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ESM 407



Geographic Information
System
Course Guide

ESM 407 Geographic Information Systems Course Guide

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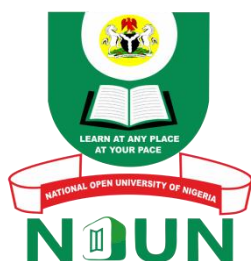
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Introduction

ESM 407 - Geographic Information Systems is a 3-credit unit course for students of Environmental Science and Resource Management.

The course is divided into five modules; each module has five study units. At the end of this course, you are expected to be conversant with issues relating to definitions of Geographic Information Systems (GIS), essential features of GIS, questions that GIS can answer, characteristics and types of geographical features.

The course further provides you with insight on GIS and related systems, geo-referencing, spatial and attributes databases and database management, spatial and attributes data models. Through this course, you would understand data manipulation/analysis operations in GIS, cartographical visualization of data, concept of data updating, as well as application of GIS. The course will also expose you to GIS implementation issues, challenges of GIS implementation in Nigeria, strategies for enhancing successful GIS implementation.

The course guide, therefore, tells you briefly what the course: ESM 407 is all about, the types of course materials to be used, what you are expected to know in each unit, and how to work through the course material. It suggests the general guidelines and also emphasizes the need for self-assessment and tutor-marked assignment. There are also tutorial classes that are available for this course and you are advised to attend.

What you will Learn in this Course

The overall aim of ESM 407 - Geographic Information Systems is to introduce you to GIS through the definitions of GIS, historical development of GIS, the value of geographical data, other technologies related to GIS, the components of GIS (hardware, software, data, personnel, and procedure), the various functions of GIS, database models (spatial and non-spatial), applications of GIS, and issues in the implementation of GIS among others.

Course Aims

This course will give you an in-depth understanding of the elements and principles of geographic information systems. It is hoped that the knowledge would equip you with the conceptual and technical issues on the practical applications of the science and technology of geographic information systems.

Course Objectives

It should be noted that each unit has some specific objectives. You should read them carefully before going through the unit. You may want to refer to them during your study to check on your progress. You should always look at the unit's objectives after completing a unit. In this way, you can be sure that you have done what is required of you by the unit.

On successful completion of this course, you should be able to:

- define geographic information systems
- highlight the essential features of GIS

- highlight some of the spatial questions that GIS can help us answer easily
- trace the historical evolution of GIS
- list the factors responsible for the growth of GIS
- explain the nature, characteristics, types and sources of geographical data
- differentiate between GIS and other related technologies
- identify the various components of a typical GIS
- state the functions of GIS
- discuss the concept of geo-referencing
- examine the processes of spatial and attribute data capture and integration
- identify the various electronic data storage devices used in GIS and the qualities of good storage devices
- outline some of the major data manipulation and analysis operations carried out in GIS
- discuss in detail, some of the geographical analysis procedures
- examine the issue of data display in a GIS environment
- explain document and printing formatting
- discuss the concept of data updating
- describe the nature, content, and functions of both spatial and non-spatial database systems
- examine the conversion from one model format to another
- discuss the concept of visualization
- identify some areas of GIS application
- discuss issues related to GIS implementation.

Working through this Course

To complete this course, you are required to read the study units, recommended text books, and other relevant materials. Each unit contains some self-assessment exercises and tutor-marked assignments, and at some points in this course, you are required to submit the tutor-marked assignments. There is also a final examination at the end of the course. Below are the components of this course and what you expected to do.

Course Materials

The major components of the course are:

1. Course Guide
2. Study Units
3. Text books
4. Assignment File
5. Presentation Schedule

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Study Units

There are five modules and 25 study units in this course. They are:

Module 1 Introduction to GIS

- Unit 1 Overview of GIS
- Unit 2 Definitions of GIS
- Unit 3 History of GIS Development
- Unit 4 Understanding Geographical Data
- Unit 5 GIS versus Allied Technologies

Module 2 Components of GIS

- Unit 1 GIS Hardware
- Unit 2 GIS Software
- Unit 3 Data
- Unit 4 Personnel
- Unit 5 GIS Method/Procedure

Module 3 Functions of GIS

- Unit 1 Data Input
- Unit 2 Data Storage
- Unit 3 Data Retrieval and Manipulation
- Unit 4 Data Output
- Unit 5 Data Updating

Module 4 Database Structure

- Unit 1 Database Structures
- Unit 2 Spatial Data Model
- Unit 3 Attribute Data Model
- Unit 4 Data Quality
- Unit 5 Sources of Data

Module 5 Application and Implementation of GIS

- Unit 1 Cartographic Application
- Unit 2 Socio-Economic Application
- Unit 3 Environmental and Natural Resources Management
- Unit 4 Facilities and Land Management Application
- Unit 5 GIS Implementation Issues

Textbooks and References

These texts will be of immense benefits to this course:

Arnoff, S. (1989). *Geographic Information Systems: A Management Perspective*. (4th ed.). Ottawa: WDL Publications.

Bolstad, P. (2005). *GIS Fundamentals: A First Text on Geographic Information Systems*. (2nd ed.). White Bear Lake, MN: Eider Press.

Burrough, P. A. (1986). *Principles of Geographical Information Systems for Land Resources Assessment*. New York: Oxford University Press.

Chakraborty, D. & Sahoo, R. N. (2007). *Fundamentals of Geographic Information Systems*. New Delhi: Viva Books.

Chang, K. (2006). *Introduction to Geographic Information Systems*. (3rd ed.). Boston: McGraw-Hill Higher Education.

Clarke, K. C. (1995). *Getting Started with Geographic Information Systems*. (3rd ed.). New Jersey: Prentice Hall.

DeMers, M. N. (2000). *Fundamentals of Geographic Information Systems*. New York: John Wiley & Sons.

ESRI (1990). *Understanding GIS: The ARC/INFO Method*. Redlands, CA: Environmental System Research Institute.

Huxhold, W. (1991). *Introduction to Urban Geographic Information Systems*. New York: Oxford University Press.

Jones, C. (1997). *Geographical Information Systems and Computer Cartography*. Essex: Addison Wesley Longman Limited.

Longley, et al (2001). *Geographic Information Systems and Science*. New York: John Wiley & Sons Inc.

Maguire, D. J. (1991). "An Overview and Definitions of GIS." In: D. J. Maguire, M. F. Goodchild & D. W. Rhind. (Eds). *Geographical Information Systems: Principles and Applications*. London: Longman, Vol. 1, pp. 9-20.

Robinson et al. (1995). *Elements of Cartography*. (6th ed.). New York: John Wiley & Sons.

Star, J. & Estes, J. (1990). *Geographic Information Systems: An Introduction*. New Jersey: Prentice-Hall.

Tomlin, C. D. (1990). *Geographic Information Systems and Cartographic Modeling*. New Jersey: Prentice-Hall.

Uluocha, N. O. (2007). *Elements of Geographic Information Systems*. Lagos: Sam Iroanusi Publications.

Wise, S. (2002). *GIS Basics*. London: Taylor & Francis.

Assignment File

The assignment file will be given to you in due course. In this file, you will find all the details of the work you must submit to your tutor for marking. The marks you obtain for these assignments will count towards the final mark for the course.

Assessment

There are two aspects to the assessment of this course. First, is the Tutor-Marked Assignment; and second, the written examination.

You are expected to apply knowledge, comprehension, information and problem solving gathered during the course. The Tutor-Marked Assignments must be submitted to your tutor for formal assessment, in accordance to the deadline given. The work submitted will count for 30% of your total course mark.

At the end of the course, you will need to sit for a final written examination. This examination will account for 70% of your total score.

Self-Assessment Exercise

You need to submit all the TMAs as provided in the ILMS in your portal. When you have completed each assignment, submit online and you can access your grades immediately before the deadline. If for any reason you cannot complete your assignment on time, contact your tutor before the assignment is due, to discuss the possibility of extension. Extension will not be granted after the deadline, unless there are exceptional cases.

Final Examination and Grading

The final examination for ESM 407 will be of 2 hours duration and have a value of 70% of the total course grade. The examination will consist of questions which reflect the self-assessment exercise and tutor-marked assignments that you have previously encountered. Furthermore, all areas of the course will be examined. It is also better to use the time between finishing the last unit and sitting for the examination, to revise the entire course. You might find it useful to review your TMAs and comment on them before the examination. The final examination covers information from all parts of the course.

Course Marking Scheme

Table I shows the course marking scheme.

Table I: Course Marking Scheme

Assessment	Marks
Tutor-Marked Assignments (TMAs)	30% of overall course marks
Final Examination	70% of overall course marks
Total	100% of Course Marks

How to Get the Most from this Course

In distance learning, the study units replace the university lecturer. This is one of the huge advantages of distance learning mode; you can read and work through specially designed study materials at your own pace and at a time and place that suit you best. Think of it as

reading from the teacher, the study guide tells you what to read, when to read and the relevant texts to consult. You are provided exercises at appropriate points, just as a lecturer might give you an in-class exercise.

Each of the study units follows a common format. The first item is an introduction to the subject matter of the unit and how a particular unit is integrated with the other units and the course as a whole. Next to this is a set of learning objectives. These learning objectives are meant to guide your studies. The moment a unit is finished, you must go back and check whether you have achieved the objectives. If you inculcate this habit, then you will significantly improve your chances of passing the course. The main content of the units also guides you through the required reading from other sources. This will usually be either from a textbook or from other sources.

Self-assessment exercises are provided throughout the unit, to aid personal studies. Working through these self-tests will help you to achieve the objectives of the unit and also prepare you for tutor-marked assignments and examinations. You should attempt each self-test as you encounter them in the units.

Read this Course Guide thoroughly

Organize a study schedule. Refer to the course overview for more details. Note the time you are expected to spend on each unit and how the assignment relates to the units. Important details, e.g. details of your tutorials and the date of the first day of the semester are available. You need to gather all these information in one place such as a diary, a wall chart calendar or an organizer. Whatever method you choose, you should decide on and write in your own dates for working on each unit.

Once you have created your own study schedule, do everything you can to stick to it. The major reason students fail is that they get behind with their course works. If you get into difficulties with your schedule, please let your tutor know before it is too late for help.

Turn to Unit I and read the introduction and the objectives for the unit.

Assemble the study materials. Information about what you need for a unit is given in the contents at the beginning of each unit. You will almost always need both the study unit you are working on and one of the materials recommended for further reading, on your desk at the same time.

Work through the unit, the content of the unit itself has been arranged to provide a sequence for you to follow. As you work through the unit, you will be encouraged to read from your set books.

Keep in mind that you will learn a lot by doing all your assignments carefully. They have been designed to help you meet the objectives of the course and will help you pass the examination.

Review the objectives of each study unit to confirm that you have achieved them. If you are not certain about any of the objectives, review the study material and consult your tutor.

When you are confident that you have achieved a unit's objectives, you can start on the next unit. Proceed unit by unit through the course and try to pace your study so that you can keep yourself on schedule.

When you have submitted an assignment to your tutor for marking, do not wait for its return before starting on the next unit. Keep to your schedule. When the assignment is returned, pay particular attention to your tutor's comments, both on the tutor-marked assignment form and also the written on the assignment. Consult your tutor as soon as possible if you have any questions or problems.

After completing the last unit, review the course and prepare yourself for the final examination. Check that you have achieved the unit objectives (listed at the beginning of each unit) and the course objectives (listed in this course guide).

Facilitators/Tutors and Tutorials

There are 8 hours of tutorials provided in support of this course. You will be notified of the dates, time and location together with the name and phone number of your tutor as soon as you are allocated a tutorial group.

Your tutor will mark and comment on your assignments, keep a close watch on your progress and on any difficulties you might encounter and provide assistance to you during the course. You should mail your tutor-marked assignment to your tutor well before the due date. At least two working days are required for this purpose. They will be marked by your tutor and returned to you as soon as possible.

Do not hesitate to contact your tutor by telephone, e-mail or discussion board if you need help. The following might be circumstances in which you would find help necessary.

Contact your tutor if you:

- do not understand any part of the study units or the assigned reading
- have difficulty with the self-tests or exercises.
- have questions or problems with an assignment, with your tutor's comments on any assignment or with the grading of an assignment.

You should try your best to attend the tutorials. This is the only chance to have face to face contact with your tutor and ask questions which are answered instantly. You can raise any problem encountered in the course of your study. To gain the maximum benefit from the course tutorials, prepare a question list before attending them. You will learn a lot from participating in discussion actively. GOODLUCK!