Introduction to Computer Programming

ASE 301 / COE 301

Unique Number: 13590

Fall 2017

Instructor: Amir Shahmoradi

office: POB 6.326

e-mail: [amir@ices.utexas.edu](mailto:amir@ices.utexas.edu)

office hours: Mon 3-5 pm, Fri 3-5 pm

Lecture meeting times: MWF 9 - 10 am

Lecture meeting place: UTC 4.110

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| Teaching Assistants: | Vivek Varier | Travis Driver | Sanjit Paliwal |
| office: | WRW 209 | WRW 209 | WRW 209 |
| e-mail: | viv.varier@utexas.edu | travis.driver7@utexas.edu | sanjit.paliwal@utexas.edu |
| office hours: | Mon 3 pm – 4 pm  Fri 10 am – 11 am  Fri 11 am – 12 pm | Mon 11 am – 12 pm  Tue 1 pm – 2 pm | Tue 4 pm –5 pm  Wed 4 pm – 5 pm  Thu 11 am – 12 pm |

**COURSE OBJECTIVES / ACADEMIC LEARNING GOALS**

The primary objective of this course is to learn basic computer programming

concepts and apply them to engineering computations. By the end of the course, you should have a good understanding of programming practices and be able to analyze engineering/mathematical problems and develop computational solutions for them, potentially collaboratively within a team. We will achieve this by learning how to program in MATLAB, Fortran, and C++. No prerequisites are required, although some knowledge of calculus and linear algebra is useful.

**COURSE SCHEDULE**

The following is a tentative outline of the topics to be covered.

* Version Control Systems (VCS): Principles of professional project management and collaborative programming with the use of Git.
* Programming History – operating systems – roundoff and truncation errors – number systems.
* Principles of Programming using MATLAB: The MATLAB development environment; syntax rules; variables and data types; conditionals; looping; input/output; functions; M files; functions; matrix operations; plotting; symbolic calculations; file processing; etc.
* (if possible) Compiled languages: Fortran and C++. general syntax rules; variable types; conditionals and looping; functions and subroutines; arrays; input/output;

**COURSE TEXTBOOKS**

No textbook is required for this course. Online class lecture notes will be used as reference. However, the following is a list of textbooks for those who are interested to self-educate themselves or go beyond class syllabus.

**MATLAB:**

1. Chapman, 2016, MATLAB Programming for Engineers.
2. Attaway, 2014, Matlab: A Practical Introduction to Programming.
3. King, 2017, MATLAB Programming for Biomedical Engineers and Scientists.
4. Van Loan, 2010, Insight through Computing, A MATLAB Introduction.
5. Driscoll, 2009, Learning MATLAB.
6. Higham, 2005, Matlab Guide.
7. Moler, 2004, Numerical Computing with Matlab.

**Fortran:**

1. Metcalf, 2011, Modern Fortran Explained.
2. Chivers, 2012, Introduction to Programming with Fortran.
3. Chapman, 2017, Fortran for Scientists and Engineers.
4. Clerman, 2012, Modern Fortran: Style and Usage.

**C++:**

1. Gottschling, 2016, Discovering Modern C++: An Intensive Course for Scientists.
2. Horstmann, 2011, C++ For Everyone.

## COURSE LOGISTICS

Grading:

Biweekly Homework: 30% (Each assignment might not be weighted the same way)

Biweekly Quizzes: 35%

Final Exam: 35%

Homework Policy:

There will be approximately one homework per lecture. Assignments will be due before lecture begins, and should be added to an online repository determined by the instructor. No late assignment will be accepted. No exceptions to the homework policy will be made without prior instructor approval.

Examinations:

The midterm exam will cover the topic from the beginning of the semester to the date of exam. The final exam will be more focused on the topics covered after midterm exam.

Attendance:

Regular attendance is expected. Any absence requires prior approval from the instructor, or compelling evidence of illness or an official letter from the university administration. Student attendance will be randomly checked.

Scholastic dishonesty: All students are responsible for upholding the University rules on scholastic dishonesty. Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University.  Since such dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced.   For further information, visit the Student Judicial Services web site <http://deanofstudents.utexas.edu/sjs/>, and the General Information Catalog information <http://catalog.utexas.edu/general-information/> .

Other matters: The University of Texas at Austin provides, upon request, appropriate academic adjustments for qualified students with disabilities. Any student with a documented disability (physical or cognitive) who requires academic accommodations should contact the Services for Students with Disabilities area of the Division of Diversity and Community Engagement at 471-6259 as soon as possible to request an official letter outlining authorized accommodations.  For more information, contact that office at 471-6259, Video Phone 410-6644, or <http://www.utexas.edu/diversity/ddce/ssd>.

## Your Expectations:

For the Fall 2017 offering of this course, we will cover the principles of computer programming using MATLAB programming language, and if time allows, also the two important modern compiled languages that are widely used in scientific computation: Fortran and C++. Specifically, upon completion of this course students will be familiar with,

* programming paradigms,
* principles of software maintenance and collaborative project development,
* differences between compiled and interpreted programming languages,
* how to use MATLAB as a simple calculator,
* how to use MATLAB as an advanced scientific computation and graphics toolbox,
* how to compile and write scientific code in modern compiled languages such as Fortran and C++,
* how to formulate cast a scientific problem in the form of a computational programming algorithm.

## Course Schedule:

The following is the tentative schedule of topics to be covered, and will be continuously updated. The exam dates are final.

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| Wed Aug 30 | Student-professor connection day; course outline |
| Fri Sep 01 | VCS - a professional programmer uses Version Control System (VCS) |
| Mon Sep 04 | NO CLASS: LABOR DAY HOLIDAY **– (HW 1 assigned)** |
| Wed Sep 06 | VCS - a professional programmer uses Version Control System (VCS) |
| Fri Sep 08 | VCS - advanced Git concepts |
| Mon Sep 11 | VCS - advanced Git concepts |
| Wed Sep 13 | VCS - advanced Git concepts |
| Fri Sep 15 | VCS - advanced Git concepts |
| Mon Sep 18 | MATLAB - programming history |
| Wed Sep 20 | MATLAB - for beginners |
| Fri Sep 22 | MATLAB - values, variables, types |
| Mon Sep 25 | MATLAB - values, variables, types |
| Wed Sep 27 | MATLAB - values, variables, types |
| Fri Sep 29 | MATLAB - values, variables, types |
| Mon Oct 02 | MATLAB - values, variables, types **– (HW 2 assigned, quiz 1)** |
| Wed Oct 04 | MATLAB - values, variables, types |
| Fri Oct 06 | MATLAB - values, variables, types |
| Mon Oct 09 | MATLAB - operators, branching, and control statements |
| Wed Oct 11 | MATLAB - operators, branching, and control statements |
| Fri Oct 13 | MATLAB - functions |
| Mon Oct 16 | MATLAB - functions **– (HW 3 assigned, quiz 2)** |
| Wed Oct 18 | MATLAB - functions |
| Fri Oct 20 | MATLAB - functions |
| Mon Oct 23 | MATLAB - functions |
| Wed Oct 25 | MATLAB - functions |
| Fri Oct 27 | MATLAB - loops and vectorization |
| Mon Oct 30 | MATLAB - loops and vectorization **– (HW 4 assigned, quiz 3)** |
| Wed Nov 01 | MATLAB - loops and vectorization |
| Fri Nov 03 | MATLAB - loops and vectorization |
| Mon Nov 06 | MATLAB - loops and vectorization |
| Wed Nov 08 | MATLAB - input/output (IO) |
| Fri Nov 10 | MATLAB - input/output (IO) |
| Mon Nov 13 | MATLAB - input/output (IO) **– (HW 5 assigned, quiz 4)** |
| Wed Nov 15 | MATLAB - input/output (IO) |
| Fri Nov 17 | MATLAB - plotting and Monte Carlo methods |
| Mon Nov 20 | MATLAB - plotting and Monte Carlo methods |
| Wed Nov 22 | NO CLASS: THANKSGIVING HOLIDAYS |
| Fri Nov 24 | NO CLASS: THANKSGIVING HOLIDAYS |
| Mon Nov 27 | MATLAB - plotting and Monte Carlo methods **– (HW 6 assigned, quiz 5)** |
| Wed Nov 29 | Semester Project / Free Discussion |
| Fri Dec 01 | Semester Project / Free Discussion |
| Mon Dec 04 | Semester Project / Free Discussion |
| Wed Dec 06 | Semester Project / Free Discussion |
| Fri Dec 08 | Semester Project / Free Discussion |
| Mon Dec 11 | ICP wrap-up: course summary, advice for your future career **(quiz 6)** |