

Title of the course:

Mathematical Physics - PHYS 5325 001

Course Duration:

Aug 23, 2021 - Dec 02, 2021

CRN: 10988

Schedule: 12.30pm-1.50pm TR Classroom Building C203

Text material:

Class notes

The "official" text book for this course is *Mathematical Methods for Physicists, Seventh Edition: A Comprehensive Guide* by Arfken, Weber and Harris. This book is a standard textbook used at several universities for the graduate mathematical method for physical sciences courses.

Recommended reference books:

- *Mathematics of Classical and Quantum Physics*, Byron and Fuller, (Dover 1990).
- *R. V. Churchill, Fourier Series and Boundary value problems*, McGraw Hill
- *Mathematical Methods in the Physical Sciences* by Mary L. Boas.

Prerequisites:

Basic knowledge of linear algebra, vector calculus, complex numbers (not analysis), etc. that you must have come across during undergraduate studies. These topics will be reviewed at the start of the course. Pl. talk to me if you have concerns.

Material:

Chapters: 1,2,3,5,6,8,11,19 and 20. Given the limited time and the broad range of topics available, we will be selective in details and topics. The syllabus is as follows

1. Mathematical Preliminaries:

Series, Binomial theorem, Taylor expansion, Vectors, Complex numbers and functions, Derivatives and Extrema, Evaluation of Integrals, Dirac Delta functions

2. Determinant and Matrices: matrix algebra

3. Vector analysis:

Review of Basic properties, Vectors in 3D space, Coordinate transformations, Differential Vector Operators, Vector Integration, Potential Theory, Integral transform

4. Vector spaces:

Vectors in Function Spaces, Gram-Schmidt Orthogonalization, Operators, Self-Adjoint Operators, Unitary Operators

5. Eigenvalue Problems:

Eigenvalue equation, Matrix Eigenvalue Problems, Hermitian Matrix Diagonalization, Normal Matrices

6. Sturm-Liouville Theory:

Introduction, Hermitian Operators, ODE Eigenvalue problems

7. Complex Variable Theory:

Complex Variables, Complex functions, Cauchy-Riemann theorem, Cauchy's integral formula

8. Fourier Series:

General Properties, Application of Fourier Series

9. Integral Transforms:

Fourier Transform, Laplace Transform, Properties of Fourier and

Laplace transforms

10. Special functions: Legendre or Bessel or Calculus of variation

No food in the class. Also, cell phones **must be turned off** or kept in the bag when in the classroom.

Instructor:

Dr. Rajendra Zope

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Office Hours:

By appointment (send email or ask in class) (open door policy).

Grading: (tentative)

Quizzes/assigned problems [30%]

Two midterm exams [30%]

Final exam [40%]

Additional guidelines for Fall 2020

TECHNOLOGY REQUIREMENTS

Course content is delivered via the Internet through the Blackboard learning management system. Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Google Chrome and Mozilla Firefox are the best browsers for Blackboard; other browsers may cause complications. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.

You will need to have access to a computer/laptop, scanner, a webcam, and a microphone. You will need to download or update the following software: Microsoft Office, Adobe Acrobat Reader, Windows Media Player, QuickTime, and Java. Check that your computer hardware and software are up-to-date and able to access all parts of the course.

If you do not have a word-processing software, you can download Word and other Microsoft Office programs (including Excel, PowerPoint, Outlook and more) for free via UTEP's Microsoft Office Portal. Click the following link for more information about Microsoft Office 365 and follow the instructions.

IMPORTANT: If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP Help Desk as they are trained specifically in assisting with technological needs of students. Please do not contact me for this type of assistance. The Help Desk is much better equipped than I am to assist you!

Course Communication: How we will stay in contact with each other

- Office Hours: • Email: UTEP e-mail is the best way to contact me. I will make every attempt to respond to your e-mail within 24-48 hours of receipt. When e-mailing me, be sure to email from your UTEP student account and please put the course number in the subject line. In the body of your e-mail,

clearly state your question. At the end of your e-mail, be sure to put your first and last name, and your university identification number.

- Discussion Board: If you have a question that you believe other students may also have, please post it in the Help Board of the discussion boards inside of Blackboard. Please respond to other students' questions if you have a helpful response.
- Announcements: Check the Blackboard announcements frequently for any updates, deadlines, or other important messages.

NETIQUETTE

As we know, sometimes communication online can be challenging. It's possible to miscommunicate what we mean or to misunderstand what our classmates mean given the lack of body language and immediate feedback. Therefore, please keep these netiquette (network etiquette) guidelines in mind. Failure to observe them may result in disciplinary action.

- o Always consider audience. This is a college-level course; therefore, all communication should reflect polite consideration of other's ideas.
 - o Respect and courtesy must be provided to classmates and to the instructor at all times. No harassment or inappropriate postings will be tolerated.
 - o When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a face-to-face situation.
 - o Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space.
- Course Policies: What do you need to do to be successful in the course

ATTENDANCE AND PARTICIPATION

Attendance in the course is determined by participation in the learning activities of the course. Your participation in the course is important not only for your learning and success but also to create a community of learners. Participation is determined by completion of the following activities:

- o Reading/Viewing all course materials to ensure understanding of assignment requirements
- o Participating in engaging discussion with your peers on the discussion boards (grading rubric provided in the "grading information" area of each forum)
- o Participating in scheduled Blackboard Collaborate sessions
- o Other activities as indicated in the weekly modules

Because these activities are designed to contribute to your learning each week, they cannot be made up after their due date has passed.

EXCUSED ABSENCES AND/OR COURSE DROP POLICY

According to UTEP Curriculum and Classroom Policies, "When, in the judgment of the instructor, a student has been absent to such a degree as to impair his or her status relative to credit for the course, the instructor may drop the student from the class with a grade of "W" before the course drop deadline and with a grade of "F" after the course drop deadline." See academic regulations in the UTEP Undergraduate Catalog for a list of excuse absences. Therefore, if I find that, due to non-performance in the course, you are at risk of failing, I will drop you from the course. I will provide 24 hours advance notice via email.

OR

I will not drop you from the course. However, if you feel that you are unable to complete the course successfully, please let me know and then contact the Registrar's Office to initiate the drop process. If you do not, you are at risk of receiving an "F" for the course.

If you are unable to attend a Collaborate session, please let me know as soon as possible so that accommodations can be made when appropriate.

DEADLINES, LATE WORK, AND ABSENCE POLICY

MAKE-UP WORK

Make-up work will be given only in the case of a documented emergency. Note that make-up work may be in a different format than the original work, may require more intensive