Computer Model Formulation

COT3502, Class #12266, Section #3914
Class Periods: Tuesday / Thursday, Period 6-7, 12:50 AM – 2:45 PM
Location: Tuesday: HPNPG316; Thursday HPNPG112
Academic Term: Fall 2023

Instructor:
Prof. Charles Hages
c.hages@ufl.edu
352-294-7002
Office Hours: Monday (Exact time TBD during first day of class. Will be announced on Canvas.)

Supervised Teacher:
Please contact through the Canvas website:

- Taofeek Tejuosho, tejuosho.taofeek@ufl.edu, Office Hours: Monday & Wednesday (*Time and Location TBD, Will be announced on Canvas.*)

Supervised Undergraduate Tutor:
Please contact through the Canvas website

- Jasmeet Bhatt, jasmeetbhatt@ufl.edu, Recitation: (*Time and Location TBD. Will be announced on Canvas*.)

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 / Co-Requisites
ECH 3023 and 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***
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a	

collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	High

Required Textbooks and Software

- Python. Can be installed for free using the Anaconda package: https://www.anaconda.com/download

Recommended Materials

N/A

Course Schedule (Tentative)

Part 1 - Introduction to Python Programming

Week 1: IDEs, Programs, Python/Spyder/Jupyter, Data types, Operators, Expressions,
Week 2: Assignments, Logical expressions and conditionals,
Week 3: Sequential data types, Loops
Week 4: Functions and modules, Plotting in matplotlib, **(Start) Project 1: Spirographs *(Tentative)***
Week 5: Series and summations, Advanced Topics
Week 6: Numpy **(Midterm 1 - *Tentative*)**

Part 2 – Numerical Methods

Week 7: Root Finding
Week 8: Numerical quadrature
Week 9: ODEs: Initial-value problems: Differential equations and initial conditions, Numerical differentiation, Euler & Heun methods
Week 10: Runga-Kutta methods, Solving coupled ODE's, Predator-Prey model
Week 11: ODEs: Boundary-value problems**:** Finite difference method, Heat conduction
Week 12: PDEs: **(Start) Project 2: Agent-based simulations *(Tentative)***
Week 13: PDEs: Finite Difference, Boundary Conditions
Week 14: PDEs: Steady-state, Matrices/Linear Algebra
Week 15: Fitting Data**:** Least squares method, Review ***(Final)***

Attendance Policy, Class Expectations, and Make-Up Policy

- Attendance of lectures is highly recommended. We will work on programming, group problems, and examples interactively in class together. You are responsible for all announcements made in class.
- Late homework cannot be accepted – don't wait until the last minute! Only selected problems will be graded each week.
- There will be several quizzes in class throughout the semester. Students will be given at least 2 days notice prior to any in class quizzes. Quiz format details will be given in class.
- The lowest homework grade and quiz will be dropped – therefore, if you are late for one of the assignments or miss a quiz it won't hurt your grade.
- There will be two exams given during class periods. Exam format details will be given in class prior to the exam.
- Requests for make-up exams will be considered only for those students who missed due to an acceptable reason as listed in the undergraduate catalog (link below). For all planned or unplanned absences, the student should inform the instructor as soon as possible according to the guidelines in the undergraduate catalog (link below).
- Students arriving late for an exam will be given only the balance of time remaining to complete their work unless an acceptable reason (see above) is provided.

- Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies, as found on this link: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Plagiarism Policy:

Submitting work for credit that is not your own is called plagiarism; it applies to any graded assignment or test. Plagiarism is a violation of the UF code of conduct and is taken seriously at UF.

For the purposes of this class, plagiarism includes, copying complete codes or flowcharts, or substantial portions of a code. Blocks of code implementing identical logic can also be plagiarism even if names and ordering of the code has been changed. Plagiarism includes copying from other students, copying work done in previous years or other classes, or from the internet. Note that plagiarism applies to both the source and the receiver of code. Bottom Line: Write all your own code for this class (it is a programming class after all!) Code fragments and ideas shared by the instructor(s) or reused from previous assignments does not constitute plagiarism.

Helpful Guidelines:

i. Do the coding yourself. You can discuss problems among yourselves, but you should write the code alone.
ii. If you do use sources – cite them as notes to the submission.
iii. It's OK to get help from the instructor or student teacher/tutor.
iv. Don't distribute copies of your code or code you have been shown by an instructor or student teacher/tutor.
v. If in doubt, ask.

Evaluation of Grades

Assignment	Percentage of Final Grade
Homework & Quizzes	20%
Project 1	15%
Project 2	15%
Exam 1	25%
Final	25%

*The lowest Homework & Quiz grade will be dropped

Grading Policy

The grading scale for the course will be as follows:

Percent	Grade	Grade Points
90-100	A	4.00
85-89.9	A-	3.67
80-84.9	B+	3.33
75-79.9	B	3.00
70-74.9	B-	2.67
65-69.9	C+	2.33
60-64.9	C	2.00
55-59.9	C-	1.67
50-54.9	D+	1.33
45-49.9	D	1.00
40-44.9	D-	0.67
0-39.9	E	0.00

Instructor may lower the threshold for attaining the letter grades specified above (to the benefit of the students).

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 who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

In-Class Recording
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

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://sccr.dso.ufl.edu/process/student-conduct-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 or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment
The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
• Your academic advisor or Graduate Program Coordinator
• HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
• Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
• Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

Campus Resources:

Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

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

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

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 suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; https://career.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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/;https://care.dso.ufl.edu.

On-Line Students Complaints*:* https://distance.ufl.edu/getting-help/; *https://distance.ufl.edu/state-authorization-status/#student-complaint*.