

TOWSON UNIVERSITY
College of Graduate Studies and Research
Integrated Homeland Security Management Program

IHSM 660 – Geographic Information Systems Applications:
Homeland Security and Emergency Management
Summer 2009

Instructor: John M. Morgan, III, Ph.D.
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Office Hours: M, T, W, R, . 7:00 – 9:00 pm
Weekends, TBA
Meeting Time: Online

Course Description

Study and use of selected computer hardware and software for the storage, retrieval, manipulation, analysis, and display of geographic data. Emphasis is placed on the application of geographic information systems (GIS) for homeland security and emergency management. The course is not intended to provide students with extensive training in particular GIS software. However, laboratory projects involving student use of Windows-based GIS software on desktop computers, and Internet-based GIS applications using Web browsers, are required and will reinforce important concepts. Note: although this is an online course, the instructor will arrange to meet students in his office in Linthicum Hall (Room 030) at a mutually agreeable time.

Course Objectives

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

- Apply important mapping concepts, particularly map scale, coordinate systems, and map projections, to the use of existing digital geospatial data.
- Perform selected GIS tasks (displaying data, getting information about features, analyzing feature relationships, creating and editing data, and presenting data) using ArcExplorer (Environmental Systems Research Institute).
- Employ Internet mapping applications for the retrieval and display of digital geospatial data.
- Find digital geospatial data for use with desktop and Web-based GIS applications using online metadata tools.
- Describe the analytical functionality of GIS.
- Describe the technological evolution of GIS.
- Understand how GIS and related geospatial technologies are used in support of homeland security and emergency management activities

Prerequisites: None.

Required Textbooks

- Greene, R. W. 2002. *Confronting Catastrophe: A GIS Handbook*. Redlands, California: ESRI Press. ISBN 1589480406 (\$14.95 list).
- Radke, S, L. and E. Hanebuth. 2008. *GIS Tutorial for Homeland Security*. Redlands, California: ESRI Press. ISBN 1589481887 (\$79.95 list).
- Kataoka, M. 2007. *GIS for Homeland Security (Case Studies in GIS)*. Redlands, California: ESRI Press. ISBN 1589481550 (\$24.95 list).

Other Required Readings

- Anonymous. n.d. *The U.S. National Grid: A Simple and Powerful Geospatial Tool*. Washington, D.C.: Federal Geographic Data Committee. Available online at <http://www.fgdc.gov/usng/USNGInfoSheetCv3.pdf>.
- Anonymous. 2008. *Public Safety and Homeland Security Situational Awareness*. Redlands, California: Environmental Systems Research Institute. Available online at <http://www.esri.com/library/whitepapers/pdfs/situational-awareness.pdf>
- Backer, J. C., et al. 2004. *Mapping the Risks: Assessing the Homeland Security Implications of Publicly Available Geospatial Information*. Arlington, Virginia: RAND National Defense Research Institute. RAND Corporation monograph available online at http://rand.org/pubs/monographs/2004/RAND_MG142.pdf

Links will be available on the Blackboard Web site for the student to order the required textbooks from Amazon.com. Additional readings and materials will be distributed by the instructor throughout the course.

References

- Amdahl, G. 2001. *Disaster Response: GIS for Public Safety*. Redlands, California: ESRI Press. ISBN 1879102889 (\$19.95 list)
- Greene, R. W. 2005. *GIS for Homeland Security*. Redlands, California: ESRI Press. Free ESRI pamphlet.
- Sui, D. Z., ed. 2008. *Geospatial Technologies and Homeland Security. Research Frontiers and Future Challenges*. Springer. ISBN 1402083394 (\$189.00 list).
- Van Oosterom, P., S. Zlatanova, and E. M. Fendel, eds. 2005. *Geo-information for Disaster Management*. Springer. ISBN 3540249887 (\$259.00 list)

Course Introduction

Timely, accurate information, easily accessed and capable of being shared across federal, state, and local government agencies is fundamental to the decision-making capability of those involved with homeland security and emergency management. Geographic information systems (GIS) provide a “common operating picture” to visualize activity patterns, map locations, and understand the multi-layered geospatial context of emergency situations. GIS can provide decision-makers with the information

they need to confront a wide variety of threats including natural disasters, terrorist attacks, sabotage, and other crises.

GIS provides a tool for the storage, retrieval, manipulation, analysis, and display of geospatial information. For example:

Detection. Geospatial information provides the spatial and temporal backdrop on which effective threat analysis can be accomplished. By linking and analyzing spatial and temporal information in real time, patterns may be detected that lead to timely identification of likely modalities and targets.

Preparedness. Emergency managers and first responders must depend on geospatial information to accomplish their mission. Geospatial information access and interoperability are critical elements as they support the means for response units to react to terrorist attacks, natural disasters, and other emergencies.

Prevention. Geospatial information provides a means to detect and analyze patterns regarding terrorist threats, probable targets, and possible attacks. This information, coupled with other geospatial information, can lead to the disruption of terrorist plans or the prevention or interdiction of attacks.

Protection. Geospatial information is an important component in the analysis of critical infrastructure vulnerabilities and in the use of decision support technologies such as visualization and simulation to anticipate and protect against cascading effects of an attack on one system as it relates to other systems.

Response and Recovery. Geospatial information has been used by many agencies and organizations in response to and recovery from natural disasters. Similarly, the information is invaluable for emergency response services of all kinds, as well as for carrying out long-term recovery operations.

Course Content

- Introduction to geographic information systems
- History of geographic information systems
- Fundamentals of mapping for geographic information systems
- The nature of geographic data
- Geographic data storage
- Geographic data retrieval and manipulation
- Geographic data analysis
- Geographic data display
- GIS and homeland security
- GIS and emergency management

Grading Criteria

Grades will be determined as follows:

Discussions (10 x 1 point)	10 points
Tutorial exercises (5 x 5 points)	25 points
Case Study	40 points
Final Exam	25 points
Total	100 points

Grading Scale

Grade	Points
A	90-100
B	80-89
C	70-79
F	0-69

Grading Standards

Students and faculty recognize that the grade the instructor gives is a professional judgment of the quality of the student's submitted work and that grades are based on shared assumptions and expectations. At the most basic level, I expect that assignments will be submitted to me on time. Assignments are to be clearly focused and organized. Generalizations and conclusions are to be adequately supported and, when appropriate, research documentation (bibliography) is to be included. A formal writing style is required, along with proper grammar, punctuation, and spelling.

It is also important that students and faculty have shared expectations regarding the grading of assignments. The following broad definitions offer general criteria for grading:

The grade of A reflects excellence. The A paper offers a well-focused and organized discussion appropriate to the assignment, reflects critical use of relevant materials, and demonstrates effective and formal writing. Case study papers must demonstrate outstanding efforts to identify varied pertinent sources, to employ those materials critically in the text of the papers, and to provide error-free citations of those resources.

The grade of B represents an effort beyond satisfactory and indicates the paper was completed in an appropriate and competent manner and, in general, demonstrates a strong attempt at original and critical analysis, writing, and research. The B paper may contain a number of minor errors of grammar or citation, and its thesis or its conclusions may be undeveloped or too weakly supported.

The grade of C indicates that the paper was done in a satisfactory or appropriate fashion and represents the average work expected for university courses. The presentation is organized around a central idea with arguments supported by relevant

examples. The paper is structured into correctly written paragraphs and sentences. Although fulfilling the assignment, the C paper may exhibit one or more weaknesses including, but not limited to, errors of punctuation and grammar, imprecise or incorrect word use, inaccurate or uncritical use of materials, occasional inconsistency of organization or development, and lack of direct relevance of the selected research materials to the topic.

The grade of F indicates that the paper is not clearly relevant to the assignment and that its topic and thesis are poorly focused or defined. The paper may display inadequate organization or development, unsupported generalizations, and nonstandard features (including language usage, sentence structure, paragraphing, and so on). Research support is absent, inadequate, or irrelevant to the assignment.

Blackboard Site

There is a Blackboard Web site for this course (Course ID: IHSM 660). Students are responsible for checking the site daily for updates and announcements. All course related materials will be available for download from the Blackboard Web site.

Discussions

This course, like others at this level, is an educational transition from content focused undergraduate courses. This course expects you to discover your own approach to learning by locating and utilizing the resources available to you through your own efforts (self-teaching). There are various readings, presentations, video and audio recordings that will help understanding the topics being covered. Also, Web searches on selected topics may be given to help find additional material. In addition, the focus moves beyond merely knowing the material in the textbooks and other readings, and expects a higher order of reasoning. Among other things, you are expected to inter-relate concepts and ideas from the course material, and from other courses and personal experience. A critical part of that process is interaction with other students and the instructor, and participation in online class discussions. The standards of oral and written communication expected of educated persons will be applied. The instructor may hold periodic class chat sessions to enhance learning and answer questions.

Your grade for online discussions will be based on your timely responses to weekly focus questions and other discussion topics. Your evaluation will be based on the quality of your response. Responses should be clear, concise, and add to the discussion or introduce a relevant point. Responses such as "I agree with John and Mary" do not constitute a quality response. Each student will post a response to weekly discussion topics and respond to the posting of at least one (1) other classmate.

Assignments

In addition to course readings, students will complete several assignments involving the use of desktop GIS software and Internet-based GIS applications. A separate handout

will be provided for each assignment and students will have at least two weeks to submit their assignment to the instructor. Unless otherwise specified by the instructor, all assignments are to be completed individually. Use APA style format and document all references used. Include a cover sheet that includes title, student name, course number, and date. The cover sheet, diagrams, tables and references are not included in the page count. All assignments must be written in narrative (essay) style. The assignment must be posted in the Assignment area of the Blackboard Web site by the due date in the syllabus. These assignments must be posted in Adobe .pdf (preferred format) or Microsoft .doc format, must be double-spaced with one-inch margins, and must use 12-point Arial font.

Research Project

Each student will develop a case study related to a GIS and homeland security or GIS and emergency management topic. Topics must be approved by the instructor. Students are encouraged to use maps, diagrams, and tables to help explain their findings. This assignment must be posted in Adobe .pdf or Microsoft .doc format, must be double-spaced with one-inch margins, and must use 12-point Arial font.

Final Exam

There will be a comprehensive open book, open notes, final exam covering all material related to the course. The final exam will consist of short answer, and essay questions. The exam will be posted on the Blackboard Web site during the last week of class.

Participation--World Wide Web Protocols

By registering for a Web-based course, you have made a commitment to participate in course discussions as well as other online activities. All course related materials will be available for download from the Blackboard Web site. Blackboard also allows you to communicate with your classmates and me in a virtual classroom 24 hours a day, 7 days a week. It is recommended that you check your email and the Blackboard Web site at several times each week for course announcements and other information.

Additional Information

Assignments. In addition to course readings, there will be regular homework and assignments. Unless otherwise indicated, all work is due 12 midnight EST on the date due in the syllabus. All work and assignments must be posted in the appropriate Assignment Area by the assigned date. No work will be accepted if sent by email. Unless otherwise specified by the instructor, all assignments are to be completed individually. Grades will be posted within 48 hours after the due date.

Email Messages. All email correspondence with me must be conducted using your Towson University email account (username@students.towson.edu). The instructor will not read/respond to any email messages sent from non-Towson

University accounts. The subject field in all Email messages must contain the course ID (i.e. IHSM 660). Emails will be answered within 48 hours.

Expectations. I take an active approach toward teaching and learning. Because the understanding of basic facts is an essential ingredient of the course, I expect students to learn through the active process of “doing.” As such, the student can expect that there will be more “hands-on” activities. Much like the technology environment, the assignments in this class will carry strict deadlines. It is up to you to complete your assignments on time. It is expected, that you will ask questions before trouble arises and assignments get pushed past the due date. There are no concessions for assignment due dates.

Extra Credit. Extra credit is not provided for or given.

Incompletes. Do not expect an Incomplete in the course unless you have serious personal problems very close to the end of the term. Towson University regulations are strict about the assignment of an Incomplete. Please consult the Graduate Catalog for further information on grading policies.

Late Policy. The assignments, participation (discussion topics and Web activities), and final exam should be submitted on time. Students have a long lead-time in which to prepare, ask questions, and seek help. Therefore, unless a major accident, illness, or work assignment (with supporting documentation) prevents a student from submitting work on time, one letter grade will be deducted from each late assignment's grade. After a week late, a grade of zero will be given.

Make-up Work. No provision has been made for make-up work in this course.

Plagiarism and Academic Dishonesty. Academic dishonesty in any form will not be tolerated. Evidence of dishonesty may result in failure of the course and submission of a letter to the Vice President. At a minimum, it will result in grade of zero for the assignment in question. Plagiarism of others' work of any kind and/or attempts to gain unfair advantage during the final examination and for other course requirements will be considered serious offenses.

Technology Requirements. Each student will need access to a Windows-based computer with Internet access in order to complete course work and assignments. Also, each student will install GIS software on their computer in order to complete assignments. Computers running the GIS software used for this course are available in Cook Library and Linthicum Hall.

Special Needs. If you have a learning disability or need accommodation for any reason, please advise the instructor within the first week of class.

Summer 2009 Course Schedule*

The following is the Summer 2009 course schedule for IHMS 660. Please note that additional information including specific pages for the readings, key terms, instructor PowerPoint presentations, and Web links will be provided on the Blackboard Web site.

Week 1 (5/26)

Topics – Course requirements; Introduction to GIS

Readings – Instructor handouts; Various Web sites

Assignments – Install ArcGIS and the exercise data on your home or work computer (see Appendix B of Radke and Hanebuth); Radke and Hanebuth, Chapter 1 (complete Exercise 1.1) and Chapter 2 (complete Exercises 2.1 through 2.5)

Discussion Topics – What is a GIS? For what purposes can a GIS be used by homeland security and emergency management officials? How can GIS enhance “situational awareness” for homeland security and emergency management officials? How can GIS serve as a “common operating picture” for homeland security and emergency management officials?

Week 2 (6/ 1)

Topics – History of GIS; Fundamentals of mapping for GIS

Readings –Instructor handouts; Various Web sites

Assignments – Radke and Hanebuth, Chapter 2 (complete Exercises 2.6 through 2.10)

Discussion Topics – What are the characteristics of a “good map”? What information can a map provide that is otherwise unavailable or difficult to develop for homeland security and emergency management purposes?

Week 3 (6/ 8)

Topics – The nature of geographic data

Readings –U.S. National Grid monograph; Rand Corporation monograph; Instructor handouts; Various Web sites

Assignments – Radke and Hanebuth, Chapter 3 (complete Exercises 3.1 through 3.5)

Discussion Topics – What is metadata? How can Web sites like the Geospatial One-Stop (<http://geodata.gov>) and The National Map (<http://nationalmap.gov>) be used to find online sources of geographic data for homeland security and emergency management applications? How can data quality affect the use of geographic data for homeland security and emergency management applications? What is the U.S. National Grid? Why should it be used for homeland security and emergency management applications? What were the conclusions of the RAND Corporation report with regard to the homeland security implications of publicly available geospatial data?

Week 4 (6/15)

Topics – Geographic data storage

Readings –Instructor handouts; Various Web sites

Assignments – Radke and Hanebuth, Chapter 3 (complete Exercises 3.6 through 3.10)

Discussion Topics – What are the differences between raster and vector data structures? How is database management incorporated in a typical GIS? What tools and techniques are available for entering data into a GIS? Why is GIS data storage and important consideration for homeland security and emergency management officials?

Week 5 (6/22)

Topics – Geographic data retrieval and manipulation

Readings –Instructor handouts; Various Web sites

Assignments – Radke and Hanebuth, Chapter 4 (complete Exercises 4.1 through 4.4)

Discussion Topics – What GIS data retrieval and manipulation tools can be used by homeland security and emergency management officials?

Week 6 (6/29)

Topics – Geographic data analysis

Readings –Instructor handouts; Various Web sites

Assignments – Radke and Hanebuth, Chapter 5 (complete Exercises 5.1 through 5.6)

Discussion Topics – What GIS data analysis tools can be used by homeland security and emergency management officials?

Week 7 (7/ 6)

Topics – Geographic data display

Readings –Instructor handouts; Various Web sites

Assignments – Radke and Hanebuth, Chapter 6 (complete Exercises 6.1 through 6.6) and Chapter 7 (complete Exercises 7.1 and 7.2); Begin work on Case Study

Discussion Topics – What GIS data display (visualization) options are available to homeland security and emergency management officials? How can the output from a GIS provide decision support for homeland security and emergency management officials?

Week 8 (7/13)

Topics – GIS and homeland security

Readings – Kataoka, Chapters 1-3, Instructor handouts; Various Web sites

Assignments - Continue work on Case Study

Discussion Topics – Describe the ways in which GIS can be used to gather and analyze intelligence (data fusion), protect critical infrastructure, and respond to complex emergencies.

Week 9 (7/20)

Topics – GIS and homeland security

Readings – Kataoka, GIS Profiles and Chapters 4-6; Instructor handouts; Various Web sites

Assignments – Continue work on Case Study

Discussion Topics – How has GIS become an indispensable, practical tool for homeland security applications by the people described in the GIS Profiles chapter of Kataoka? Describe the ways in which GIS can be used to prepare for disease outbreaks and bioterrorism and secure complex events. Why is GIS likely to remain at the forefront of efforts to deal with the physical, psychological, and economic consequences of natural disasters or terrorist attacks?

Week 10 (7/27)

Topics – GIS and emergency management

Readings – Greene, Chapters 1-4; Instructor handouts; Various Web sites

Assignments – Continue work on Case Study

Discussion Topics – Describe the ways in which GIS can be used for disaster management.

Week 11 (8/ 3)

Topics – GIS and emergency management

Readings – Greene, Chapter 5 7 and Appendix A, B, and C; Instructor handouts; Various Web sites

Assignments – Continue work on Case Study

Discussion Topics – Describe the ways in which GIS can be used for disaster preparedness and asset management.

Week 12 (8/10)

Topics – Final exam

Readings – None

Assignments – Case Study due by 8/14

Discussion Topics – None

Notes – Final exam due by 8/14

*The instructor reserves the right to modify this course schedule. Any schedule changes will be posted as they occur on the Blackboard Web site.