

MASTER OF APPLIED GEOSCIENCES and GIS

INTRODUCTION

The College of Graduate Studies at Kuwait University offers a Master of Science degree in **Applied Geosciences and Geographic Information System (GIS)**. It is a professional Joint Degree Program combining relevant specializations in the departments of Geography, and Earth & Environmental Sciences. The program focuses on three main fields of concentration: Geography, Geology and Geographic Information System (GIS). Each of these fields offers applied courses that cover advanced topics and applied methodologies.

Graduates of this program can apply their skills to urban management, public services, geophysical exploration, transportation planning and analysis, site selection, real estate, environmental management, water resources, agricultural and industrial planning, and all other services related to spatial data analysis and management.

PROGRAM REQUIREMENTS

The program requirements are:

33 TOTAL COURSE CREDITS

24 COMPULSORY COURSES (3 credits each)

- 2095-501 Selected Topics in Physical & Human Geography (**only for Non-Geographers**)
- 2095-502 Cartographic Analysis (**only for Non-Geographers**)
- 2095-503 Field Geology & Geological Mapping (**only for Geographers**)
- 2095-504 Environmental Geophysics (**only for Geographers**)
- 2095-511 Basic Geographic Information System
- 2095-512 Basic Remote Sensing (RS)
- 2095-513 Advanced Geographic Information System
- 2095-514 Advanced Remote Sensing (RS)
- 2095-515 Special Topic
- 2095-516 Graduation Project

9 ELECTIVE COURSES* (3 credits each)

Group A (Geography)

- 2095-505 Advanced Climate Change
- 2095-506 Desert Geomorphology
- 2095-507 Coastal Geomorphology

Group B (Geology)

2095-508 Geology of Natural Hazard

2095-509 Quarternary Geology

2095-510 Marine Pollution

* The student should choose 3 courses as total, including at least one course from Geography and one course from Geology.

COURSE DESCRIPTION

2095-501: SELECTED TOPICS IN PHYSICAL & HUMAN GEOGRAPHY
CR: 3

This course covers a number of basic aspects in human and physical geography. It starts with an introduction to human and physical geography, and several selected themes in both human and physical geography such as: World Surface Forma, world climate, soils and natural vegetations, Pleistocene climatic changes and their significance, and characteristics of ocean's water and floors. This course includes essential study on man and his environment, principles of human geography with a special reference to population patterns, growth, densities and urban studies.

2095-502: CARTOGRAPHIC ANALYSIS
CR: 3

This course provides a comprehensive study of GIS-applicable cartography, including cartographic principles, data acquisition methods used in map production, and methods of base map development. Basically, the course deals with the study of cartography to include history, principles, map projections, map scale, types of thematic maps, and map accuracy. Techniques used in GIS base map development (scanning, digitizing and coordinate geometry) will be introduced using hands-on exercises. Some special techniques will be offered, such as the production and presentation techniques of professional quality maps and analytical techniques. Finally, this course provides hands-on work in computer-assisted mapping projects.

2095-503: FIELD GEOLOGY & GEOLOGICAL MAPPING
CR: 3

This course is designed to introduce the students to applied aspects of field geology. Both traditional and modern methods are used in locating,

collecting, describing and mapping of geologic features. The course is taught in the field and classroom. Lectures introduce concepts and techniques, and field methods and outcrop studies allow students to gain the basic interpretation and mapping skills. At least 3 weeks of intensive field-work is required to teach students a wide range of field analytical techniques and geologic mapping emphasizing spatial relations, cross-section construction and preparation of geologic report.

2095-504: ENVIRONMENTAL GEOPHYSICS
CR: 3

This course covers introduction to geological methods used in environmental Geophysics with emphasis on data reduction and interpretation. Geophysical site investigations utilizing resistivity, electromagnetic, ground penetrating radar, and magnetic techniques will be covered. Emphasis is on geophysical detection, water resources and applications.

2095-505: ADVANCED CLIMATE CHANGE
CR: 3

This course covers these topics:

- The Quaternary Era and the changes in climate
- The Ice Age and its significance on surface forms (Ice Ages in Europe, Britain, and North Africa).
- Preglacial climatic conditions in Europe and their effect on surface forms.
- The Quaternary climatic changes and their affect on the fluctuations of sea-level.

2095-506: DESERT GEOMORPHOLOGY
CR: 3

This course is designed to discuss factors affecting surface forms in arid regions. Special attention is on the study of wind action and its affect on erosion, transportation and deposition. Classification of desert surfaces into different units are discussed, and their geomorphologic significations are shown.

2095-507: COASTAL GEOMORPHOLOGY**CR: 3**

This advanced course is dealing with factors affecting the modification of coast lines, ie. waves, tidal waves and sea-currents. Change of sea-levels and its effects on coastal forma. Classification of coasts and their geomorphologic characteristics. Geomorphic evolution and coastline changes (during the Pleistocene upto the present time).

- a- Factors effecting the modification of coast lines i.e. waves, tidal waves and sea-currents.
- b- Change of Sea-levels and its effect on coastal forma.
- c- Classification of coasts and their geomorphologic characteristics.
- d-Geomorphic evolution and coastline changes (during the Pleistocene up to the present time).

2095-508: GEOLOGY OF NATURAL HAZARD**CR: 3**

This course reviews natural hazards from geological and historical perspectives. It describes relevant geologic processes and natural disasters that are produced by events such as earthquakes, volcanic eruptions, land subsidence, sinkholes and ground failure, tsunamis and coastal hazards, flashfloods, and bolide impacts.

2095-509: QUATERNARY GEOLOGY**CR: 3**

This course surveys the characteristics, distribution, and origin of Quaternary deposits, stratigraphy, and chronology; methods used to date Quaternary deposits: ^{14}C , ^{230}Th , ^{234}U dating, luminescence, soils, tree rings, and lichenometry.

The record of Quaternary climates from marine cores: the sediment record and stable isotopes; reconstruction of Quaternary climates from ice core; pluvial and eolian deposits. The record of Quaternary climates from marine cores: the sediment record and stable isotopes; reconstruction of Quaternary climates from ice core; pluvial and eolian deposits.

2095-510: MARINE POLLUTION**CR: 3**

This course provides an understanding of the underlying processes in evaluating marine pollution issues; it discusses the most important marine pollutants, their sources, fate and effects on marine life with examples drawn from coastal and oceanic environments, including examples of local and regional interest within the Arabian Gulf areas. Plastic pollution, industrial and thermal pollution,

sewage, heavy metals and radioactive wastes; ocean disposal of on-shore wastes; shipboard wastes; oil spills and dredge spoils; consequences for fisheries and humans; pollution dynamic and kinetic modeling; pollution control.

2095-511: BASIC GEOGRAPHICAL INFORMATION SYSTEM**CR: 3 PR: 2095-501, 502, 503, 504**

The courses provides an introduction to GIS and its applications. It emphasizes the concepts needed to use GIS effectively for manipulating, querying, analyzing, and visualizing spatial data. Industry-GIS software is used to analyze spatial patterns in social, economic and environmental data, and to generate cartographic output from the analysis.

This course introduces students to the concepts, techniques, and tools of GIS, through hands-on exercises and/or projects. Project students will acquire skills and a conceptual base on which they can build further expertise in GIS.

2095-512: BASIC REMOTE SENSING**CR: 3 PR: 2095-501, 502, 503, 504**

This course covers introduction to the digital image processing techniques. It contains principles of Remote Sensing and remote sensors, image visualization and statistical extraction, radiometric and geometric correction, image enhancement, image classification and change detection. Innovative image processing approaches will also be introduced. Traditional methods of interpretation are also contrasted with digital interpretation strategies. State-of-the-art commercial image processing software is used for labs and applications development.

2095-513: ADVANCED GEOGRAPHIC INFORMATION SYSTEM**CR: 3 PR: 2095-511**

This course develops hands-on skills with industry-standard GIS Software for application in a wide variety of areas including urban infrastructure management, marketing and location analysis, environmental management, geologic and geophysical analysis and geosciences. It contains more advanced topics on raster-based cartographic modeling, 3-D visualization, geostatistics and network analysis. It covers also advanced spatial analysis, geocoding, thematic display, geodata integration, and mobile mapping systems to solve research problems.

2095-514: ADVANCED REMOTE SENSING (RS)
CR: 3 PR: 2095-512

This course focuses on the application of Remote Sensing techniques to solving real world urban and environmental problems in areas such as urban and suburban landscape, land use and land cover, transportation and communication, vegetation and forestry, biodiversity and ecology, water and water quality control, soils and minerals, geology and geomorphology studies. The current generation industry standard software is used for labs and applications development.

2095-515: SPECIAL TOPIC
CR: 3 PR: 2095-511, 512, 513, 514

This course focuses on the scientific writing of research projects and reports in Geography or Geology, based on selected special topics related to the student's background, including the research methodology. The student has to write a short

research and give a presentation followed by discussion.

2095-516: GRADUATION PROJECT
CR: 3 PR: 2095-511, 512, 513, 514

This course is designed to give students the opportunity to conduct an independent project after approval of three parties: a) Supervisor, an organizational authority as an end-user, and the College of Graduate Studies. The project develops and demonstrates student's competence in using GIS and RS techniques in a substantive application to his/her field of interest. Projects have to be developed in cooperation with a local governmental authority, utility, business, or other entity, which uses GIS and RS in its operations and research. A formal presentation and a project report are required.