

# **Course Syllabus**

## **CE 5345 Infrastructure Evaluation, Maintenance, and Renewal**

**Instructor:** Ghassan 'Gus' Khankarli, Ph.D., P.E, PMP

**Office Number:** TBD

**Office Telephone Number:** 817-272-2201

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**Office Hours:** ERB 131, Friday 4:50 to 5:30 pm or by appointment

**Course Number, Section Number, and Course Title:** CE 5345, Sec 002, 003 -  
INFRASTRUCTURE EVALUATION, MAINTENANCE, and RENEWAL

**Time and Place of Class Meetings:** Friday 2:00-4:50 pm, Room ERB 131

**Description of Course Content:** This course is designed for engineers and managers involved in infrastructure development, sustainability, and replacement. Topics include asset management, inspection, evaluation, maintenance, and renewal alternatives for waste collection and water distribution systems, surface and subsurface drainage, pavements, bridges, culverts, buildings, and other structures. Credit not granted for both CE 4302 and CE 5345. Prerequisite: CE 4347, CE 4348 or equivalent.

**Student Learning Outcomes:** The course objective is to prepare students to demonstrate sound engineering judgment for evaluating, maintaining, and rehabilitating infrastructure related components.

**Specific Course Learning Outcomes:** Upon completion of the course, the student will:

1. Demonstrate the ability to identify causes of failures for a variety of infrastructure assets.
2. Understand the difference between maintenance, rehabilitation, and repair of most civil engineering types of infrastructure.
3. Analyze complex problems to identify potential methods to repair, rehabilitate and restore damaged infrastructure.
4. Understand the importance of communicating research results through class discussions, presentations, and reports.
5. Understand the benefits of integrating the infrastructure evaluation, maintenance, and renewal process into a good asset management program.

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

**Requirements: SOFTWARE:**

Student should have a working knowledge of and access to Microsoft Word<sup>®</sup>, Microsoft Excel<sup>®</sup>, Microsoft PowerPoint<sup>®</sup>.

**Required Textbooks and Other Course Materials:**

- 1) Handouts, notes, reading assignments, problem solutions and other information are located on the class Blackboard site which will be provided by the instructor

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### Referenced Textbooks

- 1) Tsinker, G. (Editor). 2004. *Port Engineering: Planning, Construction, Maintenance, and Security*. Wiley & Sons, Hoboken, New Jersey
- 2) Papagiannakis, A.T. and E. A. Masad. 2008. *Pavement Design and Materials*. Wiley & Sons, Hoboken, New Jersey
- 3) Payant, Richard P. and Bernard T. Lewis. 2007. *Facility Manager's Maintenance Handbook, 2<sup>nd</sup> Edition*. McGraw-Hill Companies, Inc., New York, New York
- 4) Wood, Brian. 2009. *Building Maintenance*. Wiley- Blackwell, West Sussex, UK
- 5) Raina, V.K. 2004. *Concrete Bridges: Inspection, Repair, Strengthening, Testing and Load Capacity Evaluation, 1st Edition*. McGraw-Hill Companies, Inc., New York, New York

**Descriptions of major assignments and examinations with due dates:** Homework assignments, review of five peer-reviewed articles assignment, a research paper, presentation, one mid-term exam and a comprehensive final exam.

All assignments must be turned in at the start of the class or, if submitted electronically, prior to the class period in which they are due. Failure to do so will constitute a grade of zero for the assignment in question.

One week of advanced notice will be provided in scheduling each exam. The final exam will be given according to the university's published final exams schedule. Note that failure to appear for an exam at the scheduled time will constitute a grade of zero in that exam.

Homework, articles review, and paper in this class are the minimum assignments considered adequate to achieve basic proficiency of course material. Homework will be discussed in class. When doing the homework, specify date, name, course, and problem number at top of each page. Each problem is to be started on a new page. Include at the beginning of the problem, the problem statement and any diagrams given as well as any additional diagram needed to solve the problem. Then show solution. If calculations are required, all calculations should show two (2) significant figures for intermediate values calculated. Final answer should be rounded to two (2) significant figures unless all data is greater than three (3) significant figures. Then use minimum number of significant figures dictated by problem (greater than 3). When establishing elevations or distances for design drawing, answers must be in hundreds of a foot or thousands of a meter.

The exams will generally relate to the material covered in the lectures or in assignments. The philosophy of the exam is not to merely test your total recall or memorization, but to extend your thinking from theory and example problems to engineering situations. Each exam may include both open and closed book portions.

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

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**Attendance:** At The University of Texas at Arlington, taking attendance is not required. Rather, each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I have established following attendance policy:

I have elected to take attendance till Census Day but will not factor attendance into the grade. Students registered for **Section 003 (Class Number: 89796)** are expected to attend all classes. Students registered for **Section 002-Distance Learning (Class Number: 86556)** are expected to communicate with the instructor by email on a weekly basis. The email will cover the understanding or questions about the lectures covered during the week. Class participation and discussions are essential for full professional development

**Grading Policy:** Grades are based on three exams, five articles review (AR), assignments, group research paper, and attendance/presentation. Grades will be determined by averaging the exams and assignments as follows.

• Exams: 2 @ 25% each	50%
• Review and summary of peer-reviewed articles: 5 @ 4% Each	20%
• Class homework/ assignment(s) and class participation	5%
• Presentation 5%	5%
• Research paper will be weighted at 20%	<u>20%</u>
Total	100%

The presentation will cover the research topic. Proper spelling, use of clear and concise sentences on essay questions will also be considered in the grading process. Grade standards are as follows:  $100 \geq A \geq 90$ , Less than  $90 > B \geq 80$ , Less than  $80 > C \geq 70$ , Less than  $70 > D \geq 60$ , and Less than  $60 > F \geq 0$ . Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops

**Expectations for Out-of-Class Study:** Beyond the time required to attend each class meeting, students enrolled in this course should expect to spend at least an additional 9 hours per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, etc.

**Grade Grievances:** Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current University Catalog. For undergraduate courses, see <http://catalog.uta.edu/academicregulations/grades/#undergraduatetext>; for graduate courses, see <http://catalog.uta.edu/academicregulations/grades/#graduatetext>.

**Drop Policy:** Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering.

**Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes

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or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/ao/fao/>)

**Americans with Disabilities Act:** The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at [www.uta.edu/disability](http://www.uta.edu/disability) or by calling the Office for Students with Disabilities at (817) 272-3364.

**Title IX:** The University of Texas at Arlington is committed to upholding U.S. Federal Law "Title IX" such that no member of the UT Arlington community shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity. For more information, visit [www.uta.edu/titleIX](http://www.uta.edu/titleIX)

**Academic Integrity:** Students enrolled in this course are expected to adhere to the UT Arlington Honor Code:

*I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*

*I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.*

UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

**Electronic Communication:** UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

**Student Feedback Survey:** At the end of each term, students enrolled in classes categorized as "lecture," "seminar," or "laboratory" shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

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**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 syllabus*. 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. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

**Emergency Exit Procedures:** Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, **which is located to the right center or left of the classroom**. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.

**Student Support Services:** UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to [resources@uta.edu](mailto:resources@uta.edu), or view the information at [www.uta.edu/resources](http://www.uta.edu/resources).

**Writing Center. :** The Writing Center, 411 Central Library, offers individual 40 minute sessions to review assignments, *Quick Hits* (5-10 minute quick answers to questions), and workshops on grammar and specific writing projects. Visit <https://uta.mywconline.com/> to register and make appointments. For hours, information about the writing workshops we offer, scheduling a classroom visit, and descriptions of the services we offer undergraduates, graduate students, and faculty members, please visit our website at [www.uta.edu/owl/](http://www.uta.edu/owl/).

**Librarian:** Sylvia George-Williams, Engineering Librarian, UT Arlington Science & Engineering Library, NH B03C, (817) 272-7519, [sylvia@uta.edu](mailto:sylvia@uta.edu)

**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.

**Emergency Phone Numbers:** In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911

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### General Information:

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

*As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. Adjustments **will be posted on Blackboard.***

**Articles Review:** Articles will be posted on Blackboard 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 or Times New Roman), one inch margins. It shall cover at a minimum:

- Introduction
- A summary discussion of the main points that the author(s) addressed in the paper.
- Authors' conclusion

Proper spelling, use of clear and concise sentences and structure will be considered in the grading process.

Provide a cover sheet that complies with UTA's Thesis and Dissertation (T&D) Guidelines that can be found at: <http://grad.pci.uta.edu/students/services/thesis/> using the APA Style (<http://www.uta.edu/owl/resources.html>). In addition, your last name must appear in the upper right corner and the page numbers must be centered in the bottom of each page. The paper shall follow the style guidelines as shown in UTA's Thesis Manual Style guides.

**Research Paper:** Students/assigned groups will submit a research topic in infrastructure maintenance, rehabilitation, or policy for approval by **September 12**. The research paper will be completed and turned in at the beginning of the class on **November 21** prior to the scheduled presentations.

The research paper will be between 10 to 12 pages long double spaced with font 12 (Arial or Times New Roman), one inch margins.. Its format and style guidelines shall follow UTA's Thesis and Dissertation (T&D) Guidelines that can be found at:

<http://grad.pci.uta.edu/students/services/thesis/> using the APA Style (<http://www.uta.edu/owl/resources.html>). and shall cover at a minimum:

- Introduction
- Discussion of the topic to cover all three areas of infrastructure evaluation, maintenance and renewal that are covered in the class or as approved.
- Conclusion
- References (minimum 10) and proper citations

Cover sheet, abstract/executive summary, table of content and appendices/attachments are not considered part of the total pages.

Proper spelling, use of clear and concise sentences, structure, and compliance with UTA's formatting requirements will be considered in the grading process.

Your last name/Group Number must appear in the upper right corner and the page numbers must be centered in the bottom of each page.

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A separate cover sheet must be included with the submission which shows each group member's name and the section of the research paper and presentation that the respective member developed. It is expected that each respective group member will provide equivalent level of contribution to the respective group's effort in the development and production of the presentation and associated research report. This is important to ensure an equitable grade distribution for this group effort.

**Use of LAPTOP, i-pods, other electronic devices, or E-MAIL correspondence during class:** In order to minimize disruption, the use of all electronic devices will not be allowed during class. Students wishing to take notes via a laptop may do so only with prior permission from the Instructor.

**CELL PHONE use in classroom during class:** In order to minimize distractions, use of cell phones during class in the classroom is **prohibited**. Students must turn off their cell phones during class. If you are anticipating an important call, please inform the Instructor at the beginning of class and change the cell phone to "vibrate" mode. If your call comes through during class, leave the classroom quietly before beginning your conversation and return quietly as soon as the call is completed.

The Instructor reserves the right to adjust Students' grades as a result of class disruption due to cell phone or non-adherence to the above electronic device usage policy

#### Useful Links:

- Library Home Page..... <http://www.uta.edu/library>
- Subject Guides ..... <http://libguides.uta.edu>
- Subject Librarians ..... <http://www.uta.edu/library/help/subject-librarians.php>
- Database List..... <http://www.uta.edu/library/databases/index.php>
- Course Reserves..... <http://pulse.uta.edu/vwebv/enterCourseReserve.do>
- Library Tutorials ..... <http://www.uta.edu/library/help/tutorials.php>
- Connecting from Off- Campus..... <http://libguides.uta.edu/offcampus>
- Ask A Librarian ..... <http://ask.uta.edu>

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Class	Date		Topic	Description	Homework/Articles Review (AR) Due
	<b>Aug 21</b>			<b>First Day of Classes</b>	
1	22	F-A		Introduction	
	22	F-B		Asset Management Review	
2	29	F-A		Program Management	
	29	F-B		Causes of Failures in Concrete/Other Materials	
3	<b>Sept 5</b>	F-A		Causes of Failures in Concrete/Other Materials	
	5	F-B	<b>Census Day Sept 8</b>	Repair Guide	
5	12	F-A	<b>Research Topic due</b>	Repair Guide	<b>AR-1</b>
	12	F-B		Repair Guide	
6	19	F-A		Property Condition Assessment (ASTM E2018)	
	19	F-B		Property Condition Assessment (ASTM E2018)	
7	<b>26</b>	F-A		Water Leakage Assessment (ASTM E2128)	
	26	F-B	<b>EXAM I</b>		
8	<b>Oct 3</b>	F-A		Pavements (ASTM D6433)	
	3	F-B		Pavements (ASTM D6433)	
9	10	F-A		Pavements/Bridges	<b>AR-2</b>
	10	F-B		Bridges Inspection, Repair, Strengthening	
10	17	F-A		Bridges Inspection, Repair, Strengthening	
	17	F-B		Bridges Monitoring/Multi-level Parking Garages	
11	24	F-A		Tunnels	<b>AR-3</b>
	24	F-B	<b>Last Day to Drop Oct 29</b>	Tunnels/Airports	
12	31	F-A		Airports/ Ports and other Marine Structures	
	31	F-B		Ports and other Marine Structures	
13	<b>Nov 7</b>	F-A		Drainage/Water/Wastewater /Research Paper	<b>AR-4</b>
	7	F-B		Research Paper Work	
14	14	F-A		Drainage/Water/Wastewater	
	14	F-B		Formwork Design for Repair Conditions	
15	21	F-A	<b>Group Paper Due</b>	Presentation/Misc	<b>AR-5</b>
	21	F-B		. Safety, Health, Equipment Maintenance & Other Issues	
				<b>Thanksgiving Holiday Nov 27-30</b>	
	<b>Dec 3</b>			<b>Last Day of Classes</b>	
				<b>Final Exams Week Dec 8-12</b>	
16	12	F	<b>Final / EXAM II</b>	2:00 pm – 4:30 pm	

*As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. – G. A. Khankarli.”*