



School of Engineering
*Sonny Astani Department
of Civil and Environmental
Engineering*

CE 526: Engineering Mathematical Methods

Units: 4

Fall 2020 Tuesday 9:00-12:20 PM (200 minutes)

Location: OnLine

Instructor: Prof. Vincent Lee/ Athanassios Fokas

Office: KAP 230B/ 230C

Office Hours: 2 hours per week, time and day TBD

Contact Info: Email: vlee@usc.edu

Phone number: 213-740-0568

Office hours: TBD

Teaching Assistant: TBD

Office:

Office Hours:

Contact Info:

IT Help: TBD

Hours of Service:

Contact Info:

Course Description

The materials presented will serve to study methods to solve engineering problems to be discussed on a physical basis, with the mathematical tools to include Fourier series, Fourier and Laplace transforms, solving partial differential equations by separation of variables and by transform methods. To study the wave, heat and Laplace equations in rectangular, cylindrical and spherical coordinates, Calculus of Variations, Complex Functions and Theory of Residues

Learning Objectives and Outcomes

By the end of the course, the student will be able to:

1. Study and review undergraduate calculus
2. Study and review Fourier series
3. Study eigenvalues and eigenvectors
4. Study and review ordinary differential equations (ODE) and learn system of ODE
5. Study eigenvalues and eigenfunctions, orthogonal functions
6. Study partial differential equation, solution by separation of variables
7. Study 1-D, 2-D homogeneous and non-homogeneous wave, heat and Laplace equations in rectangular coordinates.
8. Study 2-D Laplace, Heat & Wave Equations - Cylindrical Coordinates.
9. Study 3-D Laplace, Heat & Wave Equations - Spherical Coordinates
10. Study Sturm-Liouville problem
11. Study Fourier and Laplace Transforms
12. Study Calculus of Variations

Prerequisite or Recommended Preparation: *undergraduate multivariable calculus and ordinary differential equations*

Co-Requisite(s): *None*

Concurrent Enrollment: *None*

Course Notes

The class will have letter grade. The class will use the university blackboard website as the primary medium for distribution of course material, including assignments, typed and written lecture notes and for syllabus, announcements and examination dates.

Technological Proficiency and Hardware/Software Required

N/A

Textbook and Supplementary Materials

E. Kreyszig Advanced Engineering Mathematics 10th ed. ISBN-13: 978-0470458365

The above textbook is available for purchase from the USC bookstore. Supplemental reading material will be provided as needed.

Description and Assessment of Assignments

The points per homework assignment and their % grade in the table below are only approximate.

All homework assigned are due on the first class of next week

Assignment	Points	% of Grade
1	60 to 70	1.66
2	60 to 70	1.67
3	60 to 70	1.67
4	60 to 70	1.66
5	60 to 70	1.67
6	60 to 70	1.67
7	60 to 70	1.66
8	60 to 70	1.67
9	60 to 70	1.67
10	60 to 70	1.66
11	60 to 70	1.67
12	60 to 70	1.67
TOTAL		20

Grading Scale

Students will be graded based on their total scores (possibly relative to the overall class performance) The following is merely a rough guideline, and is subject to revision depending on the overall class performance.

Assignment	Points	% of Grade
Homework	60 to 70 pts each	20%
Midterm I	100	24%
Midterm II	100	24%
Final	100	32%
TOTAL		100%

Assignment Submission Policy

Unless otherwise stated, homework assignments are due at the beginning of the class and/or submitted in DEN dropbox. Solutions will be posted on DEN blackboard shortly after the assignments are turned in.

Grading Timeline

The homeworks and midterms will be graded and handed back roughly one week after their due date.

Additional Policies

Late homework will not be accepted. No exceptions except instution-established emergency reasons; credit for such late homework is with the discretion of the instructor.

Reasonable collaboration in solving homework problems is allowed. This includes reviewing and discussing the problems with current CE 471 students, TA or the instructor. Everybody has to write his/her own solution independently and make sure to fully understand it. Exchanging solutions, consulting with people other than class members, finding solutions on the web or elsewhere, etc. are not allowed. Violations result in losing the credit for the entire homework set in addition to a significant percentage of the overall course grade, all with the discretion of the instructor.

All answers should be clearly and fully justified. If the steps are not clear, points will be deducted even if the final answer is correct.

Attendance will be taken in every lecture. The students are expected to be attentive, and in particular refrain from using computers or hand held devices, except for the sole purpose of the class. Non-compliance will result in point deduction from class participation part of the grading, and possibly a percentage of the overall course grade, all with the discretion of the instructor.

Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	Posted Lecture Notes	Deliverable
Week 1 Aug25	Review: undergraduate Calculus Review Fourier series	L01, L02	Homework 1 assigned
Week 2 Sep 1	Fourier series & methodology extended to orthogonal series, Eigenvalues & Eigenvectors	L02, L03	Homework 2 assigned
Week 3 Sep 8	Eigenvalues & Eigenfunctions, Orthogonal Series Expansion, System of Ordinary Diff. Equations	L03, L04	Homework 3 assigned;
Week 4 Sep 15	Partial Differential equations (PDE) 1-D wave equation	L05, L06	Homework 4 assigned
Week 5 Sep 22	1-D Wave & Beam Equations Mid-Term #1	L06	
Week 6 Sep29	2-D Wave equation – Rectangular Coordinates	L07	Homework 5 assigned
Week 7 Oct 6	1-D, 2-D Heat Equations – Rectangular Coordinates,	L08	Homework 6 assigned
Week 8 Oc 13	Non-homogeneous PDE of the Laplace, heat and wave equations	L08, L09	Homework 7 assigned
Week 9 Oct 20	2-D Laplace, Heat & Wave Equations - Cylindrical Coordinates	L09, L10	Homework 8 assigned
Week 10 Oct 27	3-D Laplace, Heat & Wave Equations - Spherical Coordinates, Mid-Term #2	L11	
Week 11 Nov 3	3-D Heat & Wave Equations - Spherical Coordinates	L12	Homework 9 assigned;
Week 12 Nov 10	Fourier Transform, Applications to PDE	L13	Homework 10 assigned
Week 13 Nov 17	Laplace Transform, Applications to PDE	L14	Homework 11 assigned
Week 14 Npv24	Calculus of Variations 1: Euler- Lagrange Equations, Extreme of Integrals under Constraint	L15	Homework 12 assigned Class Ends
Week 15	Calculus of Variations 2: Sturm- Liouville Problem, Hamilton Principles	L16	No Class
FINAL Dec2-9 tbd	Date: For the date and time of the final for this class, consult the USC <i>Schedule of Classes</i> at classes.usc.edu/ .		

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call
engemannshc.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 – 24/7 on call
engemannshc.usc.edu/rsvp

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086
equity.usc.edu, titleix.usc.edu

Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support - (213) 740-2421
studentaffairs.usc.edu/bias-assessment-response-support

Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710
studentaffairs.usc.edu/ssa

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.