Syllabus
Math 2090, version 1.2
Effective: January 17, 2017

Math 2090—Elementary Differential Equations and Linear Algebra

Course Description: Introduction to first order differential equations, linear differential equations with constant coefficients, and systems of differential equations; vector spaces, linear transformations, matrices, determinants, linear dependence, bases, systems of equations, eigenvalues, eigenvectors, and Laplace transforms.

Textbooks and Other Materials

Read the following textbook information carefully. Please use the ISBN listed below to order the correct materials. ODL is not responsible for student purchases that result in the receipt of the wrong materials. *It is your responsibility* to order the correct textbook materials. Courses are written to specific textbook editions; edition substitutions *are not allowed*.

Required Textbook

Stephen W. Goode and Scott A. Annin. *Differential Equations and Linear Algebra.* Third Edition. Upper Saddle River, NJ: Pearson Education Inc., 2007.

Hardcover:	**ISBN-13:** 978-0-13-045794-3	
	ISBN-10: 0-13-045794-9	
Loose Leaf:	**ISBN-13:** 978-0-321-65652-0	
	ISBN-10: 0-32-165652-0	

NOTE: There are options for electronic versions of the textbook not listed here. Be sure to order according to the correct edition.

Ordering Information

Please review the following tips for ordering your course materials:

1. Do not purchase your textbooks until your enrollment is approved. During the processing period, a new section may be opened that could require a different textbook or edition.
2. *Always order by the ISBN*. Publishers and vendors often offer the same textbook title under different ISBNs. You must have the correct ISBN to access your online website.
3. If you are having problems locating a textbook, contact us at Answers@outreach.lsu.edu for assistance.

Other Materials and Resources

A non-graphing, non-programmable calculator will be allowed on exams.

Required Software: Microsoft Word, Adobe Acrobat Reader

You must use a recent version of MS Word to upload assignment responses. You will use Acrobat Reader to view the module lecture materials.

We recommend that you use Mozilla Firefox or Google Chrome as your web browser. *Internet Explorer is not compatible with your Moodle course site.*

Required Hardware: Web cam with a microphone (built-in or external), headphones or working speakers, and reliable high speed internet

Proctored exams are completed online and require the hardware listed above. You are encouraged to review the technical requirements provided on the ProctorU website and to perform a test on their equipment prior to enrolling in this course to make sure they have the necessary resources available.

Technical Requirements: http://www.proctoru.com/tech.php

Equipment Test: http://www.proctoru.com/testitout/

Nature and Purpose of the Course

Mathematics 2090 is an introduction to linear algebra and differential equations primarily designed for the science major. Traditionally, linear algebra and differential equations are taught as two separate courses. By offering a course covering both topics, we can expose you to the applications of linear algebra and to the study of differential equations at the same time. In addition to providing the insight into the connections between the subjects, there is a second important reason for a combined linear algebra and differential equations course. A combined course can be completed much faster than two different courses. This allows you to complete the math requirement for your major and thus begin courses in your major more quickly.

The purpose of this course is to enable you to solve differential equations and systems of differential equations. Linear algebra is introduced, developed and then applied to solving differential equations. Specific material to be covered will be first order differential equations, linear differential equations, matrices and matrix algebra, determinants, eigenvalues and eigenvectors, vector spaces, linear transformations, linear dependence, bases and systems of differential equations.

It is assumed that you have completed a second-semester calculus course and are familiar with techniques of integration. If your integration techniques are rusty, then a thorough review is recommended before attempting Module 09 and beyond.

Course Outcomes

Upon completion of this course, students are expected to be able to:

1. Perform basic arithmetic operations on matrices
2. Differentiate and integrate matrix functions
3. Use row operations to reduce matrices to row-echelon and reduced row-echelon form
4. Use row operations to solve linear systems of equations
5. Calculate matrix determinants and inverses
6. Solve linear systems of equations with Cramer's Rule
7. Identify and utilize the concepts of vector spaces, subspaces, spanning sets, linear independence, bases, and dimension
8. Identify and utilize the concept of linear transformation
9. Compute eigenvalues and eigenvectors for a given matrix
10. Solve separable, exact, and linear first order differential equations
11. Solve homogeneous linear constant coefficient differential equations
12. Solve non-homogeneous linear constant coefficient differential equations using a variation of parameters and the method of undetermined coefficients
13. Interpret high order systems of differential equations as first order systems
14. Solve homogeneous linear systems of differential equations
15. Solve non-homogeneous linear systems of differential equations
16. Compute Laplace transforms by the definition
17. Compute inverse Laplace transformations
18. Solve initial value problems using Laplace tranforms
19. Use the first and second shift theorems for Laplace transforms

Working with the Course Materials

Remember, this course covers an entire semester of work or the equivalent of a classroom course lasting 15 weeks. That means that each module in this course equals nearly a week of course work and will require the same time and effort on your part. *Do not expect to complete each module in a single study session.* Understand, too, that if you choose to submit

assignments at a high pace, your instructor may not be able to grade your work at the same rate.

Each module contains information, activities, and assignments organized under a consistent series of headings. Get familiar with how the module is organized. Each module in this course is organized into the following sections:

1. The learning objectives for the module
2. Reading assignments from both the lecture material (key terms, theorems, and examples) and the textbook
3. A self-check comprising chapter review questions from the textbook
4. The graded module assignment

You should work through these parts of the module in order. Specific recommendations are provided in a link to the course module instructions, which you should review before beginning the first module.

Suggested Study Techniques

1. Carefully review the module objectives to help you focus on the information that will be covered on the exams.
2. Concentrate on the reading assignments, the module lecture material, and any additional resources provided. This review should include a detailed examination of any illustrative problems and examples. After an assignment has been completed, a rapid re-reading of the related text and other materials is strongly recommended.
3. Put yourself on a definite schedule. Set aside a certain block of hours per day or week for this course and work in a place where distractions are minimal.
4. Try to submit one assignment each week or at least every two weeks. Delays in submitting assignments usually result in lagging interest and the inability to complete the course.
5. Review your module assignments after they have been graded, paying special attention to any instructor feedback provided. We suggest that you wait for assignment feedback before you submit subsequent assignments.
6. Regardless of how you complete your graded assignments, keep in mind that module completion should not be your sole preparation for your exams. As with any college course, you should study for your exams.

Reading Assignments

You will read an average of 15–20 pages per module.

Topic Outline

This course covers the following specific topics:

Module	Topic
01	Matrices and Linear Algebra
02	Linear Systems, Row Operations, and Gaussian Elimination
03	Matrix Inverses and Determinants
04	Properties of Determinants and Cofactor Expansions
05	Vector Spaces and Subspaces
06	Spanning Sets, Linear Dependence, Linear Independence, Bases, and Dimension
07	Linear Transformations
08	Eigenvalues and Eigenvectors
09	Differential Equations—Basic Ideas and Separable Equations
10	First Order Linear Equations and Exact Equations
	Mid-Course Examination
11	General Theory for Linear Differential Equations and the Constant-Coefficient Homogeneous Case
12	The Method of Undetermined Coefficients: Annihilators
13	The Variation-of-Parameters Method
14	First-Order Systems of Differential Equations and Vector Formulations
15	General Results for First-Order Linear Differential Systems
16	Variation-of-Parameters for Linear Systems
17	Definition of the Laplace Transform
18	The Laplace Inverse and Solution of Initial-Value Problems
19	The First Shift Theorem and the Unit Step Function
20	The Second Shift Theorem
	Final Examination

Module Assignments

A large part of the instructional process is conducted through the Module Assignments that are located at the end of each module. Follow the steps listed below when submitting assignments.

1. Type your work in a document and then convert it to a PDF that you will submit for grading in Moodle. Make certain the copy you submit is legible. Further instructions are provided in each module assignment.

2. Put your name, enrollment number, course number, and module number at the top right hand corner of each page. Number your pages 1 of __, etc. Show all of the work required to obtain your answers. Answers submitted without accompanying justification will be given little credit.

3. Keep a copy of your work in case any of the files are lost or deleted.

4. Your assignments will be recorded according to the date received in Moodle.

Remember, your instructor has seven calendar days to grade each assignment.

General Guidelines

Carefully study the textbook material before you begin to prepare the module assignments. This study should include a detailed examination of the illustrative problems and examples, as well as the assigned reading. The textbook provides many examples to further your understanding of the subject matter.

Additionally, detailed examples and exposition are provided in the lecture materials to aid you with your study. This is a self-taught course and as such, it requires that you possess some self discipline. It is not appropriate for you to obtain outside help with your module assignments.

You should submit each module assignment as soon as it is completed. Once you submit an assignment, you cannot revise it, so be sure to check your work. Your instructor will normally post a grade for your assignment *within seven calendar days*. Understand that occasional delays will occur, such as during holidays and semester breaks or if you submit several module assignments within the same week. ODL will alert students in the event of closure or anticipated grading delays.

Do not rely too heavily on your textbook or other resource materials when preparing your assignments. If you do, you may not realize until exam time that the perfect response you prepared for an assignment was only possible because you referred to resource material without really learning or understanding the material and concepts. Therefore, *you should attempt each assignment without referring to the resource material,* and if you find it necessary to look up an answer, be sure you have actually learned the concept and material rather than merely reflecting it in the answer.

Put yourself on a definite schedule. Set aside a certain block of hours per day or week for this course and work in a place where distractions are minimal. Try to submit a module each week or at least every two weeks. Delays in submitting modulesles usually result in lagging interest and the inability to complete the course.

Academic Integrity

Students in Online Distance Learning (ODL) courses must comply with the *LSU Code of Student Conduct*. Suspected violations of the academic integrity policy may be referred to LSU Student Advocacy & Accountability (SAA), a unit of the Dean of Students. If found responsible of a violation, you will then be subject to whatever penalty SAA determines and will forfeit all course tuition and fees.

Plagiarism

Students are responsible for completing and submitting their own course work and preparing their own modules. All work submitted in the course modules must be the student's own work unless outside work is appropriate to the assignment; all outside material must be properly acknowledged. It is also unacceptable to copy directly from your textbook or to use published answer keys or the teacher's edition of a textbook.

Collaboration

Unauthorized collaboration constitutes plagiarism. Collaborative efforts that extend beyond the limits approved by the instructor are violations of the academic integrity policy. Students who study together are expected to prepare and write their own individual work for submission and grading.

For more information and links to the *LSU Code of Student Conduct* and the SAA website, go to the ODL Academic Integrity policy on our website.

Examinations and Grading Policy

There will be two multiple-choice examinations. The mid-course exam covers material in Modules 01–10 and follows Module 10, and the final exam covers material in Modules 11–20 and follows Module 20. You will have a maximum of three hours to complete the exams.

You are allowed a blank white board during the exam. To verify the white board is blank, you must show your white board to the proctor before you begin your exam. At the end of the exam, the proctor will instruct you to wipe clean the white board; the proctor must witness you wiping clean the white board.

You may also use a non-programmable, non-graphing calculator.

Module assignments are 100 points each, and exams are 100 points each.

Course grade = average of module assignments + exam scores. Each component is weighted by the following predetermined percentages.

Component	Weight (%)
Module Assignments	50%
Mid-Course Exam	25%
Final Exam	25%

YOU MUST EARN A PASSING AVERAGE ON THE EXAMINATIONS IN ORDER TO PASS THE COURSE

The following grading scale applies:

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97%–100% = A+
 93%–96% = A
 90%–92% = A-
 87%–89% = B+
 83%–86% = B
 80%–82% = B-
 77%–79% = C+
 73%–76% = C
 70%–72% = C-
 67%–69% = D+
 63%–66% = D
 60%–62% = D-
  0%–59% = F
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IMPORTANT: The final exam cannot be taken until you meet the following requirements. Under no circumstances may the final exam be taken earlier.

1. You must have been enrolled in the course for *at least three weeks*, regardless of when the modules and other exams are completed.

2. You must have a grade posted in the Moodle grade book for the Module 20 Assignment in order to unlock access to the final exam. Please allow at least seven days for the final assignment grade to be posted in the gradebook.

To read the full exam policy and other policy statements, visit
http://www.outreach.lsu.edu/Extended-Campus/Online-Distance-Learning/Guidelines-Policies/Policies.

Taking Your Examinations

You are required to create a Louisiana State University ODL ProctorU account and to take your examinations through ProctorU, a remote proctoring service that allows you to take exams anywhere with internet access (some restrictions apply). Information on creating your ProctorU

account can be found in the "Getting Started" module in Moodle. You cannot use an account created through another university, so if you already have an account, you will still need to create an account associated with LSU Online Distance Learning (ODL).

There is a separate charge for each proctored exam. The ProctorU website provides links you can use to find out how ProctorU works and to check your computer to see that it meets the technical requirements. In addition, to test using ProctorU, you need access to a web cam with a microphone (built-in or external), headphones or working speakers, and reliable high speed internet to use this service. A complete list of technical requirements is available from the ProctorU website.

You should schedule your exams about a week before you are ready to take them in order to avoid any additional charges.

Transcript Information

After you have completed this course, your grade will be filed with the Office of the University Registrar. If a transcript is needed, it is your responsibility to make a request to the registrar. If you would like to order a transcript, visit the Office of the University Registrar Transcript Requests page to view your options at
http://sites01.lsu.edu/wp/registraroffice/student-services/transcript-request/.

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