



MATH 265: Differential Equations

Course Syllabus

Summer Session I – 2027

Instructor: Dr. Irina V. Viktorova

Credits: 4

Contact Hours: 60

Prerequisites: Multivariable Calculus

Class Meeting Days & Time: TBD

Office Hours: by appointment after a class or via Zoom (see Moodle site)

Email: *(omitted)*

Course Type: Standard Course

Course Fee: TBA

Course Description

Topics include the first order differential equations, modeling and applied problems involving first order differential equations, linear second order equations, modeling of free and forced mechanical vibrations, higher order linear differential equations, Cauchy-Euler (equidimensional) equations, Laplace integral transformation, matrix methods for linear systems.

Learning Outcomes

By the end of this course, students will be able to:

- Construct solutions of elementary differential equation problems,
- Learn how such problems arise in applications,
- Learn to model engineering problems,
- Analyze how the solutions vary as problem parameters as well as initial conditions change,
- Use technology to compute and display solutions,
- Learn and use operational analysis to solve differential equations,
- Learn matrix methods to solve linear systems of differential equations

Course Materials

Textbook (optional): *Fundamentals of Differential Equations and Boundary Value Problems*, by R. Kent Nagle, Edward B. Saff, and Arthur David Snider, 7th edition, Pearson, 2019.

The course's Moodle site is the primary location for readings and assignments.

Online Homework

You must obtain an access code for Edfinity online homework based on the Nagle/Saff/Snider textbook (*Fundamentals of Differential Equations*). This product provides a complete student solutions manual, and an online homework system. You will access Edfinity through the home page icon.

Assessment

Attendance	10%
Edfinity Homework	5%
Quizzes	5%
Exam 1	20%
Exam 2	20%

Exam 3 20%
Cumulative Final Exam 20%

Grading

Students are reminded that it is their responsibility to note the dates of exams and other assignments. No alternative exam dates will be offered and professors are not required to give partial credit for any late work (they do so at their discretion: the Institute's default policy is no extensions and a zero for any work turned in late). Students who book travel when they have an exam or other assessment will have to change their plans or accept a zero. Letter grades for student work are based on the following percentage scale:

Letter Grade Range	Numerical Score Equivalent	Student Performance
A	93% - 100%	Exceptional
A-	90% - 92%	Excellent
B+	87% - 89%	Superior
B	83% - 86%	
B-	80% - 82%	
C+	77% - 79%	Satisfactory
C	73% - 76%	
C-	70% - 72%	
D+	67% - 69%	Low Pass
D	63% - 66%	
D-	60% - 62%	
F	59% or less	Fail (no credit)

Please note: decimal numerals between 1-4 are rounded down while 5-9 are rounded up: e.g., expect 89.4 to be 89.0 while 89.5 to round up to 90.

At the end of the semester certain adjustments will be made according to the following list. These "lowest scores" include zeros recorded for unexcused absences.

- Your three lowest homework assignments will be dropped.
- Your lowest quiz score will be dropped.
- Your lowest midterm exam score will be replaced by your Final Exam score (if advantageous to you).

Course Requirements

Grades are based on the following criteria.

Attendance (10%)

Attendance is an important part of this course. You are allowed 2 unexcused absences per course without penalty, per Institute policy. If you attend all the other meetings, you will receive 10% for this part of your grade. There are no make-ups offered for attendance.

Edfinity Homework (5%)

Assignments for particular sections of the text are usually due after the section is covered in class. Assignments become unavailable at 11:59 PM on the due date. Deadlines will not be extended, but your three lowest assignment scores will be dropped.

Quizzes (5%)

There will be a number of short quizzes that students will do online.

Exams 1-3 (60%)

Each of the three initial exams will count as 20% of the final grade. The final exam grade will automatically be substituted for the lowest regular exam grade *if that is to the student's advantage*.

Final Cumulative Exam (20%)

The comprehensive final exam will account for 20% of your final numerical grade. No rescheduling of the final

exam is permitted. **Exemptions will be allowed for those students who have an 89.5 or higher course average on the last day of classes and an 89.5 or higher average on Exams 1 – 3.** For those who are not exempt, the final exam grade will automatically be substituted for the lowest midterm exam grade if it is to the student's advantage.

Extension & Submitting Late Work

Work submitted after the deadline will receive a grade of zero, not partial credit. Each student is allowed one extension of 24 hours over the entire semester. This can be used for any assignment but the final project. Students need to email the instructor before the deadline and inform the instructor of their use of the extension. Any work submitted after the 24-hour extension will be marked zero. As for all policies, exceptions can be made by the Director for students with special accommodations or in case of medical emergencies, etc.

Attendance Policy

Attendance is expected and mandatory for classroom times and co-curricular activities. The first two absences per course due to illness will be considered excused "sick days" and do not require medical documentation. To receive additional excused absences due to illness, students are required to see a local physician or request a letter from an Institute-approved doctor documenting they should be excused from class for illness.

Unexcused absences will adversely affect a student's academic performance and will result in a reduction of the student's final course grade by 4% per absence up to a maximum of 10%. Excessive unexcused absences (4 or more, not including the excused "sick day") may lead to receiving a failing grade or disciplinary action. It is the student's responsibility to be aware of the number of absences or late arrivals for each course, and to ask the instructor when in doubt.

If students miss class, they are responsible for obtaining class notes from other students and/or for meeting the professor during office hours. Any work missed in class because of an excused absence may be made up within one week of the return to the class. Any work missed that was a quiz or other test must be made up outside of class time and will, in the interest of intellectual honesty, be a slightly different test than the one given in class.

Presence during mandatory field trips is especially important.

Legitimate reasons for an excused absence or tardiness includes: death in immediate family, religious observances, illness or injury, local inclement weather, medical appointments that cannot be rescheduled.

Students who request an approved absence to observe a religious holiday must submit a formal request to the Institute's Director within one week after the add/drop period when course schedules, including any field trips, are finalized. No exceptions will be made after this deadline.

Except in the case of medical emergencies, absences are not accepted when tests are scheduled; tests cannot be made up. Furthermore, scheduled times and dates indicated for exams, quizzes, oral presentations, and any other graded assignments cannot be changed for any reason. Even if more sections of the same class are activated, students may only take exams during the scheduled times and dates for the section they are enrolled in.

Tardiness Policy

Students are expected to attend all classes punctually. Any student arriving up to 15 minutes late or leaving up to 15 minutes earlier than the scheduled class end time will be marked as tardy. Each incident of tardiness (late arrivals to or early departures from class) is 1% off the final grade. However, should a student arrive more than 15 minutes late or depart more than 15 minutes before the conclusion of the class, it will be recorded as an absence.

Students are also expected to remain in class during the time of instruction except for a reasonable amount of time to use the restroom. Students who leave class and do not return during the class session will receive an unexcused absence or late penalty.

Academic Integrity

All forms of cheating (i.e., copying during exam either from a fellow student or making unauthorized use of notes) and plagiarism (i.e., presenting the ideas or words of another person for academic evaluation without acknowledging the source) will be handled according to the Institute Academic Policy, which can be found in the Umbra Institute Academic Policies and Conduct Guidelines.

Utilizing ChatGPT or other artificial intelligence (AI) tools for the generation of content submitted by a student as their own as part of any assignment for academic credit at the Institute constitutes a form of plagiarism.

Should the Institute become aware of a student's use of such platforms and services, the student will be subject to the same consequences and judicial proceedings as are in place for plagiarism (defined above).

Classroom Policy

Students are expected to follow the policy of the Institute and demonstrate the appropriate respect for the historical premises that the school occupies. Students are not allowed to use their cell phones, ear buds, or laptops while in class or during co-curricular events and activities, unless otherwise specified in the course syllabus or expressly permitted by the instructor for special learning. This policy also applies to earbuds and headsets. Students who do not respect these rules will be subject to disciplinary warnings and probation, be given an unexcused absence from class, and other disciplinary action including dismissal from the course.

Moodle

Please note that Moodle, not this syllabus, is the ultimate reference for due dates, assignment prompts, and course announcements. It is *the student's responsibility* to check the site regularly to be aware of announcements as well as to see and record all due dates for assignments.

Schedule of Topics, Readings, and Exams

WEEK 1

Meeting 1 L.1 Introduction and Background, L.2 Solutions to I.V.P., Existence and Uniqueness, L.3 Separable Equations

Meeting 2: L.4 Linear Equations, L.5 Exact Equations and Special Integrating Factors, Substitutions and Transformations, L.6 Compartmental Analysis and Newtonian Mechanics

Meeting 3 L.7 Introduction to Linear 2nd order differential equations, L.8 Homogeneous Linear Equations: Real, Repeated and Complex roots of characteristic equation L.7 Introduction to Linear 2nd order differential equations, L.8 Homogeneous Linear Equations: Real, Repeated and Complex roots of characteristic equation

Meeting 4: Exam 1

WEEK 2

Meeting 5: L.9 Linear equations with Variable coefficients, Higher order Linear equations with constant coefficients

Meeting 6 L.10 Superposition Principle and Nonhomogeneous equations, Method of Undetermined coefficients L.11 Variation of Parameters

Meeting 7: L.12,13 Mechanical vibrations, Review

Meeting 8 Exam 2

WEEK 3

Meeting 9: L.14,15 Definition and Properties of Laplace Transform, L.16 Inverse Laplace Transform and Solving I.V.P. with Laplace Transform

Meeting 10 L.17 Laplace Transform of Discontinuous and Periodic Functions.

Meeting 11 L.18 Convolution Theorem

Meeting 12 L.19 Matrices and Vectors, Linear Systems in Normal Form

WEEK 4

Meeting 13 L.20 Homogeneous Systems with Constant Coefficients: Real and Complex eigenvalues, Multiple eigenvalue case.

Meeting 14 L.20 Homogeneous Systems with Constant Coefficients: Real and Complex eigenvalues, Multiple eigenvalue case.

Meeting 15: Exam 3

Meeting 16 L.21 Fundamental Matrix Solutions

WEEK 5

Meeting 17: L.21 Matrix Exponential Function Solutions L.22 Nonhomogeneous Linear Systems

Meeting 18 L.22 Nonhomogeneous Linear Systems Review

Meeting 19: Review

Meeting 19: Final Exam