Phys 308: Mathematical Physics

University of Mississippi

"God used beautiful mathematics in creating the world." – Paul Dirac, physicist.

Instructor: Cecille Labuda, Associate Prof of Physics & Astronomy
Class time/location: MWF 09:00 – 09:50, Lewis 109
Office hours/location: MW 14:30 – 16:30, T 14:00 – 14:45 and by appointment, Lewis 121B
Email: cpembert@olemiss.edu
Phone: +16629153945
Syllabus V1 : 12/30/2024

Books

- Mary Boas. *Mathematical Methods in the Physical Sciences, 3rd edition.* ISBN: 978-0471198260
- Ian Stewart. *In Pursuit of the Unknown. 17 Equations that Changed the World.* ISBN: 978-0465085989
- Spiegel, Lipschutz and Liu. *Schaum's Mathematical Handbook of Formulas and Tables (5th or any edition).* ISBN: 978-1260010534

Description

Application of differential equations, vectors, and other techniques to physical problems.

Prerequisites

Phys 212 or Phys 303. Corequisite: Math 353.

Course Objectives

On completion of this course, students should have developed familiarity and be able solve physical problems involving the mathematical constructs enumerated below. Additional topics may be covered.

- Cartesian, cylindrical and spherical coordinates (basis vectors, line, area and volume elements and the basic operators such as the gradient and Laplacian operators, divergence and curl)
- Complex numbers and the complex plane
- Vector analysis
- Taylor series, Fourier series and Fourier transforms
- Series solutions of differential equations
- Special functions (including Legendre, Bessel functions and other special functions)

Grading Scale

- $90\% \leq \mathbf{A} \leq 100\%$
- $88\% \leq \mathbf{A}- < 90\%$
- $85\% \leq \mathbf{B}+ < 88\%$
- $80\% \leq \mathbf{B} < 85\%$
- $78\% \leq \mathbf{B}- < 80\%$
- $75\% \leq \mathbf{C}+ < 78\%$
- $70\% \leq \mathbf{C} < 75\%$
- $68\% \leq \mathbf{C}- < 70\%$
- $50\% \leq \mathbf{D} < 68\%$
- $\mathbf{F} < 50\%$

Evaluation

Class Exercises and Summaries (5%)

Group class exercises worked on blackboards, book summaries and short book presentations leading class discussions. Exercises are graded for completion. Book summaries, presentations and leading discussions are graded for content and quality.

Written exams (45%)

3 closed-book exams weighted as follows:

- 2 exams highest grades: 17.5%+17.5%=35%
- 1 exam lowest grade: 10%

Oral exam [5%]

An end-of-semester presentation selected from the topics covered. The presentation must cover the meaning, physical applications and history of

the development or discovery of the equations or functions.

Homework (20%)

The homework grade will only count if the exam average is >50%. *Otherwise the homework grade will be computed as zero.*

- Homework sets must be turned in at the beginning of class when due. [c]
- Students are encouraged to work together to solve homework problems. However, students may not copy homework solutions from each other, from solutions manuals or from any source whatsoever. Copied homework will be given a grade of zero.
- Homework solutions must be presented according to the homework rubric or it may not be graded.

Final exam (25%)

- The final exam will be comprehensive. The format will be similar to the tests.

Examination Dates

Test dates (except for the final exam) and topics are subject to change.

Test 1: 02/24
Test 2: 03/24
Test 3: 04/21
Final Exam: Wednesday May 07, 08:00 am.

Policies

Attendance

Class attendance is **required**. For more than 3 but fewer than 6 absences, the final calculated grade will be **reduced by a partial letter grade** (+/-) at the time grades are officially assigned. For more than 6 absences, the final calculated grade will be reduced by a full letter grade. If you must be absent for exams, you must discuss this with me before the exam to determine whether the absence will be excused and rescheduled. For unexpected exam absences, you must contact me by email or telephone within 24 hours after the absence or the exam will not be rescheduled. Allowances will be made for non-attendance in circumstances deemed to be reasonable by the instructor.

Students are asked to isolate when sick with illnesses that are communicable in a social setting. In such cases, email me as soon as possible and I will work with you to help you continue your progress in the course. In your email, state how long you expect not to attend class.

Academic Integrity

By choosing to be part of the University of Mississippi community, every student agrees to abide by the University of Mississippi Creed and the UM Academic Integrity Policy. Cheating is forbidden and will result in a zero grade on the given assignment. If a second case of cheating occurs, this will result in an F for the entire course. Unless explicitly permitted by the instructor, distribution of materials provided in this class via the internet or otherwise is not allowed. Accessing such materials for your own use is also in violation of the UM Academic Conduct Code. Distribution of your own class notes is strongly discouraged except for occasional loaning of notes to students also enrolled in the class.

University of Mississippi Access and Inclusion

The University of Mississippi is committed to the creation of inclusive learning environments for all students. If there are aspects of the instruction or design of this course that result in barriers to your full inclusion and participation or to accurate assessment of your achievement, please contact the course instructor as soon as possible. Students should also contact Student Disability Services at 662-915-7128 so that office can 1) provide you with an Instructor Notification form, 2) facilitate the removal of barriers and 3) ensure you have equal access to the same opportunities for success that are available to all students.

Audio-video recording and electronic note-taking

Audio and/or video recording of class lectures is not allowed unless explicit permission is given by the instructor. Permitted recordings may not be distributed online or elsewhere and all must be deleted at the end of the semester. Electronic note-taking is only allowed on devices with screens that lay flat.

Important Dates

Please see the UM academic calendar (https://registrar.olemiss.edu/spring-2025/)

1848
THE UNIVERSITY of
MISSISSIPPI