Math 230 – Differential Equations

Spring 2021 Course Syllabus

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

If you are coming to campus, you must prescreen at https://www.richland.edu/prescreen
Updated information regarding Richland's response to COVID-19 can be found on the College's coronavirus page at https://www.richland.edu/coronavirus

Course Meeting Information

The course meets January 14 through May 13. Here are some important dates.

- January 27 is the last day to withdraw and get a refund.
- May 7 is the last day to withdraw from the course without receiving a letter grade.
- The comprehensive final exam may be completed anytime between May 10 and May 13.
- Absolutely no late work will be accepted after

This is an online course and does not meet face-to-face. The Canvas learning management system will be used. 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 is determined by submission of assignments within Canvas. Assignments will be due throughout the week and, per federal guidelines, you 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. Please do not leave a voice mail as it will not reach the instructor in time to help you.

Office Hours

Office hours will be held by Zoom meeting. Information is provided within Canvas.

Office hours are tentatively scheduled for the times listed below.

- Monday, Wednesday, Friday: 1:00 pm – 1:50 pm
- Tuesday, Thursday: 10:00 pm – 10:50 pm (yes, 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 cover: First-order equations (including initial value problems, basic numerical methods, existence and uniqueness of solutions, separable equations, linear equations, exact equations, substitution methods and applications). Higher-order equations (including 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

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.

These exams will be available within Canvas as a PDF document. You will have 90 minutes to download and complete each chapter exam and 150 minutes to complete the final exam. Within 10 minutes of completing the exam, you will need to scan your response to a PDF file and then submit it to Canvas.

- **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. These items will be scanned and submitted to Canvas as a PDF file.

- **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.
- **Discussions** are conducted online within Canvas and provide opportunity for students to interact with each other.

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 13.

Course Expectations

Student Expectations of Instructor

Here are some things you can expect from the instructor.

- The instructor will be present in the course. This is not a correspondence course; the instructor will be checking the course daily. The instructor may occasionally provide

guidance in the discussions, but the goal is for the students to run with those.

- Responses to email or Canvas messages will occur in a timely manner, usually within a few hours, but at most by the next day.
- Assignments will be graded within 3 days of submission.
- 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. As an online course, there is great potential for misunderstanding. Electronic communication is more difficult than in-person communication and communicating mathematics electronically is even more difficult because of the special symbols, formatting, and language. It is easy to mistake something said and blow it out of proportion. The instructor does not intend to offend anyone, so if you're taking something that way, please accept my apologies ahead of time and then ask for clarification.

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 be present in the course on near-daily basis. There may be a few times where you miss a day, but you should be in the course at least four (4) times a week. This is not a course where you can check in every few days or just on the weekend and succeed.
- 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.
- Students will take advantage of any course forums to ask questions that are not personal in

nature. This allows other students to benefit from and potentially answer the questions.

- When a student contacts the instructor for help, the student should be prepared to show what has been attempted or already accomplished. 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." While you may be lost, that is a larger request than can be solved by email and it provides no place for the instructor to begin.
- 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.
- Students will be asked to sign, date, and submit an honor statement before each exam. The honor statement is "I will not give or receive any unauthorized assistance on this exam." The authorized resources are described inside Canvas, but typically allow the textbook, notes, homework, lecture material inside Canvas, and calculator. Unauthorized resources are typically outside resources including other people. Outside resources may be used as long as they are in your notes before you begin the exam.
- Students will seek help if there are technology issues.

Attendance Policy

Participation vs Attendance

Online students are subject to the same attendance requirements as a traditional face-to-face course, but since there are no class meetings to attend, it must be redefined to mean active participation in the course.

Student attendance in an online course is defined as *active participation* in that course as described in the course syllabus. Here is that definition:

> Active participation may include posting to discussion forums, submitting assignments, and completing quizzes or exams. Logging into the course or viewing content does not satisfy the definition of active participation.

Online Attendance Policy

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, if not daily. 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.

Printer

Having a working printer is highly recommended. Your exams and other handouts will be delivered as a PDF file. While you can hand-write the answers to the exams or copy the information down, it takes time and introduces opportunity for copying mistakes.

SmartPhone or Scanner

You will need to scan your written work to submit it into Canvas. Adobe makes a free app called Adobe Scan that will work with your smart phone. Some people may have multifunction printers that include a scanner and that can work as well.

The point is that you need some way of getting your written work submitted to Canvas as a PDF file.

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/

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.

Due to COVID-19, this information may not be current.
You should contact the center for more information.

Instructor

Because of the COVID-19 shutdown, I will not be available for face-to-face meetings with students. Meetings may be conducted using Zoom. The instructor is available during the scheduled office hours and by request.

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.

Because of COVID-19, these study groups may need to be conducted online.

Mathematics Enrichment Center

The Mathematics Enrichment Center, located in S118, provides free walk-in tutoring for mathematics courses.

Contact tutoring@richland.edu for more information.

Academic Success Center

The Academic Success Center consolidates several student services into one area. It is located in the south wing of the first floor next to the Kitty Lindsay Learning Resources Center (library).

Testing

The testing center is located in room N114. You must provide a photo identification and know the name of your instructor to use this service.

Tutoring

The tutoring center provides tutoring on a walk-in or appointment basis in room C148. Students seeking mathematics tutoring should visit the Mathematics Enrichment Center.

Accommodations

There are accommodations available for students who need extended time on tests, note takers, readers, adaptive computer equipment, braille, enlarged print, accessible seating, sign language interpreters, books on tape, taped classroom lectures, writers, or tutoring. If you need one of these services, then you should see Learning Accommodation Services in room C148. If you request an accommodation, you will be required to provide documentation that you need that accommodation.

Teaching and Learning Center (formerly Online Learning)

The Teaching and Learning Center is the new name for Online Learning, whose name didn't do

justice to the help they provided. 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 W143, but the best way to contact them is through the "Help" link in the lower-left corner of Canvas or at https://www.richland.edu/academics/online-learning/online-learning-help-desk/

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.

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.

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 a safe learning environment for all students 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 us about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking, we must share that information with the Title IX Coordinator. Although we 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. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.

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. Richland's Title IX Coordinator is Alex Berry, email: aberry@richland.edu, office: N105, phone: 217-875-7211, ext. 6314.

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.
- Accountability - We assume and demonstrate responsibility for our actions.
- Diversity - We believe that our similarities and differences are opportunities for establishing a common bond and strengthening the College.

Other College Services

There are some additional services that Richland provides to its students. While they may not directly pertain to this class, you may benefit from them.

Learning Feedback System

At the end of each semester, students are invited to provide feedback to their instructors about the course. This includes things that went well and opportunities for improvement. This online feedback is anonymous and the instructor won't see it until grades have been turned in.

The Learning Feedback System (LFS) is primarily intended to provide feedback to the instructor. However, if you have a issues or concerns, you should not wait until the end of the semester to talk to your instructor. Please come to me at any time. The feedback system is available at https://people.richland.edu/feedback.

myRichland

myRichland is the student information system portal and is located at https://my.richland.edu.

You may use it to find the course schedule, register for classes, check your grades, obtain unofficial transcripts, review financial aid, and other student services.

Library

The Learning Resources Center (LRC) has print and electronic resources available. They offer research assistance and information literacy sessions; they also have individual and group study areas.

Student Success Center

The Student Success Center, in room N117, is designed to be a one-stop shop for most student services. These include advising and registration, career services, counseling services, financial aid, veteran affairs, student records, and the transfer center.

The Student Success Center has coffee and snacks available daily, school supplies such as paper, pens, and highlighters, and personal supplies such as toothpaste, toothbrushes, and cough drops.

A few other student services are located in other rooms of the main building. These include Campus Life, which supports new student orientation, clubs, organizations, and student leadership, and the TRiO program that offers academic and personal support to first-generation, low-income, and students with disabilities.

Office of Student Engagement

The Office of Student Engagement, in room C133, has a Snack Center to provide grab-and-go food for students who were short on cash while on campus or who did not have time to grab a meal before coming to campus. The office also has personal supplies such as condoms and menstrual products available for students.

The Gender Inclusive/Family bathroom and many women's bathrooms are also stocked with complimentary menstrual products.

Food Pantry

In addition to the snacks in the Student Success Center and the Office of Student Engagement, Richland has partnered with The Good Samaritan Inn to create The Pantry at Richland Community College. If you are a student facing food insecurity, please complete the referral form at https://bit.ly/2ykuGUL or visit the Student Success Center.

Directory of Student Services

Due to construction on campus that began in Fall 2020, some services may be relocated. Check with faculty or in the Student Success Center for locations.

Because of COVID-19, some offices will see reduced staffing and availability. A list of support services with descriptions, phone numbers, and email addresses is found online at https://jics.richland.edu/syllabi/mastersyllabus-studentservices.pdf

The main phone number for Richland Community College is 217-875-7211 or 217-875-7200. This is an automated system available 24 hours a day.

Student Service	Location	Extension
Accommodations	C148	6379
Campus Life	C131	6243
Career Services	N117	6267
Cashier	N117	6227, 6226
Counseling Services	N117	6267
Financial Aid	N117	6271
Library	C152	6303
Mathematics Enrichment Center	S118	6383
Registration and Enrollment	N116	6267
Student Employment	N103	6305
Student Engagement	C131	6243
Student Records	N117	6267
Student Support Services/TRiO Program	C143	6440
Teaching and Learning Center	W143	6376
Testing	N114	6238
Transfer Center	N117	6438
Tutoring	C148	6379
Veterans' Affairs	N117	6205

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 0, January 14–17 . . . . . Introduction to Differential Equations

- Definitions and terminology

Week 1, January 18–24 . . . . . Introduction to Differential Equations

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

Week 2, January 25–31 . . . . . First-order Differential Equations

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

Week 3, February 1–7 . . . . . First-order Differential Equations

- Exact equations, potential functions (calc 3), substitutions to make exact
- Solutions by substitutions; homogeneous equations, Bernoulli equations, linear substitution
- *Receive Take Home 1: Applications of First Order Differential Equations*
- Euler's method; Numerical solvers
- Improved Euler

Week 4, February 8–14 . . . . . Higher-order Differential Equations

- Runga-Kutta methods (RK4)
- *Exam 1: First Order Differential Equations*
- Linear differential equations; initial-value and boundary-value problems, homogeneous equations, non-homogeneous equations,
- *Take Home 1 Due: Applications of First Order Differential Equations*

Week 5, February 15–21 . . . . . Higher-order Differential Equations

- Linear independence, Wronskian, existence and uniqueness of solutions
- Reduction of order
- Homogeneous linear equations with constant coefficients

Week 6, February 22–28 . . . . . Higher-order Differential Equations

- Undetermined coefficients – superposition approach
- Undetermined coefficients – annihilator approach
- Variation of parameters

Week 7, March 1–7 . . . . . Higher-order Differential Equations

- Variation of parameters
- *Receive Take Home 2: Applications of Second Order Differential Equations*

- Cauchy-Euler equation
- Taylor series solutions

Week 8, March 8–14 . . . . . Series Solutions of Linear Equations

- *Exam 2: Higher Order Differential Equations*
- Review of power series, shifting indices; Solutions about ordinary points, recurrence relations
- *Take Home 2 Due: Applications of Second Order Differential Equations*

Week 9, March 22–28 . . . . . Series Solutions of Linear Equations

- Solutions about singular points, Method of Frobenius
- *Receive Take Home 3: Series Solutions*
- Special functions; Bessel's Equation, Legendre's Equation

Week 10, March 29–April 4 . . . . . Laplace Transform

- Definition of the Laplace transform
- *Take Home 3 Due: Series Solutions*

Week 11, April 5–11 . . . . . 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 12, April 12–18 . . . . . Laplace Transform

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

Week 13, April 19–25 . . . . . Higher-order Differential Equations

- Solving systems of linear equations using elimination
- Solving systems of linear equations using Laplace Transforms
- Preliminary linear algebra theory; superposition principle, general solutions

Week 14, April 26–May 2 . . . . . Systems of Linear First-order DEs

- Existence and uniqueness of solutions; Linear independence/dependence; Wronskian
- Homogeneous linear systems; distinct real eigenvalues; repeated eigenvalues, complex eigenvalues, eigenvectors
- *Receive Take Home 4: Systems of Differential Equations*

Week 15, May 3–9 . . . . . Systems of Linear First-order DEs

- Nonhomogeneous linear systems; undetermined coefficients, variation of parameters
- Matrix exponentials, nonhomogeneous solutions
- *Take Home 4 Due: Systems of Differential Equations*

Finals Week, May 10–14. . . . . Final Exams

- *Comprehensive Final Exam*