

# Applied Mathematics in Chemical Engineering for Seniors

ECH 4905

**Class Periods:** Monday, Wednesday 9<sup>th</sup> and 10<sup>th</sup> periods  
Please note that additional lectures will take place on occasion

**Location:** TBD  
**Academic Term Sp. 2022**

## **Instructor:**

Name: R. Narayanan

Email Address: [ranga@ufl.edu](mailto:ranga@ufl.edu) (Please write ECH 4905 on your subject line to get an answer quickly)

Office Phone Number: 352 392 9103 Room 419 Chemical Engineering

Office Hours: Monday and Wednesday TBD 419 Chemical Engineering Building, unless otherwise indicated on CANVAS

**Teaching Assistants:** NONE

## **Course Description**

Methods of linear systems, chemical engineering applications in finite and infinite dimensional spaces, concepts of stability, application to transport phenomena: 3 Hours

## **Course Pre-Requisites / Co-Requisites**

Course on ordinary differential equations

## **Course Objectives**

Clearly state the learning objectives of the course, and how those objectives will be accomplished (give a list of specific actions or course elements).

## **Materials and Supply Fees**

NONE

**Required Textbooks and Software :** NONE

**Recommended Materials but NOT REQUIRED:** (I will NOT follow this book in style or chapter sequence. The chapters are generally written as stand-alone and in that regard as well as others, this book is very nice. While this book is not required, I might occasionally refer to problems in the book- in any case such problems will be re-typed and put on CANVAS when needed).

**20 Lectures on eigenvectors, eigenvalues, and their applications: Problems in Chemical Engineering**

**Author:** L.E. Johns

**Publisher :** Orange Grove Press, 2015

**ISBN:** 9781616101657

## **Tentative Course Schedule**

- Week 1: Linear operators, homogenous and inhomogeneous equations. Matrix multiplication, inner products, adjoints, eigenvalues, solvability. Two extra lectures will be given this week and recorded
- Week 2: More on solvability-. One extra lecture will be given and recorded
- Week 3: Please view the recorded lectures and the class problems.  
Example problems on matrices, Det. and Trace
- Week 4: Eigenvalues extended to stability of reactors, Eigenfunction expansion applications to diffusion problem in rectangular coordinates, in cylindrical coordinates.
- Week 5: Unsteady heat diffusion problems in one dimension
- Week 6: The Laplacian operator and Unsteady diffusion problems again in multiple dimensions

Week 7	Laplacian in cylindrical coordinates.
Week 8	Review of Homework and <b>EXAM 1</b>
Week 9	Spring Break
Week 10	Stability problems in Transport Phenomena
Week 11	More on stability, Eigenfunction expansions in Taylor Dispersion
Week 12	Some nonlinear problems and regular perturbations
Week 13	View Recorded Lectures
Week 14	Domain perturbations and applications
Week 15	More on domain perturbations and reviews.
Week 16	<b>EXAM 2</b>

### ***Attendance Policy, Class Expectations, and Make-Up Policy***

Class attendance will not be noted. Exams are announced on this syllabus. The EXAMS will take place in the evenings – the timings and locations will be announced on CANVAS. E-learning. However quizzes will ONLY be announced ONE week in advance on CANVAS E learning. NO make ups will be allowed for any quiz because quiz points are bonus points. Absence from EXAMS must be due to medical reasons and will require certification.

### ***Evaluation of Grades***

You will be assigned Homework problems. These will be posted on CANVAS e-learning and will NOT be evaluated. **These problems will typically NOT involve number crunching.** They will usually involve derivations of expressions. The instructor will provide hints and often even solutions to these problems during the lectures. **However, in general we will not provide solutions. If you have difficulty working out these problems see the instructor. These problems or problems very close to them will certainly appear in the exams and quizzes.**

There will be TWO exams and two Quizzes. There will be NO Final exam. The exams and quizzes will be CLOSED Book unless otherwise announced. No communication devices, smart phones or computers will be permitted. EXAM POINTS WILL AMOUNT TO 600 POINTS. QUIZ POINTS AMOUNT TO 100 POINTS AND ARE BONUS. SO IF YOU MISS A QUIZ YOU JUST MISS THE BONUS FROM THAT QUIZ. MAXIMUM POINTS ARE 600 BUT THEORETICALLY A PERSON COULD SCORE 700 POINTS (IF HE/SHE GETS ALL EXAMS AND ALL QUIZZES CORRECT).

### ***Grading Policy***

Grades percentage (based on pints earned out of 600) (Grades are NOT determined by a curve).

Percent of total points	Grade
0-10	E
11-15	D (no D minus grade will be given)
16-20	D+
20-30	C (no C minus grade will be given)
31-40	C+
41-50	B-
51-65	B
66-80	B+
81-90	A-
91-100	A

More information on UF grading policy may be found at:  
<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

### ***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/>.

### ***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://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 or TAs in this class.

### ***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: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

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
- Jennifer Nappo, Director of Human Resources, 352-392-0904, [jpennacc@ufl.edu](mailto:jpennacc@ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

**You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated. Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.**

**If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email [covid@shcc.ufl.edu](mailto:covid@shcc.ufl.edu)) to be evaluated for testing and to receive further instructions about returning to campus. UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Please visit the [UF Health Screen, Test & Protect website](#) for more information.**

### ***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](mailto: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:** <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](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

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