

COURSE SYLLABUS
CE 4306 INFRASTRUCTURE ASSET MANAGEMENT

Summer 2010
COURSE SYLLABUS
The University of Texas at Arlington
College of Engineering
Department of Civil Engineering
CE 4306 – Infrastructure Asset Management
(3 Credit Hours)

Instructors: Mohammad Najafi, Ph.D., P.E. and G. 'Gus' Khankarli, Ph.D. P.E., PMP

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Office Hours: Monday through Thursday 5:30 PM - 6:00 PM or by appointment

Course Number, Section Number, and Course Title: CE 4306, Sec 001(50250) & Sec 002(50251) - **INFRASTRUCTURE ASSET MANAGEMENT**

Time and Place of Class Meetings: MTWR 3:30-5:30 PM, Room 109 Nedderman Hall.

Teaching Assistant (TA): Mustafa Kanchwala

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Office Hours: Mon. and Wed., 1:00 - 3:00 PM (Additional Office Hours by Appointment).

Abstract: This course provides the student with an in-depth understanding of the issues related to infrastructure planning, engineering, and economics. The focus will be on the prioritization, stewardship, management and decision-making roles within the engineering division of a large public works agency. Various infrastructure planning concepts will be reviewed and discussed. Numerous case studies will be described and discussed, which will demonstrate that in order to plan and implement a successful public works project, many controversial issues must be faced and difficult problems must be solved. Decision-making at agency and other levels of government will consider the reports prepared by planners covering engineering feasibility, environmental and social impact assessments, and financial and economic analyses. Evolving modern planning issues will be introduced and discussed, including sustainability; environmental economics; environmental justice; uncertainty and risk-benefit analysis; partnerships with private entities versus total privatization; and the optimum staff–mix utilization in-house versus outsourcing.

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Description of Course Content: This course is designed for engineers and managers involved in infrastructure asset management. Topics include pipeline deterioration parameters, asset management technologies, risk assessment, infrastructure inventory, inspection, life cycle costs, government regulations and case studies. Practical examples and applications will be discussed with emphasis on decision-making, project management, application, and reporting. Prerequisite: graduate standing and consent of instructor.

Catalog Description: Infrastructure inventory, inspection, and life cycle costs. Topics include pipeline deterioration parameters, asset management technologies, risk assessment, government regulations and case studies. Prerequisite: Grade of C or better in either CE 3310 or IE 3312.

Student Learning Outcomes: The course objective is to prepare students to demonstrate sound engineering judgment for planning and valuing assets as well as managing the inherent risks associated with infrastructure related components including pipelines. In addition, this course will focus on the following student abilities and coeducational outcomes.

1. Fundamental Knowledge – Students will demonstrate ability to identify risk factors and perform life cycle costing of infrastructure components.
2. Independent Abilities – Students will interpret and discuss the impact of governmental regulations, planning, engineering, and economics decisions on the long term performance of infrastructure assets.
3. Critical Thinking – Students will demonstrate the ability to assess, interpret and understand a research topic related to infrastructure life cycle costing including the impact of government regulations and other market factors on infrastructure management decisions via class work and assignments.
4. Advanced Knowledge – Students will analyze complex issues to determine the long term performance of assets.
5. Effective Communication – Students will demonstrate effective communication skills via class discussion and presentation.
6. Professional Development – Students will explain how changing technology and the need for retaining good infrastructure lead to a professional life long learning experience.

All outcomes are observed implicitly through class participation, exams, assignments, reports and formal/informal communications with instructor.

Requirements: Consent of instructor

Required Textbooks and Other Course Materials:

Goodman, Alvin S. and Makarand Hastak. (2006). *Infrastructure Planning Handbook: Planning, Engineering, and Economics*. McGraw-Hill/ASCE, New York, NY.

Handouts, notes, reading assignments, problem solutions and other information will be posted on the class WebCT site. (www.uta.edu/webct)

Note: Minor adjustments to the syllabus may be required.

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Reference Readings and Textbooks

Najafi, M. and Gokhale. S. (2005). *Trenchless Technology: Pipeline and Utility Design, Construction and Renewal*. McGraw-Hill, New York.

Amekudzi, A. and McNeil. S. 2008. *Infrastructure Reporting and Asset Management*. American Society of Civil Engineers, Virginia.

Descriptions of major assignments and examinations with due dates:

Term Group Project

There is one term group project, which will be completed throughout the term. Groups will be composed of three (3) or four (4) students per group. Students will be given the option to organize their own groups. Students without groups will be assigned to a team by the instructor. All instructions and relevant material for the term group project will be handed out at the scheduled date.

The group project has **four** (4) Submittals including the Final Oral Presentation. Each submittal will receive a single group grade. However, the individual grade of each student depends on his/her peer evaluation of the student's work within the team (***refer to Special Policy 2***). The final presentation will be evaluated by the peer groups.

The term group project submittals need to be turned in by the date and time they are due (***refer to Special Policy 1: late submissions***). The term group project represents **30%** of the student's final grade. The breakdown of the term group project grade is shown below.

Midterm Exam

There will be a midterm exam which will cover material discussed in the **lectures** and in **guest presentations**. The midterm exam represents **20%** of the student's final grade.

Final Exam

There will be a final exam which will cover material discussed in the **lectures** and in **guest presentations**. The final exam represents **20%** of the student's final grade.

GRADING

The breakdown of the total grade is:

• Class Participation and Discussions	10%
• Homework	20%
• Term Group Project:	
• Submittal No. 1 – Proposal	5%
• Submittal No. 2 – Feasibility Study and Analysis	5 %
• Submittal No. 3 – Progress Report	5 %
• Submittal No. 4 – Documentation	5%
• Submittal No. 5 – Oral Presentation, & Critique	10%
• Exams	<u>40 %</u>
• Total:	<u>100 %</u>

NOTES

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1. The course description and course schedule handouts provide the general framework for the course. However, the instructors reserves the right to make any modifications or changes to the course, depending on the class progress, or on any special circumstance that may arise during the semester.
2. ***All submissions must be turned in typed or handwritten using engineering paper.*** Only one side of the paper should be used. Assignments that deviate from these instructions (e.g., torn from spiral binder, etc.) will not be accepted. Separate instructions will be provided for term project submissions.
3. Problems and questions should be re-stated or paraphrased. Neat sketches should be used when ever appropriate.
4. References should be stated on the right hand side of the assignment (e.g., Text p. 179, etc.).
5. Your assignment should be turned in with your name, course number, assignment number, and page number on each sheet. Neatness and presentation are important and will be considered when grading assignments.
6. There will be no curve for the final grade, only straight averages. The grading policy for this course is as follows:

X = Cumulative student score for the semester

<u>Student Score</u>	<u>Grade</u>
$X \geq 90$	A
$90 > X \geq 80$	B
$80 > X \geq 70$	C
$70 > X \geq 60$	D
$60 > X$	F

See the “**Make-up Exam and Assignment Policy**” section for accommodations of incomplete or missed assignments.

Attendance Policy: Each student is expected to be prepared to actively participate in the class discussions. As such, assigned readings should be completed prior to the start of the each class. Students registered for **Section 001 (Class Number: 50250)** are expected to attend all classes. Class participation and discussions are essential for full professional development. In-class participation is achieved through Q&A and active discussion. **Section 002 (Class Number 50251) – Distance Learning students** can participate in class discussions through daily email communication with the instructors with copy to all students (list will be provided by the Instructor) for proper participation.

Drop Policy: Please see university drop policy and deadlines in the Graduate Catalog for official methods and policies. An overall summary drop/withdraw policies of concern are listed below.

Graduate students who wish to change a schedule by dropping a course must first consult with their Graduate Advisor. Regulations pertaining to adding or dropping courses are described below. The last day to drop a course taught in regular semesters is at the end of the 12th week of class. The last day to drop a course in the other, non-traditional semesters corresponds to 75

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percent of the duration of the course. The last day to drop a course is listed in the Academic Calendar available.

1. A student dropping a graduate course after the Census Date but on or before the end of the last day to drop a course may with the agreement of the instructor, receive a grade of W but only if passing the course with a C or better average. A grade of W will not be given if the student does not have at least a C average. In such instances, the student will receive a grade of F if he or she withdraws from the class.
2. A student desiring to drop all courses in which he or she is enrolled is reminded that such action constitutes withdrawal (resignation) from the University. The student must indicate intention to withdraw and drop all courses by filing a resignation form in the Office of the Registrar or by Web at www.uta.edu/registrar.
3. In most cases, a student may not drop a graduate course or withdraw (resign) from the University after the last day to drop a course. Under extreme circumstances, the Dean of Graduate Studies may consider a petition to withdraw (resign) from the University after the last day to drop a course, but in no case may a graduate student selectively drop a course after the last day to drop a course and remain enrolled in any other course. Students should use the special Petition to Withdraw for this purpose. See the section titled Withdrawal (Resignation) From the University section of the Graduate Catalog, <http://grad.uta.edu/leftMenuPages/gradcalendar.asp>, for additional information concerning withdrawal.

Students wanting to drop all courses for which they are enrolled must withdraw from the University.

A student who wishes to withdraw (resign) voluntarily from the University before the last day to drop a course deadline must file a resignation form in the Office of the Registrar or file online at www.uta.edu/registrar. After the last day to drop a course deadline, a graduate student or undergraduate student enrolled in a graduate course is not permitted to withdraw or to selectively drop courses. In exceptional cases, however, a graduate student may request to withdraw after the last day to drop a course deadline by obtaining a Petition to Withdraw form and submitting it to the Dean of Graduate Studies. (Students should use the special Petition to Withdraw for this purpose and not the Petition form used for other types of requests.) If the petition is not approved, the student remains responsible for all coursework requirements. Therefore, students should not discontinue class attendance or course assignments unless they have been notified in writing that the Dean of Graduate Studies has approved the petition to withdraw. A Petition to Withdraw form is available online through the Virtual Graduate School Advisor or in the Graduate School office.

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 92-112 - The Rehabilitation Act of 1973 as amended. With the passage of federal legislation entitled *Americans with Disabilities Act (ADA)*, pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate based on that disability. Student responsibility primarily rests with informing faculty of their need for accommodation and in providing authorized documentation through designated administrative channels. Information regarding

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specific diagnostic criteria and policies for obtaining academic accommodations can be found at www.uta.edu/disability. In addition, you may visit the Office for Students with Disabilities in room 102 of University Hall or call them at (817) 272-3364.

Academic Integrity: All students are expected to pursue their academic careers with honesty and integrity. Academic dishonesty includes, but is not limited to, cheating on a test or other course work, plagiarism (offering the work of another as one's own) and unauthorized collaboration with another person. Students found responsible for dishonesty in their academic pursuits are subject to penalties that may range from disciplinary probation to suspension to expulsion from the University.

In accordance with the Rules and Regulations of the Board of Regents of The University of Texas System (Part One, Chapter VI), institutional procedures regarding allegations of academic dishonesty are outlined in Part Two, Chapter 2, of the UT Arlington Handbook of Operating Procedures. This information may be obtained by accessing the Student Judicial Affairs Web site at www2.uta.edu/discipline/ or by obtaining a hard copy of Mav Dates & Data in the Office of Student Development.

Student Support Services Available: The University of Texas at Arlington supports a variety of student success programs to help you connect with the University and achieve academic success. These programs include learning assistance, developmental education, advising and mentoring, admission and transition, and federally funded programs. Students requiring assistance academically, personally, or socially should contact the Office of Student Success Programs at 817-272-6107 for more information and appropriate referrals.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week unless specified in the class syllabi. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. Classes are held as scheduled during this week and lectures and presentations may be given.

Librarian to Contact: Barbra Howser, Science and Technology Library, NH.

E-Culture Policy: The University of Texas at Arlington has adopted the University email address as an official means of communication with students. By email, UT-Arlington is able to provide students with relevant and timely information, designed to facilitate student success. In particular, important information concerning registration, financial aid, payment of bills, and graduation may be sent to students through email.

All students are assigned an email account and information about activating and using it is available at www.uta.edu/email. New students (first semester at UTA) are able to activate their email account 24 hours after registering for courses. There is no additional charge to students for using this account, and it remains active as long as a student is enrolled at UT-Arlington. Students are responsible for checking their email regularly.

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UTA's E-mail is the prime means for communication. Therefore, the University and the Instructor have the right to send communications to students via e-mail and the right to expect that those communications will be received and read in a timely fashion. The Office of Information Technology (OIT) will assign all students an official University e-mail address. It is to this official address that the University will send e-mail communications. Students are expected to check their official e-mail account on a frequent and consistent basis to stay current with University communications. The University recommends checking e-mail daily; in recognition that certain communications may be time-critical.

A student must give current and correct local and permanent addresses and telephone numbers to the Office of the Registrar and must notify this office immediately of any changes. Official correspondence may be mailed, versus e-mailed, to the appropriate address depending upon the nature of the correspondence and the academic calendar; if the student has moved and failed to correct this address, he or she will not be relieved of responsibility on the grounds that the correspondence was not delivered.

Make-up Exam and Assignments Policy: No make-up exams and assignments are given or accepted except for medical or other similar hardships where advanced arrangements are made with the instructor; or in case of non-selective medical emergencies with appropriate physician's note or documentation. Other than circumstances describe above, failure to take the exam or turn in assignments at the scheduled time will constitute a grade of zero in the exam and assignment. It is the student's obligation to contact the instructor, generally before the examination so that appropriate arrangement (if any) may be made.

Grade Grievance Policy: It is the obligation of the student, in attempting to resolve any student grievance regarding grades, first to make a serious effort to resolve the matter with the instructor with whom the grievance originated. Individual instructors retain primary responsibility for assigning grades. The instructor's judgment is final unless compelling evidence shows discrimination, preferential treatment or procedural irregularities. If students wish to appeal, their requests must be submitted in writing on an Academic Grievance Form available in departmental or program offices to the department chair or program director. Before considering a grievance, the department chair or program director will refer the issue to a departmental or program committee of graduate faculty. If the committee cannot reach a decision acceptable to the parties involved, the department chair or program director will issue a decision on the grievance. If students are dissatisfied with the chair or director's decision, they may appeal the case to the academic dean. If they are dissatisfied with the academic dean's decision, they may appeal it to the Dean of Graduate Studies. Students have one year from the day grades are posted to initiate a grievance concerning a grade.

For issues involving scholastic dishonesty, see the Academic Dishonesty entry in the UTA undergraduate catalog.

General Information:

WebCT Site: Handouts, notes, articles, and other information are located on WebCT

Distance learning students will use the instructor's email to submit class material such as reports, homework, etc to the instructor. This will allow large files to be submitted without any problems. Please insure you keep email receipt as a proof for submission of assignments.

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Articles Review: Articles will be posted on WebCT and are due by the dates shown on the class schedule. The articles shall be two to three pages long double-spaced with font 12 Arial.

Exam for Engineering Distance Education: Distance education students should make every effort to take the scheduled exam on-campus during the regularly scheduled time if the student's work schedule permits.

If this is not possible, a proctor may give the exam within a 24-hour period of the regularly scheduled exam in accordance with the current "**Exam policy for Engineering Distance Education.**" Early arrangement with the Engineering Distance Education office coordinator is encouraged.

Laptop or Email use in the classroom: In order to minimize distraction, the use of laptop and Email in the classroom will not be allowed.

Cellular Phone use in the classroom: In order to minimize distraction, turn off the cell phone or change the setting to 'vibrate.' If it is necessary to use it due to an emergency, please leave the classroom quietly and return when done.

Class	Date	Day	Topic	Chapter	Instructor & Assignments
1	13	T	Overview of the Course; General Planning Concepts	1 Describe Project and Organize Project Teams	MN and GAK Guest Lecturer
2	14	W	Liquid Assets		Video
3	15	TH	Planning Objectives	2	MN
4	19	M	Pavement asset management	Handout	SR Prob. 1.1
5	20	T	Prioritization of capital and maintenance projects	5, 6, 7	GAK
6	21	W	Planning procedures for major capital projects	3 Submittal 1: Project Proposals Due	MN
7	22	TH	Decision models and modern methods for treatment of uncertainty and risk	17, 18	GAK
8	26	M	MIDTERM EXAM Decision models and modern methods for treatment of uncertainty and risk.	17, 18	GAK Prob. 3.2, 3.3, 3.6, 6.1, 6, 2, 6.3
9	27	T	Prioritization of capital and maintenance projects	5, 6, 7	GAK
10	28	W	Environmental and social impact assessment I: requirements and procedures	11	GAK

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Class	Date	Day	Topic	Chapter	Instructor & Assignments
11	29	TH	Environmental and social impact assessment II: sustainability, environmental justice, and other modern issues	12, 15 Submittal 2: Feasibility Study and Analysis	GAK
12	Aug 2	M	Financial analyses	8	GAK Prob. 17.2, 18.1, 18.2
13	3	T	Public involvement and legal and institutional issues I: requirements and procedures	13,14	GAK
14	4	W	Public involvement and legal and institutional issues I: requirements and procedures	13,14	GAK
15	5	TH	Economic analyses I: concepts.	9 Submittal 3: Progress Report Due	DD
16	9	M	Economic analyses I: concepts.	10	DD Prob. 9.3, 9.4, 10.1, 10.2, 10.3
17	10	T	Public involvement and legal and institutional issues II: agency management models, privatization, outsourcing, and other modern issues.	13, 14, 16	GAK
18	11	W	Public involvement and legal and institutional issues II: agency management models, privatization, outsourcing, and other modern issues.	13, 14, 16	GAK
19	12	TH	<u>FINAL EXAM</u> Teams to work on presentation		Staff
20	16	M	<i>Group Project Presentation</i>	Project Report and Presentation Due	GAK

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TERM GROUP PROJECT
(40% Final Grade)

Due: Refer to the submission schedule

Grade: _____ **Name:** _____

OVERVIEW

Objective – This project will provide hands-on experience with the planning, analysis, design, development, and feasibility study of a **public infrastructure project**. It will involve working in a small team (3 or 4 people) to:

1. Establish contact with a local public agency or project will be assigned by instructor.
2. Identify projects currently in the planning stage;
3. Analyze the project for planning and feasibility with respect to various issues illustrated in Figure 2.4 in the text; and
4. Determine feasible alternates based on your analysis of the available data and include documentation and presentation of your prioritized alternates.

Project Summary – As a first step you must establish contact at a local public works agency whose people would be willing to commit a limited amount of time to share planning data related to the selected project and provide necessary information to help formulate and develop your project. This project will be subdivided into four phases, each with a separate submittal(s), and a Final Oral presentation, as follows:

1) Project Proposal: In this phase your team will

- (a) Identify an infrastructure project of suitable scope and complexity that is currently in the planning phase;
- (b) Perform a preliminary requirement analysis for the project, e.g., (i) project background and need, (ii) what are the program goals and objectives of the agency and how this project addresses some of these goals and objectives, (iii) What needs, deficiencies, and problems are being addressed by the selected project, and (iv) other issues such as what is the anticipated budget, schedule, and the planning stage etc.
- (c) Determine feasibility of the assignment. Assignment feasibility is to be able to identify most of the characteristics of interest or elements as highlighted in Figure-2.4 (Textbook) and that information is available for you to conduct an analysis.
- (d) Summarize the information in a short (**not to exceed four pages single spaced**) proposal clearly documenting your answers to the above questions. Also, include an introduction section describing the agency, organizational chart and the jurisdiction. Please list the name of your contact, designation, address, phone, email, etc.

2) Project Feasibility Study and Analysis:

In this phase your team will

- a) Collect data with respect to each of the characteristics of interest or elements pointed out in Figure 2.4 (i.e., technical, social, political, institutional, etc) and identify various feasible alternatives.

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- b) Based on available data and your analysis, prioritize various options or alternates that you have identified.
- c) Justify your answers based on your understanding of the planning, engineering, and economic issues discussed in the class and what you have learned through your individual efforts in Assign-1.
- d) Document your results in a **PowerPoint presentation with a minimum 10 slides.**
- e) **20 minute Class presentation**

3) Progress Report, Peer Review & Critique:

Two submittals will be required in this phase: **Progress Report** and **Peer Review & Critique**. In the progress report document your project, data, analysis and recommendations along with relevant Figures, Tables, pictures, and references. Include information from phase-1 and 2 above (**text not to exceed 10 pages single spaced or a maximum of 12000 words**).

The progress report will be handed to your peer group for review and critique, which means your team, will also review another team's progress report. In the peer review & critique, your team needs to discuss the strengths, weaknesses of your peer group's project and provide suggestions and/or recommendations. Your team will be required to question your peer group based on your review & critique report during final oral presentation. **Peer Review & Critique report should not exceed two pages.**

Group-1 to critique Group-2; **Group-2** to critique Group-3; **Group-3** to critique Group-1.

- 4) Documentation:** In this phase your team will prepare the final documentation for your project by including the comments received from your peer group and provide a cover letter describing the actions you have taken in response to the review comments. Also include a copy of your PowerPoint Presentation (**paper and electronic version for both Report and presentation**). Final presentation will be scheduled during week 16 (refer to the course schedule).

Important Submittals (Check Course Outline for Dates):

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Submittal Checklist

The submittal should have the following characteristics as a minimum:

- _____ • The report should be submitted using plastic black spiral binding, with a heavier type of colored paper for the front and back covers, with a clear transparency sheet over the front cover for protection of the cover page. The cover page should contain all relevant information for the assignment. **A three ring binder could also be used in place of spiral binding.**
- _____ • All material contained in the report should be letter size (8 1/2" x 11") or folded to letter size.
- _____ • **The report should include as a minimum** an Abstract, Introduction, Agency and Project Description, Data and analysis, Feasible alternates, Criteria for evaluation, Evaluation results, Prioritized list of alternates, Conclusions, References, and Appendices.
- _____ • All material should be word-processed or type-written, using single space, space-and-a-half or double space, with the exception of flowcharts and sketches, which can be done by hand (electronic drawings are preferred), leaving 1" top, bottom, left and right margins. Use a consistent font and font size throughout the submittal (Times New Roman-12 is encouraged but not required).
- _____ • All the pages must be numbered in the submittal.
- _____ • If the report has sections, please separate them using colored paper dividers or tabs.
- _____ • A professionally-written **memorandum** addressed to Director of Engineering, appropriately dated, formally submitting for review and evaluation, and describing the content and organization of your report, followed by a **table of contents** that references each item within the submittal.
- _____ • The submittal should include any appendices, attachments or exhibits relevant to your project **including a list of references** (and copies where necessary for clarity).
- _____ • **Include an Electronic copy of your report and your presentation.** Do not include files in pdf format.