14:440:102 – Integrated Data Driven Design for Engineering Applications (ID3EA 2)

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Course Description

Welcome to Integrated Data Driven Design for Engineering Applications! This course is an introduction to computers, computer programming, and their applications to different engineering fields. In this course, you will form an understanding of how computers handle information, the fundamentals of computer programming, and how we can use computers as a tool to solve problems. We will use MATLAB, a computer programming language and interface, as our window into the topics below.

Course Topics

a. Students will apply the engineering design process to real-world engineering applications.
b. Students use data literacy and apply it to engineering applications.
c. Students will build upon their fundamental computer programming skills and apply them to engineering applications.
d. Students will recognize the value of teamwork, project management and professional ethics, learning to leverage their individual skills and appreciate the benefits of diversity in collaborative settings.
e. Students will improve their communication skills, effectively conveying their design ideas to stakeholders and document their design processes.

Through this course, students will learn:

1. **An understanding of how computers work.** This will be demonstrated by an ability to:
   a. Describe the main strengths of computing for engineering applications
   b. Describe what a programming language is
   c. Describe what a computer program is

2. **An understanding of the fundamentals of programming using MATLAB.** This will be demonstrated by an ability to:
   a. Describe what variables are, in terms of bits and what they represent
   b. Set variables in MATLAB and give them values

c. Describe the different types of information variables can represent in MATLAB
d. Modify the value of variables with arithmetic and logical operators
e. Write program that produces a desired output
f. Correctly use programs that they and others have written
g. Use conditional statements to perform different operations depending on an input
h. Describe the uses of conditional statements
i. Use loops to repeat operations a desired amount of times
j. Define the different types of loops and describe their uses
k. Create functions that operate on a universal level
l. Describe the advantages of user-defined functions
m. Create more complex, modularized programs with multiple user-created functions
n. Use some tools that are specific to the MATLAB programming interface

3. **An understanding of the broad usefulness of computer programming.** This will be demonstrated by an ability to:
   a. Use programs to solve engineering problems
   b. Explore computer programming might be used in different engineering disciplines, including their own.

4. **An understanding of the advantages in teams.** This will be demonstrated by the ability to:
   a. Work in teams to solve engineering problems.
   b. Use project management to meet project deliverable deadlines.

5. **An understanding of the basics of effective technical communication their design processes.** This will be demonstrated by an ability to:
   a. Present their work in person with effective visuals and verbal communication.
   b. Effectively comment computer code.
   c. Write design memos for projects.

Contents

Course Schedule

See canvas for course schedule

Course Materials

Course Website on Canvas

Our Canvas site is the most important resource for this course, as it is a hub for all other course resources. If this is your first course with Canvas, you will need to request a Canvas account using the following link:

https://canvas.rutgers.edu/students/getting-started-in-canvas-students/

Or by logging into the Rutgers Canvas portal. Access to all course materials, the course schedule, lecture notes, and important announcements will be posted here.

MATLAB

Students will have access to MATLAB through their own computers.

To obtain MATLAB, you must create a Mathworks account with a Rutgers email. Once you do this, you can download MATLAB from the Mathworks website, or use MATLAB Online via the link on the Canvas page and logging in.

This is a large class. In order to help us focus our student interactions on teaching and learning, please contact Mathworks support with any MATLAB installation issues at:

https://www.mathworks.com/support/contact_us.html?s_tid=sp_ban_cs

Required Text

The required textbook for this class is **free and online** through the following website:

https://eng.libretexts.org/Bookshelves/Introductory_Engineering/Introduction_to_Engineering/01%3A_Chapters

Readings will be required from this text. Homework will be based on material contained in this text as well as covered in Lecture/Recitation/Community Engagement. We will only be using certain chapters of the textbook, including but not limited to: Chapters 6 to 16.

Communication

Please use emails to contact your instructors outside of class. Please include your Name, Course/section, RU ID, and NETID in the closing of the email when emailing your instructors. Be sure to also use your scarletmail address as we cannot provide any responses to your personal email addresses.

Prerequisites and Requirements

The pre-requisite for the course is passing grade 14:440:101: Introduction to Data Driven Design for Engineering Applications or equivalent. This course is required for all first-year engineering students. This course will assume that students know high school-level math.

Course Materials and Meetings

Attendance in all course meetings is mandatory.

Lecture

Lectures will consist of course announcements, lecture material, going over some lecture exercises for that week, important announcements about course logistics, and question and answer time.

Recitation

Recitations will consist of hands-on activities elaborating upon topics in the previous week's lectures. Each recitation will have a team of instructors, making them your best time to ask questions and get help figuring out course materials in class.

Community Engagement

In the first half of Community Engagement, we'll focus on career readiness and planning for your engineering major, covering topics like academic policies, campus resources, and strategies for success. You'll engage in activities with special guests, receive important announcements, and have time to ask questions about your academic and career goals. In the second half, you'll collaborate on your ID3EA project, applying what you've learned to a hands-on engineering challenge while preparing for teamwork. Highlights include crafting an elevator pitch, attending career fairs, learning from upperclassmen and faculty, and connecting with the engineering community.

Conduct

Students are expected to arrive to class on-time and be ready to begin at the start of class whenever possible. We understand that lateness does happen. If you must arrive late to class, please try to do so without disrupting any ongoing learning. Wait for an instructor to be finished with communicating with other students before talking to them about what you missed. It is ultimately your responsibility to make up for any missed activities in class.

Please be courteous to your instructors and fellow students. This class is an open, collaborative setting, and discussion of all ideas pertinent to the class is welcome. You may also wish to discuss non-pertinent information. This is permitted so long as it is within the realm of acceptable behavior as defined in the Rutgers code of conduct. However, please note that off-topic discussions can be disruptive to both your learning and the learning of others.

Assignments

Readings/Homework

Reading assignments will be given prior to the topic being covered in the class. You will have a reading "quiz" associated with most of the readings. Each reading assignment will be announced and posted on Canvas along with a due date. They will show up as quizzes but will be categorized within the homework portion of your grade.

You will be assigned additional weekly problems for homework that will be due after the lecture and recitation associated with the topic covered. Homework will follow up on each week's lecture exercises and recitation activities. Submission for these problems will be through MATLAB Grader on Canvas. You will have as many submission attempts as you need before the deadline to correctly answer these problems.

Lecture Exercises

During each lecture meeting, one of the questions we go over will be due as an assignment on MATLAB Grader through Canvas. This will be a portion of your attendance grade.

Projects and Project Reports

There will be one 6 week long group project this semester that will focus on experimental design. You will be tasked to use experimental design to solve a multidisciplinary engineering project. You will be tasked as a group to support your final results and 8-10 minute long group presentation, **Project deliverables must be submitted in .pdf format and provide editor privilege, and will be checked for plagiarism and group member participation.**

Incomplete Homework and Missed Reports

We acknowledge that your schedules are busy, and that sometimes you may not have time to complete homework by a due date. Therefore, we have the following incomplete homework policies: We will drop one incomplete homework assignments/readings. Incomplete assignments will have no grade entered for them in the gradebook, and will show up as a 0. **Due to this homework policy, we cannot accept any late Homework and Reading assignments for any reason.**

Late projects will be accepted with a 25% penalty per week.

Quizzes

There will be between 2 comprehensive quizzes that will have questions about topics covered up to that point in the semester, with a focus on the material covered on the newest topics. Quizzes will be completed in class during community engagement or online. Each quiz will be approximately 30-45 minutes in length. Quizzes will be conducted via Akindi Scantron sheets and open-ended sheets and/or Canvas Quizzes . Quizzes will have 5-10 multiple choice questions and 1-2 short answer question(s).

Final Comprehensive Exam

Your final comprehensive exam will be in person in Week 11 and will be made up of 30-40 multiple choice and 3-4 open ended short answer questions similar to those you might answer on quizzes, and it will be given during Community Engagement.

Grade Disputes

If you believe an assignment or exam is incorrectly marked, you have two weeks from the posting of the grade to communicate to your instructor to discuss it. It is suggested that you put this in writing. Requests to regrade assignments after this time will not be considered.

Course Grades

Grade Calculation	
Assignment	**Grade Component**
Quizzes	15%
Final Exam	15%
Reading Assignments	5%
Homework	10%
Lecture Participation	10%
Group Project	25%
Recitation Participation	10%
Community Engagement	10%

Percent of Credit	Letter Grade
≥90-100	A
≥85-90<	B+
≥80-85<	B
≥75-80<	C+
≥70-75<	C
0-69<	NC

Note that grades will not be rounded to the closest whole number. You must get at least 90% of course credit to get an A, 86% to get a B+, etc. We will not round 89.99 to 90. We do not plan on "curving" quiz, exam or course grades. Sorry!