Math 230 – Differential Equations
Spring 2025 Course Syllabus

James Jones, Professor of Mathematics
Mathematics, Science, and Business Division – Richland Community College

Course Meeting Information

The Spring 2025 semester begins January 13 and ends May 9.

Section 01 meets in W249 from 10:00 to 11:10 am on Monday, Wednesday, and Friday.

Here are some important dates.

- January 23 is the last day to withdraw and get a refund.
- May 6 is the last day to withdraw from the course without receiving a letter grade.
- The comprehensive final exam is Wednesday, May 7, from 10:00 to 11:50 am.
- No late work will be accepted after May 9.

This is a face-to-face course that uses the Canvas learning management system. There is an online student orientation to Canvas and the College that must be completed prior to obtaining access to your courses in Canvas.

Attendance requires both (1) physical presence with active engagement in the classroom and (2) submitting assignments. Being present but working on other things does not count as attendance. Classroom attendance is recorded to the nearest 10% of a class period (7 minutes).

Assignments will be due throughout the week and, per federal guidelines, a typical student should expect to dedicate a minimum of 12 hours per week to this course.

Instructor Information

James Jones, Professor of Mathematics
Email: james@richland.edu
Web: https://people.richland.edu/james

Phone: 217-875-7211, ext 6490
Office: S224
Canvas: https://richland.instructure.com

The best way to contact the instructor is through Canvas or by email.

Office Hours

I spend most of my office hours in the classroom before and after class. This allows me to help students with their assignments, homework, projects, exams, and questions. Students are encouraged to come to class early each day and use that time to ask questions of the instructor, work on projects, or just socialize with other students in the course.

These office hours are on Monday, Wednesday, and Friday in room W249.

8:20–8:30 am, 9:40–10:00 am, 11:10–11:30 am, 12:30–1:00 pm, 1:50–2:00 pm, 3:10–3:20 pm

Text

- Differential Equations with Boundary-Value Problems, seventh edition. Dennis G. Zill, Michael R Cullen. Copyright 2009, Brooks/Cole. ISBN-13: 978-0-495-10836-8 (required)
- Differential Equations with Boundary-Value Problems Student Solutions Manual. Warren S. Wright, Dennis G. Zill, Carol D. Wright. Copyright 2009, Brooks/Cole Publishing Company. ISBN 978-0-495-38316-1. (Optional)

Student Audience

Transfer students. Students pursuing degrees in engineering or mathematics.

Prerequisite

Successful completion (C or better grade) of Math 122, Calculus and Analytic Geometry II.

Course Description

MATH 230 - Differential Equations
Hours: 4 lecture - 0 lab - 4 credit

Math 230, Differential Equations, begins with some definitions and terminology and mathematical models used in a differential equations course. First-order and higher-order differential equations, along with the methods of solutions and their applications are introduced. Modeling with higher-order, Laplace transform, and systems of linear first-order differential equations are covered. At the end, students learn series solutions of linear equations. Numerical methods are covered throughout the course.

Applicable toward graduation where program structure permits.

- Certificate or degree: All certificates and all degrees.
- Group requirement: Mathematics
- Area of Concentration: Mathematics.

Illinois Articulation Initiative (IAI)

The Illinois Articulation Initiative is a statewide transfer agreement. Their website is at http://www.itransfer.org

Differential Equations is the Mathematics Majors course MTH 912. This is the IAI description for the course.

> The course must clearly cover: First-order equations - including all the following topics: existence and uniqueness of solutions, initial value problems, basic numerical methods,

separable equations, linear equations, exact equations, substitution methods and applications. Higher-order equations - including all the following topics: the general solution to homogeneous linear equations, linear independence, method of undetermined coefficients, the general solution to linear non-homogeneous equations, variation of parameters, and applications. In addition to the above, the course must cover at least two of the following in detail: 1. Solutions of initial value problems by Laplace transforms, 2. Power series solutions, 3. Partial differential equations and Fourier series, 4. Systems of linear differential equations, 5. Further numerical methods, 6. Non-cursory treatment of other advanced topics. Prerequisite: MTH 902, Calculus II with a C or better.

Topical Outline

A weekly calendar listing the specific material covered each week is provided at the end of this syllabus. This section is provided as a broad overview of the major topics covered.

This course does not run on calendar weeks and any attempt to coerce the calendar into a weekly schedule necessarily introduces some approximation. For example, an exam may be in a different week than the weekly heading suggests or a chapter may begin midweek.

The official calendar that the students receive is a one page, 16 week, daily calendar. This calendar lists the section from the textbook being covered each day and the dates that major assessments are due. Due dates will also be listed in the Canvas learning management system.

- Introduction to Differential Equations – 1 week
- First-Order Differential Equations – 3 weeks
- Second-Order Differential Equations – 4 weeks
- Series Solutions – 2 weeks
- Laplace Transforms – 3 weeks
- Systems of Differential Equations – 3 weeks

Models and Applications

For first-order and second-order differential equations, the textbook breaks application problems and mathematical models into separate chapters after covering the theory. This course combines the applications and the theory. Since applications may be worked using multiple methods, it becomes too lengthy to list the applications on the calendar. Rather, some of the major models that we will cover are listed here.

First-Order Models

- Linear models; exponential growth and decay, Newton's law of cooling, mixture problems, series circuits
- Non-linear models; logistic growth, chemical reactions

Higher-Order Linear Models

- Initial value problems; spring/mass systems with free undamped motion, free damped motion, and driven motion; series circuit analogue
- Boundary value problems; deflection of a beam, eigenvalues and eigenfunctions, buckling of a column

Systems of Differential Equations

- First-order: Mixture problems involving systems of tanks, electronic networks
- Second-order: Coupled springs, electronic networks

Course Objectives, Goals, and Outcomes

A topical outline of the content covered in the course follows this section.

Specific Course Objectives

Upon completion of this course, the student should be able to

- use direction fields to find solutions to differential equations.
- identify which techniques can be used to solve a first order differential equation.
- solve first order differential equations that are autonomous, separable, linear, exact, homogeneous, or require substitutions (including Bernoulli equations).
- solve higher order homogeneous linear differential equations with constant coefficients.
- solve higher order nonhomogeneous linear differential equations using undetermined coefficients (superposition and annihilator approaches).
- use variation of parameters to solve a nonhomogeneous linear differential equation.
- solve Cauchy-Euler differential equations.
- use series to find a solution about ordinary points and regular singular points.
- use the Laplace transform to linear differential equations.
- solve systems of linear equations using elimination, Laplace transforms, and matrices.
- use the Euler, modified Euler, and Runge-Kutta methods to find numerical solutions to differential equations.
- use technology including numerical solvers and computer algebra systems to find solutions.

General Course Objectives

While learning differential equations is certainly one of the goals of this course, it is not the only objective. Upon completion of this course, the student should be able to …

- demonstrate comprehension and understanding in the topics of the course through symbolic, numeric, and graphic methods.[1]
- demonstrate the use of proper mathematical notation.[1]
- use technology when appropriate and know the limitations of technology.[4]

- work with others towards the completion of a common goal.[2,4]
- use deductive reasoning and critical thinking to solve problems.[4]
- apply common sense to mathematical problems.[4]
- effectively communicate the student's understanding of the subject.[1,2]

The numbered superscripts refer to the Richland Cross-Disciplinary Outcomes addressed by that objective.

Richland Cross-Disciplinary Outcomes

Richland Community College has established some outcomes for degree-seeking students. These are not necessarily completed within a single course, but should be demonstrated and assessed at some point before the student graduates. Richland may utilize anonymous student work samples for outcomes assessment and continuous improvement of courses and programs.

Richland Community College's cross-disciplinary outcomes are:

1. The degree-seeking student will communicate effectively in writing.
2. The degree-seeking student will orally communicate effectively.
3. The degree-seeking student will access, evaluate, and appropriately use information in research and applied contexts.
4. The degree-seeking student will think critically and creatively.

Program Outcomes

In addition to the cross-disciplinary outcomes, the mathematics program at Richland Community College has established some discipline-specific outcomes and goals.

1. **Mathematical Reasoning**: Students will apply mathematical reasoning to solve story problems. This goal influences the course, but is not measured directly.
2. **Preparatory Skills**: Students will demonstrate mathematical competencies needed for success in other courses. This goal influences the course, but is not measured directly.

Type of Instruction

Discussion, problem solving, student questions, student participation, oral presentations, and lecture. Students are expected to read the material before coming to class and are strongly encouraged to come to class with a list of questions and to ask these questions.

Method of Evaluation

Any of the following methods of evaluation may be used: problem solving exams, objective exams, essays, research papers, oral presentations, group projects, individual projects, quizzes, homework, discussions, and activities.

Exams (65%)

There will be three chapter exams plus a comprehensive final.

- **Exam 1**: First Order Differential Equations (15%)
- **Exam 2**: Higher Order Differential Equations (15%)
- **Exam 3**: Laplace Transforms (15%)
- **Final Exam**: Comprehensive final exam (20%)

Take-Home Exams (20%)

Some of the material in Differential Equations is too time consuming to adequately test in a 70 minute period; this content will be assessed with take-home exams.

- **Take Home 1**: Applications of First Order Differential Equations (5%)
- **Take Home 2**: Applications of Second Order Differential Equations (5%)
- **Take Home 3**: Series Solutions (5%)
- **Take Home 4**: Systems of Differential Equations (5%)

Assignments (15%)

This is a catch-all category for all other assignments, assessments, discussions, and activities in the course. 10% of the assignments in this category will be dropped. Here are some of the more prevalent assignment types.

- **Homework** problems from the textbook will be assigned. These are mostly-odd problems from the book that students work and check using answers from the back of the book, the class wiki, intuition, other students, or the instructor. Homework is essential to mastering the material. Problems on the exams are often similar to problems from the homework. Instead of turning in homework, students will be given a quiz in Canvas with a few short questions similar to the problems they worked for the homework.
- **Technology Projects** will involve writing computer programs or using a computer algebra system to solve the more challenging problems.
- **Quizzes** will be given, especially to assess learning during long chapters.
- **Chapter Highlights** are summary documents of the important concepts in a chapter that are prepared by the student to help them review and understand each chapter.

Exam Scoring Rubric

Each question on exams will be scored according to the following rubric.

Rating	Score	Description
Awesome	105%	Correct answer with sufficient work
Good	90%	Correct answer without work, only transcription errors
Okay	75%	Wrong answer, mathematical but not conceptual errors
Fair	60%	Few conceptual errors, but on the right track
Poor	45%	Major conceptual errors, but has some idea of solution
None	0%	Did not answer, answer or work completely wrong

The rubric is a guideline, but there is some fluidity. The point is that to get full credit (extra credit) you will need to show work. If you copied something wrong but did everything else right, then you can still end up with a good. On the other hand, if your work is completely wrong but you happened to guess correctly, you may not get any points.

Some questions will be more skills oriented and not require a lot of work but may contain multiple parts. The rubric does not apply to questions like that and so the percentage of correct questions will be used to find the closest rating from the rubric.

Grading Policy

Letter grades will be assigned to final adjusted scores as follows:

A: 90-100%   B: 80 - 89%   C: 70-79%   D: 60-69%   F: below 60%

Final scores will be rounded to the nearest integer, so a 79.5% will round up to 80% and be considered a "B".

All grades are subject to audit and correction. Sometimes mistakes are made entering grades, other times mistakes are made in the grading itself. Your grade may increase or decrease when this happens. For this reason, you should strive to do better than the minimum needed for the grade you desire.

Consideration may be given to such qualities as participation, attitude, and cooperation to produce the optimal learning situation for everyone.

Grades will be kept inside the Canvas learning management system.

Assignments are due by the end of the day. Late assignments lose 20% of their value per calendar day. The instructor reserves the right to apply this rule to missed exams as well as regular assignments.

Absolutely no late work will be accepted after May 9.

Extra Credit

Exams may earn up to 5% extra credit if you get the questions correct and show sufficient

work. Since exams are worth 85% of the grade, this allows for up to 4.25% extra credit overall.

Course Expectations

Student Expectations of Instructor

Here are some things you can expect from the instructor.

- Responses to email or Canvas messages will occur in a timely manner. The goal is within 12 hours during the week and within 36 hours over the weekend. At times, you will find the instructor at the computer and have a response to simple questions within 15 minutes. That is not, by any means, a guaranteed response time, but don't be surprised if it happens. I do not have a smartphone and am not connected to email 24-7. I do take my laptop with me while traveling, but sometimes hotel internet is flaky. In other words, don't wait until something is due to ask about it. When the problem is too difficult to answer within 12 hours, the instructor will send you a message notifying that it will take longer.
- Assignments will be graded within 3 days of submission. Exams may take longer and the instructor may withhold release of exam grades until all students have completed their exams.
- The instructor will provide guidance and direction on assignments, but will usually steer the student towards the answer rather than just providing the correct answer. Understanding the problem and process is more important than just getting the answer.
- When the instructor makes a mistake, he will admit it and not blame Canvas or other technology for his mistakes. Be aware that the explanation of the mistake may include his frustration with the technology, but he will accept blame if it is really is his mistake. If the mistake warrants, adjustments may be made.
- The instructor will treat students with civility and respect.

Instructor Expectations of Student

Here is what is expected out of students in this course.

- Students will communicate with the instructor. Life-events happen, but the instructor needs to know about them as soon as possible when they are going to interfere with learning. Do not just disappear from the course for a while.
- Students will be civil and respectful of all persons in the course.
- Students will monitor Canvas and their student emails and respond to the instructor or other classmates in a timely fashion.
- If a student contacts the instructor for help and then figures it out before the instructor has a chance to respond, the student will notify the instructor that the problem has been resolved or that help in a different area is needed.
- Students will read the book, watch the videos, and read the material in Canvas before contacting the instructor for help. Many of the questions that students have are already

answered in the online material and you can find them faster yourself than you can by contacting the instructor and waiting for a response.

■ When a student contacts the instructor for help, the student should be prepared to show what has been attempted or already accomplished. If emailing, the student should be specific in his or her requests. Do not send a request for help that just says, for example, "I don't understand derivatives," and expect help by email. That is too large of a topic and it is usually just one sticking point that is difficult to self-identify when you don't understand the material. You should meet with the instructor in person in that situation.

■ Students will be academically honest in their work. Among other things, this means that you will complete your own homework and take your own exams. You are welcome to receive help on homework, projects, and discussions, but the exams need to be yours. You may use a calculator on all exams unless otherwise indicated.

■ Students will seek help if there are technology issues.

Attendance Policy

Participation vs Attendance

Regular attendance and participation is essential for satisfactory completion of this course. You need to be actively involved in this course several times a week.

You need to regularly monitor your Canvas inbox and Richland email for notifications and information.

Students who do not communicate with the instructor and have irregular or infrequent attendance, miss the first day of class, or miss any two consecutive days may be dropped.

Students who, because of excessive absences, cannot complete the course successfully, are required to be administratively dropped from the class at midterm. If a student stops attending after midterm, it is the student's responsibility to withdraw to avoid an "F". Do not stop participating and assume that you will be withdrawn from the class by the instructor.

Although dropping students for non-attendance at midterm is required, students whose participation in the course is occasional or sporadic may be dropped from the class at any point during the semester at the instructor's discretion. The safest way to make sure you're not dropped for non-attendance is to continue to actively participate in the course.

The student is responsible for all assignments, changes in assignments, or other information given in the course. Regularly and frequently monitor your communications for updates or changes, but communicate with your classmates to get notes and other information.

Time Requirements

The federal government requires that there is enough material in this course for a typical student to spend a minimum of 12 hours per week working on it.

In [34 CFR 600.2](), the federal government requires that the amount of student work for a credit hour reasonably approximates not less than one hour of class and two hours of out-of-class work per week for each semester hour. That is, there are three (3) hours of material per week for each credit hour.

Students taking a four (4) credit hour course should expect to spend a minimum of 12 hours per week on this course. Students taking a five (5) credit hour course should expect to spend a minimum of 15 hours per week on this course.

If you are taking 15 credit hours, then you should expect to spend at least 45 hours a week on course work. That is the equivalent of a full-time job. The government considers that if you are taking 15 credit hours, then being a student is your full-time job.

According to the federal regulations, this target is a minimum, not an average.

Failure of the course to meet these time requirements could result in loss of program integrity, forcing the college to recover federal financial aid, and ultimately loss of accreditation.

At face value, it sounds overwhelming and impossible, but the time includes reading the book, watching videos, working on homework and projects, and participating in discussions.

The point is to manage your time effectively so that you don't feel the course is overwhelming.

Technology

The use of technology in this course is consistent with the Technology Statement in the [Illinois Mathematics & Computer Science Articulation Guide]() (IMACC, 2019, p. 2). Technology is used to enhance the learning of Differential Equations, but it is not the focus of the instruction. There will be instances when we will use the calculator or computer to aid in our understanding or remove some of the tediousness of the calculations (especially in the area of numerical approximations). There may be some projects, homework, or portions of a test that require you to use technology to complete.

Here are some of the technology tools that we may use.

Calculator

This class is an upper-level mathematics class and a graphing calculator is preferred. That said, differential equations does not use many of the typical features of a graphing calculator (graphing functions, finding values from the graph, displaying a table of values, and finding the definite integrals numerically), so a scientific calculator may be sufficient. A Texas Instruments TI-84 or TI 83 is the recommended calculator and will be used by the instructor for demonstration purposes.

The TI-89 or TI-Nspire CAS calculators have a computer algebra system (CAS) built in and offer

advantages, especially if you plan on taking additional calculus or engineering courses. A word of caution: having an advanced calculator does not compensate for having weak calculus skills.

Calculators may be used to do homework and may be used on exams and/or quizzes.

Computer

It is highly recommended that you have a computer and do not attempt to complete this course with just a tablet or smart phone. That said, there is no software that must be installed to complete the course, but there is software that can be installed to make your life a whole lot easier. That software will run on Windows, Mac, or Linux operating systems, but not on a Chromebook.

Maxima

Maxima is an open-source computer algebra system that is free for you to download and use at home. It is available from http://maxima.sourceforge.net/

WinPlot

WinPlot is a free graphing software package for Windows written by the late Rick Parris at Phillips Exeter Academy in Exeter, New Hampshire. The software is useful for creating graphs and it is easy to copy/paste the graphs into other applications. Exeter Academy maintained the server with the software for about 4 years after Parris' death, but the site is no longer available. To download the software, visit the instructor's Mathematical Software page at https://people.richland.edu/james/software

As the name suggests, WinPlot is a Windows only application. Mac users may have similar software available to them, but it won't be called WinPlot.

Microsoft Excel

This spreadsheet application is useful for numerical methods such as Euler, Improved Euler, and Runge-Kutta 4. It is loaded on all of the student computers at Richland.

Microsoft Office 365, which includes Word, Excel, PowerPoint, Access, and Publisher, is available free to students enrolled in credit courses at Richland through the Microsoft Student Advantage program. More information is available at https://jics.richland.edu/MicrosoftStudentAdvantage/

You can also install Excel by going logging into https://office.com using your Richland email address and NetID. Then click on Install Office.

Additional Supplies

The student should have access to a pencil, paper, and calculator each day. You may occasionally want a ruler or graph paper.

Additional Help

The student is encouraged to seek additional help when the material is not comprehended. Mathematics is a cumulative subject; therefore, getting behind is a very difficult situation for the student. There are several places where you can seek additional help in your classes.

Some services provide a phone number or extension. When only an extension is provided, you will need to first call the main phone number at 217-875-7211.

Instructor

I try to make myself as available to the students as I can. My office hours are listed at the beginning of this syllabus, but those are just the times I'm scheduled to be available to the students. Grab me and ask me questions if you see me in the hallway. Ask questions before or after class. If I'm in my office and it's not my scheduled office hours, go ahead and stop in.

The instructor should be considered the authoritative source for material related to this class. If a tutor or other student says something that disagrees with the instructor, believe the instructor.

Study Groups

Probably the best thing you can do for outside help is to form a study group with other students in your class. Work with those students and hold them accountable. You will understand things much better if you explain it to someone else and study groups will also keep you focused, involved, and current in the course.

Mathematics Enrichment Center

The Mathematics Enrichment Center, room S102, provides free walk-in tutoring for mathematics courses. They also provide help with study skills and preparation for taking the mathematics placement test.

Contact tutoring@richland.edu for more information.

Testing Center

The testing center is located in room N114. You may be required to use the testing center if you miss an in-class exam or if an online exam needs proctored.

You must provide a photo identification and know the name of your instructor to use the service.

Academic Success Center

The Academic Success Center consolidates several student services into one area. It is located in room S134.

Tutoring

The tutoring center provides tutoring on a walk-in or appointment basis in room S134.

Students seeking mathematics tutoring should visit the Mathematics Enrichment Center in room S102. For the current tutoring schedule and study resources, visit https://richland.instructure.com/courses/1830817

Accommodations

The Accommodations Office is located in room S134 and provides support to students with documented physical, psychiatric, or learning disabilities. Students needing accommodation services should visit https://www.richland.edu/accommodations or contact accom@richland.edu as early in the semester as possible.

If you request an accommodation, you will be required to provide documentation that you need that accommodation and the instructor will be unable to provide the accommodation until the notified of the accommodations by the Accommodations Office.

Students who have approved accommodations should contact their instructor to discussion the implementation of the accommodations for the course.

Student Tech Support

The Student Tech Support help desk is located inside the Teaching and Learning Center. They provide technical support for students including answering questions about Canvas, myRichland, e-mail, cell phones, tablets, and laptops. They can also help troubleshoot your computer issues and make sure your computer is ready for course work.

They are located in room W202, but the best way to contact them is electronically.

For Canvas-related issues, use the "Help" link in the lower-left corner of Canvas and select Report a problem.

For non-Canvas related issues, email student.tech@richland.edu or visit https://www.richland.edu/academics/tlc/student-tech-support/

Open Computer Labs

Students often wish to know where, besides the classroom, they can go to use the software. There are computers located in the Learning Resources Center and in the Academic Success Center that you may use.

Microsoft Office Student Advantage

Currently enrolled students in credit courses may download and install the Microsoft Office software on their personal Mac or Windows devices at no additional cost. To install the software, visit https://office.com, log in using your Richland email address and NetID password, and choose "Install Software."

For questions or assistance with Microsoft Office, contact Student Tech Support by email at student.tech@richland.edu, at extension 6376, or in person at the Teaching and Learning Center in room W202.

Richland Thrive

Richland Thrive is an implementation of an early-alert identification and intervention system powered by the Hobsons' Starfish software. The software is designed to help students achieve academic success, retention, and graduation.

When academic indicators suggest a student may be experiencing difficulties that may negatively impact academic success, the instructor may raise a referral flag that notifies the student of concern through an email to the student's Richland email, requests a Student Success Coach or Student Success staff member contact the student to discuss and follow-up on the issue, or encourages student to discuss the matter with the instructor.

If you receive an email notification of a referral flag in any of your courses, you are encouraged to contact the instructor as soon as possible to discuss the issue. The purpose of the discussion is to accurately assess its potential impact on your academic success and to plan and put into action steps to be successful in the course. For more information about the Richland Thrive system, contact the Student Success Center at ext. 6267.

College & Division Policies

Academic Integrity Policy

All students are expected to maintain academic integrity in their academic work and honesty in all dealings with the College. A student who cheats, plagiarizes, or furnishes false, misleading information to the College is subject to disciplinary action up to and including failure of a class or suspension/expulsion from the College.

The Academic Integrity Policy also governs student misuse of intellectual property.

All work must be original and completed during the Spring 2025 semester to receive credit. Generative AI such as ChatGPT is not considered original work.

Students who are suspected of violating the Academic Integrity Policy may be required to take quizzes or exams in a proctored setting.

NetID Password and User Account Privacy

Your Richland NetID password should not be shared with anyone. Providing your password or account access to anyone else will be considered a violation of the RCC Academic Integrity Policy and the Responsible Use of Information Technology Policy.

To protect your account, you should always log off of College computers and online systems before exiting a classroom or public location.

Students who are suspected of allowing others to access their account may be required to take quizzes or exams in a proctored setting.

Non-Discrimination Policy

Richland Community College policy prohibits discrimination on the basis of race, color, religion, sex, marital or parental status, national origin or ancestry, age, mental or physical disability (except where it is a bonafide occupational qualification), sexual orientation, military status, status as a disabled or Vietnam-era veteran.

Responsible Use of Classroom Content

Class discussions, papers, pictures, video, and any other work created for a course are all considered official course content. Work including papers, discussions, quizzes, assignments, etc., must be confined to the classroom (either on-campus or virtual) and should not be shared outside the classroom without the express permission of the person who created it. Students should respect the privacy of person-to-person or person-to-class communication in all forms. Violating others' privacy may result in removal from the course. Significant or repeated violations may result in suspension or expulsion. This standard is pursuant to Board Policy 5.8.1 (Responsible Use of Information Technology) and the Code of Student Conduct

Copyright Notice

The materials used in this course are protected by Copyright law. Faculty lectures, course supplementary materials, articles, quizzes and exams, papers, data, web pages, and artwork are among the properties protected. This is not an exhaustive list. Items may or may not be marked with a Copyright symbol ©. Regardless, the intellectual property used in this course is owned by the creator who is the sole determiner of how the property is used, including but not limited to copying, distribution, performance, display, or revisions.

Any questions a student may have about the use of course materials can be explained by the instructor or library staff.

Student misuse of intellectual property is subject to the Academic Integrity Policy as explained in the Student Handbook and Section 5.9 of the Board Policy Manual.

Title IX and Sexual Misconduct

Richland Community College is committed to providing for all students a safe learning environment that is free of all forms of discrimination and sexual harassment, including sexual assault, domestic violence, dating violence, and stalking. If you (or someone you know) has experienced or experiences any of these incidents, know that you are not alone.

All Richland Community College faculty members are "responsible employees," which means that if you tell me about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking, I must share that information with the Title IX Coordinator. Although I have to make that notification, you will control how your case will be handled, including whether or not you wish to pursue a formal complaint. Richland's goal is to make sure students are aware of the range of available options and have access to the needed resources.

If you wish to speak to someone privately, you can contact Growing Strong Sexual Assault Center at 217-428-0770.

More information about Title IX can be found on Richland's website at https://www.richland.edu/campus-police. Richland's Title IX Coordinator is Nicole DelMastro-Jeffery, titleix@richland.edu, N186A, phone: 217-875-7211, ext. 6273.

Electronic Communication Devices Policy

The Mathematics, Science, and Business Division prohibits the use of cell phones, pagers, and other non-learning electronic communication equipment within the classroom. All equipment must be turned off to avoid disturbances to the learning environment. If a student uses these devices during an examination, quiz, or any graded activity, the instructor reserves the right to issue no credit for these assignments. The instructor needs to approve any exceptions to this policy.

Richland Community College Core Values

- **Commitment**: We are dedicated to meeting the needs of the communities we serve.
- **Respect**: We recognize the expertise of all members of the College community and encourage individual contributions.
- **Excellence**: We strive to develop and pursue higher standards.
- **Integrity and Accountability**: We are accountable to the communities we serve and are truthful, sincere, transparent, and responsible for our actions.
- **Diversity, Equity, Inclusion, and Belonging (DEIB)**: We foster an environment where diversity, equity, inclusion, and belonging are incorporated across all levels of the organization and recognize the importance of eliminating barriers for students, employees, and community members.

Other College Services

Richland provides many services to its students. While they may not directly pertain to this class, you may benefit from them. A list of support services with descriptions, phone numbers, and email addresses is found online at
https://jics.richland.edu/syllabi/mastersyllabus-studentservices.pdf

Weekly Calendar

This course is organized by unit and day rather than by week. Content scheduled and due throughout the week and the title for the week may not reflect the only content covered that week. This chart is provided as a convenience for students who organize their life by calendar week.

Students will receive a separate daily calendar that contains the section numbers covered each day as well as the due dates for major activities. Due dates are also listed in Canvas.

Week 1, January 13–19 . . . . **Introduction**

- Definitions and terminology
- Initial-value problems, existence and uniqueness of solutions
- Differential equations as mathematical models

Week 2, January 20–26 . . . . **1st Order**

- Solution curves without a solution, direction fields; Autonomous first-order differential equations
- Separation of variables

Week 3, January 27–February 2 . . . . **1st Order**

- Linear equations, integrating factor
- Exact equations, potential functions (calc 3), substitutions to make exact
- Solutions by substitutions; homogeneous equations, Bernoulli equations, linear substitution
- Receive Take Home 1

Week 4, February 3–9 . . . . **Numeric Solutions**

- Euler's method; Numerical solvers
- Improved Euler
- Runga-Kutta methods (RK4)
- Exam 1: First order differential equations

Week 5, February 10–16 . . . . **Higher Order**

- Linear differential equations; initial-value and boundary-value problems, homogeneous equations, non-homogeneous equations, ; Linear independence, Wronskian, existence and uniqueness of solutions
- Take Home 1 Due
- Reduction of order

Week 6, February 17–23 . . . . Higher Order

- Homogeneous linear equations with constant coefficients
- Undetermined coefficients – superposition approach
- Undetermined coefficients – annihilator approach

Week 7, February 24–March 2 . . . . Higher Order

- Variation of parameters
- Receive Take Home 2
- Cauchy-Euler equation

Week 8, March 3–9 . . . . Series Solutions

- Taylor series solutions
- Exam 2: Higher order differential equations
- Review of power series, shifting indices
- Take Home 2 Due

Week 9, March 10–16 . . . . Spring Break

- Spring break, no classes

Week 10, March 17–23 . . . . Series Solutions

- Solutions about ordinary points, recurrence relations
- Solutions about singular points, Method of Frobenius
- Receive Take Home 3

Week 11, March 24–30 . . . . Laplace Transform

- Special functions; Bessel's Equation, Legendre's Equation
- Definition of the Laplace transform
- Take Home 3 Due

Week 12, March 31–April 6 . . . . Laplace Transform

- Inverse transforms and transforms of derivatives, solving initial value problems
- Operational properties of the transform; translations on the s-axis; Translations on the t-axis, unit step (Heaviside) function, piecewise functions

Week 13, April 7–13 . . . . Laplace Transform

- Derivatives of a transform, transforms of integrals, convolutions; Transforms of periodic functions
- The Dirac Delta function
- Exam 3: Laplace transforms

Week 14, April 14–20 . . . . Higher Order

- Solving systems of linear equations using elimination
- Solving systems of linear equations using Laplace Transforms

Week 15, April 21–27 . . . . Systems of Linear DE

- Preliminary linear algebra theory; superposition principle, general solutions; Existence and uniqueness of solutions; Linear independence/dependence; Wronskian
- Homogeneous linear systems; distinct real eigenvalues; repeated eigenvalues, complex eigenvalues, eigenvectors
- Receive Take Home 4

Week 16, April 28–May 4 . . . . Systems of Linear DE

- Nonhomogeneous linear systems; undetermined coefficients, variation of parameters
- Matrix exponentials, nonhomogeneous solutions
- Take Home 4 Due

Finals Week, May 5–10 . . . . Final Exams

- Review Final
- Comprehensive Final Exam, Wednesday, May 7, 10:00-11:50 am