

Dr. Edward Brash  
Class times:  
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Office: Luter 304  
T/ R 9:30-10:45 Luter 323  
757-594-7451

**Office Hours:** T/R 1:30-3:00 (subject to change)

### **PHYS 340 – Methods of Theoretical Physics – Spring 2025**

**Text:** (eBook with WebAssign course enrollment) *Advanced Engineering Mathematics*, Dennis R. Zill.

**Resources:** All of the course material can be found on GitHub at:  
<https://github.com/brash99/phys340.git>

**Description:** The course covers a series of mathematical topics that are necessary for your success in more advanced physics courses, such as quantum mechanics. These topics include: Vectors, Linear Algebra, Fourier Series, Partial Differential Equations, Vector Calculus, Complex Variables

**Learning Objectives:** To solve problems in linear algebra and vector calculus in preparation for more advanced physics courses.

**Homework:** This class will use WebAssign for the ebook and the homework. Please login to WebAssign to register for the class: the class key is **cnu 6549 8513**. You can login through <http://webassign.net> or <https://student.cengage.com/>

**Exams:** There will be two in-class exams and a final exam.

**Grading:** The breakdown is:

Homework:	40%
Exams:	30%
Final:	30%

**Final Grades** will be assigned as follows:

A 87-100	B+ 77-79	C+ 67-79	D+ 67-69	F < 50
A- 80-86	B 73-76	C 63-76	D 63-66	
	B- 70-72	C- 60-72	D- 60-62	

#### **Course Outline:**

1. Vectors
  - a. Ordinary Vectors
  - b. Vector Algebra
  - c. Index (Einstein) notation
  - d. Vector Spaces
  - e. Tensors
2. Matrices Linear Algebra
  - a. Systems of Equations
  - b. Determinants

- c. Use of the Inverse
  - d. Eigenvalue Problem/Orthogonal Matrices
  - e. **EXAM I**
3. Complex variables
    - a. Complex Algebra
    - b. Complex Functions
    - c. Cauchy Riemann Equations
  4. Vector Calculus
    - a. Fields
    - b. Curvature and Acceleration
    - c. Vector Derivatives
    - d. Line Integrals
    - e. Green's Theorem
    - f. Stokes' Theorem
    - g. Divergence Theorem
    - h. **EXAM II**
  5. Fourier Series
    - a. Cosine and Sine Series
    - b. Complex Fourier Series
    - c. Sturm-Liouville Problem
  6. Partial Differential Equations
    - a. Separable Equations
    - b. Heat Equation
    - c. Wave Equation
    - d. Laplace Equation

**Honor Code:** This class is conducted under the CNU code of academic conduct:

"On my honor, I will maintain the highest standards of honesty, integrity and personal responsibility. That means I will not lie, cheat, or steal and as a member of this academic community, I am committed to creating an environment of respect and mutual trust."

**University Statement on Diversity and Inclusion:**

The Christopher Newport University community engages and respects different viewpoints, understands the cultural and structural context in which those viewpoints emerge, and questions the development of our own perspectives and values, as these are among the fundamental tenets of a liberal arts education.

Accordingly, we affirm our commitment to a campus culture that embraces the full spectrum of human attributes, perspectives, and disciplines, and offers every member of the University the opportunity to become their best self.

Understanding and respecting differences can best develop in a community where members learn, live, work, and serve among individuals with diverse worldviews, identities, and values. We are dedicated to upholding the dignity and worth of all members of this academic community such that all may engage effectively and compassionately in a pluralistic society.

If you have specific questions, suggestions or concerns regarding diversity on campus please contact [Diversity.Inclusion@CNU.edu](mailto:Diversity.Inclusion@CNU.edu)

**Disabilities:**

In order for a student to receive an accommodation for a disability, that disability must be on record in the Office of Student Affairs, 3<sup>rd</sup> Floor, David Student Union (DSU). If you believe that you have a disability, please contact Jacquelyn Barnes, Student Disability Support Specialist in Student Affairs (594-7160) to discuss your needs.

Students with documented disabilities are to notify the instructor at least seven days prior to the point at which they require an accommodation (the first day of class is recommended), in private, if accommodation is needed. The instructor will provide students with disabilities with the reasonable accommodations approved and directed by the Office of Student Affairs. Work completed before the student notifies the instructor of his/her disability may be counted toward the final grade at the sole discretion of the instructor.

**Success:**

I want you to succeed in this course and at Christopher Newport. I encourage you to contact me during office hours or to schedule an appointment to discuss course content or to answer questions you have. During the Coronavirus pandemic, our conversations may need to be via electronic means. If I become concerned about your course performance, attendance, engagement, or well-being, I will contact you first. I also may submit a referral through our Captains Care Program. The referral will be received by the Center for Academic Success as well as other departments when appropriate (Counseling Services, Office of Student Engagement). If you are an athlete, the Athletic Academic Support Coordinator will be notified. Someone will contact you to help determine what will help you succeed. Please remember that this is a means for me to support you and help foster your success at Christopher Newport.

**Academic Support:**

The Center for Academic Success offers free tutoring assistance for Christopher Newport students in several academic areas. Center staff offer individual assistance and/or workshops on various study strategies to help you perform your best in your courses. The center also houses the Alice F. Randall Writing Center. Writing consultants can help you at any stage of the writing process, from invention, to development of ideas, to polishing a final draft. The Center is not a proofreading service, but consultants can help you to recognize and find grammar and punctuation errors in your work as well as provide assistance with global tasks. Contact them as early in the writing process as you can!

You may contact the Center for Academic Success to request a tutor, confer with a writing consultant, obtain a schedule of workshops, or make an appointment to talk with a staff member about study skills and strategies. The Center is located in Christopher Newport Hall, first floor, room 123. You may email [academicsuccess@cnu.edu](mailto:academicsuccess@cnu.edu) or call (757) 594-7684.

**Safety Protocols Specific to COVID-19 and Academic Instruction:**

Offering in-person instruction on campus requires everyone to take individual responsibility for reducing the risk of exposure for all campus community members both inside and outside the classroom. Irresponsible behavior jeopardizes not only your own health, but also that of your fellow students, friends, professors and advisors, and members of our staff. Therefore, you are expected to learn and diligently follow the safety protocols required by the University at all times. Until further notice, the following protocols apply specifically to instructional spaces and academic buildings.

Prior to leaving their residence hall room or home, students should:

- conduct daily health screenings; and
- pack cloth face covering(s), personal cleaning supplies, and related items for campus use.

Students cannot enter instructional spaces or academic buildings if they:

- are experiencing symptoms of any illness, regardless of whether they believe the illness to be COVID-19;

- have been exposed to someone with COVID-19;
- are in isolation while waiting for COVID-19 test results;
- have been directed to quarantine by a University or health department official; or
- have been diagnosed with COVID-19 and have not been approved to return to campus by a healthcare provider.

All students must adhere to the following requirements while inside instructional spaces, common areas and offices:

- attend only the classes and sections in which they are officially enrolled;
- sit in their assigned seats or work at their assigned stations every class period;
- wear a face covering at all times\* (face coverings should cover the nose and mouth, be secured under the chin, and fit snugly against the sides of the face);
- use additional personal protective equipment as required for specific classes;
- maintain physical distancing of at least six feet from other people;
- disinfect their own work areas upon arrival in and prior to departure from the instructional space;
- refrain from sharing personal materials, such as pens, textbooks, etc., with others;
- refrain from bringing food and drinks into the instructional space;
- follow all directional signs; and
- follow directives regarding office hours and advising appointments.

*\*Students who have received an exemption from the face covering requirement for health reasons must present the proof of the exemption provided by the Office of Student Affairs to the instructor upon entering the instructional space.*

Because non-compliance potentially endangers others, faculty members:

- are authorized to instruct anyone in non-compliance with safety protocols to correct the non-compliance or immediately leave the instructional space; and
- may submit referrals to CHECS to report non-compliance with safety protocols.

Faculty should immediately notify the Vice President for Student Affairs, Kevin Hughes (dosa@cnu.edu or kmhughes@cnu.edu), if they become aware of a student who has sought a diagnostic test or who has been exposed. In addition, faculty members may submit referrals through the Captain's Care Program to report absences as a way of identifying students who may have become ill. It would be appropriate to do so when students have not attended class or communicated with the faculty member in any way for a period of one week or longer.

### **Course Materials:**

All content created and assembled by the faculty member and used in this course is to be considered intellectual property owned by the faculty member and Christopher Newport University. It is provided solely for the private use of the students currently enrolled in this course. To ensure the free and open discussion of ideas, students may not make available any of the original course content, including but not limited to lectures, discussions, videos, handouts, and/or activities, to anyone not currently enrolled in the course without the advance written permission of the instructor. This means that students may not record, download, screenshot, or in any way copy original course material for the purpose of distribution beyond this course. A violation may be considered theft. It is the student's responsibility to protect course material when accessing it outside of the physical classroom space.