

MAP4319

Industrial Problems in Applied Math

Spring 2018

Instructor: Dr. Erik Lundberg

Office: SE 264

Office Hours: Wed, Fri : 12 noon - 2 pm

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Catalog description: This research-intensive course pits students, in small groups, against truly real-world problems provided by industrial partners. The content knowledge of the course is determined by the methods needed in order to tackle the problems under investigation and may include modeling, computer programming, linear algebra, differential equations, optimization, and statistics.

Textbook: No textbook is required.

Broader course description and objectives: This course was developed with the support of the PIC Math program (Preparation for Industrial Careers in Mathematics), sponsored by the Mathematical Association of America (MAA), the Society for Industrial and Applied Mathematics (SIAM), and the National Science Foundation (NSF). Goals of the PIC Math program are to engage math majors in industrial research, prepare them for industrial careers, and expose students to problems outside of academia which are mathematical in nature.

In this course, students work together in team of 3-5 students on a semester-long project. The projects are provided by external industrial partners. By the end of the course, each group will: (a) formulate a precise statement of the open-ended industry problem, (b) develop a plan of action for the main work on the problem, (c) produce a workable solution to their problem, (d) complete a 12-page written report, and (e) present a 12-minute oral report to their industrial partner. The main objective of the course is that each student, while working in a classroom setting, will experience how math is done in the real world.

This URI portion of the course will address all six Student Learning Objectives (SLOs), described below under “research intensive designation”.

Prerequisites: MAP 2302 or MAP 3305 and MAS 2103 or MAC 2313.

Course grade: Course grades will be determined by

Homework/Class Attendance/Participation/Team Meetings:	15%
Team Evaluations/Personal Evaluations/Time-sheets:	10%
Biweekly Presentations:	15%
Biweekly Reports and Midterm Report:	15%
Final Individual Report:	15%
Final Group Presentation:	15%
Final Group Technical Report:	15%

Grading scale: A/A-: 90-100%, B+/B/B-: 80-89%, C+/C: 70-79%, D: 60-69%

The final group technical report will be due May 1. Final group presentations will occur on Wednesday April 18 and Friday April 20. These presentations will be recorded on video and students will be expected to dress in professional (“business casual”) attire whenever interacting with their industry liason.

Requirements:

- **Homework / Class Attendance / Participation / Team Meetings:** Class time will largely serve as team meeting time. As such, attendance and participation during class are essential. There will be occasional homework assignments (such as literature searches) relevant to the projects. Student will receive a 0 for each missed class, team meeting, etc. unless he/she can provide a sound justification for missing the class or meeting.
- **Biweekly Team Evaluations / Personal Evaluations:** Each student is expected to become a part of their team. There is no one that can bring your particular skill set to your group other than you. As such, you will be required to submit biweekly evaluations on your team members and yourself, documenting the tasks of the group for the week and how much effort you and each group member put into the project. The evaluation will include an estimate of percentage that each member contributed over the two weeks prior (percentages totaling 100%).
- **Biweekly Time-sheets:** Each student will keep track of the time spent on the project. The actual time spent on the project will be recorded and submitted biweekly.
- **Biweekly Presentations:** Every two weeks, there will be a group presentation: one seamless presentation where each group member takes a turn presenting.
- **Biweekly Individual Reports:** Each team member will be required to write an individual biweekly report about the project in LaTeX. These reports will include a technical section (where you are encouraged to include graphs, figures, and tables), and a section with informal discussion and reflection. The first report is due during the first week in February and should be at least 4 pages long.
- **Final Individual Report:** You will turn in an individual report written in LaTeX based on combining and revising the biweekly reports described above.
- **Final Group Presentation:** Your group will give a final presentation to your industrial partner (either in person or over video conference). This presentation will be held during the final exam period for this course and should be only 12 minutes (not including time for questions).
- **Final Group Report:** Your group will turn in a final 12-page technical report written in LaTeX. A midterm first draft of the report (written in technical style with a bibliography and citations) is due the last day of class before Spring break.

Research Intensive Designation:

This course contains an assignment designed to help students conduct research and inquiry at an intensive level. If this class is selected to participate in the university-wide assessment program, students will be asked to complete a consent form and submit electronically some of their research assignments for review. Visit the Office of Undergraduate Research and Inquiry (OURI) for additional opportunities and information at <http://www.fau.edu/ouri>.

This URI portion of the course will address all six Student Learning Objectives:

- 1 Knowledge: Students will demonstrate knowledge of Mathematical Modeling using differential equations, linear algebra, and/or statistics.
- 2 Formulation of Questions: The project description provided by the industrial partner will be open-ended and will thus require students to arrive at a precise formulation of relevant questions. This will require background research.

- 3 Plan of Action: Using the course timeline as a template, each group is expected to set detailed and realistic goals for arriving at a workable end product.
- 4 Critical Thinking The main work on the project will require critical thinking and problem solving.
- 5 Ethical conduct: Plagiarism will be discussed, and proper citations will be included in the final report will additionally expose the students to ethical conduct.
- 6 Communication: Students will demonstrate communication throughout the semester with written and oral reports. They will also write a final research paper, and they will present the final results to their industrial client.

Rules of client engagement:

Each team will be in contact with a client from industry for their project. I must approve all emails to this contact. Meetings with the client require the utmost respect, and students will dress professionally for any face-to-face meetings (whether in person or through video conferencing). Presentations to clients must be prepared carefully in advance. Don't get caught late in the game and have to tell the client that you aren't prepared. In order to stay on track to meet deadlines and to arrive at a deliverable final product, understand that you will need to devote substantial time outside of class.

Team Meetings:

Teams will meet both in and outside of class. Each week teams will summarize their own progress, agree on the next steps, and make a definite plan for the tasks of each team member.

Incomplete grades:

A grade of I (incomplete) will only be given under certain conditions and in accordance with the academic policies and regulations put forward in FAU's University Catalog. The student has to show exceptional circumstances why requirements cannot be met. A request for an incomplete grade has to be made in writing with supporting documentation, where appropriate.

Classroom etiquette policy:

University policy on the use of electronic devices states: "In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions."

Disability policy statement:

In compliance with the Americans with Disabilities Act (ADA), students who require special accommodation due to a disability to properly execute coursework must register with the Office of Student Accessibility Service (SAS) – in Boca Raton, SU 133 (561-297-3880) and follow SAS procedures.

Academic integrity:

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see http://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf