

# FALL 2024

## SYLLABUS

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|----------------------|---|
| <i>Course title</i>  | <b>Intermediate ODEs</b>  |
| <i>Course number</i> | MAP 4305/5304   |
| <i>Schedule</i>      | <b>Online</b>   |
| <i>Instructor</i>    | Maia Martcheva<br>maia@ufl.edu<br><a href="http://people.clas.ufl.edu/maia/">http://people.clas.ufl.edu/maia/</a> |
| <i>Office hours</i>  | on Zoom, Zoom link is in Canvas<br>by appointment,<br>In-person: M 6th period                                     |
| <i>Office</i>        | Little Hall 469   |

*Goal:* Students will have more advanced skills with ordinary differential equations (ODEs). Students will be introduced to and develop skills to work with systems of ODEs.

*Textbook:* Fundamentals of Differential Equations and Boundary Value Problems, Nagle, Saff, Snider (authors), Pearson, 2021, 7th edition.

*Software:* MyLab by Pearson, Honorlock.

### *Modules:*

- (1) Review of basic relevant concepts of MAP 2302.
- (2) Section 5.2: Differential Operators and the Elimination Method for Systems.
- (3) Section 5.4: Introduction to the Phase Plane. Section 5.5: Applications to Bimathematics
- (4) Section 9.4: Linear Systems in Normal Form
- (5) Section 9.5: Homogeneous Linear Systems with Constant Coefficients. Section 9.6: Complex eigenvalues
- (6) Section 9.7: Non-homogeneous Linear Systems
- (7) Section 9.8: The Matrix Exponential Function
- (8) Section 12.2: Linear Systems in the Plane.
- (9) Section 12.3: Almost Linear Systems
- (10) Section 12.4: Energy Methods, Section 12.5: Lyapunov's Direct Method
- (11) Section 12.5: Limit Cycles and Periodic Solutions
- (12) Section 12.7: Stability of Higher Dimensional Systems
- (13) Section 11.2: Eigenvalues and Eigenfunctions
- (14) Section 11.3: Regular Sturm-Liouville Boundary value Problems
- (15) Section 11.4: Non-homogeneous Boundary Value Problems and the Fredholm Alternative

*Prerequisites:* MAP 2302 and a Linear Algebra (e.g. MAS 3114 or MAS 4105). Access and some familiarity with Mathematica will be useful but not required. Students can obtain access to Wolfram Mathematica from UF.

**Requirements:**

- (1) There will be 3 exams taken in MyLab
  - Exam 1 – **September 25, 2024, online in MyLab.**
  - Exam 2 – **October 30, 2024, online in MyLab.**
  - Exam 3 – **December 4, 2024, online in MyLab.**
- (2) There will be the following quizzes in MyLab:
  - Quiz 1 – **September 11, 2024, online in MyLab.**
  - Quiz 2 – **October 16, 2024, online in MyLab.**
  - Quiz 3 – **November 13, 2024, online in MyLab.**
- (3) You can take the exams and quizzes on the specified day from 9:00am to 8:00pm. Exams are 60 mins long, and quizzes are 35 mins long.
- (4) You may use a basic calculator on the computer. You may have scratch paper that needs to be destroyed when you finish the exam. Formula sheets (table of integrals and custom formula sheet) that may be used during an exam are provided in Canvas in the folder "Files".
- (5) There will be weekly homework assignments. Students are encouraged to work together on homework but each student should submit a personal homework on MyLab.
- (6) Students will be expected to watch the videos.
- (7) I will use Mathematica for computation and illustration. Having access to the software may be useful.
- (8) Students will be expected to seek help from the instructor during office hours.

*Student Learning Outcomes:*

- (1) Students will be able to solve homogeneous and non-homogeneous first order linear systems with constant coefficients using matrix analysis or the elimination method for differential operators.
- (2) Students will be able to analyze first order non-linear systems using phase-plane analysis, energy methods, including Lyapunov methods, and periodic solution Theorems.
- (3) Students will be able to reduce a higher order equation or system to a first order system in normal form and then analyze it using methods for first order systems.
- (4) Students will be able to solve homogeneous and non-homogeneous boundary value problems for second order ODEs.

*Grading:* Grades will be based on (1) Exams; (2) Quizzes; (3) Homework. The maximal possible grades are:

- Exam 1 – 100 points
- Exam 2 – 100 points
- Exam 3 – 100 points
- Quizzes – 150 points
- Homework – 25 points

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- Lowest test score, lowest quiz score, and lowest 2 homework scores will be dropped.
  - Maximal Total: 325 points

Additional grading policies:

- (1) Class letter grades are based on a curve. Approximate minimal cutoffs are:
  - A range – 292 points or higher
  - B range – 260 points or higher
  - C range – 227 points or higher
  - D range – 195 points or higher
- (2) **MyLab’s grading is final.** It is your responsibility to input your results correctly.
- (3) Pluses and minuses with the letter grades are assigned as appropriate and based on the curve. For example, if you are in the B range, you may get B-,B or B+.
- (4) With a valid and verified reason, a make up quiz or exam may be approved. Those should be taken at latest within a week of the original date.

*Special Accommodations:*

Students requesting classroom accommodations or special arrangements during examinations must first register with the Disability Resource Center

<https://disability.ufl.edu/>

The DRC will provide documentation. The student must then present this documentation to instructor to meet the requesting accommodation. This should be done as early in the semester as possible.

*Academic Honesty:*

Students are expected to know and follow the Code of Student Conduct. In particular, students must refrain from cheating, not make their work available for cheating, give due credit and citation for any quoted work, and make only fair use of copyrighted materials and software. You are expected to take exams and quizzes on your own and complete the homework within your team. The university has a policy on academic honesty, which should be followed.

*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](mailto:umatter@ufl.edu) (or see <http://umatter.ufl.edu/>) so that the U Matter, We Care Team can reach out to the student in distress. 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.

*Course Evaluation:*

Students are invited to provide feedback on the quality of instruction in this course by completing online evaluations at <https://ufl.bluera.com/ufl>. 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://gatorevals.aa.ufl.edu/public-results/>