CE 6301: Infrastructure Management
CRN: 17036
Fall 2023

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Office Hours: TBD @Teams

Class meetings: MW 6:00 p.m. to 7:20 p.m. at Miners Hall 301

Course Information: What this class is about and what we will do

COURSE DESCRIPTION
This course is designed to provide students with an understanding of infrastructure management concepts and practices. The course will cover contemporary topics and practical applications in the field, including but not limited to:

- Sustainable Infrastructure Systems
- Smart Infrastructure
- Resilient Infrastructure
- Asset Management
- Life Cycle Cost Analysis

This course follows a student centered-learning approach. Student's active participation and interaction constitutes a major portion of the learning activities in the classroom. There will topics assigned to the students individually or as a team to conduct research under the direction of the instructor in order to prepare lectures follow up with an open class discussion.

COURSE OBJECTIVES OR EXPECTED LEARNING OUTCOMES
In this course, we will discuss and apply practical approaches to better understand how the concepts taught in class can be applied to real world infrastructure management problems. Topics will be presented by the instructor or guest speakers as a lecture or a case study format.

The objectives of CE 6301 are: (1) to introduce students to infrastructure problems by discussing engineering and management approaches to address infrastructure challenges; (2) to explain the decision-making process to manage infrastructure assets; (3) identify the data needed to manage infrastructure assets in an agency; (4) to describe and discuss data collection and condition assessment methods for infrastructure management; (5) to discuss strengths and weaknesses of infrastructure management systems to assess infrastructure needs, to prioritize funding allocation, and to perform what-if impact analysis; (6) to apply infrastructure management decision-support tools to solve problems; (7) to discuss strategies to implement Infrastructure Management Systems (IMS) in an agency; (8) to understand the concepts and principles of sustainability and resilience in infrastructure management; (9) to explore the applications and benefits of smart infrastructure in various domains.

LEARNING MODULES
The course is divided into five modules listed below.
 MODULE 1: Fundamental Concepts of Infrastructure Management
  1.1 Introduction to Infrastructure Management
  1.2 Infrastructure Management Process and Asset Management Systems
  1.3 Decision Making Process for Infrastructure Management

 MODULE 2: Infrastructure Management Elements and Analytical Methods for Decision Making
  2.1 Inventory and Data Management
  2.2 Condition Assessment of Infrastructure Assets
  2.3 Needs Analysis and Forecasting Infrastructure Performance
  2.4 Prioritization of Funds and “What if” Impact Analysis
  2.5 Quantifying the Benefits of Infrastructure Management Strategies

 MODULE 3: Implementing Infrastructure Management Systems
  3.1 Tools for Infrastructure Management Systems
  3.2 Barriers for the Implementation of Infrastructure Management Systems
  3.3 Communicating Infrastructure Needs to Funding Authorities

 MODULE 4: Sustainable Infrastructure Systems
  4.1 Introduction to Sustainable Infrastructure Systems
  4.2 Planning and Operations of Sustainable Infrastructure Systems

 MODULE 5: Smart Infrastructure Systems
  5.1 Introduction to Smart Infrastructure Systems
  5.2 Planning and Operations of Smart Infrastructure Systems

The activities consist of lectures, guest lectures, homework, and exams. The tentative weekly lesson and assessment plans are as follows:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Module</th>
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<tbody>
<tr>
<td>1</td>
<td>Aug-28</td>
<td>Fundamental Concepts of Infrastructure Management</td>
</tr>
<tr>
<td>2</td>
<td>Sep-6*</td>
<td>Infrastructure Management Process and Asset Management Systems</td>
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<tr>
<td>3</td>
<td>Sep-11</td>
<td>Decision Making Process for Infrastructure Management</td>
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<tr>
<td>4</td>
<td>Sep-18</td>
<td>Inventory and Data Management</td>
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<tr>
<td>5</td>
<td>Sep-25</td>
<td>Condition Assessment of Infrastructure Assets</td>
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<tr>
<td>6</td>
<td>Oct-2</td>
<td>Needs Analysis and Forecasting Infrastructure Performance</td>
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<td>7</td>
<td>Oct-9</td>
<td>Prioritization of Funds and “What if” Impact Analysis</td>
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<td>8</td>
<td>Oct-16**</td>
<td>Quantifying the Benefits of Infrastructure Management Strategies</td>
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<td>9</td>
<td>Oct-23</td>
<td>Tools for Infrastructure Management Systems</td>
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<tr>
<td>10</td>
<td>Oct-30</td>
<td>Barriers for the Implementation of Infrastructure Management Systems</td>
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<tr>
<td>11</td>
<td>Nov-6</td>
<td>Communicating Infrastructure Needs to Funding Authorities</td>
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<tr>
<td>12</td>
<td>Nov-13</td>
<td>Introduction to Sustainable Infrastructure Systems</td>
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<td>13</td>
<td>Nov-20</td>
<td>Planning and Operations of Sustainable Infrastructure Systems</td>
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<td>14</td>
<td>Nov-27</td>
<td>Introduction to Smart Infrastructure Systems</td>
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<tr>
<td>15</td>
<td>Dec-4</td>
<td>Planning and Operations of Smart Infrastructure Systems</td>
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<td>16</td>
<td>Dec-11</td>
<td>Final Exam</td>
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</table>

* No class on September 4 (Week 2) in observance of Labor Day
** Remote class (Microsoft Teams) on Wednesday October 18 (UTEP vs. NMSU Football Game)

Note: Handouts and course material will be provided during the development of the course. Students should review their e-mails periodically for communications related to the course. A virtual folder will be also implemented to facilitate distribution of the course material.
TEXTBOOK

There is no required text for the course. Handouts, technical papers, and reports will be provided to the students during the development of the course. Make sure that you have access to Blackboard and check the site on a regular basis. Additional helpful references are: Public Infrastructure Asset Management, Second Edition by W. Uddin, W. R. Hudson, and R. C. G. Haas, McGraw-Hill, 2013; International Infrastructure Management Manual by NAMS Group, 2006; Smart Infrastructure: The Future by Brian Collins and David Metz, Palgrave Macmillan, 2018; Sustainable and Resilient Infrastructure Systems by Bilal M. Ayyub and Mohammad S. Hamid, ASCE Press, 2020.

ASSIGNMENTS

Individual and team assignments will be given along the course. Some assignments will require touse of software packages installed in your own laptops or on-line tools. Students should be able to discuss in class the solutions to the assignments. Knowledge acquired in the assignments will be graded directly or through a quiz.

Students will be required to make individual or team class presentations on selected topics related to the topics address in the course. The purpose of class presentations is to enhance oral communication skills that are vital for a successful professional career in infrastructure management.

TERM PROJECT

Students are required to conduct research and prepare a project term paper on a selected infrastructure management topic assigned by the instructor. The final project term paper will be a scholarly work prepared in accordance with the current Transportation Research Review (TRR) Instructions for Authors Submitting for TRR Publication. If you are using Large Language Models (LLMs) or Generative AI (e.g. ChatGPT, Microsoft New Bing, Google Bard) for your paper, please adhere to the TRR guidelines outlined in the same instructions. (https://trb.secure-platform.com/a/page/trrjournal/forauthors).

GRADING

Your grade for this course will be determined on the basis of 100 points as follows:

- Exams (2) 30 points
- Attendance 10 points
- Term Paper (individual) 25 points
- Assignments 15 points
- Final Project Assignment (team) 20 points

Final grades are based on the normal distribution of points as shown below:

- A 100 - 90
- B 89 - 80
- C 79 - 70
- D 69 - 60
- F < 60
TECHNOLOGY REQUIREMENTS

PowerPoint slides, class notes, homework, examinations, announcements, grades will be available in Blackboard. Office hours (consultations) and discussions will be in person. Students may request by email for online consultation in Microsoft Teams. Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Mozilla Firefox browser is recommended.

You will need to have access to a computer/laptop, scanner, a webcam, and a microphone. You will need to download or update the following software: Microsoft Office, Adobe Acrobat Reader, Windows Media Player, QuickTime, and Java. Check that your computer hardware and software are up-to-date and able to access all parts of the course.

If you do not have a word-processing software, you can download Word and other Microsoft Office programs (including Excel, PowerPoint, Outlook and more) for free via UTEP’s Microsoft Office Portal. Click the following link for more information about Microsoft Office 365 and follow the instructions.

IMPORTANT: If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP Help Desk as they are trained specifically in assisting with technological needs of students. Please do not contact me for this type of assistance. The Help Desk is much better equipped than I am to assist you!

Course Communication: How we will stay in contact with each other

- **Office Hours**: TBD @ Microsoft Teams
- **Email**: e-mail is the best way to contact me outside the class meeting times and office hours. I will make every attempt to respond to your e-mail within 24 hours of receipt if you follow the following email guidelines. When e-mailing me, be sure to email from your UTEP student account (@miners.utep.edu) and please put the course number (CE5362) in the subject line. In the body of your e-mail, start with a polite salutation, then clearly state your question. At the end of your e-mail, be sure to put your first and last name, and your university identification number.
- **Discussions**: Discussion will be face-to-face during and immediately after class meetings or during office hours.
- **Announcements**: Check the Blackboard announcements frequently for any updates, deadlines, or other important messages.

Course Policies: What do you need to do to be successful in the course

ATTENDANCE POLICY

Attendance will be taken in every class meeting, either by signing your signature in an attendance form, or calling your name to return graded homework. Your signatures will be checked for consistency throughout the semester. Inconsistent, missing signature, or failure to pick up graded homework during class time or failure to respond when your name is called will be marked as absent. For class meetings in Microsoft Teams, the sign-in and sign-out records will be used as an additional way of taking attendance.

EXAMINATION POLICY

- Examinations are conducted in persons during class time.
• To discourage students from focusing narrowly on only a few questions, no practice exam will be given.

• Rescheduling of an exam is possible if you inform me ASAP before the exam, with a valid reason. Examples of valid reasons are official UTEP travel, accident, medical, family emergency, jury duty, court appearance, military service, isolation/quarantine, job interview. These are not expected and cannot be rescheduled. You may need to show documentary evidence (e.g., a doctor’s letter, police report, or court letter). Events that can be pre-scheduled or rescheduled are not valid reasons. Examples of non-valid reasons are vacation, wedding, driving test, sending car for service, etc. If an emergency happens during the exam day, you should contact me or the TA at the earliest possible time.

COURSE DROP POLICY
If you feel that you are unable to complete the course successfully, please let me know and then contact the Registrar’s Office to initiate the drop process. If you do not, you are at risk of receiving an “F” for the course.

I may drop you from the course if you:

- Fail to attend more than 8 class meetings (in the attendance records); or
- Fail to submit more than 4 homework/lab assignments/field trip assignments combined; or
- Fail to submit more than 1 exam.

I will not drop you from the course if you are being investigated for cheating.

EXTRA CREDIT POLICY
I will not give extra credits to individual – this is considered a form of preferential treatment/discrimination. If an opportunity to earn extra credit arises, all students in the course will have equal opportunity.

ALTERNATIVE MEANS OF SUBMITTING WORK IN CASE OF TECHNICAL ISSUES
I strongly suggest that you submit your work with plenty of time to spare in the event that you have a technical issue with the course website, network, and/or your computer. I also suggest you save, scan or make copies of all your work (answers to discussion points, quizzes, exams, and essays) in a separate Word document as a back-up. This way, you will have evidence that you completed the work and will not lose all the credit. If you are experiencing difficulties submitting your work through the course website, please contact the UTEP Help Desk. You can email me your back-up document as a last resort to claim credits.

ACCOMMODATIONS POLICY
The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation
based on a disability must register with the UTEP Center for Accommodations and Support Services (CASS). Contact the Center for Accommodations and Support Services at 915-747-5148, or email them at cass@utep.edu, or apply for accommodations online via the CASS portal.

SCHOLASTIC INTEGRITY POLICY

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as one's own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) for possible disciplinary action. To learn more, please visit HOOP: Student Conduct and Discipline.

Usage of Large Language Models/Generative AI

If you are considering using a large language model [(LLM), e.g. ChatGPT, Microsoft New Bing, Google Bard] or Generative AI to help prepare your assignments and term paper, you must comply with the following statement (based on TRR's Committee on Publication Ethics):

Authors who use AI tools in the writing of a manuscript, production of images or graphical elements of the assignments or term paper, or in the collection and analysis of data, must be transparent in disclosing in the Materials and Methods (or similar section) of the paper how the AI tool was used and which tool was used. Authors are fully responsible for the content of their manuscript, even those parts produced by an AI tool, and are thus liable for any breach of publication ethics.

Plagiarism Detecting Software

Some of your coursework and assessments may be submitted to SafeAssign, a plagiarism-detecting software. SafeAssign has used review assignment submissions for originality and will help you learn how to properly attribute sources rather than paraphrase.

CLASS RECORDINGS

Recording of class proceedings, either voice or video, by student is not allowed. Doing so may result in disciplinary action.

COPYRIGHT STATEMENT FOR COURSE MATERIALS

All materials (textbook, homework questions and solutions, exam questions and solutions) used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated, such as by posting in the Internet or social media. Doing so may result in disciplinary action.
COURSE/INSTRUCTOR EVALUATION

A course/instructor evaluation will be conducted in class near the end of the semester.

FINAL COMMENT

This course is designed for the students to understand infrastructure management concepts and tools learning how to apply them to address present and future infrastructure challenges. The instructor expects all the students to succeed in learning the course subjects. It is critical for your success to establish a good studying habit in order to do very well in this course. Please do not hesitate to ask questions in class, or see your instructor outside of class. Any specific comments that students have on how the course might be improved are particularly welcomed.

Course Resources: Where you can go for assistance

UTEP provides a variety of student services and support:

Technology Resources
- **Help Desk**: Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.

Academic Resources
- **UTEP Library**: Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- **University Writing Center (UWC)**: Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- **Math Tutoring Center (MaRCS)**: Ask a tutor for help and explore other available math resources.
- **History Tutoring Center (HTC)**: Receive assistance with writing history papers, get help from a tutor and explore other history resources.
- **RefWorks**: A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.

Individual Resources
- **Military Student Success Center**: Assists personnel in any branch of service to reach their educational goals.
- **Center for Accommodations and Support Services**: Assists students with ADA-related accommodations for coursework, housing, and internships.
- **Counseling and Psychological Services**: Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.