

PRINCIPLES OF ENGINEERING ANALYSIS- II

Academic Term: Spring 2021

Instructor: Dr. Oana Cazacu, Professor, Dept. Mechanical and Aerospace Engineering

Office: Room 150, REEF, Shalimar, FL; E-mail: cazacu@reef.ufl.edu (preferred mode of communication)

Office Phone: (850) 833-9350

Office Hours: Wednesday, 2:00-4:00 pm EST; only one-on-one Zoom meetings; for scheduling please contact instructor by email the day prior.

Grader: N/A

Class Schedule:

Lectures are taught and professionally video recorded in the REEF studio in Shalimar, FL on Tuesday 10 am-12:00 pm CT and Wednesday, 10:00-11:00 am CT.

As has been the case in the past, the videos of the lectures will be posted shortly after recording on Canvas, so students in each section can view them at any time, according to their own schedule.

Gainesville: In previous terms, the video recordings of classes taught from Shalimar have been shown on in the CSE Bldg on main campus. For Spring 2021, the students are not required to view the lectures in CSE.

Course Description for EGM 6322- 3 credit hours

Partial differential equations of first and second order. Hyperbolic, parabolic, and elliptic equations including the wave, diffusion, and Laplace equations. Integral and similarity transforms. Boundary value problems of the Dirichlet and Neumann type. Green's functions, conformal mapping techniques, and spherical harmonics. Poisson, Helmholtz, and Schroedinger equations.

Course Pre-Requisites / Co-Requisites

[EGM 4313](#) or [MAP 4341](#). or permission of the instructor

Course Objectives

The goal of EGM 6322 is to provide the students with the ability to find the proper mathematical setup for given physical and engineering boundary value problems, understanding of the qualitative “behavior” of the solutions of PDEs, methodologies to find closed-form solutions, and rationale for adopting specific numerical approaches.

Required Textbooks and Software

No required text. Course notes are developed by the instructor

Recommended Materials

- STANLEY J FARLOW, PARTIAL DIFFERENTIAL EQUATIONS FOR SCIENTISTS AND ENGINEERS, DOVER PUBLICATIONS
 - KING, BILLINGHAM, OTTO, DIFFERENTIAL EQUATIONS, CAMBRIDGE UNIV. PRESS
 - E. BUTKOV: MATHEMATICAL PHYSICS (1968 EDITION AVAILABLE AT AMAZON.COM)
- BERG, ELEM.PARTIAL DIFF. EQUATIONS

Lecture Topics

1. Laplace transform

1. The Laplace integral
2. Basic properties of Laplace transform
3. The inversion problem
4. The rational fraction decomposition
5. The convolution theorem

2. Some Concepts of the Theory of Distributions (Butkov 6.1-6.5)

1. Dirac Delta Function;
2. Delta Sequences
3. The δ calculus
4. Representation of Delta Functions
5. Application of δ calculus

3. Fourier Transform

1. Representation of a Function
2. Examples of Fourier transformations
3. Properties of Fourier transforms
4. Fourier Integral Theorem
5. Fourier Transforms of distributions
6. Fourier sine and cosine transforms
7. Applications

4. Partial Differential Equations

1st order PDEs; 2nd order PDEs: classification, reduction to canonical form; Non-homogeneous 2nd order PDEs

Hyperbolic Equations

Longitudinal wave motion in slender elastic rod; wave motion in infinite strings; d'Alembert Solution; Wave Eq. Solution using Fourier series and transforms; reflections and transmissions at boundaries ; Applications: Wave motion in stretched finite strings-separation of variables methods;Vibration of stretched finite membranes (rectangular and circular membranes).

Parabolic Equations

The diffusion equation and related equations: Method of solution: Laplace transforms
Separation of variable methods; The method of eigenfunction expansions

Elliptical Equations

Laplace's Equation: derivation of the equation; examples

Boundary value problems: (i) Dirichlet problems

(ii) Neuman problems.

Methods of solution of Laplace's equation

Direct solution procedure; separation of variable methods

Cartesian coordinates; plane polar coordinates. Laplace equation in cylindrical coordinates;

Poisson integral formula for the disc; Applications to inviscid flow; Spherical harmonics

Laplace Eq. via Green's function; Line source within a half-plane region

Poisson Integral for the Sphere

Further solutions via Green's functions.

Biharmonic equation; biharmonic function formulation of 3-D problems in elasticity

Poisson's Equation; Green's function for Poisson Equation Gravitational potential

Policies and Procedures:

Exams: Two 2- hours exams will be given during the semester during the regularly scheduled class time. In addition, on April 13th, there will be a take-home special assignment. No “final exam” will be given. All the exams are open-notes, but closed book, closed- homework solutions. No exams will be given prior to the scheduled dates and no makeup exams will be allowed.

Exam 1 is scheduled on March 2; Exam 2 is on April 6th, during 7th and 8th Periods.

Online Course Recording

In the eventuality that we will have to have on line course recordings:

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.

F2F Course Policy in Response to COVID-19

We will have face-to-face instructional sessions to accomplish the student learning objectives of this course. In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions.

- You are required to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution.
- This course has been assigned a physical classroom with enough capacity to maintain physical distancing (6 feet between individuals) requirements. Please utilize designated seats and maintain appropriate spacing between students. Please do not move desks or stations.
- Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.
- Follow your instructor’s guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom.
- If you are experiencing COVID-19 symptoms (Click here for guidance from the CDC on symptoms of coronavirus), please use the UF Health screening system and follow the instructions on whether you are able to attend class. Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms.
- Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. Find more information in the university attendance policies.

Attendance Policy, Class Expectations, and Make-Up Policy

In person attendance is not required. You are personally responsible for all information disseminated during the lectures. This means knowing all homework due dates, knowing when exams will be given, where they will be given, what material they will cover, and knowing all material, handouts, and announcements made in the lectures, whether or not you were present. Thus, if you miss a lecture, it is your responsibility to obtain all information presented during that lecture. "I missed that information" or "I was unaware of that information" will not be accepted as valid excuses.

Excused absences must be in compliance with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation.

Grading: Grades will be determined using these weights: 20% special assignment, 40% Exam 1, 40% Exam 2.

Grading Policy

Percent	Grade	Grade Points
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

For individuals in the gray area between two grades, performance on the homework will be used to make the final decision

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.

Course web site. A course web site is established through EDGE. Students will be expected to check it on a regular basis for up-to-date course information. This may include changes to the syllabus, homework assignment due dates, and exam schedules.

Special Needs. If you require accommodations due to a disability, please call me.

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:

- Malisa SARTINORANONT, GRADUATE STUDENT COORDINATOR, (352) 392-8404, msarnt@ufl.edu
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@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>

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: <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](mailto:title-ix@ufl.edu), 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 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>.