

# EGM6813 Fluid Mechanics II - Spring 2022

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Class Time: Tuesday 5th & 6th Periods (11:45am – 1:40pm)  
Thursday 6th Period (12:50pm – 1:40pm)

Class Location: CSE E122 (On-campus) and Web (online)

Course Description:

Mathematical and physical structures of the Navier-Stokes equation. Exact solutions of the Navier-Stokes equation for viscous flows. Low Reynolds number flows. Incompressible laminar boundary layer flows. Energy equation and heat transfer. Unsteady flows. Instability. Turbulence.

Prerequisite: EGM6812, or equivalent fluid mechanics knowledge;

Text: *Class Notes*

Format: The lectures for this course are pre-recorder and accessible via Canvas. The schedule of when the lectures must be watched is dictated by the 11 homeworks.

**The on-campus and zoom meetings are help-sessions** and they will be during class time. **They are not lectures.** They are only to make announcements, provide hints about the homeworks, answer questions about the recorded lectures, and answer homework questions. The on-campus and zoom sessions will be taped and will be available. However, they are NOT lectures and you may decide to watch them only as needed.

Grading Policy

Homeworks – 30%, Exam-I – 30%, Exam-II – 40%

A = [90,100], A- = [87,90), B+ = [84,87), B = [80,84), B- = [77,80), C+ = [74,77), C = [70,74), C- = [67,70), D+ = [64,67), D = [60,64), D- = [57,60), E = [0,57).

Homework, Final Presentation and Exam Policy

**Homework and assignments are to be submitted as PDF files on Canvas before the due date.** All assignments should be neat and legible. Points will be taken off for sloppy work. You may discuss the assignments with other students, but you are expect to put in individual effort. Copying and plagiarizing assignments will not be accepted.

Academic Honesty

All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. You are expected to uphold academic honesty and failure to comply will result in disciplinary action.

TA & Office Hours: As of now no TA has been assigned to this course and there may not be one, since the enrollment is below the cutoff.

My office hour will be during the class time Tuesday 11:45 - 1:40pm, Thursday 12:50 - 1:40pm. I do not expect the on-campus and zoom meetings to run the entire period. You can request individual meetings and I can meet you either in-person or over zoom..

Recommended Books:

Books (1) and (2) are overall the best books for this course - You should purchase one of them. Books (3) and (4) excellent books as well. They are perhaps harder, but they will be most useful

as you become more knowledgeable in fluid mechanics. I will use book (5) when we consider boundary layer theory. Book (6) is a classic. I will use book (7) for perturbation theory. Book (8) again a very good source from continuum mechanics perspective.

1. *Incompressible flow*, by R.L. Panton
2. *Viscous Fluid Flow*, by F.M. White
3. *Introduction to Fluid Mechanics*, by G.K. Batchelor
4. *Fluid Mechanics*, by L.D. Landau & E.M. Lifschitz
5. *Boundary Layer Theory*, by H. Schlichting
6. *Hydrodynamics*, by H. Lamb
7. *Perturbation Methods in Fluid Mechanics*, by M. Van Dyke
8. *Stromungsmechanik I in Handbuch der Physik*, by J. Serrin

### Outline

1. Vorticity equation
2. Exact solutions of Navier-Stokes equations
3. Boundary layer and lubrication theory
4. Solutions by asymptotic analysis and perturbation methods
5. Hydrodynamic stability
6. Introduction to Chaos and Turbulence

### **Lecture Schedule<sup>(\*)</sup> (tentative)**

Week 1	Thu, Jan 6		Week 9	Tue, Mar 1	Exam-1
Week 2	Tue, Jan 11			Thu, Mar 3	
	Thu, Jan 13		Week 10	Tue, Mar 8	Spring Break
Week 3	Tue, Jan 18	HW1 – Up to Lecture-4		Thu, Mar 10	Spring Break
	Thu, Jan 20		Week 11	Tue, Mar 15	HW7 – Up to Lecture-27
Week 4	Tue, Jan 25	HW2 – Up to Lecture-7		Thu, Mar 17	
	Thu, Jan 27		Week 12	Tue, Mar 22	HW8 – Up to Lecture-29
Week 5	Tue, Feb 1	HW3 – Up to Lecture-10		Thu, Mar 24	
	Thu, Feb 3		Week 13	Tue, Mar 29	HW9 – Up to Lecture-34
Week 6	Tue, Feb 8	HW4 – Up to Lecture-14		Thu, Mar 31	
	Thu, Feb 10		Week 14	Tue, Apr 5	HW10 – Up to Lecture-36
Week 7	Tue, Feb 15	HW5 – Up to Lecture-18		Thu, Apr 7	
	Thu, Feb 17		Week 15	Tue, Apr 12	HW11 – Up to Lecture-40
Week 8	Tue, Feb 22	HW6 – Up to Lecture-22		Thu, Apr 14	
	Thu, Feb 24		Week 16	Tue, Apr 19	Exam-II

### ***Online Course Recording***

All the lectures have been recorded and available through Mediasite.

[https://ufedge.video.ufl.edu/Mediasite/Catalog/catalogs/fall2019\\_egm6812](https://ufedge.video.ufl.edu/Mediasite/Catalog/catalogs/fall2019_egm6812)

Some of our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded.

If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

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

It is extremely important that students watch the lecture videos on or before the suggested date in the course schedule. Not watching videos in a timely manner results in poor or mediocre performance. Excused absences at the quizzes and exams must be consistent with university policies in the graduate catalog and require appropriate documentation.

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 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/>.

### ***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/policies/student-honor-code-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 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
- Robin Bielling, Director of Human Resources, 352-392-0903, [rbielling@eng.ufl.edu](mailto:rbielling@eng.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)

### ***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](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 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](mailto: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 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://care.dso.ufl.edu>.

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