

Mathematical Physics
01:750:464/01:750:511

Instructor: Andrew Mastbaum

Summary: Advanced topics in mathematical physics, which vary from year to year, but typically include aspects of, Group theory, complex analysis, Fourier series, differential equations, integral transforms, statistical methods, and methods in scientific computing

Pre-requisites: 01:640:421 or 01:640:423

Co-requisites: None

Meeting times: Two 80 minute lectures per week
Lectures TF 1 (8:40 am – 9:20 am)
Recitations: none

Text: None

LMS: Canvas

Provisional Plans for Remote Instruction:

The primary course material will be presented in synchronous lecture-based meetings, which will include pair or small group exercises. The lecture portions will be recorded and posted to the LMS, and available to all students asynchronously. Special meeting times will be designated as needed for students unable to participate at the synchronous meeting time, to facilitate small group work. If no such group work option can be arranged for a student, flexible office hours will be set up to ensure all students engage in active problem solving. We believe such case-by-case arrangements are feasible given the small expected course size. Office hours (likely multiple per week) will be scheduled based on student availability, with additional meetings by appointment. Students will be encouraged to use online communications platforms (LMS, WebEx, etc.) to work cooperatively on problem sets and group exercises, and to ask questions outside of normal office hours.

Problem sets and exams will be open-book take-home assignments and graded on an absolute scale. Students will be encouraged to work together on homework. Exams will be taken individually, being released then uploaded online with a fixed time window, and students will not be restricted in the materials they use during the exams. Given the nature of the course and advanced material, we do not foresee a need for additional monitoring. Students will additionally complete an independent study project and present their findings in class, providing another test of their individual comprehension.

Technology requirements: Students will need access to a computer capable of (a) using web conferencing software to attend the synchronous lectures, (b) viewing recorded videos on the LMS website and, (c) accessing cloud-based computer programming tools.

Provisional Grading Plans: The grading will be done on an absolute scale according to a rubric for each assignment, with the components listed below. The “project” component is an independent study exercise culminating in a written report and presentations to the class.

Class participation: 15%
Homework: 30%
Project: 15%
Mid-term: 20%
Final Exam: 20%

Schedule (provisional):

Week:	Topic
1	Intro, Foundations 1 (Series, etc.)
2	Foundations 2 (Matrices), Computer methods (Python)
3	Intro group theory, Generators
4	Angular momentum, Discrete groups, differential forms
5	Project talks 1, Complex intro
6	Complex functions, Integrals
7	Series, Residues & poles
8	Mappings, Fourier series
9	Fourier transform, Convolution
10	Laplace transforms
11	Nonlinear methods, Nonlinear Diff. Eq. 1
12	Nonlinear Diff. Eq. 2, Probability & distributions
13	Project talks 2, Statistical tests, least sq., ML
14	Confidence intervals, Machine learning

Academic Integrity:

Students are expected to maintain the highest level of academic integrity. You should be familiar with the university policy on academic integrity: <http://academicintegrity.rutgers.edu/academic-integrity-policy/> Violations will be reported and enforced according to this policy.

Use of external sources to obtain solutions to homework assignments or exams is cheating and a violation of the University Academic Integrity policy. Cheating in the course may result in penalties ranging from a zero on an assignment to an F for the course, or expulsion from the University. Posting of homework assignments, exams, recorded lectures, or other lecture materials to external sites without the permission of the instructor is a violation of copyright and constitutes a facilitation of dishonesty, which may result in the same penalties as explicit cheating.

Not only does the use of such sites violate the University's policy on Academic Integrity, using such sites interferes with your achievement of the learning you are paying tuition for. Assignments, quizzes, and exams are given not simply to assign grades, but to promote the active learning that occurs through completing assignments on your own. Getting the right answer is much less important than learning how to get the right answer. This learning is critical to your success in subsequent courses and your careers.

Student wellness Services

Student Counseling, ADAP & Psychiatric Services (CAPS) wellness for non-emergency psychological health issues services (848) 932-7884, 17 Senior Street, New Brunswick, NJ 08901
<http://health.rutgers.edu/medical-counseling-services/counseling/>

Violence Prevention & Victim Assistance (VPVA), (848) 932-1181, 3 Bartlett Street, New Brunswick, NJ 08901, <http://www.vpva.rutgers.edu/>

Office of Disability Services (848) 445-6800, Lucy Stone Hall, Suite A145, Livingston, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854, <https://ods.rutgers.edu/>

Scarlet Listeners for confidential peer counseling and referral hotline, (732) 247-5555,
<http://www.scarletlisteners.com>