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U N I V E R S I T Y

Engineering Faculty Document No. 88-21
March 4, 2021

**TO:**  The Faculty of the College of Engineering

**FROM:**  Division of Construction Engineering and Management

**RE:**  CEM 58800

The faculty of Construction Engineering and Management has approved the following new course. This action is submitted to the Engineering Faculty with a recommendation for approval.

**CEM 58800 – Pipeline Condition Assessment and Integrity Management**

Sem. 1, 2, S; Lec; 3-credit hours

**Course Description**

This course presents a comprehensive approach to assess the condition of underground pipelines and to utilize the data. It does this by presenting field inspection data acquisition technologies, data evaluation and analysis, and data management utilizing Computerized Maintenance Management Systems (CMMS) and Geographic Information Systems (GIS). By the end of the course students will know how to apply the results of different sensing systems to predict future conditions or develop corrective actions to ensure pipeline integrity.

**Reason**

The area of underground facilities is not represented by most engineering programs but plays an important role in civil society. Understanding how to assess and maintain these facilities are an important element of infrastructure development and maintenance for the overall health, safety, and welfare of the public. This course has been taught by Dr. Iseley at other institutions and online with over 50 attendees per year.

*Makarand Hastak*
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Makarand Hastak, Professor and Head
Division of Construction Engineering & Mgmt.

**Selected Topic in**
**Construction Engineering & Management (CEM)**
**Fall 2021**

**Course Title: Pipeline Condition Assessment and Integrity Management**
**(3 credit hours)**
**Course CEM 597 – TR – 9:00 - 10:15 am – Room 2579: Wang Hall**
**Course Syllabus**

## Information About the Instructor

**Instructor:** Prof. Tom Iseley
Office Location: HAMP 1231
Phone number: 765-496-5211
Cell Phone number: 404-386-5667
Email Address: diseley@purdue.edu
Office hours, times: Tuesday & Thursday - 2:00 pm – 5:00 pm
Upon request, virtual Office/Consultation Hours are available through WebEx to discuss questions related to weekly readings and/or assignments.
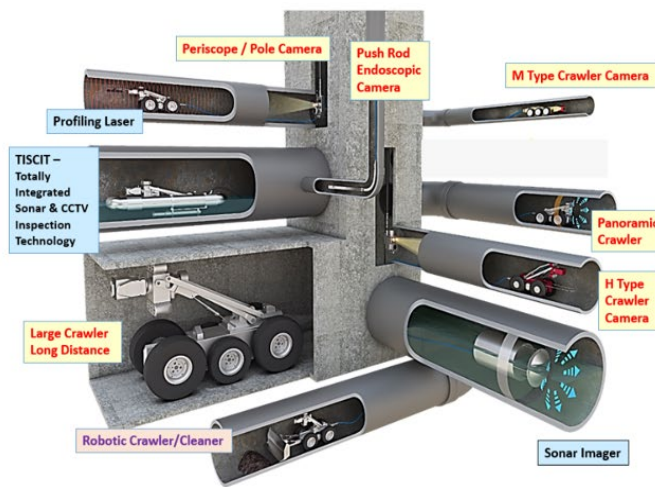
## Course Description

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

## Learning Outcomes

- Review and evaluate pipe break data, pipe performance, and physical characteristics of the buried assets,
- Evaluate the possible methods of inspection for their appropriateness and cost effectiveness to provide the required type and level of information,
- Develop a comprehensive PCA&IM program,
- Understand how PCA&IM program impact service life decisions, and Improve oral and written communication skills, including effective presentation.

PCA Technologies



Utilizing Drone Technology

## Student's Responsibility:

The student has a responsibility to take appropriate advantage of the educational opportunities available at the university, to actively participate in the learning process in a serious and conscientious manner, and to respect the rights of other members of the university community with regard to academic affairs.

## Learning Resources, Technology, & Texts

**Text Book:**

Reports:

- AWWA M77 Condition Assessment of Water Mains
- EPA/600/R-12/017: Condition Assessment Technologies for Water Transmission and Distribution Systems.
- EPA/600/R-12/018: Field Demonstration of Innovative Condition Assessment Technologies for Water Mains: Leak Detection and Location.
- EPA/600/R-10/082: Innovative Internal Camera Inspection and Data Management for Effective Condition Assessment of Collection Systems
- EPA/600/R-14/03: Demonstration of Innovative Sewer System Inspection Technology: SL-RAT™
- EPA/600/R-14/081: Demonstration of Innovative Sewer System Inspection Technology: SewerBatt™

## Keys to Success:

In order to facilitate a deeper understanding of the concepts in this course, students will be expected to obtain textbooks, attend and participate in class. Assignments are essential to understanding the material. Students are expected to complete the assignments for each class in a timely manner.

## Homework:

All Homework Assignments should be submitted through BrightSpace. An assignment file should be appended by your username, such as "assignment1-kim53.doc". This will make it easier for me to manage assignment files. Homework assignments are due at the beginning of the class. Each assignment *will* need to be considered as a professional assignment; therefore, neatness and thoroughness are essential components.

# Course Schedule:

| Week | Topics for Pipeline Condition Assessment and Integrity Management |
|------|------------------------------------------------------------------|
| 1 | Introduction & fundamentals of Pipeline Condition Assessment and Integrity Management |
| 2 | Gravity, non-pressure pipe for wastewater and storm water conveyance systems. |
| 3 | Pressure pipe for water product conveyance systems. |
| 4 | Pipeline materials and installation practices. |
| 5 | Mechanism of failure and rates of deterioration |
| 6 | Gravity pipeline inspection techniques |
| 7 | Pressure pipeline inspection techniques |
| 8 | Gravity pipeline cleaning & rehabilitation methods |
| 9 | Pressure pipeline cleaning & rehabilitation methods |
| 10 | Manhole inspection techniques |
| 11 | Manhole rehabilitation techniques |
| 12 | Data collection and management |
| 13 | Computerized Maintenance Management Systems (CMMS) & GIS |
| 14 | Inspection and Detection technologies for Oil and Gas Pipelines |
| 15 | Case studies: City of Atlanta, Lexington (NC), etc. |

| RUBRIC FOR HOMEWORK, QUIZ, EXAM, ETC- SUBMISSIONS: | |
|------------------------------------------------------|------------------|
| **Requirements** | **Allowable Points** |
| All text questions should be prepared with Microsoft Word processing software | 5 |
| All problems should be solved either in excel or word document | 5 |
| Top sheet must have the student's name on it | 1 |
| First sheet must have the title of the assignment on it, (ex. Homework, etc.) | 1 |
| Problem numbers must be clearly shown. | 1 |
| What is "given" or "data" and what is "required" must be clearly indicated. | 1 |
| Solution must progress from top to bottom and left to right on the sheet. | 1 |
| Problem solution must exhibit proper math expressions, etc. | 1 |
| All relevant formulas or expressions used must be shown. | 1 |
| Leave space between lines of problem solution etc., for professor's input | 1 |
| Do not skip steps in the solution procedure assuming that it is implicitly clear to the professor what you are doing or trying to do. | 1 |
| Clearly state your assumptions, if you make any, needed or not, in the problem solution. | 1 |
| "Units" must be kept track of and shown in each stage of the problem solution. | 1 |
| "Units" must be put in the solution expressions and properly cancelled out to reflect the unit for the final answer(s). | 1 |
| Box all answers and show the units for all answers you have. | -2 and -2 = - 4 |
| Wrong answers will cost **at least 20%** of the weight of a problem no matter what the reason for the mistake is. | |
| Think about the magnitude, unit, and relevance of the answer(s) you get and decide on whether it makes any sense or not. If it does not, remove it rather than conveying the expression that you are not able to exhibit proper logic or reasoning. | 5 |
| For an answer like 2.12, the 0.12 part makes sense, for an answer like 5,498.12;  the 0.12 part does not, use your common sense and proper measurement of accuracy in percent or some other means. | 2 |
| Try to check your final answer(s) by some other means if you can think of any another method, or by checking consistency of units, or by just doing a rough check by intuition or by simple reasoning. | 1 |

## Missed Assignment Policy:

There will be no make-up assignments except for documented medical reasons or extraordinary situations. These requests will be accepted at my discretion and may include a point penalty of 5% per day late. Asking for an extension does not guarantee it will be granted.

## Grading:

| | | |
|---|---|---|
| Mid-Term Exam | 20% |
| Homework/Classwork | 20% |
| Projects | 20% |
| Presentations | 20% |
| Final Exam | 20% |

This course will be graded on the following standard:

| Course Aggregate | Grade |
|---|---|
| 97-100 | A+ |
| 93-96 | A |
| 90-92 | A- |
| 87-89 | B+ |
| 83-86 | B |
| 80-82 | B- |
| 77-79 | C+ |
| 73-76 | C |
| 70-72 | C- |
| 67-69 | D+ |
| 63-66 | D |
| 60-62 | D- |
| <60 | F |

## Incompletes

A grade of incomplete (I) will be given only in unusual circumstances. To receive an 'I' grade, a written request must be submitted prior to the academic calendar deadline and approved by the instructor. The request must describe the circumstances, along with a proposed timeline for completing the course work. Submitting a request does not ensure that an incomplete grade will be granted. If granted, you will be required to fill out and sign an "Incomplete Contract" form that will be turned in with the course grades. Any requests made after the course is completed will not be considered for an incomplete grade.

## Attendance Policy during COVID-19

In the current context of the COVID-19 pandemic, in-person attendance cannot be a factor in final grades. However, the timely completion of alternative assessments and online participation can be part of the final grade. Students are expected to attend in-person courses when they are able.
"Students are expected to attend all classes in-person unless they are ill or otherwise unable to attend class. If they feel ill, have any symptoms associated with COVID-19, or suspect they have been exposed to the virus, students should stay home and contact the Protect Purdue Health Center (496-INFO).

In the current context of COVID-19, in-person attendance cannot be a factor in the final grades. However, timely completion of alternative assessments can certainly be part of the final grade. Students need to inform the instructor of any conflict that can be anticipated and will affect the timely submission of an assignment or the ability to take an exam.

Classroom engagement is extremely important and associated with your overall success in the course. The importance and value of course engagement and ways in which you can engage with the course content even if you are in quarantine or isolation, will be discussed at the beginning of the semester. Student survey data from Fall 2020 emphasized students' views of in-person course opportunities as critical to their learning, engagement with faculty/TAs, and ability to interact with peers.

Only the instructor can excuse a student from a course requirement or responsibility. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflicts, when advance notification to an instructor is not possible, the student should contact the instructor/instructional team as soon as possible by email, through Brightspace, or by phone. In cases of bereavement, quarantine, or isolation, the student or the student's representative should contact the Office of the Dean of Students via email or phone at 765-494-1747. Our course Brightspace includes a link to the Dean of Students under 'Campus Resources.'"

## Academic Guidance in the Event a Student is Quarantined/Isolated

"If you must quarantine or isolate at any point in time during the semester, please reach out to me via email so that we can communicate about how you can continue to learn remotely. Work with the Protect Purdue Health Center (PPHC) to get documentation and support, including access to an Academic Case Manager who can provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Your Academic Case Manager can be reached at acmg@purdue.edu. Importantly, if you find yourself too sick to progress in the course, notify your academic case manager and notify me via email or Brightspace. We will make arrangements based on your particular situation."

**DURING CLASS TIME ALL NOISEMAKING DEVICES SUCH AS CELL PHONES MUST BE TURNED OFF OR MUTED. TEXT-MESSAGING OR BROWSING THE INTERNET DURING CLASS WILL NEGATIVELY AFFECT A STUDENT'S PARTICIPATION GRADE.**

## Classroom Guidance Regarding Protect Purdue

"The Protect Purdue Plan, which includes the Protect Purdue Pledge, is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. Required behaviors in this class include: staying home and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, properly wearing a mask in classrooms and campus building, at all times (e.g., mask covers nose and mouth, no eating/drinking in the classroom), disinfecting desk/workspace before and after use, maintaining appropriate social distancing with peers and instructors (including when entering/exiting classrooms), refraining from moving furniture, avoiding shared use of personal items, maintaining robust hygiene (e.g., handwashing, disposal of tissues) prior to, during and after class, and following all safety directions from the instructor.

Students who are not engaging in these behaviors (e.g., wearing a mask) will be offered the opportunity to comply. If non-compliance continues, possible results include instructors asking the student to leave class and instructors dismissing the whole class. Students who do not comply with the required health behaviors are violating the University Code of Conduct and will be reported to the Dean of Students Office with sanctions ranging from educational requirements to dismissal from the university.

Any student who has substantial reason to believe that another person in a campus room (e.g., classroom) is threatening the safety of others by not complying (e.g., not properly wearing a mask) may leave the room without consequence. The student is encouraged to report the behavior to and discuss the next steps with their instructor. Students also have the option of reporting the behavior to the Office of the Student Rights and Responsibilities. See also Purdue University Bill of Student Rights."

## Academic Integrity

Academic integrity is one of the highest values that Purdue University holds.  Individuals are encouraged to alert university officials to potential breaches of this value by either emailing or by calling 765-494-8778.  While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.

The Purdue Honor Pledge "As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue"

## Nondiscrimination Statement

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential.  In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity.  The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.  Link to Purdue's nondiscrimination policy statement.

## Netiquette

Your instructor and fellow students wish to foster a safe online learning environment. All opinions and experiences, no matter how different or controversial they may be perceived, must be respected in the tolerant spirit of academic discourse. You are encouraged to comment, question, or critique an idea, but you are not to attack an individual. Our differences, some of which are outlined in the University's nondiscrimination statement below, will add richness to this learning experience. Please consider that sarcasm and humor can be misconstrued in online interactions and generate unintended disruptions. Working as a community of learners, we can build a polite and respectful course ambience. Please read the Netiquette rules for this course:
- Monitor how much space/time you are taking up in any discussion. Give other students the opportunity to join in the discussion.
- Do not use offensive language. Present ideas appropriately.
- Be cautious in using Internet language. For example, do not capitalize all letters since this suggests shouting.
- Avoid using vernacular and/or slang language. This could lead to misinterpretation.
- Keep an "open-mind" and be willing to express even your minority opinion.
- Think and edit before you push the 'Send' button.

- Seek and take in feedback from others; learning from other people is an important life skill.

## Diversity & Inclusion Statement

1. In our discussions, structured and unstructured, we will explore a variety of challenging issues, which can help us enhance our understanding of different experiences and perspectives. This can be challenging, but in overcoming these challenges we find the greatest rewards. While we will design guidelines as a group, everyone should remember the following points:
   - We are all in the process of learning about others and their experiences. Please speak with me, anonymously if needed, if something has made you uncomfortable.
   - Intention and impact are not always aligned, and we should respect the impact something may have on someone even if it was not the speaker's intention.
   - We all come to the class with a variety of experiences and a range of expertise, we should respect these in others while critically examining them in ourselves.
2. This course, as with every course offered at Purdue, plays a part in creating and sustaining a welcoming campus where all students can excel. There are many initiatives in CE department and supported by the university focused on this goal, and this course is designed to take advantage of those resources. Learning experiences and assignments address diversity and inclusion, not because they are "topics," but because they are necessary to prepare students to be successful in a diverse, global environment.

3. We strive for equity, providing equal access and opportunity, and working to maximize student potential. This requires both instructor and students to identify and remove barriers that may prevent someone from full access or full participation. You can help by:
   - Contacting me, anonymously if needed, if you see a potential barrier for someone or yourself in participating fully in the class. This might be a physical barrier such as access to technology or a personal situation.
   - Suggesting ways in which members of our class can support each other. Virtual study groups and discussion boards are examples, but I encourage you to be creative in your ideas.
   - Getting to know each other as contributing members of our learning community. Everyone has something to contribute, and while I designed the course to take advantage of the wealth of knowledge, expertise, and experience we bring together, I cannot do it well without your participation. There are many opportunities built into this course for this type of work. It is important we do it together.

## Basic Needs Security

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed and Student Support Services is available to serve students 8 a.m.-5 p.m. Monday through Friday. Considering the significant disruptions caused by the current global crisis as it related to COVID-19, students may submit requests for emergency assistance from the Critical Needs Fund.

## Course Evaluation

During the last two weeks of the semester, you will be provided with an opportunity to give feedback on this course and your instructor. Purdue uses an online course evaluation system. You will receive an official email from evaluation administrators with a link to the online evaluation site. You will have up to 10 days to complete this evaluation. Your participation is an integral part of this course, and your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

# Students with Disabilities

 Purdue University strives to make learning experiences as accessible as possible.  If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options.  You are also encouraged to contact the Disability Resource Center at: **drc@purdue.edu** or by phone: 765-494-1247.

# Emergency Preparation

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

Guidelines regarding ensuring access to emergency information:
- Keep your cell phone on to receive a Purdue ALERT text message.
- Log into a Purdue computer connected to the network to receive any Desktop Popup Alerts.
- If you have a "no cell phone" in class policy allow one or two students who have signed up for Purdue ALERT to keep their phones on to receive any alerts

# Mental Health Statement

- **If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try WellTrack.** Sign in and find information and tools at your fingertips, available to you at any time.
- **If you need support and information about options and resources**, please see the Office of the Dean of Students for drop-in hours (M-F, 8 am- 5 pm).
- **If you're struggling and need mental health services**: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

# Violent Behavior Policy

Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity. See the University's full violent behavior policy for more detail.

# Disclaimer
The above policies and attached schedule and assignments for this course are subject to change by the professor in the event of extenuating circumstances.