



AMIRKABIR

University of Technology

Experimental Methods in Structural Engineering Spring 2018

COURSE DESCRIPTION:

This course is intended to introduce students to experimental methods, test planning, model preparation, loading systems, instrumentation, data acquisition and data processing. The course covers aspects of static and structural dynamics problems. Advance methods of testing will include hybrid techniques for substructure testing which combine simultaneous physical and numerical simulations. New testing methods of complex structural systems will be presented. Elements of modal testing and nondestructive methods will be introduced. The course provides an overview of laboratory work and is complemented with several “hands-on” applications in laboratory using testing and computing equipment.

COURSE STAFF:

Instructor: Dr. Siamak Epackachi

TA: Vahid Bokaeian

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Office hours: M/Tue 15:00-16:00 pm

CLASS SCHEDULE:

Lecture: Monday 13:30-15:00 pm / Tuesday 13:30-15:00 pm-Room No. 501-Building No. 1

Recitation: Will be scheduled at the first week of classes.

REFERENCES:

1 Harris and Sabnis, “Structural Modeling and Experimental Techniques” CRC Press 1999

2 Nachtigal, C.L., “Instrumentation and Control,” Wiley & Sons, 1990

3 Reese and Kawahara, “Handbook of Structural Testing”, Prentice Hall / Fairmont Press 1993

4 Malhotra and Carino, “Handbook of Nondestructive Testing of Concrete”, CRC Press, 1991

GRADING:

Assignments 20%

Final Exam 30%

Final Project 50%

- Attendance at all lectures and recitations, and active participation is expected. The instructor regularly brings up questions and discussions during lecture time. Students are encouraged to volunteer in answering questions and participate in discussions.
- *Sustained effort starting today:* Come to class and recitations regularly. Pay attention in class without distractions through smartphones etc. Bring a scientific calculator and follow along with calculations in class.



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- For the assignments, although students may consult with classmates, it is expected that solutions that are submitted, reflect the individual work of students.
- A significant part of engineering is written communication of laboratory work and analysis/design proposals. Heavy emphasis will be placed on clarity, organization and readability of your work.
- For the final project, you will have a 30 min presentation of your report. The presentation will be done jointly when each student will present a proportional part from the total presentation. The final report is due on same day at end of the presentations. The presentations (PPT) and the report should be submitted electronically to the instructor.
- All homework and project will be done in groups of up to five students.
- Part of the assignments include reports from visiting structural tests and laboratories or reports from presented videos of some lab tours and experiments.

Tentative Lecture Topics:

The following subjects will be introduced:

- Introduction to physical modeling
- Similitude, modeling and dimensional analysis
- Structural and material testing (steel, concrete, and masonry materials)
- Measurement systems, statistical and error analysis
- Test planning, design and implementation - test protocols
- Loading Systems (setups, loading devices, actuators, control, and etc.)
- Instrumentation (strain, displacement, crack detection, stress, force, temperature, fiber optics, and etc.)
- Data Acquisition - analog and digital
- Computerized data processing - numerical and graphical
- Data archiving and curating- data quality control