

**Syllabus**  
**EES 211 -Fundamentals of GIS (3 units)**

**Advanced Certificate in GIS**  
**Department of Earth and Environmental Sciences**  
**College of Science and Mathematics, California State University, Fresno**  
**(online course offered through the Division of Continuing and Global Education - CGE)**

**Fall 2012 (August 22 – Dec 16, 2011)**

Instructor: Dr. Zhi (Luke) Wang  
Phone: (559)278-4427 M - F 9:00 am – 6:00 pm Leave a message if there is no response. The call will be returned within 24 hours unless the instructor is out of town.

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**Basic Course Information**

This is a 3-unit online course (equivalent to 5 hours per week) to be learned at any time during the offering period. The course materials are available through Blackboard (login using your CSUF e-mail passwords)

Information for the entire class will be posted on announcements weekly, or more often if necessary. For personal questions, email or telephone the instructor. When writing an E-mail to the instructor, be sure to write “*EES211-LastName-Initial-lab# or question*” (no space anywhere) in the subject line, otherwise the email will be deleted as junk mail.

**Response Times:** The instructor will check and respond to email and the discussion board at least 4 days a week. Assignments will be graded, posted in the grade book and returned within the week of the due date.

**Catalog Description**

**EES 211. Fundamentals of GIS (3)**

**Prerequisites: None.** Fundamental concepts and techniques of GIS; hands-on labs on data exploration and analysis; advanced skills in spatial and 3-D analysis on terrain and watershed delineation; midterm and final term projects. Asynchronous online.

**Additional Course Information**

While there are no specific prerequisites, this course is intended for:

- Bachelor’s degree holders and equivalent professionals who did not have chance to learn GIS but need to use it now as is needed or required in many professions.
- Master’s or Ph. D. candidates or degree holders who want to use GIS for enhancing research, employability and continued education in science and computer applications.

- Any other matriculated persons who have desirable backgrounds in basic science and computer applications(including but not limited to environmental studies and sciences, geosciences, biosciences, physical sciences, engineering, social and economic sciences, etc.), familiar with database and spreadsheet software packages (such as dBase, Access and Excel etc.).

**Course Goal**

The goal of this course is to teach the advanced skills of GIS and abilities to build various GIS analysis models using diverse input data and information to resolve issues in natural resources management.

**Student Learning Outcomes**

Upon completion of this course the students will be able to:

1. Compile, categorize and combine GIS tools, concepts, data and models to solve in-situ environmental problems. This includes identifying the scientific and application needs, data acquisition and analysis, and report writing at the professional level. Students in this course are required to complete two self-proposed GIS projects which will require synthesis and evaluation.
2. Create, devise, restructure and relate various GIS components such as maps, tables, digital documents, air photos, drawings, geological and geographic data etc. to produce mapping results of the combined GIS analyses. This is applied in the midterm project on water uses by US counties.
3. Critique the values of proposed ideas, materials and the GIS assessment results for decision making. This is learned through the term project proposal and its execution.
4. Resolve issues involved in choosing a suitable GIS analysis procedure and toolset for the project; organize data and modify various map projections for the project purposes; expertly apply ArcCatalog and Toolboxes in ArcGIS; properly choose, convert and align various coordinate systems in the GIS project.
5. Integrate data, vector and raster models, and convert from one to another.
6. Create and integrate GIS spatial data and demographic data from various sources to explore social, demographic, scientific, engineering, political and economic conditions of a given system.
7. Delineate temporal and spatial distribution of human resources, economic status, natural resources and hazards etc. in a given geographic region.
8. Create and conduct hypothesis or scenario testing; compare, evaluate and critique input data; interpret the results; summarize, conclude and produce recommendations on results.
9. Disseminate results through reports, publications, presentations and/or other outlets.

**Required Textbook**

K-T Chang, *Introduction to Geographic Information Systems*, 6<sup>th</sup> edition. McGraw Hill Companies, 2012 (ISBN 978-0-07-336931-0).

**Bases for Course Grade**

Assignment	Weight
Online Attendance	10%
Lab exercises	60%
Midterm project	10%
Term project	20%
<b>Total</b>	<b>100%</b>

Letter grade	Percentage
A	90% or higher
B	80% or higher
C	70% or higher
D	60% or higher
F	Lower than 60%

### **Online Discussion Attendance:**

The instructor will post questions on the “Discussion Board” of Blackboard. Student input on the “discussion board” is required (beneficial to oneself and others) and will be tracked by the Course Statistics function and utilized in determining the points for on-line attendance.

### **Online Lab Exercises:**

There are up to 20 hands-on lab exercises designed to help you learn the methods/techniques of GIS in a step-by-step fashion. You must complete at least 15 labs in order to pass the course. These lab exercises will generally be due by 5 pm Friday of the assignment week. Each lab counts for 5.0 points. Labs submitted after the deadline will lose 0.5 point (10%) per day of delay.

### **Midterm Project:**

The instructor assigns a midterm project on **water resources usage by all counties in the United States**. There are various water resources such as fresh, salty, surface and subsurface water etc. that can be used for various beneficial purposes such as irrigation, aquaculture, domestic use, industrial, recreation and power generation, etc. The dataset is provided by USGS in text and Excel formats. Students will choose certain uses of the water resources and conduct GIS mapping analysis. The results, including a written report and all map and document files, will be submitted through Blackboard. The submitted zipped ArcMap document and data **must** be able to display properly on another computer, otherwise, 1/10th of the midterm grade will be deducted. Specific directions will be given for packaging the document and data files.

### **Term Project:**

A student proposed, but instructor approved, term project on **natural resources management** in general will be conducted. The instructor will help you define a geographic region and the problem of interest during the last four weeks. You will then obtain and create various datasets for the **project area**. You will apply and integrate almost all the GIS techniques learned in the course for your research in the project. You are required to submit a comprehensive project report. A detailed “**Lab and Term Project Guideline**” is attached to the end of this syllabus.

### **Required Materials - Hardware and Software Requirements, Cost**

Each student must have access to a computer with a DVD drive and capable of running MS Windows-based software. The student bears the cost of hardware and Internet access. The minimum system requirements are:

- Operating system: Windows 2000 professional or higher
- CPU Speed: 1.6 GHz or higher
- Memory (RAM): 1 GB
- Free Disk Space: 5 GB
- Broadband Internet access
- ArcGIS Desktop software, including the Spatial Analyst, 3D Analyst, Network Analyst, and Geostatistical Analyst extensions, will be provided at no cost to students.

### **Resources**

- Students must have Fresno State email account [Campus Email](http://email.csufresno.edu/)(http://email.csufresno.edu/). Your username and password will be used to login for courses and various services on campus. To access this course, you need to login to [Blackboard](http://blackboard.csufresno.edu/) (http://blackboard.csufresno.edu/)
- Student resources can be found at [Blackboard 9.1 Student Guide!](http://blackboard.csufresno.edu/students/index.shtml) (http://blackboard.csufresno.edu/students/index.shtml)
- If you find you are unable to access the Blackboard, first contact the [Technology Innovation for Learning and Teaching \(TILT\)](http://www.csufresno.edu/tlt/) (http://www.csufresno.edu/tlt/) or call the TILT Blackboard

resource center at 559-278-7373 Monday through Friday from 8:00am to 5:00pm. After hours, email TILT at [dcfeedback@csufresno.edu](mailto:dcfeedback@csufresno.edu) or call 559-278-7000 seven days a week between 7:00am to 10:00pm. If there is still a problem contact the instructor.

- When in Blackboard view the initial announcement. A link to Blackboard 9.1 Student Guide can be found at [Blackboard 9.1 Student Guide!](http://blackboard.csufresno.edu/students/index.shtml)(<http://blackboard.csufresno.edu/students/index.shtml>). Read it through before you access the course materials below.

### **How to Learn in This Web-Based Course**

1. With your work or home computer connected to the internet, login to [Blackboard](http://blackboard.csufresno.edu/) (<http://blackboard.csufresno.edu/>) using the login name and password of your CSUF e-mail account. Click on the name of this course.
2. Click on [First Day: Orientation and Software Installation](#) to go through the brief orientation, read the syllabus, and install required computer programs (provided).
3. Click on the "Required Basic Computer Skills" to go through the Excel and Access tutorials for your lab 0.
4. To begin the formal course work, first go to the "Weekly Modules" which include lecture notes and labs. Review the lecture notes, read the book chapters and then complete the required labs. Afterward, you must answer the questions posted on the "Discussion Board" to earn the attendance score.
5. Please provide your CREATIVE inputs on the "Discussion Board" (do not copy from others), so that other students may have the benefit of your queries. I will check the "Discussion Board" regularly. Personal questions (such as grade concerns) should be sent to the instructor by e-mail.
6. Please provide CREATIVE answers and do not copy from others. You are encouraged to view and correct the answers from others.
7. For e-mail communications and all submissions, you must follow the e-mail rules in this course, otherwise, your e-mail may get lost. **E-mail Rules:** In the SUBJECT line of your e-mail, type "**EES211-YourLastName-FirstName-HomeWork#**" (e.g., **EES211-Smith-John-Lab1, EES211-Smith-John-question**). **The name of your lab file should be the same as the e-mail Subject name. If you do it EXACTLY, your e-mail will go directly to the designated mail box for EES211 and will not get lost. Thanks for your corporation!! Send your e-mail to [zwang@csufresno.edu](mailto:zwang@csufresno.edu).**
8. Finally, I am reminding you that this is a highly technical and very time-consuming course (depending on your computer programming and GIS literacy). Thus, if you have a heavy schedule or time conflict, please adjust it to leave more time for this course.

### **E-mail Rules**

- Login to your e-mail account. The e-mail should be sent to [zwang@csufresno.edu](mailto:zwang@csufresno.edu).
- In the "SUBJECT" line of your e-mail, type "**EES211-YourLastName-Initial-HomeWork#**" (e.g., **EES211-Smith-John-Lab1, EES211-Smith-John-ProjectReport**).
- In the "Attachment" line, attach your PDF file (one lab per e-mail). Click on "send" button and wait until the e-mail is sent out.

**EES 211: Fundamentals of GIS, Tentative schedule**

<b>Week</b>	<b>Date</b>	<b>Monday-Tuesday</b>	<b>Wednesday-Friday</b> <b>Labs are due by 5 pm Friday</b>
1	8/22-24	Lab0: Excel and database skill	<i>Lecture 1: Introduction</i>
2	8/27-8/31	<b>Lab1:</b> Chpt 1, Tasks 1 and 2	<i>Lecture 2: Map projection</i> <b>Lab2:</b> Chpt 2, Tasks 1-4
3	9/3-7	<b>September 3 - Labor Day - no classes on campus.</b>	<i>Lecture 3: Representing Real World</i> <b>Lab3:</b> Chpt 3, Tasks 1-6
4	9/11-14	<b>Lab4:</b> Chpt 4, Tasks 1-3	<i>Lecture 4: Data Input and Preparation</i>
5	9/17-21	<b>Lab5:</b> Chpt 5, Tasks 1-3	<b>Lab6:</b> Chpt 6, Tasks 1-3
6	9/24-28	<b>Lab7:</b> Chpt 7, Tasks 1-5	<b>Lab8:</b> Chpt 8, Tasks 1-6
7	10/1-5	<b>Lab9:</b> Chpt 9, Tasks 1-3	<b>Lab10:</b> Chpt 10, Tasks 1-3
8	10/8-12	<b>Lab11:</b> Chpt 11, Tasks 1-3	<i>Lecture 5: Vector Analysis</i> <b>Start Mid-term project</b>
9	10/15-19	<b>Work on Mid-Term project</b>	<b>Submit Mid-Term project report by 5 pm Monday</b>
10	10/22-26	<i>Lecture 5: Raster Analysis</i> <b>Lab12:</b> Chpt 12, Tasks 1-5	<b>Lab13:</b> Chpt 13, Tasks 1-3 <i>Lecture 6: Digital Elevation Modeling</i>
11	10/29-11/2	<b>Lab14:</b> Chpt 14-Tasks 1-4	<b>Lab15:</b> Chpt 15-Tasks 1-5
12	11/5-9	<b>Lab16:</b> Chpt 17-Tasks 1-6	<b>Lab17:</b> Chpt 17-Tasks 1-6
13	11/12-16	<b>November 12 - VETERANS' DAY; no classes on campus.</b>	<b>Lab 18:</b> download, merge, Clip and Analyze DEM files, creating 3-D maps and TIN (Bb).
14	11/19-23	<b>Lab19:</b> Spatial and 3-D Analyst: ArcScene (Bb)	<b>Nov 21-23, No classes on campus (Thanksgiving Recess)</b>
15	11/26-30	<b>Conceiving a GIS project</b>	<b>Submit your GIS Project Proposal through email by 5 pm Friday</b>
16	12/3-7	<b>GIS project</b>	<b>GIS project</b>
17	12/10-14	<b>GIS project</b>	<b>GIS project</b>
18	12/17-20	<b>Final Examination week - complete the project report</b>	<b>Submit project report by 5 pm Dec 18</b>

**E-mail Rules:** The SUBJECT line of your e-mail and your lab file should be named as **“EES211-YourLastName-FirstName-Lab#”** (e.g., EES211-Smith-John-Lab1). This way, your submissions can be well managed in my computer. Thanks for doing so.

## **TextBook Chapters**

Chapter 1: Introduction

Chapter 2: Coordinate Systems

Chapter 3: Vector Data Model

Chapter 4: Raster Data Model

Chapter 5: GIS Data Acquisition

Chapter 6: Geometric Transformation

Chapter 7: Spatial Data Editing

Chapter 8: Attribute Data Input and Management

Chapter 9: Data Display and Cartography

Chapter 10: Data Exploration

Chapter 11: Vector Data Analysis

Chapter 12: Raster Data Analysis

Chapter 13: Terrain Mapping and Analysis

Chapter 14: Viewsheds and Watersheds

Chapter 15: Spatial Interpolation

Chapter 16: Geocoding and Dynamic Segmentation

Chapter 17: Path Analysis and Network Applications

Chapter 18: GIS Model and Modeling

**Evaluation Rubrics for GIS Online Discussion and Labs**

<b>Contents\Grade</b>	<b>Poor 2pts</b>	<b>Fair 3 pts</b>	<b>Good 4pts</b>	<b>Excellent 5 pts</b>
<b>Discussion</b> Have the analysis answers been written in detail with accuracy and insight?	Answers to the online questions show limited detail, accuracy and insight.	Answers to the online questions show some detail, accuracy and insight.	Answers to the online questions show considerable detail, accuracy and insight.	Answers to the online questions show a high degree of detail, accuracy and insight.
<b>Map Organization</b> Has the map been designed in an organized manner?	The organization of the map is displayed with limited effectiveness.	The organization of the map shows some effectiveness.	Map is displayed and organized in an effective manner.	There is a high degree of effectiveness in the organization.
<b>Map Technology</b> Has the student exhibited an ability to use the software to achieve the desired results?	Exhibits no command of the software and is able to use it with limited effectiveness.	Exhibits satisfactory command of the software and is able to use it with some effectiveness.	Exhibits good command of the software and is able to use it effectively.	Exhibits a high degree of ability in the use of the software.
<b>Map Application</b> Does the layout contain all the necessary cartographic elements?	The layout is missing several elements. These may include a legend, compass, title etc.	The layout is missing one or two of the following: a legend, compass, title etc.	The layout is designed with effectiveness and includes necessary cartographic elements.	The layout contains all necessary elements and is designed with a high degree of effectiveness.

### Evaluation Rubrics for GIS Term Project Reports

Qualities & Criteria	Poor (0-59.9)	Moderate (60-79.9)	Good (80-100)
<b>Format/Layout</b> <i>(Weight 15%)</i>	Follows poorly the requirements related to format and layout.	Follows, for the most part, all the requirements related to format and layout. Some requirements are not followed.	Closely follows all the requirements related to format and layout.
<b>Content/Information/Map</b> <i>(Weight 50%)</i>	The essay is not objective and addresses poorly the issues referred in the proposed topic. The provided information is not necessary or not sufficient to discuss these issues. <b>Maps were poorly organized and displayed.</b>	The essay is objective and for the most part addresses with an in depth analysis most of the issues referred in the proposed topic. The provided information is, for the most part, necessary and sufficient to discuss these issues. <b>Maps were well organized and displayed.</b>	The essay is objective and addresses with an in depth analysis all the issues referred in the proposed topic. The provided information is necessary and sufficient to discuss these issues. <b>Maps were very well organized and displayed.</b>
<b>Quality of Writing</b> <i>(Weight 20%)</i>	The essay is not well written, and contains many spelling errors, and/or grammar errors and/or use of English errors. The essay is badly organized, lacks clarity and/or does not present ideas in a coherent way.	The essay is well written for the most part, without spelling, grammar or use of English errors. The essay is for the most part well organized, clear and presents ideas in a coherent way.	The essay is well written from start to finish, without spelling, grammar or use of English errors. The essay is well organized, clear and presents ideas in a coherent way.
<b>References and use of references</b> <i>(Weight 15%)</i>	Most of the references used are not important, and/or are not of good/scholarly quality. There is not a minimum of 5 scholarly resources, and/or they are not used effectively in the essay. References are not effectively used, and/or correctly cited and/or correctly listed in the reference list according to APA style.	Most of the references used are important, and are of good/scholarly quality. There is a minimum of 5 scholarly resources that are for the most part used effectively in the essay. Most of the references are effectively used, correctly cited and correctly listed in the reference list according to APA style.	All the references used are important, and are of good/scholarly quality. There is a minimum of 5 scholarly resources that are used effectively in the essay. All the references are effectively used, correctly cited and correctly listed in the reference list according to APA style.

**Overriding criterion: Originality and authenticity.** If the essay is identified as not being original, and/or not done by the student, the instructor has the right to grade the paper as an F.



## **Reference Materials**

- Gorr, W.L., and K. S. Kurland, *GIS Tutorial Workbook for ArcView 9*, ESRI Press, 2005. (ISBN 1-58948-127-5)
- Bernhardsen, T., 1999. *Geographic Information Systems: An Introduction*, 2nd Edition, John Wiley & Sons, New York.
- Clarke, K.C., 2003. *Getting Started with Geographic Information Systems*, 4<sup>th</sup> edition, Prentice Hall, New Jersey.
- DeMers, M.N., 2000. *Fundamentals of Geographic Information Systems*, 2nd Edition, John Wiley & Sons, New York.
- ESRI, 1990. *Understanding GIS: The ARC/INFO Way*, Environmental Systems Research Institute, Redlands.
- ESRI, 1996. *Using ArcView GIS*, Environmental Systems Research Institute, Redlands.
- ESRI, 1999. *Getting to know ArcView GIS*, Environmental Systems Research Institute, Redlands.
- Heywood, I., Cornelius, S. and Carver, S., 1998. *An Introduction to Geographical Information Systems*, Addison Wesley Longman, New York.
- Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (eds.), 1999. *Geographical Information Systems*, 2nd Edition, John Wiley & Sons, New York.
- Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (eds.), 2001. *Geographical Information Systems and Science*, 2nd Edition, John Wiley & Sons, Chichester.
- Star, J. and Estes, J., 1990. *Geographic Information Systems: An Introduction*, Prentice Hall, Englewood Cliffs.
- Tomlin, C.D., 1990. *Geographic Information Systems and Cartographic Modelling*, Prentice Hall, Englewood Cliffs.
- Zeiler, M., 1999. *Modeling Our World: The ESRI Guide to Geodatabase Design*. Environmental Systems Research Institute, Redlands.

## **Course Policies**

You must satisfactorily complete at least 15 out of the 20 lab sessions. You will receive an “Incomplete” or “F” grade automatically if you miss more than 10 lab exercises, regardless of the work you have completed. These lab exercises will generally be due at 5 pm Friday of the assignment week. Late penalty for exercises and assignments is 10% per day (i.e. Don't be late unless you have a legitimate reason, such as illness or real emergencies.) The project report must be presented with acceptable professional standards, i.e. clear logical layouts, neat and legible, no scribbling, no untidy work.

## **University Policies**

### **Students with Disabilities:**

Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the Henry Madden Library, Room 1202 (278-2811).

### **Honor Code:**

“Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities.” You should:

- a) understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)
- b) neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.

- c) take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Instructors may require students to sign a statement at the end of all exams and assignments that “I have done my own work and have neither given nor received unauthorized assistance on this work.” If you are going to use this statement, include it here.

**Cheating and Plagiarism:**

"Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations).

**Computers:**

"At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from [Information Technology Services](http://www.csufresno.edu/ITS/) (<http://www.csufresno.edu/ITS/>) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources."

**Disruptive Classroom Behavior:**

"The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. ... Differences of viewpoint or concerns should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live. Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

**Copyright policy:**

Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its [Copyright Web Page](http://csufresno.edu/library/information/copyright/) (<http://csufresno.edu/library/information/copyright/>).

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material. You may download one copy of the materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material. Beyond this use, no material from the course web site may be copied, reproduced, republished, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.

**Subject-to-Change Notice**

This syllabus and schedule are subject to change depending on the course progress. The above schedule and procedures are subject to changes in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent. Any substantive changes to this syllabus will be accompanied by the distribution of a revised syllabus.

## Lab and Term Project Guideline

### 1. How to produce PDF files for your labs and combine them into one PDF for submission:

- In ArcView 9.x (ArcGIS): Access “layout view” by clicking the button at the lower left corner of normal view. Go to “file/export map”, then “save as” PDF file. Name the file as “EES211-YourLastName-Firstname-Lab#”
- Combine your PDF files into one file for the same lab, by opening the first PDF file, then insert new pages using “Documents/Pages/Insert” functions, or follow the specific procedures in your version of Adobe PDF software.
- Please E-mail your PDF file as an attachment file (one PDF per lab) and **use the correct SUBJECT name of the e-mail**. Otherwise, your homework could be lost in the system.

### 2. How to prepare a project proposal?

In this term project proposal you will:

- Specify your project's objectives
- Briefly describe the information sources you expect to use
- List the expected results in terms of knowledge gained or analysis accomplished

It is understandable that in preparing a project proposal many things are not completely understood in the beginning and it is possible that major changes in the project may occur as you execute it. The main purpose of this outline is to give me an understanding of what you intend to do so that I can help you define a project that is feasible within the time frame and the information resources that are available. It is better to focus your ideas rather narrowly first and then broaden them out later. Many students start out attempting to do more than the time available during the semester will permit.

### 3. How to prepare the term project report?

A written report detailing each step should be submitted on or before the stated deadline. Ideas for term projects may come from past students, your professional work, GIS web sites, GIS magazines or research journals, etc. The written report should be double-spaced typed and limited to 10 pages or less, including necessary figures and tables. This report should have all components as outlined below. In the body of the report you are to present a thorough discussion of the data, the analysis, problems encountered and the solutions and new findings. As the reports will be graded somewhat subjectively and loosely based on their levels of usefulness, students are advised to seek for in priori approval from the instructor and must include the following sections:

- Title page (project title, abstract, student name, and email address)
- Introduction and Problem statements (up to 1 page)
- Data collection and assembly (up to 1 page)
- Analytical methodology and procedures (up to 2 pages)
- Results and discussion (up to 5 pages)
- Concluding remarks (up to 1 page)
- Cited references (list and cite at least 5 peer-reviewed references)

Reports will be graded based on

- Whether or not the problems can be solved without using GIS.
- Use of appropriate data sources
- Proper use of data analysis techniques (including 3-D analysis)
- Analytical methodology
- Grammar, spelling
- Report structure (abstract, table of content, bibliography, etc.)