THE UNIVERSITY OF TEXAS AT AUSTIN
Department of Aerospace Engineering and Engineering Mechanics

COE 301 Introduction to Computer Programming
Spring, 2019

SYLLABUS

Unique Number: 13550

Instructor: Ann Chen

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Lecture Time: MWF 9 am -10 am

Lecture Location: ETC 2.136

Office hours: Monday 3pm – 5pm at ASE 3.214

Teaching Assistants:

Teaching Assistants:	TBD	TBD
e-mail:	TBD	TBD
office hours:	TBD	TBD

Web Page: Information about the course, such as the syllabus, homework assignments, handouts, and homework solutions, will be posted regularly on Canvas (*http://canvas.utexas.edu*). You will also be able to monitor your progress in the course by reviewing your assignment/exam grades.

Catalog Description: Basic computer programming concepts for engineering computations. Programming in MATLAB or similar computing environments is emphasized, but more advanced languages may also be discussed.

Course Objectives: 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 be able to think in a structured manner about solutions to engineering/mathematical problems and have an understanding of coding practices. We will cover C++ and MATLAB.

Prerequisites: No prerequisites are required, although some knowledge of calculus and linear algebra is useful.

Impact on Subsequent Courses in Curriculum: COE 301 is a prerequisite for COE 311K, Engineering Computation and COE 322, Scientific Computation.

Relationship of Course to Program Outcomes:
This course contributes to the following ABET Criterion 3 outcomes and those specific to the EAC accredited program.

Outcome	√	Outcome	√
a. An ability to apply knowledge of mathematics, science, and engineering	√	g. An ability to communicate effectively	
b. An ability to design and conduct experiments, as well as to analyze and interpret data		h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	
c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	√	i. A recognition of the need for and an ability to engage in life-long learning	
d. An ability to function on multi-disciplinary teams		j. A knowledge of contemporary issues	
e. An ability to identify, formulate, and solve engineering problems	√	k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	√
f. An understanding of professional and ethical responsibility			

ABET Program Criteria Achieved:
Program criteria are unique to each degree program and are to be compiled from the program criteria given for each degree program and listed in table format below. The faculty should check which of the program criteria are achieved in the course.

Criterion	√	Criterion	√	Criterion	√
A. Aerodynamics		G. Orbital Mechanics		M. Preliminary/Conceptual Design	
B. Aerospace Materials		H. Space Environment		N. Other Design Content	
C. Structures		I. Attitude Determination and Control		O. Professionalism	
D. Propulsion		J. Telecommunications		P. Computer Usage	√
E. Flight Mechanics		K. Space Structures			
F. Stability and Control		L. Rocket Propulsion			

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

- Introduction to computers – operating systems
- C++ Programming: overview of C++; data types; syntax rules; arithmetic operations; sequence, conditionals, repetition; flow control; functions; arrays; pointers; dynamic memory allocation, file processing; etc.
- MATLAB: M-files; file processing; control statements; vector and matrix operations; plotting; functions; MATLAB ODE solvers; linear systems and its applications; etc.

Textbooks:
There is no textbook required for COE301. Books which may serve as useful references are listed below.

1. "C++ For Everyone", Cay S. Horstmann, 2nd edition.
2. "MATLAB Programming for Engineers", S. J. Chapman, Brooks/Cole Fourth Edition, 2008 (other editions are also acceptable)

Class Schedule:
The following is the tentative schedule of topics to be covered, and will be continuously updated.

Jan 23	Introduction to the course and programming
Jan 25	Basic shell commands, printing in C++ [Lab 1]
Jan 28	Number systems, Data representation
Jan 30	C++ variables, data types, naming rules in C++, meaning of =, C style printing
Feb 1	Arithmetic operations, operator precedence, type casting [Lab 2]
Feb 4	Relational operators, if/else structure, logical operators
Feb 6	More on if/else, switch, while loops
Feb 8	More on while loops, estimate pi using the Monte Carlo Method [Lab 3]
Feb 11	for loop, numerical integration
Feb 13	Nested loops
Feb 15	Connection time [Lab 4]
Feb 18	Debugging tools gdb, review for exam 1
Feb 20	Exam 1
Feb 22	Introduction to functions
Feb 25	Recursion, Global variables, finding prime numbers
Feb 27	Scope, Pass by value vs. Pass by reference
Mar 1	Exam 1 solved, Introduction to C-Arrays [Lab 5]
Mar 4	Arrays vs. pointers, interaction of arrays and functions
Mar 6	C++ vectors, 2D C-arrays
Mar 8	Emulating 2D arrays with vectors, Game of life [Lab 6]
Mar 11	Writing larger pieces of code
Mar 13	More on writing larger pieces of code, Structs
Mar 15	C++ classes
Mar 18-23	Spring Break, no class
Mar 25	Game of life problem session [Bonus Lab]
Mar 27	C++ classes continue, an introduction to C++ templates
Mar 29	C++ Review
Apr 1	Exam 2
Apr 3	Introduction to MATLAB
Apr 5	MATLAB vectors [Lab 8]
Apr 8	Operations on vectors, basic plotting
Apr 10	MATLAB matrices
Apr 12	Operations on matrices, solving a system of linear equations [Lab 9]
Apr 15	Programming in MATLAB: relational and logical operators, if structure.
Apr 17	Programming in MATLAB: for loops, nested for loops and m-file functions
Apr 19	Linear algebra applications: similarity measures and data interpolations [Lab 10]

Apr 22	Linear algebra applications: least squares data fitting using polynomials
Apr 24	Linear algebra applications: linear maps – rotation and image warping
Apr 26	Linear algebra applications: simulating linear dynamics systems [Lab 11]
Apr 29	Basic image manipulation, image filters and effects
May 1	Vectorization of image processing, course evaluation
May 3	Advanced plotting, data visualization [Lab 12]
May 6	More on linear algebra: Google's page rank
May 8	More on linear algebra: Google's page rank
May 10	Final review

Software:
Homework will include programming assignments to be completed on a computer. C++ compiler and MATLAB will be used for all assignments. A Linux virtual machine will be required for certain C++ assignments. We will provide a suitable pre-installed virtual disk image for download and use in VirtualBox.

Homework Policy:
Assignments will be given, on average, every week. Assignments will be due at the beginning of the lecture on the date marked on the assignment sheet, unless modified by the instructor. Late assignments will be penalized by 20% of the total score per day. No late homework will be accepted 5 days after the due date.

Students are strongly encouraged to discuss course topics with each other, since such discussions are an important part of the learning process. However, each student must carry out assignments independently. All assignments in this course may be processed by TurnItIn, a tool that compares submitted material to an archived database of published work to check for potential plagiarism. Other methods may also be used to determine if the homework is the student's original work. Regardless of the results of any TurnItIn submission, the faculty member will make the final determination as to whether or not a homework set has been plagiarized.

Examinations:
There will be three open-notes exams. The final exam date will follow the university schedule. The other two exams are tentatively scheduled on Feb. 20 and Apr. 1 in class. Alternative dates for the exams will be arranged only for students with documented medical emergencies.

Grading:
Homework 50%
Exam 1 10%
Exam 2 10%
Final 30%

Letter grades will be assigned as follows:

Grade	Cutoff
A	90
A-	87
B+	84
B	80

B-	77
C+ C C-	74 70 67
D	57
F	<57

Attendance: Regular attendance is expected.

Important Dates:

Jan. 22 Class begins.

Jan. 25 Last day of the official add/drop period; after this date, changes in registration may require the approval of the department chair and usually the student's dean.

Feb. 6 This is the date the official enrollment count is taken. Last day an undergraduate student may add a class except for rare and extenuating circumstances. Last day to drop a class for a possible refund.

April 8 Last day an undergraduate student may, with the dean's approval, withdraw from the University or drop a class except for urgent and substantiated, nonacademic reasons.
Last day an undergraduate student may change registration in a class to or from the pass/fail basis.
Last day to apply for an undergraduate degree.

May 10 Last class day.

Academic Integrity:

Each student in the course is expected to abide by the University of Texas Honor Code: "As a student of The University of Texas at Austin, I shall abide by the core values of the University and uphold academic integrity." **Plagiarism is taken very seriously at UT.** Therefore, if you use words or ideas that are not your own (or that you have used in previous class), you must cite your sources. Otherwise you will be guilty of plagiarism and subject to academic disciplinary action, including failure of the course. You are responsible for understanding UT's Academic Honesty and the University Honor Code which can be found at the following web address: http://deanofstudents.utexas.edu/sjs/acint_student.php

Services for Students with Disabilities:

This class respects and welcomes students of all backgrounds, identities, and abilities. If there are circumstances that make our learning environment and activities difficult, if you have medical information that you need to share with me, or if you need specific arrangements in case the building needs to be evacuated, please let me know. I am committed to creating an effective learning environment for all students, but I can only do so if you discuss your needs with me as early as possible. I promise to maintain the confidentiality of these discussions. If appropriate, also contact Services for Students with Disabilities, 512-471-6259 (voice) or 1-866-329- 3986 (video phone). http://ddce.utexas.edu/disability/about/

Evaluation:

Note that the Measurement and Evaluation Center (MEC) forms for the Cockrell School of Engineering will be used during the last week of class to evaluate the course and the instructor. Students are strongly encouraged to complete it.

Prepared by: Ann Chen Updated on: 01/22/2019