CEE 8813A: IT-Based Infrastructure Management – Spring 2004

Class Room:	Room 110 Mason Building
Computer Lab:	Room 297 Mason Building
Time:	Tuesdays, 3.05 – 5.55 PM
Credits:	3 Hours

Instructor
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Course Description

The advent of information technology (IT) has brought profound change to our society and offers a great opportunity for improving the productivity and efficiency in our operating and managing the life-cycle activities of the CEE engineered systems. It is important for civil and environmental engineers to know the strength and limitation of IT. This course will present a broad and integrated approach to the introduction of IT, as well as the impact and application of IT on infrastructure engineering systems. A highway pavement system, one of the crucial infrastructure engineering systems for continuously supporting economic prosperity, will be used throughout this course to illustrate how IT can be applied throughout the entire life-cycle activities of a pavement system, including planning, design, construction, operation, maintenance, and rehabilitation. Although we use pavement system to illustrate the use of IT, students should be able to apply the same concept and framework to other infrastructure systems. Examples of the application of IT to other infrastructure systems, such as bridge, sewer, and pipeline systems, will also be briefly discussed in this course.

Students will learn basic programming skills using GPS/GIS techniques, MS VB.Net, database management using MS Access; students will also learn the applications of other emerging technologies such as voice recognition, image processing technology, wireless application protocol (WAP), and knowledge base system (KBS) on collecting, storing/retrieving, processing, analyzing, and presenting data and information for practical problems. The technologies used for the development of IT-based pavement management system will be presented, and some components and the data from the system will be used as exercises and team projects so students will gain a better appreciation of the various issues raised the system's development. Students will also learn the benefits that can be achieved from the implementation of an IT-based pavement management system.

With this course, students will acquire basic knowledge in IT and understand the potential application and benefits of IT for infrastructure engineering systems. With this introductory course, students have better idea to take the relevant courses to further enhance their knowledge such as the courses of infrastructure system, database, GIS, etc.

Course Outline

Lecture	Date	Topics
1	Jan. 11	**1. Course Overview.** **2. Introduction to Engineered Systems, Infrastructure Systems, and Information Management System.**
2	Jan. 18	**3. Highway Pavement Technologies and PMS** - Design, and associated considerations and challenges - Construction, and associated considerations and challenges - Condition assessment methods - Maintenance/rehabilitation – Pavement Management System (PMS) - Need for an Integrated Highway Pavement System.
3	Jan. 25	**4. Information Technologies** - Global Position System (GPS)/Geographic Information System (GIS) - VB.Net Programming - Database Management - Internet/Intranet - Other Technologies including knowledge base system, wireless technology, PDA, image processing, voice recognition, and others.
4	Feb. 1	
5	Feb. 8	
6	Feb. 15	
7	Feb. 22	
8	Mar. 1	**Highway Pavement Technologies and PMS (lecture 2 cont.)** - Design, and associated considerations and challenges - Construction, and associated considerations and challenges - Condition assessment methods - Maintenance/rehabilitation – Pavement Management System (PMS) - Need for an Integrated Highway Pavement System.
9	Mar. 2	**5. Development and Application of IT to Pavement Management System (PMS)** - IT application on PMS - Data acquisition - Data Management - Decision support and knowledge discovery - Key components in PMS decision support system - Pavement performance measurement and forecasting - Pavement treatment strategy determination - Pavement need analysis and funding allocation • Discuss final project.
	Mar. 9	Spring Break
10	Mar. 16	Mid-Term Exam
11	Mar. 23	• Pavement performance measurement and forecasting - Pavement condition evaluation methodology - Pavement performance definition and measurement - Pavement performance forecasting with deterioration models - Regression analysis - Probabilistic analysis (Markov Chain)
12	Mar. 30	• Pavement Maintenance and Rehabilitation - Treatment Criteria - Economic/premium strategies • Need Analysis - What is need analysis and why it is important - How to conduct need analysis • Guest lecture from Federal Highway Administration (FHWA)

Lecture	Date	Topics
13	Apr. 6	• Funding allocation (Selecting projects when funding is constrained) - What is funding allocation and why it is important - How to conduct funding allocation - Worst first - Optimization - Simulation • Invited guest lecture from GDOT or on-site visit
14	Apr. 13	• Final project discussion • Other Technologies. - knowledge base system, - wireless technology, - PDA, - image processing, - voice recognition, and others
15	Apr. 20	Project Presentation

Course Evaluation

Homework Assignments	30%
Midterm Exam	25%
Term Project	35%
Participation	10%

Textbooks & References

Optional:

- Modern Pavement Management (Haas, Hudson and Zaniewski, 1994)
- Infrastructure Management (Haas, Waheed and Uddin, 1997)
- Management Information System (Kenneth C. Laudon and Jane P. Laudon, 2001)

Other readings will be provided as they are assigned.