

14:440:127– Introduction to Computers for Engineers

Syllabus

Rutgers University, Spring 2010

Lecturer: Blase E. Ur

- Lecture Instructor:** **Blase E. Ur**, Rutgers University School of Engineering
Email: blaseur@rci.rutgers.edu
Office: Engineering B-110 732-445-2687x16
- Lectures:** Wed (8:40a - 10:00a) or Wed (12:00p-1:20p) in SERC-111
- Recitation Instructor:** **Bo Jin**, Mechanical/Aerospace Engineering
Email: bocheng@rci.rutgers.edu
Office: Engineering D-106
- Recitation:** Thurs 1:40p - 3:00p and Mon 10:20a - 11:40a in Eng B-125
- Recitation Instructor:** **Cyrus Gerami**, Electrical/Computer Engineering
Email: cgerami@eden.rutgers.edu
Office: CoRE 511
- Recitation:** Thurs 5:00p - 6:20p and Fri 12:00p - 1:20p in Eng B-125
- Recitation Instructor:** **Saqib Ahmed**, Materials Science and Engineering
Email: saahmed@eden.rutgers.edu
Office: CCR 137
- Recitation:** Fri 8:40a - 10:00a and Fri 3:20p - 4:40p in Eng B-125
- Recitation Instructor:** **Wen Yueh**, Electrical/Computer Engineering
Email: wenyueh@eden.rutgers.edu
Office: CoRE 511
- Recitation:** Fri 1:40p - 3:00p and Mon 1:40p - 3:00p in Eng B-125

Office Hour Schedule:

Monday- 11:40a - 1:40p, *Bo* in Engineering D-106

Monday- 2:00p - 3:00p, *Wen* in CoRE 511

Monday- 5:00p - 6:00p, *Blase* in Engineering B-110

Tuesday- 5:00p - 6:00p, *Blase* in Engineering B-110

Wednesday- 10:15a - 11:15a, *Blase* in Engineering B-110

Thursday- 3:30p - 4:30p, *Cyrus* in CoRE 511

Thursday- 5:00p - 6:00p, *Blase* in Engineering B-110

Friday- 10:15a - 11:15a, *Saqib* in CCR 137

Friday- 1:00p - 2:00p, *Blase* in Engineering B-110

Or by appointment... just email us!

Course Objectives: * Learn to think logically to solve engineering problems
 * Become comfortable programming in the Matlab language
 * Gain design experience
 * Master the computer skills necessary for modern engineers

Suggested Textbook: Matlab for Engineers by Holly Moore- 1st OR 2nd Edition.

Grading Policy: Exam 1: 15%
 Exam 2: 15%
 Exam 3: 20%
 Projects 1 through 5: 8% each, so 40% total
 Homework Problem Sets (Pass/Fail): 5%
 Attendance in recitation: 5%

Matlab Software: Matlab is available in the DSV Lab (Eng B-125), EIT Lab (Eng D-110), ARC 111, and other labs. You can also access Matlab through SSH on eden.rutgers.edu or engsoft.rutgers.edu

Buying Matlab: You can purchase an educational license of Matlab for \$99 from http://www.mathworks.com/academia/student_version

Computer Accounts: You will need an Engineering account, which is different than your Eden account. The Engineering Account is distributed on the first day of recitation; please contact Mark Sproul (msproul@jove.rutgers.edu) to get an Engineering Account if you join the class late.

POLICIES:

1. No late work will be accepted. Absences or tardiness for exams will result in automatic failure of that exam, except in the case of documented medical or family emergencies.
2. Exams are held during your regularly scheduled and assigned recitation. You may only sit for the exam with a different recitation after receiving PRIOR email approval from Blase.
3. You must have your Rutgers ID Card with you during all exams.
4. Please refrain from using your laptop during lecture or sit near the back.
5. Homework and projects will be submitted through Sakai. You must submit '.m files' unless otherwise stated; other file formats will receive no credit. Be sure to check the 'no plagiarism box'.

COLLABORATION POLICIES:

1. For HOMEWORK PROBLEM SETS, you may collaborate with up to 2 other students. Collaboration means you may discuss the problems, but you all must write up your own solutions. At the top of your problem set, you must state the names of all other students with whom you worked AS COMMENTS.
2. For PROJECTS, you may talk at a high level about the project with up to 2 other students. By *high level*, we mean that you can say things like 'We need to use a For Loop to accomplish this task'. Once you start 'speaking in Matlab code', you've gone too far. Students may help each other debug their code, but the only hands that should ever touch the keyboard for your project are your own. Transferring even small portions of code to each other is certainly not allowed. At the top of your submission, state the names of all other students with whom you discussed the project. For some projects, we may allow you to work with a partner and submit a single solution. If this is the case, we will clearly identify the project as a 'partners assignment.'
3. EXAMS are closed book. No collaboration, notes, calculators, or aids are permitted for exams.
4. ALL violations of this collaboration policy will be prosecuted as per Rutgers' Academic Integrity Policy. Sanctions include failure of the course and suspension/expulsion from the university.

TENTATIVE COURSE SCHEDULE

1. Week of 1/20: Syllabus, Matlab Environment, Variables, Basic Data Types, Relational and Logical Operators, Conditional Statements (If)

Book- *Chapters 1 and 2, Sections 8.1, 8.4.1*

2. Week of 1/27: Conditionals continued (If / Switch), Built-in Functions, Input and Output (disp, fprintf), Creating and Manipulating Matrices, Matrix Math, Matrix Functions, Colon Operator/Linspace, Dot Multiplication, Cross Products

Book- *Sections 3.1-3.5, 3.9, 4.1, 4.3, 7.2, 8.1, 8.3.1, 8.4, 9.1*

****Project 1** assigned 1/29. It will be due 2/8.

3. Week of 2/3: More Advanced Uses of Matrices: Logical Functions, Logical Indexing, Systems of Equations, Root Finding. Cell Arrays. 3-Dimensional Arrays. Sound and Image Processing. Meshgrid.

Book- *Sections 3.5, 4.1-4.3, 9.1-9.3, 10.1-10.4, 13.1*

****Project 2** assigned 2/5. It will be due 3/5.

4. Week of 2/10: 2-D Plotting, 3-D Plots (mesh vs. surf), LogLog Plots, Graphical Input, Interpolation, Regression, and Fitting Equations to Polynomial and Non-Polynomial Data

Book- *Sections 4.2, 5.1-5.4, 7.3, 12.1-12.2, Appendix C (2nd Edition Only)*

*****EXAM 1** to be given in your first recitation meeting after this lecture (2/11, 2/12, or 2/15)

5. Week of 2/17: Introduction to Loops

Book- *Sections 8.2, 8.5*

6. Week of 2/24: Loops Continued, Debugging Loops

Book- *Sections 3.6, 8.5, 13.3*

****Project 3** assigned 2/26. It will be due 3/30.

7. Week of 3/3: User-Defined Functions, Anonymous Functions, Scope, Comments, Programming Best Practices and Error Checking.

Book- *Sections 6.1-6.4, 6.5 (2nd Edition Only)*

8. Week of 3/10: Case Study: Video Processing, Animation, Pseudorandom Numbers

Book- *Sections 3.6, 8.5, 13.3*

*****EXAM 2 to be given in your first recitation meeting after this lecture (3/11, 3/12, or 3/21. Spring Break is in the middle.)**

9. Week of 3/24: Problem Solving, Algorithm Analysis, and Efficient Code. Case Studies: Sudoku and Primality Testing

Book- *Sections 6.1-6.4, 6.5 (2nd Edition Only)*

10. Week of 3/31: Graphical User Interfaces, Handles, Prototyping, and the Engineering Design Process

Book- *Section 8.4.5 plus online resources/handouts*

****Project 4** assigned 4/2. It will be due 4/18.

11. Week of 4/7: Object-Oriented Programming, Case Study: Simulation

Book- *Handouts and Online Resources*

12. Week of 4/14: Case Study: Data Collection and Analysis, File Input (i.e. `xlsread`, `textread`), Web Scraping and Pattern Matching (Regular Expressions)

Book- *Handouts and Online Resources*

****Project 5** assigned 4/16. It will be due 5/3.

13. Week of 4/21: Numerical and Symbolic Methods for Equation Solving, Calculus, and Advanced Engineering Mathematics. Binary Numbers

Book- *Sections 11.1-11.2, 11.4*

14. Week of 4/28: Data Types, Computational Error, Specialized Data Types (Sparse Arrays, Character Arrays, Structures), Parallel Computing, Recursion

Book- *Sections 3.8, 10.1 (10.1.5 in particular), 10.3, 10.5, plus handouts*

Optional Lecture TBA: Review for Final Exam

*****EXAM 3 (Final Exam) will be given in your final recitation meeting- 4/29, 4/30, 5/3**