

Computer Model Formulation

COT3502 Section 0098

Class Periods: TR, periods 6-7, 12:50 AM-2:45 PM

Location: MAE 0303

Academic Term: Spring 2019

Instructor:

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Course Description

Solutions of scientific and engineering problems using digital computers. Formulation of models for describing physical processes, numerical analysis and computer programming. (4 credits).

Course Pre-Requisites

ECH 3023, MAP 2302 and MAC 2313.

Course Objectives

Formulate mathematical process models.

Solve mathematical models using analytical methods.

Solve mathematical models using numerical methods.

Write computer programs to solve mathematical models.

Materials and Supply Fees

N/A

Relation to Program Outcomes (ABET):

Outcome	Coverage
a. Apply knowledge of math, science, and engineering.	High
b. Design and conduct experiments	
c. Design system, component, or process	
d. Function on teams	High
e. Formulate and solve problems	High
f. Professional and ethical responsibility	Medium
g. Communication	Medium
h. Understanding the impact of engineering solutions	
i. Lifelong learning	
j. Contemporary issues	Medium
k. Techniques, skills, and tools for engineering practice	High
l. Recognition of industrial health and safety issues	

Coverage is given as high, medium, or low. An empty box indicates that this outcome is not part of the course.

Required Textbooks and Software

- 1 Automate the boring stuff with Python <https://automatetheboringstuff.com> (ABS.pdf)
- 2 Programming for Computations <http://hplgit.github.io/Programming-for-Computations/pub/p4c/> P4C.pdf)
- 3 Python in easy steps <https://www.amazon.com/Python-easy-steps-Covers-3-7/dp/1840788127> (PES)

Additional Materials

- Project Euler <https://projecteuler.net/> contains a large number of short (but sometimes difficult) coding problems. Some homework problems are taken from this site.

Course Schedule (approximate)

Week	Topic	Resources
1	Introduction to Python Programming Computers, programs, and programming Python and the Spyder GUI Basic data types and operators Expressions and assignments	tu1.pdf tu2.pdf + ABS 1 HW1.pdf
2	Logical expressions and conditionals Loops Following the code and debugging	PES 1 + tu3.pdf + ABS 2 tu4.pdf + tu5.pdf HW2.pdf
3	Quiz 1 (multiple choice) – Python basics (syntax) Compound data types: Strings, lists and tuples Type conversions	tu6.pdf HW3.pdf
4	Functions and modules Plotting in matplotlib Project 1: Spirographs	tu7.pdf + ABS 3 tu8.pdf + tu9.pdf HW4.pdf
5	Iteration and accumulation: series and summations Elements of dual-key cryptography	tu10.pdf HW5.pdf
6	Project 2: RSA encryption Quiz 2 – Compound data types, functions, modules	HW6.pdf
7	Excel basics Integrating Python with Excel - openpyxl	tu11.pdf + ABS 12 HW7.pdf
8	Review Midterm – Simple programs	
9	Spring Break	
10	Ordinary differential equations Differential equations and initial conditions Discretization of derivatives Euler method Error analysis of Euler method Runge Kutta methods	P4C 4 HW8.pdf
11	Introduction to numpy Solving coupled ODE's with numpy Predator-Prey model Quiz 3 – ODE's + Excel	tu12.pdf tu13.pdf HW9.pdf
12	Partial differential equations Finite difference method Transient heat conduction Project 3: Reaction-diffusion with Gray-Scott model	P4C 5 HW10.pdf
13	Non-Linear equations Bisection Newton method Secant method	P4C 6 HW11.pdf
14	Vectors and Matrices Matrix representation of linear equations Solving linear equations by Gauss elimination	tu14.pdf HW12.pdf

		Linear algebra with Python: the numpy.linalg library Quiz 4 – Solving non-linear equations	
15		Solving coupled systems of non-linear equations Multi-variable Newton-Raphson method Using Python's root finding module	tu15.pdf HW13.pdf
16		Review for Final	

Attendance Policy, Class Expectations, and Make-Up Policy

- a Students will be assigned homework each week. Homework will focus on computer programming and related assignments. Homework is for practice and will not be collected or graded. Solutions to some of the problems will be provided.
- b The midterm will be given during class periods, and the final exam during the scheduled time.
- c Quizzes and tests will involve multiple choice questions, written questions, and computer assignments.
- d You are responsible for all announcements made in class.
- e You are responsible for printing the assignments from the class web page located at <https://elearning2.courses.ufl.edu>.
- f Requests for re-grading of assignments and exams will only be considered within a one-week period from the time graded work is returned in class.
- g Grades will be posted on the web. Throughout the semester, you have to ensure that they are entered correctly. Corrections will be considered only within a one-week period after the grades have been posted on the web.
- h Students may request a makeup for any activity sponsored by the university, for health reasons and for family emergencies. Other reasons at the instructor's discretion. Makeup tests and quizzes will be given at the end of the semester. There will be no make up for the final exam except for health or family reasons. In such cases the student will receive an Incomplete with a makeup to be given the following semester.

Evaluation of Grades

Assignment	Percentage of Final Grade
Midterm Exam	25%
Final Exam	25%
Quizzes (4)	20%
Projects (3)	30%
Total	100%

Grading Policy (approximate – subject to modification)

Percent	Grade	Grade Points
85-100	A	4.00
80-85	A-	3.67
75-80	B+	3.33
70-75	B	3.00
65-70	B-	2.67
60-65	C+	2.33
55-60	C	2.00
50-55	C-	1.67
45-50	D+	1.33
40-45	D	1.00
35-40	D-	0.67
0 - 35	E	0.00

Schedule of Quizzes and Tests

Quiz 1	Tue Jan 22 nd Period 7
Quiz 2	Thu Feb 14 th Period 7
Quiz 3	Thu Mar 21 st Period 7
Quiz 4	Thu April 11 th Period 7
Midterm	Thu Feb 28 th Periods 6 & 7
Final	Mon Apr 29 th 5:30-7:30 pm

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor.

Campus Resources:

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.