

AS.110.302 section 88 Syllabus

Differential Equations and Applications

Course Information

Expanded Course Description::

Additional Details: This course can satisfy an elective requirement for the mathematics major.

Lectures and Live Meetings

Recorded lectures will be uploaded to Canvas. Individual reviews with the instructor may be arranged at any time by email.

Homework

In order to master the material, there will be required homework problems. Homework will be due by end of day Sunday. Each homework assignment will consist of multiple choice assignments in Canvas, each corresponding to a textbook section. These assignments are untimed and may be closed out of and returned to later.

Exams

There will be two midterm exams and a cumulative final exam. All exams are given in Canvas, using Respondus LockDown Browser and Monitor. The exam problems will be a mix of true/false, multiple choice, fill in the blank, and essay. For the essay questions, you will type your final answer into the provided textbox during the exam, and then scan and upload your written work to Canvas immediately after the exam.

Course Topics

- Introduction o 1.1 Mathematical Models and Slope Fields o 1.2 Solutions to Some Differential Equations o 1.3 Classification of Differential Equations
- First Order Differential Equations o 2.1 Linear Equations and Integrating Factors o 2.2 Separable Equations o 2.4 Linear vs. Nonlinear Equations o 2.5 Autonomous Equations and Population Dynamics o 2.6 Exact Equations and Integrating Factors o 2.7 Numerical Approximations: Euler's Method
- Second Order Linear Equations o 3.1 Homogeneous equations with Constant Coefficients o 3.2 Solutions of Linear Homogeneous Equations: The Wronskian o 3.3 Complex Roots of Characteristic Equation o 3.4 Repeated Roots: Reduction of Order o 3.5 Nonhomogeneous Equations: Method of Undetermined Coefficients o 3.6

Variation of Parameters

- [Higher Order Linear Equations](#) o 4.1 General Theory o 4.2 Homogeneous Equations with Constant Coefficients o 4.3 The Method of Undetermined Coefficients
- [The Laplace Transform](#) o 6.1 Definition of the Laplace Transform o 6.2 Solution of Initial value Problems o 6.3 Step Functions o 6.4 Discontinuous Forcing Functions
- [Systems of First Order Linear Equations](#) o 7.1 Introduction o 7.2 Review of Matrices o 7.3 Linear Algebraic Equations: Independence, Eigensystems o 7.4 Basic Theory of First order Linear Systems o 7.5 Homogeneous Linear Systems with Constant Coefficients o 7.6 Complex Eigenvalues o 7.7 Fundamental Matrices o 7.8 Repeated Eigenvalues
- [Nonlinear Differential Equations And Stability](#) o 9.1 The Phase Plane: Linear Systems o 9.2 Autonomous Systems and Stability o 9.3 Locally Linear Systems

Course Information:

Differential Equations and Applications

AS.110.302.88 (4.0 Credits)

AE Spring 2026 [AE Spring 2026]

Description

This is a course in ordinary differential equations (ODEs), equations involving an unknown function of one independent variable and some of its derivatives, and is primarily a course in the study of the structure of and techniques for solving ODEs as mathematical models. Specific topics include first and second ODEs of various types, systems of linear differential equations, autonomous systems, and the qualitative and quantitative analysis of nonlinear systems of first-order ODEs. Laplace transforms, series solutions and the basics of numerical solutions are included as extra topics. Prerequisites: Grade of C- or better in 110.107 or 110.109 or 110.113, or a 5 on the AP BC exam. Area: Quantitative and Mathematical Sciences.

AS Foundational Abilities

Science and Data (FA2)

Department: AS Mathematics

College: Krieger School of Arts and Sciences

Instructor Information :

Instructor



Nicholas Marshburn

✉ nmarshb1@jhu.edu

Course Schedule:



Location and Schedule:

Schedule Detail: [Lecture: 01-20-2026 to 04-27-2026, None Online]

CRN: AS.110.302.88.AE Spring 2026

Course Learning Outcomes

Course Learning Outcomes:



No Course Learning Outcomes are available for this course.

Required Text and Other Materials

Textbooks:

Text: Either of the following texts is usable for this course:

- **Elementary Differential Equations**, 10th edition, William E. Boyce and Richard C. DiPrima, **ISBN: 9781119925064**.
- **Elementary Differential Equations with Boundary Value Problems**, 10th edition, William E. Boyce and Richard C. DiPrima, **ISBN : 978-0-470-45831-0**.

Evaluation and Grading

Note that the final course syllabus may differ from the information below.

Grading Breakdown:

15% Online Homework

25% Midterm 1

25% Midterm 2

35% Final Exam

90 - 100: A

80 - 89: B

70 - 79: C

60 - 69: D

59-: F

KSAS Academic Policies

The policies below are regularly updated to reflect KSAS teaching policies and guidelines.

Academic Policies:



Academic Integrity

The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the internet, generative AI, or electronic devices, unauthorized collaboration, alteration of graded assignments, forgery or falsification, lying, facilitating academic dishonesty, and unfair competition.

Report any violations you witness to the course instructor. You can read the [Homewood Undergraduate Academic Ethics Policy](#) in detail and report an incident through Student Affairs. You may consult the Associate Dean of Student Conduct (or designee) by calling the Office of the Dean of Student Life at 410-516-8208 or via email at studentconduct@jhu.edu.



Student attendance and illness

Class attendance is a student responsibility and is expected of all JHU undergraduate students. Occasionally, health, family or personal matters may interfere with a student's ability to attend class. In this situation, the student is expected to notify their professors and instructors as soon as possible about missing class and discuss how to make up missed class time or assignments. More detailed information is provided by the [Dean of Students](#). Please note that the [Student Health and Wellness Center](#) does not provide documentation for students who miss individual classes.



Religious Holidays

Religious holidays are valid reasons to be excused from class. Students who must miss a class or an examination because of a religious holiday must inform the instructor as early in the semester as possible in order to be excused from class or to make up any work that is missed. A list of many [Religious Holidays and Holy Days](#) is maintained by Student Affairs and more information may be found at [Religious and Spiritual Life](#). If you have any questions regarding a particular case or would like any guidance, please do not hesitate to contact the [Johns Hopkins University Chaplain](#) at 410-516-1880 or kschnurr@jhu.edu.

Students may also request a [Religious Accommodation](#) through the [Office of Institutional Equity](#).



Student drop deadline

The last day a student can drop a class is at the end of the sixth full week of classes. The [Academic Calendar Page](#) contains specific information about drop and withdraw dates published by the University Registrar's.



Incomplete grades

The **Incomplete Grades policy** is articulated in the "Grades" section of the [Academic Catalogue](#).

Please visit the Academic Catalogue for the most up to date deadlines related to incomplete grades and the process for students to make an incomplete request.



Final Examinations

For more information on final exams, please consult the [Final Exam Policy](#) in the Academic Catalogue.

The Final Exam Schedule is updated each semester and is available through the [Registrar's Office](#) under Students --> Course Schedule.

Please note that instructors are not permitted to make ad hoc arrangements for the administration of final examinations.



Final Course Grades

Course grades are submitted within 48 hours of the administration of the scheduled final exam time/final project due date (if in lieu of a final exam, etc.).

Final course grades will appear in SIS > My Grades. More information about accessing a summary of your official course grades can be found through the [IT Office](#).



Starfish for reporting student progress/difficulty

[Starfish](#) is a tool through which faculty may raise concerns about students experiencing academic or personal challenges. This is an early intervention system that can be used to connect the appropriate assigned staff members to a student in order to provide support and resources. Students and advisors may be notified when a starfish flag is submitted. Starfish is also the platform that can collect mid-semester progress reports for undergraduate students.



Students with Disabilities – Accommodations and Accessibility

Students with disabilities (including those with psychological conditions, medical conditions and temporary disabilities) **must request that their accommodations are shared** with instructional staff by Student Disability Services (SDS) for each course. SDS will then provide an Accommodation Letter with instructors. Please request accommodations be shared for this course as early as possible to provide time for effective communication and arrangements.

Johns Hopkins University values diversity and inclusion. We are committed to providing welcoming, equitable, and accessible educational experiences for all students. For further information or to start the process of requesting accommodations, please contact [Student Disability Services at Homewood Campus](#), Shaffer Hall #101, call: 410-516-4720 and email: studentdisabilityservices@jhu.edu or visit the website.



Student Health and Wellness

[Health and Wellness](#) is an integral part of Campus Life at Johns Hopkins University. The Health and Wellness page has information on the Student Health Center, Health Promotion, Fitness, and Sexual Assault Response and Prevention.

For all illness, please note that “Sick notes” are not required to be provided and students should abide by the honor system when reporting that they need to miss class due to a medical issue.

If you are struggling with anxiety, stress, depression or other mental health related concerns, please consider visiting the JHU Counseling Center. There is more information about **Mental Health Services** in the section below.



Mental Health Services

Anxiety, stress, and mental health

JHU has several resources to support students. Many students experience stress, anxiety or depression during their college career. The [Counseling Center](#) has many resources available to students.

In addition, The [Johns Hopkins University Behavioral Health Crisis Support Team](#) (BHCST) pairs experienced, compassionate crisis clinicians with specially trained public safety officers on every shift on and around the Homewood campus, seven days a week. The BHCST will provide immediate assistance to those who need it and, just as importantly, link individuals in crisis to ongoing support services in the days and weeks that follow. Homewood community members can call Public Safety, 410-516-5600, and ask for a BHCST clinician.

If you have concerns about yourself or a fellow student, please contact:

- For [emergencies](#) (threat to self or others): 410-516-4600 or 911
- For on-scene mental health support: BHCST at 410-516-4600
- For all undergraduates: Student Outreach & Support at 410-516-7857 or studentoutreach@jhu.edu (undergraduates)



AS Foundational Abilities

Krieger launched the [General Education Model](#) in Fall 2024 based on the six [Foundational Abilities](#). The Arts and Sciences Foundational Abilities (AS-FA) requirement is designed to ensure that students earn a number of credits in academic areas outside of their primary major, developing breadth as well as depth.

Krieger courses are tagged with an AS-FA-tag. Guidance for students and faculty about the Foundational Abilities can be found in the [Academic Catalogue](#) or the [First-Year Academic Guide](#) distributed by the KSAS and WSE Offices of Academic Advising. Course tags are visible in the Academic Catalogue and in SIS.



Inclusivity and Classroom Climate

Johns Hopkins University is committed to creating a classroom environment that values the diversity of experiences and perspectives that all students bring. Everyone on campus has the right to be treated with dignity and respect. JHU believes fostering an inclusive climate is important because research shows that students who interact with peers who are different from themselves learn new things and experience tangible educational outcomes. You can read more about the commitment to an inclusive educational environment and goals based on results of the Campus Climate Survey through the [Office of the Provost](#).

Please help create a welcoming and vibrant classroom climate. You should expect to be challenged intellectually by instructors, the TAs, and your peers, and at times this may feel uncomfortable. Indeed, it can be helpful to be pushed sometimes in order to learn and grow. But at no time in this learning process should someone be singled out or treated unequally on the basis of any seen or unseen part of their identity.



University Statement on Equal Opportunity

Johns Hopkins University is committed to equal opportunity for its faculty, staff, and students. To that end, the university does not discriminate on the basis of sex, gender, marital status, pregnancy, race, color, ethnicity, national origin, age, disability, religion, sexual orientation, gender identity or expression, veteran status or other legally protected characteristic. You can read detailed equity statements from the [Office of Institutional Equity](#).