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

Lecture meeting times:	MWF 9 - 10 am
Lecture meeting place:	UTC 4.110

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: 32.5% (Each assignment might not be weighted the same way)
Biweekly Quizzes: 32.5%
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.

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)**