li>• Compare between Vector- and Raster-Based Data Analysis: Overlay and Buffering (I12)</li> </ul>
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<p><b>c- Professional Skills</b></p>	<p><b><u>By the end of the course the student will have the ability to:</u></b></p> <p>P12.Plan and manage an information systems project from inception to final implementation and cut-over</p> <p>P15.Apply the principles of effective information acquisition, information management, organization, and information-retrieval to text, images, sound, and video.</p>
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	<p>P19. Maintain existing information systems.</p> <ul style="list-style-type: none"> <li>• Introduction to ArcCatalog</li> <li>• Introduction to ArcMap</li> <li>• Use ArcMap software package to work with map layers and change their scale</li> <li>• Measure Map features</li> <li>• Use GIS to change map projections</li> <li>• Project a Feature Class from a Geographic to a Projected Coordinate System</li> <li>• Import a Coordinate System</li> <li>• Project a Shapefile by Using a Predefined Coordinate System</li> <li>• Convert from One Coordinate System to Another</li> <li>• Use GIS to represent features in a vector model</li> <li>• Examine the data file structure of Coverage and Shapefile</li> <li>• Create File Geodatabase, Feature Dataset, and Feature Class</li> <li>• Convert a Shapefile to a Personal Geodatabase Feature Class</li> <li>• View USGS DEM Data</li> <li>• View a Satellite Image in ArcMap</li> <li>• Download and Process DEM and DLG from the Internet</li> <li>• Digitize On-Screen in ArcMap</li> <li>• Edit a Shapefile</li> <li>• Use Topology Rule to Fix Dangles</li> <li>• Enter Attribute Data of a Geodatabase Feature Class</li> <li>• Create New Attribute by Data Computation</li> <li>• Use Graduated Symbols, Line Symbols, Highway Shield Symbols, and Text Symbols <ul style="list-style-type: none"> <li>• Label Streams</li> </ul> </li> <li>• Edit map view layout and design the final map</li> <li>• Add map legend</li> <li>• Create feature attribute queries in GIS</li> <li>• Execute location queries in GIS</li> <li>• Build buffers and make spatial queries in GIS</li> <li>• Perform Buffering and Overlay</li> <li>• Measure Distances Between Points and Lines</li> <li>• Compute General and Local G-statistics</li> </ul>
<p><b>d- General Skills</b></p>	<p><b>Students will be able to:</b></p> <p>G1. Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.</p> <p>G7. Show the use of general computing facilities.</p>
<p><b>4- Course Content</b></p>	<ul style="list-style-type: none"> <li>• Introduction to GIS; background and an overview</li> <li>• Coordinate Systems</li> <li>• Vector Data Model</li> <li>• Raster Data Model</li> <li>• GIS Data Acquisition</li> <li>• Geometric Transformation</li> <li>• Spatial Data Editing</li> <li>• Attribute Data Input And Management</li> <li>• Data Display And Cartography</li> <li>• Data Exploration</li> <li>• Vector Data Analysis</li> <li>• Raster Data Analysis</li> </ul>
<p><b>5- Teaching and Learning Methods</b></p>	<p>Lectures, Labs, Projects, Individual study &amp; self-learning.</p>

<b>6- Teaching and Learning Methods for Students with Special Needs</b>	<ul style="list-style-type: none"> <li>• Students with special needs are requested to contact the college representative for special needs ( currently Dr Hoda Mamdouh in room C504)</li> <li>• Consulting with lecturer during office hours.</li> <li>• Consulting with teaching assistant during office hours.</li> <li>• Private Sessions for redelivering the lecture contents.</li> </ul> <p>For handicapped accessibility, please refer to program specification.</p>
<b>7- Student Assessment:</b>	
<b>a- Procedures used:</b>	Exams and Individual Projects
<b>b- Schedule:</b>	<p>Week 7 exam  4 Projects through the semester  Week 16 Final exam</p>
<b>c- Weighing of Assessment:</b>	<p>7<sup>th</sup> week exam 30%  Projects 20%  Lab Quiz 10 %  Final exam 40%</p>
<b>8- List of References:</b>	
<b>a- Course Notes</b>	
<b>b- Required Books (Textbooks)</b>	<p>Text Book  Kang-Tsung Chang, An Introduction to Geographical Information Systems, McGraw-Hill  6th ED. 2011</p>
<b>c- Recommended Books</b>	<p>Ormsby et al., <i>Getting to Know ArcGIS Desktop</i>, 2<sup>nd</sup> Edition, ESRI Press, 2004.</p>
<b>d- Periodicals, Web Sites, ..., etc.</b>	

**Course Instructor:**

**Head of Department:**

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