PHY320 is offered through the
SCHOOL OF ARTS AND SCIENCES
SYLLABUS

Course Number: PHY320	**Course Name: Theoretical Physics**
Semester: Spring 2025	**CRN: 2224**
Schedule: MWF 13:00-13:50 in SAMC357	**Mode: In person**
Instructor: David Abbott	**Email: abbottds@buffalostate.edu**
Office Hours: MT 11:00-12:00 or by appointment	**Office Location: 361A SAMC**
Phone: 878-5201 (office), 812-4038 (cell, pls text first)	

Catalog Information

Course Description: Introduction to advanced mathematical applications in physics: complex numbers, linear algebra, eigenvalue problems, multiple integrals, vector analysis, Fourier series and transforms, differential equations, and Legendre polynomials. Required for physics majors. Offered spring only.

Prerequisite Courses: PHY112 or (PHY108 and MAT127) or instructor permission.

Learning Outcomes for this Course: On completion of this course, students will be able to:

1. Evaluate different mathematical techniques for solving various physical problems.
2. Apply complex numbers in polar notation, exponential functions, trigonometric functions, and hyperbolic functions.
3. Utilize linear algebra to solve eigenvectors-eigenvalues problems.
4. Solve double and triple integrals in Cartesian, cylindrical, and spherical coordinates for physical systems.
5. Construct Fourier series for harmonic functions and Fourier transforms for non-periodic functions.
6. Develop power series solutions of differential equations and the generating function for Legendre polynomials.

Things you need (or might want)

Required

- Mathematical Methods in the Physical Sciences (3rd Edition, Wiley, 2005) by Mary L. Boas.
- BrightSpace access (see below)
- A way to scan and upload written work (e.g. a smart phone with an app like CamScanner or Genius Scan)
- A way to record, edit, and upload video (e.g. iPhone with iMovie)
- email account

Recommended

- Scientific calculator
- Graphing software (e.g. Excel, desmos)

D2L Brightspace

D2L Brightspace is BuffState's Learning Management System. All students have access through Brightspace for all courses in which they are enrolled. I use BrightSpace to

- Keep records of class activity (Day Pages)
- Make announcements to the class
- Manage and collect student work
- Share resources (mostly websites)
- Keep a gradebook.

About the BrightSpace gradebook: I keep grades and feedback for all graded work on D2, but I do not program D2L to produce syllabus-based grade estimates. As a result, ***D2L's course grade estimates are meaningless.*** I will periodically provide information about how to produce meaningful, syllabus-based grade estimates from the D2L gradebook.

Course Schedule

Here is the tentative course schedule. The instructor will adjust content, assignments, and due dates to accommodate changing needs during the semester. Official dates and assignment details will be posted on Brightspace.

Week	Date	Topic	Events
1	1/27	Intro to Ordinary Differential Equations (ODEs) Solving separable 1st order ODEs analytically Solving ODEs numerically (Euler method)	
2	2/3	Physics applications of ODEs	
3	2/10	Introduction to PDEs	
4	2/17	Linear Algebra	Exam 1
5	2/24	Linear Algebra	
6	3/3	Multiple Integrals	
7	3/10	Multiple Integrals	
8	3/17	Multiple Integrals	Exam 2
9	3/24	SPRING BREAK	
10	3/31	Vector Calculus	
11	4/7	Vector Calculus	
12	4/14	Fourier Series	Exam 3
13	4/21	Fourier Series	
14	4/28	Complex numbers	
15	5/5	Complex numbers	
16	5/12	CEP WEEK	Final Exam

Evaluation and Attendance

Grades: Grades will be awarded according to a total points scheme.

Category	Points	
Exams (E)	**600**	There will be four exams (including the final). Exams focus on class activities and homework, but everything is "fair game."
Portfolio (P)	**100**	You will keep an organized notebook (physical or digital) of artifacts and reflective statements that documents your growth as a mathematical physicist. I will check the portfolio and provide feedback periodically. The portfolio grade will be based on its quality at the end of the term.
Videos (V)	**100**	You will do a group project that culminates in the production and sharing of an instructional video covering a topic from the course. Project grade includes the final presentation and other assignments designed to keep your project on track.
Assignments (A)	**200**	Expect about two assignments every week, totaling well over 200 possible points. ***Only the first 200 points you earn in this category count toward your grade.*** Here are some types of assignments: Reading/video reflections: You will read/watch information about upcoming class content and write a short reflection as part of each reading/viewing assignment. Expect about twelve of these worth 10 points each. Homework sets: Written assignments- typically worked out solutions for end-of-the-chapter style problems. Expect about twelve of these, worth about 20 points each.

Grade Breakpoints: Breakpoints may be shifted down slightly at end of term, at the instructor's discretion.

Total points	Letter Grade
930 and up	A
900 and up	At least an A-
800 and up	At least a B-
700 and up	At least a C-
600 and up	At least a D

Attendance:

Policy:

Regular attendance and class participation is essential for survival in physics classes. Attendance means physical presence in the classroom for entire meeting time. Class participation includes regular in-class speaking and whiteboard writing (both within small groups and to the whole class).

Attendance and participation records will be kept. Prolonged absence and/or failure to participate regularly in class will prompt requests for explanation. Excessive or prolonged absence may result in lowered grade or a grade of incomplete.

Expectations:

Attend completely: Come to class every day, on time (in class, ready to learn at 13:00). Stay focused and engaged until you are dismissed. Participate regularly in class discussions. Do not multitask.

Engage in the community for this class: Contribute to discussions. Collaborate with your classmates during and outside class. Develop a rapport with the instructor and your classmates. Meet with classmates about this course outside class time. Come to office hours (or make an appointment).

Contribute to a vibrant, safe learning community: This class relies on atmosphere of trust and curiosity to succeed. Everyone must feel safe enough and valued enough to speak out (see inset). In legalistic terms:

> *"All students are expected to comport themselves in a manner that does not convey to others in the college community any disrespect, intolerance, or rude behavior based on age, race, religion, color, national origin, gender, sexual orientation, disability, or marital, veteran, or socioeconomic status. All members of the college community are expected to contribute to the college environment to move the college community in the direction of respect for all."*

Collaborate with your classmates: Working with your classmates on homework and in-class activities is strongly encouraged. Done right, collaboration leads to strong learning. Done right, collaboration is not cheating. The key is to make sure the work you turn in represents your own choices of words and representations. **That said, I have zero tolerance for verbatim copying, plagiarism, and other forms of teaching.** Not sure about the difference between collaboration and cheating? Ask!

Monitor your own progress and seek help in a timely fashion: Physics moves fast and it's easy to fall behind. Some confusion and frustration are natural parts of learning, but you cannot allow either to persist for long. Seek help from your classmates and/or your instructor immediately if you find yourself struggling with material for more than two consecutive class periods. Do not expect to work miracles when the test (or the end of the semester) is looming.

Think you are sick? Please do not come to class if you think you might be contagious! In the event of medical problems, email the instructor ASAP. Please include the nature of the illness and expected duration of absence.

Homework policy:

Philosophy*:*

1) ***I prefer imperfect, on-time submissions to late work, however polished.***
2) ***Students don't have to do all the HW to learn what they need***

The homework system has the following features:

- Harsh late penalties for time-sensitive assignments (reading reflections, problem sets)
- Wiggle room, both for imperfect work and missed work; you don't have to do perfect work or turn everything in to earn all the homework points
- Opportunities to recover points through revision of graded work.

Electronics:

- Bring phone (for two factor authentication), but keep it silenced.
- Phone, laptop, and tablet use is encouraged for class-related activity only.
- No electronic recording without permission; no photography without permission.
- Be prepared to log onto all class-related computer resources- memorize your passwords and carry your phone for two-factor authentication.

Reasonable Accommodation

Any student eligible for and needing academic adjustments or accommodations because of a documented disability should consult with the course instructors. If you qualify for accommodations because of a disability, please submit a letter from Disability Services to the instructors in a timely manner so that your needs may be addressed. For additional information contact: 878-4500 or disabilityserv@buffalostate.edu.

Religious Observance

If you have any conflicts regarding religious observances, please talk to the instructors as soon as possible and they will attempt to accommodate scheduling conflicts.

Classroom Behavior and College Policies

Students and faculty each have a responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Buffalo State's policies regarding such matters can be found at http://www.buffalostate.edu/equity/x750.xml.

A Plethora of Campus Services

The **Dean of Students Office** helps students navigate the college experience, particularly during difficult situations such as personal, financial, medical, and/or family crises. If you or someone you know needs support, services are available. For a list of support services and information, please visit http://deanofstudents.buffalostate.edu/, 716-878-4618 or stop by 311 Campbell Student Union during business hours.

The **Students of Concern Care Team** meets regularly throughout the semester to provide support for students who raise concern about their potential for harm to themselves or others. The Care Team will assess the potential risk to personal and campus safety that might result from the actions of individual students, will connect students in need with appropriate resources and will monitor compliance with required support plans. To report a concern, please go to the following website: https://pavesuite.com/BuffaloState/PublicPortal/ConcerningIncident. If you have any questions, call (716) 878-4618 or email youngsm@buffalostate.edu.

The **Milligan's Food Pantry** provides students who are food insecure with the opportunity to get non-perishable food from a campus source. Our Student Resource Coordinator, Kristen Helling, can respond to questions regarding Milligan's or the Emergency Relief Fund and is available at catalakj@buffalostate.edu or at 716-878-3069.

For other resources to share with students:

- Student Conduct and Community Standards Office: Phone: (716) 878-3051
- Weigel Health Center: Phone: (716) 878-6711
- The Counseling Center: Phone: (716) 878-4436
- Student Resources Page: http://deanofstudents.buffalostate.edu/resources-students
- Sexual Violence Prevention information and resources: https://deanofstudents.buffalostate.edu/sexual-violence-prevention, Sexual Violence Prevention also provides in class presentations. You can contact Nina Pierino for more information, pierinng@buffalostate.edu or, at (716) 878-3069

Title IX Statement

My priority as your professor is to ensure a safe, respectful education environment where all students can learn and thrive. The University does not tolerate any form of discrimination or harassment (including sexual assault, dating and domestic violence, stalking) based on protected characteristics (e.g., sex, gender identity, sexual orientation, religion, pregnancy, etc.) or related retaliation. All faculty and teaching assistants are considered mandated reporters by the University, which means that if they observe or learn of sex-based harassment/ discrimination or related retaliation, they are obligated to immediately share that information with the University's Title IX Coordinator. This obligation, grounded in law and policy, is designed to protect the safety of students and the broader Buffalo State community, as well as ensure that students receive information about available supportive measures and resolution options to enable them to make informed choices. Supportive measures include reasonable academic accommodations available with or without the filing of a formal complaint.

If you need academic accommodations due to sex discrimination, harassment, or related retaliation, you may:

On Campus Resources:

- Contact the TIX Coordinator directly (titleix@buffalostate.edu or 716-878-5212), without sharing any personal information with me.
- If you would like to speak with a confidential counselor about sexual misconduct, The Counseling Center provides 24/7 confidential support for students via the Bengal Support Line (833-823-0260), or by scheduling an appointment at 716-878-4436.
- If you are a student with a disability and require reasonable accommodations to meaningfully participate in this course, please contact the University's Student Accessibility Services at your earliest convenience (sas@buffalostate.edu or 716-878-4500), as SAS is responsible for processing and approving such requests.
- If you are pregnant, have recently experienced childbirth, and/or have medical needs related to childbirth, please contact our Title IX Coordinator for assistance.
- You can file an anonymous report with our University Police Department: 716-878-6333, police@buffalostate.edu

Off Campus Resources

- Crisis Services: 24/7 hotline, 716-834-3131
- National Suicide Prevention Lifeline: 1-800-273-8255
- Family Justic Center: 716-558-7233, safe@fjcsafe.org