

MEC 507, Fall 2019 (SBU)

Mathematical Methods in Engineering Analysis I

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Class Time and Location: Th: 4:00 – 6:50 p.m., Frey Hall 305

Instructor: Professor Foluso Ladeinde

Office Location: Heavy Engineering 224

Preferred E-mail Address: foluso.ladeinde@stonybrook.edu

Instructor Office Hours (Tentative): Tu, Th: 11:00 AM – 12:30 PM

Help: TBD

Office Hours:

Textbook: Advanced Engineering Mathematics, Michael D. Greenberg, 2nd Edit. (1998) Prentice Hall (Publ.) ISBN 0-13-321431-1

Prerequisite: Graduate standing in mechanical engineering and/or permission of the instructor.

Course Description: An introduction to the use of mathematical analysis techniques for the solution of engineering analysis techniques for the solution of engineering analysis problems and the simulation of engineering systems. Both continuous and discrete methods are covered. Initial and boundary value problems for ordinary and partial differential equations are treated.

1. **Functions of complex variables:** Cauchy-Riemann equations (analytic functions), harmonic functions, multi-valued functions and branch cuts, Cauchy theorem and integral formula, Taylor and Laurent series (singularities), residue theorem and contour integration
2. **Calculus of variations:** Basic concepts. Extremisation of functionals, Brachistochrone problem, isoperimetric problem, constrained extremisation, Hamilton's principle; applications.
3. **Linear Mathematics:** Vector space (dimension and basis), inner product (normed vector spaces), Gram-Schmidt orthogonalization, projections, change of basis, linear operator, linear equations, eigenvalue problems and diagonalization
4. **Ordinary and partial differential equations (ODEs/PDEs) - ODE solution methods per se, and as a way to solve partial differential equations via Separation of Variables and Transforms:** Storm-Louville theory, ODE's (local analysis), Classification of ODE's, Methods of Undetermined Coefficients, Variation of Parameters, Series Solutions of Regular and Regular Singular Equations, Bessel, Legendre, Airy, and other special functions. (For these topics, students are required to review, on their own, the methods of separation of variables for partial differential equations, Fourier Series, and Laplace Transforms from their undergraduate classes.)

Tentative Course Flow (Subject to Change):

Week 1.	Complex Variables	8/26-8/30
Week 2.	Complex Variables	9/2-9/6
Week 3.	Complex Variables	9/9-9/13
Week 4.	Complex Variables/Calculus of Variation	9/16-9/20
Week 5	Calculus of Variation	9/23-9/27
	(Midterm: 9/26; Thursday)	
Week 6.	Calculus of Variation	9/30 – 10/4
Week 7	Calculus of Variation	10/7 - 10/11
Week 8.	Calculus of Variation/Linear Mathematics	10/14 – 10/18
Week 9.	Linear Mathematics	10/21-10/25
Week 10.	Linear Mathematics	10/28-11/1
Week 11.	Linear Mathematics	11/4-11/8
Week 12.	Ordinary & Partial Differential Equations	11/11-11/15
Week 13.	Ordinary & Partial Differential Equations	11/18-11/22
Week 14.	Ordinary & Partial Differential Equations	11/25-11/29; No Class on 11/28
Week 15.	Ordinary & Partial Differential Equations	12/2-12/5
Weeks 16.	Ordinary & Partial Differential Equations	12/9-12/10
	Finals	12/11 – 12/19
	Commencement	12/20, 1:30 PM

Grading:

Midterm I: 30%, Final (Cumulative): 40%, Homework and Class Assignments: 30%

Make-up classes:

I will be travelling somewhat during the semester and will not be able to attend a few of our regularly scheduled classes. I will try to make these classes up at a mutually convenient time. I will announce suggested make up times well in advance, and make sure that they are reasonable for everyone.

Student Accessibility Support Center Statement

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Student Accessibility Support Center, ECC (Educational Communications Center) Building, Room 128, (631)632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Student Accessibility Support Center. For procedures and information go to the following website: <http://www.stonybrook.edu/ehs/fire/disabilities>

Academic Integrity Statement

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected

instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.