Laboratory Manual

Geographical Information System
For

Final year IT Students

20, Feb 2005 – ISO 9000 Tech Document
© Author JNEC, Aurangabad
FORWARD

It is my great pleasure to present this laboratory manual for final year engineering students for the subject of Geographical Information System, keeping in view the vast coverage required for understanding the concept and applications of GIS.

As a student, many of you may be wondering with some of the questions in your mind regarding the subject and exactly what has been tried is to answer through this manual.

As you may be aware that MGM has already been awarded with ISO 9000 certification and it is our endure to technically equip our students taking the advantage of the procedural aspects of ISO 9000 Certification.

Faculty members are also advised that covering these aspects in initial stage itself, will greatly relived them in future as much of the load will be taken care by the enthusiasm energies of the students once they are conceptually clear.

Prof. S.D.Deshmukh.
Principal
Vision of JNEC
College seeks to be the engineering college of choice in Maharashtra that can provide the best learning experience, the most productive learning community, and the most creative learning environment in Engineering Education and will be recognized as one of the best Engineering Colleges in India.

Mission of JNEC
To develop innovative engineers with human values, well equipped to solve complex technical problems, address the needs of modern society and pursue lifelong learning, by providing them competent, caring and committed faculty.

IT Vision:
IT department is committed to ensure the quality education to students’ by providing innovative resources & continuous up-gradation of the department. To achieve “Heights of Excellence” in the world we strive to organize regular interaction with Industry and Alumni.

IT Mission:
To impart core technical competency & knowledge in students through curriculum and certification programs to fulfill the industry requirements which ultimately benefits society at large.

Program Educational Objectives:

I. Preparation: To prepare students to excel in PG program or to succeed in Industry/Technical profession through global, rigorous education.

II. Core Competence: To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems and also to pursue higher studies.

III. Breadth: To train students with good scientific and engineering breadth so as to comprehend, analyze, design and create novel product and solution for the real life problems.

IV. Professionalism: To inculcate in students’ professional and ethical attitude, effective communication skills, team work skills, multi-disciplinary approach and an ability to relate engineering issues to broader social context.

V. Learning Environment: To provide students with academic environment aware of excellence, leadership, written ethical codes and guidelines and lifelong learning needed for successful professional career.
LABORATORY MANUAL CONTENTS

This manual is intended for the final year IT students in the subject of GIS. This manual typically contains practical/Lab Sessions related to GIS covering various aspects related to the subject to enhanced understanding.

Although, as per the syllabus, concepts of Geographical Information system ,data type vector and raster, approaches for designing GIS application ,data base handling is prescribed, we have made the efforts to cover various aspects of GIS covering different applications like site selection and identification,decision making analysis and monitoring etc. various examples of geographical entities ,spatial data Attribute data specifications. Various input data sources primary and secondary , I/P data editing etc.

Students are advised to thoroughly go through this manual rather than only topics mentioned in the syllabus as practical aspects are the key to understanding and conceptual visualization of theoretical aspects covered in the books.

Good Luck for your Enjoyable Laboratory Sessions

A.M.Mohsin
SUBJECT INDEX

1. Applications of GIS, Definition, introduction to Geography, concept of geographical referencing,
   Various types of maps
2. GIS application - Program in C for finding sitting for nuclear radioactive waste disposable site.
3. GIS application - Program in C to assist in house hunting.
4. GIS application - Program in C to identify conservation zones in Zdarske Vrchy
5. To Study GIS data Model and Spatial entity
6. To study layer based and object oriented approach in building computer world.
7. To study data analysis in GIS.
8. To study data quality and GIS project management.
9. Case study –GIS project
DOs and DON'T DOs in Laboratory:

1. Do not handle any equipment before reading the instructions/Instruction manuals

2. Read carefully the power ratings of the equipment before it is switched on whether ratings 230 V/50 Hz or 115V/60 Hz. For Indian equipments, the power ratings are normally 230V/50Hz. If you have equipment with 115/60 Hz ratings, do not insert power plug, as our normal supply is 230V/50 Hz, which will damage the equipment.

3. Observe type of sockets of equipment power to avoid mechanical damage

4. Do not forcefully place connectors to avoid the damage

5. Strictly observe the instructions given by the teacher/Lab Instructor

Instruction for Laboratory Teachers:

1. Submission related to whatever lab work has been completed should be done during the next lab session. The immediate arrangements for printouts related to submission on the day of practical assignments.

2. Students should be taught for taking the printouts under the observation of lab teacher.

3. The promptness of submission should be encouraged by way of marking and evaluation patterns that will benefit the sincere students.

WARMUP EXERCISES:

Define Geography.
Define GIS.
What are the various sources for getting geographical information.
What are maps.
List different types of maps
List different applications of GIS.
What is decision making.
Which type of data structures are used in building GIS application.
What do you mean by Layer based approach in building GIS.
What do you mean by object oriented approach in building GIS.
1. Lab Exercises:

[Purpose of these exercises is to familiarize students with GIS and required information.]

**Exercise No1: (2 Hours) - 1 Study Practical**

Applications of GIS, Definition, introduction to Geography, Concept of geographical referencing, various types of maps.

To test knowledge of students in geography,

Various geographical referencing and map types.
2. Lab Exercises:
Exercise No 2: (2 Hours) - 1 Practical
(Purpose of the exercise is to give a feel of developing a GIS application by using 'C'.
GIS application - Program in C for finding siting for
Nuclear radioactive waste disposable site, by using following flow chart.)
Using GIS FOR SITING A NIREX waste site

1. Identify relevant siting factors
2. Collect appropriate data and digitize
3. Identify siting criteria and map
4. Overlay
5. Examine output ok?
6. New factors required?
   - Yes
   - No
7. Final Potential areas

Yes

No
3. Lab Exercises:

Exercise No 3: (2 Hours) - 1 Practical

GIS application - Program in C to assist in house hunting

House hunting criteria identified

Must be close to a school
Must live near a main road
Would like to live close to an urban area
Would like to live in an area with a low crime

Appropriate geographical data sets identified

Map showing school locations
Map showing main roads
Map showing location of urban center
Map showing insurance zones as a surrogate measure for crime rates

GIS procedures used to create maps

Map showing proximity to school
Map showing proximity to main road
Map showing proximity to urban centre
GIS procedure used to extract areas of low ins.

Map showing low insurance areas

Composition map produced which provide

GIS procedures used to weight importance of each map

Overly Zones of low insurance

Suitable areas, low insurance

Using GIS to assist in house hunting

Yes

No

Decide to look at houses in these areas?

View houses
4. Lab Exercises:

**Exercise No 4: (2 Hours) - 1 Practical**

GIS application - Program in C to identify conservation zones in Zdarske Vrchy

5. Lab Exercises:

**Exercise No 5: (2 Hours) - 1 Study Practical**

To Study GIS data Model and Spatial entity

1) Raster data structure
   Representing Road as a geographical feature (i.e. line entity, in raster and vector data structures.)

   (10*10 cell grid)

2) Vector data structure
6. Lab Exercises:

Exercise No 6: (2 Hours) - 1 Study Practical

To study layer based and object oriented approach in building computer world, in GIS

1) Layer base approach
2) Object oriented approach

7. Lab Exercises:

Exercise No 7: (2 Hours) - 1 Study Practical
To study data analysis and data management concepts in GIS.

8. Lab Exercises:

Exercise No 8: (2 Hours) - 1 Study Practical
To study data quality and GIS project management

9. Lab Exercises:

Case study –GIS project

9. Quiz on the subject:

Quiz should be conducted on tips in the laboratory, recent trends and subject knowledge of the subject. The quiz questions should be formulated such that questions are normally are from the scope outside of the books. However twisted questions and self formulated questions by the faculty can be asked but correctness of it is necessarily to be thoroughly checked before the conduction of the quiz.

10. Conduction of Viva-Voce Examinations:

Teacher should oral exams of the students with full preparation. Normally, the objective questions with guess are to be avoided. To make it meaningful, the questions should be such that depth of the students in the subject is tested Oral examinations are to be conducted in co-cordial environment amongst the teachers taking the examination. Teachers taking such examinations should not have ill thoughts about
each other and courtesies should be offered to each other in case of difference of opinion, which should be critically suppressed in front of the students.

11. Submission:

Document Standard:
A] Page Size A4 Size
B] Running text Justified text
C] Spacing 1 Line
D] Page Layout and Margins (Dimensions in Cm)

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12. Evaluation and marking system:
Basic honesty in the evaluation and marking system is absolutely essential and in the process impartial nature of the evaluator is required in the examination system to become popular amongst the students. It is a wrong approach or concept to award the students by way of easy marking to get cheap popularity among the students to which they do not deserve. It is a primary responsibility of the teacher that right students who are really putting up lot of hard work with right kind of intelligence are correctly awarded.

The marking patterns should be justifiable to the students without any ambiguity and teacher should see that students are faced with unjust circumstances.