# MATH 3330. Differential Equations—Syllabus

**Thomas W. Judson, Professor**  
**Department of Mathematics and Statistics**

## Course Description
Solving of differential equations of physics, chemistry and engineering, and a study of the characteristics of the solutions. Prerequisite: MATH 3315. For a more detailed course description, see [http://www2.sfasu.edu/math/courses/syllabi/MTh337Syllabus.pdf](http://www2.sfasu.edu/math/courses/syllabi/MTh337Syllabus.pdf)

## Course Prerequisites
A grade of C or better in MATH 3315 or concurrent enrollment in MATH 3315.

## Course Time and Meeting Place
- MATH 3330-001 will meet at 11–12:15 TuTh in MATH 210.

## Instructor
- Thomas W. Judson, Professor  
  Department of Mathematics and Statistics  
  Office: Math 316  
  TEL: (936) 468–1704  
  Email: judsontw @ sfasu.edu

## Textbook
The textbook for this course is  
Thomas W. Judson. *The Ordinary Differential Equations Project*, preliminary edition. January, 2020. The textbook is available for free at [http://faculty.sfasu.edu/judsontw/ode/index.html](http://faculty.sfasu.edu/judsontw/ode/index.html). There are PDF and HTML versions, but you will find the HTML version most useful since it contains interactive Sage Cells. The textbook is a work in progress and will be updated periodically.

## Using Technology
We will make heavy use of technology in MATH 3330. Our primary platform will be CoCalc ([https://cocalc.com](https://cocalc.com)). For MATH 3330 you will need to obtain an account on CoCalc if you do not already have one. To avoid confusion, please use your SFA email to create your account. Directions for getting a CoCalc account can be found at [CoCalc-Quick-Start.pdf](https://cocalc.com)

We can use CoCalc to access Sage and Jupyter notebooks. Sage is a computer algebra system like Mathematica or Maple. Unlike Mathematica or Maple, Sage is free open-source software. You can access Sage online or download it to your computer. You can even run Sage on your iPad or iPhone. We will be using Sage extensively in MATH 3330. You can find out more about Sage at [http://www.sagemath.org/](http://www.sagemath.org/). The Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code (including Octave, R, and Sage), equations, visualizations and narrative text. For more information on the Jupyter Notebook see [https://jupyter.org](https://jupyter.org).

You may not use your cellphone in class for a calculator.

## Grading and Exams
Your MATH 3330 course grade will be based on three 50 minute exams, a final exam, homework, projects, and prep assignments. Your course grade will be determined as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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</table>

[http://faculty.sfasu.edu/judsontw/math3330/index.html](http://faculty.sfasu.edu/judsontw/math3330/index.html)
Differential Equations—Syllabus

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Prep Assignments</td>
<td>10%</td>
</tr>
<tr>
<td>Projects</td>
<td>20%</td>
</tr>
<tr>
<td>Exams</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
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</tbody>
</table>

Semester numerical scores will be converted into letter grades according to the following method.

<table>
<thead>
<tr>
<th>Range of numerical values</th>
<th>Corresponding Letter</th>
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</thead>
<tbody>
<tr>
<td>90-100</td>
<td>A</td>
</tr>
<tr>
<td>80-89</td>
<td>B</td>
</tr>
<tr>
<td>70-79</td>
<td>C</td>
</tr>
<tr>
<td>60-69</td>
<td>D</td>
</tr>
<tr>
<td>0-59</td>
<td>E</td>
</tr>
</tbody>
</table>

When we calculate your final grade at the end of the course, we will calculate a score on a 0-100 point scale using the scores that you have obtained during the course, and using the grade breakdown given above. Your course grade will then be obtained using this table. In the event of a fractional score, we will always round up to the nearest integer.

**Ressurection Policy.** If you score better on the final exam than your lowest midterm exam, we will replace your midterm grade with your final exam grade. The ressurection policy does not apply to your homework grade or to the arithmetic exam.

**Exam Policy**

Exams are scheduled far in advance, and it is impossible to move the time or date. However, in rare cases where it is impossible for an individual to take the exam at the scheduled time, we will work with you to make other arrangements. Exceptions for taking the exam out of sequence are the following:

1. A medical excuse. Please provide proper documentation according to university rules.
2. A University sponsored event such as an athletic tournament, a play, or a musical performance. Your coach or director must contact us in advance.
3. A religious holiday. Please send a short email explaining the situation.
4. Extreme hardship such as a family emergency. Please have the proper university office contact us.

The above are the only allowable excuses for taking the exam before the scheduled time. Under no circumstances do we give late exams. Since we can only accommodate a limited number of students taking the exam at an earlier time, please make sure that you fall into one of the above categories before you contact us. If you miss an exam due to illness or a family emergency, you will not be penalized. We will assign you a grade based on the rest of your coursework. If you have a conflict with the final exam, you must contact the Registrar. Only the Registrar can schedule an out-of-sequence final exam.

**Homework**

Homework assignments will be available on the calendar page or in CoCalc (https://cocalc.com). There is no question that the best way to learn math is by doing math, and homework exercises are an essential part of any math course. If you just go to a math class and watch the teacher work problems, but do not actually try doing any problems on your own, then there is very little chance you will really learn the subject. It is also very unlikely that you will do well on exams without working through homework problems ahead of time. When doing homework, do not just write down answers. Think about the problems posed, your strategies, the meaning of your computations, and the answers you get. The main point is not to come up with specific answers to the specific problems you are working on, but to develop an understanding of what you are doing so that you can apply your reasoning to a wide range of similar situations. It is very unlikely that later on in life you will see exactly the same math problems you are working on now, so learn the material in such a way that you are prepared to use your general knowledge of mathematics in the future, not just how to apply particular formulas for very specific problems.

You are encouraged to form study groups with other students in the class so that you can discuss your work with each other; however, all work submitted must be written up individually. Make sure that even if you do work in groups, that you come away with the ability to explain everything you end up writing up in your homework.

Generally, there will be a problem set due each week. Assignments will be graded and will typically be returned to you at the following class meeting. Since getting behind in a math class is one of the most uncomfortable things you can do to yourself, homework must be turned in on time. **Since we will drop your lowest homework grade, we will not accept late homework assignments.**
Copying solutions off of the Internet or from another student will be considered an act of academic dishonesty.

Homework Grading
In general, each problem or part of a multi-part problem will be worth one point. More complex problems will be graded according to the following rubric.

- 3 Points. Work is completely accurate and essentially perfect. Work is thoroughly developed, neat, and easy to read. Complete sentences are used where appropriate.
- 2 Points. Work is good, but incompletely developed, hard to read, unexplained, or jumbled. Answers that are not explained may received 2 points even if correct. The work contains the right idea but is flawed.
- 1 Point. Work is sketchy. There is some correct work, but most of the work is incorrect.
- 0 Points. Work is minimal or non-existent. Solution is completely incorrect.

Prep Assignments
Daily prep assignments (available on D2L, https://d2l.sfasu.edu/d2l/home) are designed to get you ready for each class. Prep assignments will be collected at the beginning of each class. These prep assignments should not take too much of your time. In fact, if you spend more than 60 minutes, please stop working on the assignment and just hand in what you have.

The Classroom
Any questions you ask in class will likely be ones that other students will want answered as well, so get over any hesitation you might have and ask questions as the material is presented. You will not be penalized for doing this, no matter how trivial or simple you think your questions might seem. Remember, the class is being held for you to learn the material, not just to give you a time to copy notes off of a blackboard, so be sure to get help when you need it and stay involved in your class.

Getting Help with MATH 3330
Ask lots of questions in class and remember to take advantage of office hours.

Credit Hours
Per SFA policy 5.4, your schedule should reflect that there is (1) an amount of student work per credit hour that reasonably approximates not less than one hour of class or direct faculty instruction and two hours of out-of-class student work per week for fifteen weeks over a long semester, or the equivalent amount of work over a different amount of time; or (2) at least an equivalent amount of work as outlined in item 1 above for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours.

Add/Drop Policy
The Add/Drop Policy can be found at http://www.sfasu.edu/policies/add_drop.asp

Attendance Policy
Regular attendance is expected in MATH 3330. Attendance and Excused Absences Policy can be found at http://www.sfasu.edu/policies/class_attendance_excused_abs.asp

Withheld Grades Semester Grades Policy (A-54)
Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

The circumstances precipitating the request must have occurred after the last day in which a student could withdraw from a course. Students requesting a WH must be passing the course with a minimum projected grade of C.

Students with Disabilities
To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices/

Acceptable Student Behavior
Classroom behavior should not interfere with the instructor’s ability to conduct the class or the ability of other students to learn from the instructional program (see the Student Conduct Code, policy D-34.1). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic or other penalties. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Students who do not attend class regularly or who perform poorly on class projects/exams may be referred to the Early Alert Program. This program provides students with recommendations for resources or other assistance that is available to help SFA students succeed.

You are off the grid in MATH 3330. You may use your tablet or notebook computer to access the textbook in class; otherwise, consider yourself off the grid when you are in MATH 3330. Please be respectful of your fellow students and your instructor. Cell phone use and texting are not allowed in class. Remember to turn your cell phone off and place it in your bag or backpack before entering the classroom. Any cell phone that is visible will be collected and
returned to you at the end of class. Exceptions to this rule include volunteer firemen, physicians on-call, those who are on the shortlist to receive an organ transplant, etc.

**Academic Integrity (A-9.1)**

Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

**Definition of Academic Dishonesty**

Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit.

Any acts of academic dishonesty will be dealt with according to University policy. Penalties for academic dishonesty may result in a failing grade for the assignment, failing the course, or even dismissal from the university.


**Mental Health and Wellness**

SFA values students' mental health and the role it plays in academic and overall student success. SFA provides a variety of resources to support students' mental health and wellness. Many of these resources are free, and all of them are confidential.

- **On-campus Resources:**
  - SFA Counseling Services
    - [www.sfasu.edu/counselingservices](http://www.sfasu.edu/counselingservices)
    - Rusk Building, 3rd Floor
    - 936.468.2401
  - SFA Human Services Counseling Clinic
    - [www.sfasu.edu/humanservices/139.asp](http://www.sfasu.edu/humanservices/139.asp)
    - Human Services, Room 202
    - 936.468.1041
  - **Crisis Resources:**
    - Burke 24-hour crisis line: 1.800.392.8343
    - Suicide Prevention Lifeline: 1.800.273.TALK (8255)
    - Crisis Text Line: Text HELLO to 741-741

_Last modified: August 24, 2021_
**MATH 3330. Differential Equations—Calendar**

**Thomas W. Judson, Professor**

**Department of Mathematics and Statistics**

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### Week 1

**Tuesday 8/24/21**

- **Course Orientation—Introduction to CoCalc, LaTeX, and Jupyter Notebook**

  - Read *Guidelines For Good Mathematical Writing* by Francis Su.
  - Take a selfie (in front of my office door if you are on campus) and fill out the course questionnaire (*course-questionnaire.pdf*) and submit both to the appropriate D2L dropbox.
  - Make sure that you have a CoCalc account under your SFA email address. See **Using Technology** in the syllabus ([http://faculty.sfasu.edu/judsontw/math337/syllabus.html](http://faculty.sfasu.edu/judsontw/math337/syllabus.html)).

**Notes and What to Do Before Class**

- Assignment 0 due in CoCalc (on Thursday, August 26 at 11:59 PM)

### Week 2

**Thursday 8/26/21**

- **§1.1. Modeling with Differential Equations**

  - The prep assignment for §1.1 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
  - **Last day to change schedules other than to drop courses.**

**Tuesday 8/31/21**

- **§1.2. Separable Differential Equations**

  - The prep assignment for §1.2 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.

**Thursday 9/2/21**

- **§1.3. Geometric and Quantitative Analysis**

  - The prep assignment for §1.3 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
  - Assignment 1 due in CoCalc (on Friday, September 3 at 11:59 PM)

### Week 3

**Tuesday 9/7/21**

- **§1.4. Analyzing Equations Numerically**

  - Read it again, *Guidelines For Good Mathematical Writing* by Francis Su.
  - The prep assignment for §1.4 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
  - Assignment 2 due in CoCalc (on Tuesday, September 7 at 11:59 PM)

**Thursday 9/9/21**

- **§1.5. First-Order Linear Equations**

  - The prep assignment for §1.5 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
  - Assignment 3 due in CoCalc (on Friday, September 10 at 11:59 PM)
  - Project 1 Due (on Friday, September 9, 2021)

### Week 4

**Tuesday 9/14/21**

- **§1.6. Existence and Uniqueness of Solutions**

  - The prep assignment for §1.6 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
  - Assignment 4 due in CoCalc (on Tuesday, September 14 at 11:59 PM)

**Thursday 9/16/21**

- **§1.7. Bifurcations**

  - The prep assignment for §1.7 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
  - Assignment 5 due in CoCalc (on Friday, September 16 at 11:59 PM)

### Week 5

**Tuesday 9/21/21**

- **§2.1. Modeling with Systems**

  - The prep assignment for §2.1 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
  - Assignment 6 due in CoCalc (on Friday, September 24 at 11:59 PM)
<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Section</th>
<th>Assignment Notes</th>
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</thead>
<tbody>
<tr>
<td>Thursday</td>
<td>9/23/21</td>
<td>Exam I (Chapter 1)</td>
<td></td>
</tr>
<tr>
<td>Tuesday</td>
<td>9/28/21</td>
<td>§2.2. Geometry of Systems</td>
<td>The prep assignment for §2.2 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box.</td>
</tr>
<tr>
<td>Thursday</td>
<td>9/30/21</td>
<td>§2.3. Numerical Techniques for Systems</td>
<td>The prep assignment for §2.3 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box. Project 2 Due (on Friday, October 1, 2021)</td>
</tr>
<tr>
<td>Tuesday</td>
<td>10/5/21</td>
<td>§2.4. Solving Systems Analytically</td>
<td>The prep assignment for §2.4 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box. Assignment 7 due in CoCalc (on Tuesday, October 5 at 11:59 PM)</td>
</tr>
<tr>
<td>Thursday</td>
<td>10/7/21</td>
<td>§3.1. Linear Algebra in a Nutshell</td>
<td>The prep assignment for §3.1 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box.</td>
</tr>
<tr>
<td>Tuesday</td>
<td>10/12/21</td>
<td>§3.2. Planar Systems</td>
<td>The prep assignment for §3.2 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box. Assignment 8 due in CoCalc (on Tuesday, October 12 at 11:59 PM)</td>
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<tr>
<td>Thursday</td>
<td>10/14/21</td>
<td>§3.3. Phase Plane Analysis of Linear Systems</td>
<td>The prep assignment for §3.3 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box. Assignment 9 due in CoCalc (on Friday, October 15 at 11:59 PM)</td>
</tr>
<tr>
<td>Tuesday</td>
<td>10/19/21</td>
<td>§3.4. Complex Eigenvalues</td>
<td>The prep assignment for §3.4 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box. Assignment 10 due in CoCalc (on Tuesday, October 19 at 11:59 PM) Wednesday, October 20 is the last day to drop courses.</td>
</tr>
<tr>
<td>Thursday</td>
<td>10/21/21</td>
<td>Exam II (Chapter 2 and Chapter 3 (Sections 3.1–3.3))</td>
<td>The prep assignment for §3.5 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box. Project 3 Due (on Tuesday, October 26, 2021)</td>
</tr>
<tr>
<td>Tuesday</td>
<td>10/26/21</td>
<td>§3.5. Repeated Eigenvalues</td>
<td>The prep assignment for §3.5 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box.</td>
</tr>
<tr>
<td>Thursday</td>
<td>10/28/21</td>
<td>§3.6. Changing Coordinates</td>
<td>The prep assignment for §3.6 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box.</td>
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<tr>
<td>Tuesday</td>
<td>11/2/21</td>
<td>§3.7. The Trace-Determinant Plane</td>
<td>The prep assignment for §3.7 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box. Assignment 11 due in CoCalc (on Tuesday, November 2 at 11:59 PM)</td>
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<td>Thursday</td>
<td>11/4/21</td>
<td>§4.1. Homogeneous Linear Equations</td>
<td>The prep assignment for §4.1 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box. Assignment 12 due in CoCalc (on Friday, November 5 at 11:59 PM)</td>
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<tr>
<td>Tuesday</td>
<td>11/9/21</td>
<td>§4.2. Forcing</td>
<td>The prep assignment for §4.2 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box. Assignment 13 due in CoCalc (on Tuesday, November 9 at 11:59 PM)</td>
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<tr>
<td>Thursday</td>
<td>11/11/21</td>
<td>§4.3. Sinusoidal Forcing</td>
<td>The prep assignment for §4.3 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box.</td>
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<tr>
<td>Tuesday</td>
<td>11/16/21</td>
<td>§4.4. Forcing and Resonance</td>
<td>The prep assignment for §4.4 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropdown box. Assignment 14 due in CoCalc (on Tuesday, November 16 at 11:59 PM)</td>
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<tr>
<td>Date</td>
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<td>Thursday</td>
<td><strong>Exam III</strong> (Chapters 3 and 4)</td>
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<td>11/18/21</td>
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<tr>
<td>Tuesday</td>
<td><strong>Thanksgiving Recess (No class)</strong></td>
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<tr>
<td>11/23/21</td>
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<tr>
<td>Thursday</td>
<td><strong>Thanksgiving Recess (No class)</strong></td>
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<td>11/25/21</td>
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<tr>
<td>Tuesday</td>
<td><strong>§5.1. Linearization</strong></td>
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</table>
| 11/30/21   | • The prep assignment for §5.1 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.  
• Project 4 Due (on Tuesday, November 30, 2021)  
• **Monday, November 29 is the last day to drop courses.** |
| Thursday   | **§5.2. Hamiltonian Systems**                                         |
| 12/2/21    | • The prep assignment for §5.2 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.  
• Assignment 15 due in CoCalc (on Friday, December 3 at 11:59 PM) |
| Tuesday    | **Final Exam at 10:30–12:30**                                        |
| 12/7/21    |                                                                      |

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Course Time and Meeting Place

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Instructor

- Thomas W. Judson, Professor
  Department of Mathematics and Statistics
- Office: Math 316
- TEL: (936) 468–1704
- Email: judsontw @ sfasu.edu
- Fall 2021 Office Hours
  - Monday: 5–6 PM
  - Tuesday: 12:15–1:45 PM
  - Wednesday: 5–6 PM
  - Thursday: 12:15–1:45 PM
  - Additional office hours by appointment

Textbook

The textbook for this course is Thomas W. Judson. The Ordinary Differential Equations Project, preliminary edition. January, 2020. The textbook is available for free at http://faculty.sfasu.edu/judsontw/ode/index.html. There are PDF and HTML versions, but you will find the HTML version most useful since it contains interactive Sage Cells. The textbook is a work in progress and will be updated periodically.

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You may not use your cellphone in class for a calculator.

Grading and Exams

Your MATH 3330 course grade will be based on three 50 minute exams, a final exam, homework, projects, and prep assignments. Your course grade will be determined as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
</table>

http://faculty.sfasu.edu/judsontw/math3330/index.html
Semester numerical scores will be converted into letter grades according to the following method.

<table>
<thead>
<tr>
<th>Range of numerical values</th>
<th>Corresponding Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-100</td>
<td>A</td>
</tr>
<tr>
<td>80-89</td>
<td>B</td>
</tr>
<tr>
<td>70-79</td>
<td>C</td>
</tr>
<tr>
<td>60-69</td>
<td>D</td>
</tr>
<tr>
<td>0-59</td>
<td>E</td>
</tr>
</tbody>
</table>

When we calculate your final grade at the end of the course, we will calculate a score on a 0-100 point scale using the scores that you have obtained during the course, and using the grade breakdown given above. Your course grade will then be obtained using this table. In the event of a fractional score, we will always round up to the nearest integer.

**Ressurection Policy.** If you score better on the final exam than your lowest midterm exam, we will replace your midterm grade with your final exam grade. The ressurection policy does not apply to your homework grade or to the arithmetic exam.

**Exam Policy**

Exams are scheduled far in advance, and it is impossible to move the time or date. However, in rare cases where it is impossible for an individual to take the exam at the scheduled time, we will work with you to make other arrangements. Exceptions for taking the exam out of sequence are the following:

1. A medical excuse. Please provide proper documentation according to university rules.
2. A University sponsored event such as an athletic tournament, a play, or a musical performance. Your coach or director must contact us in advance.
3. A religious holiday. Please send a short email explaining the situation.
4. Extreme hardship such as a family emergency. Please have the proper university office contact us.

The above are the only allowable excuses for taking the exam before the scheduled time. Under no circumstances do we give late exams. Since we can only accommodate a limited number of students taking the exam at an earlier time, please make sure that you fall into one of the above categories before you contact us. If you miss an exam due to illness or a family emergency, you will not be penalized. We will assign you a grade based on the rest of your coursework. If you have a conflict with the final exam, you must contact the Registrar. Only the Registrar can schedule an out-of-sequence final exam.

**Homework**

Homework assignments will be available on the calendar page or in CoCalc (https://cocalc.com). There is no question that the best way to learn math is by doing math, and homework exercises are an essential part of any math course. If you just go to a math class and watch the teacher work problems, but do not actually try doing any problems on your own, then there is very little chance you will really learn the subject. It is also very unlikely that you will do well on exams without working through homework problems ahead of time. When doing homework, do not just write down answers. Think about the problems posed, your strategies, the meaning of your computations, and the answers you get. The main point is not to come up with specific answers to the specific problems you are working on, but to develop an understanding of what you are doing so that you can apply your reasoning to a wide range of similar situations. It is very unlikely that later on in life you will see exactly the same math problems you are working on now, so learn the material in such a way that you are prepared to use your general knowledge of mathematics in the future, not just how to apply particular formulas for very specific problems.

You are encouraged to form study groups with other students in the class so that you can discuss your work with each other; however, all work submitted must be written up individually. Make sure that even if you do work in groups, that you come away with the ability to explain everything you end up writing up in your homework.

Generally, there will be a problem set due each week. Assignments will be graded and will typically be returned to you at the following class meeting. Since getting behind in a math class is one of the most uncomfortable things you can do to yourself, homework must be turned in on time. **Since we will drop your lowest homework grade, we will not accept late homework assignments.**
Copying solutions off of the Internet or from another student will be considered an act of academic dishonesty.

Homework Grading
In general, each problem or part of a multi-part problem will be worth one point. More complex problems will be graded according to the following rubric.

- 3 Points. Work is completely accurate and essentially perfect. Work is thoroughly developed, neat, and easy to read. Complete sentences are used where appropriate.
- 2 Points. Work is good, but incompletely developed, hard to read, unexplained, or jumbled. Answers that are not explained may receive 2 points even if correct. The work contains the right idea but is flawed.
- 1 Point. Work is sketchy. There is some correct work, but most of the work is incorrect.
- 0 Points. Work is minimal or non-existent. Solution is completely incorrect.

Prep Assignments
Daily prep assignments (available on D2L, https://d2l.sfasu.edu/d2l/home) are designed to get you ready for each class. Prep assignments will be collected at the beginning of each class. These prep assignments should not take too much of your time. In fact, if you spend more than 60 minutes, please stop working on the assignment and just hand in what you have.

The Classroom
Any questions you ask in class will likely be ones that other students will want answered as well, so get over any hesitation you might have and ask questions as the material is presented. You will not be penalized for doing this, no matter how trivial or simple you think your questions might seem. Remember, the class is being held for you to learn the material, not just to give you a time to copy notes off of a blackboard, so be sure to get help when you need it and stay involved in your class.

Getting Help with MATH 3330
Ask lots of questions in class and remember to take advantage of office hours.

Credit Hours
Per SFA policy 5.4, your schedule should reflect that there is (1) an amount of student work per credit hour that reasonably approximates not less than one hour of class or direct faculty instruction and two hours of out-of-class student work per week for fifteen weeks over a long semester, or the equivalent amount of work over a different amount of time; or (2) at least an equivalent amount of work as outlined in item 1 above for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours.

Add/Drop Policy
The Add/Drop Policy can be found at http://www.sfasu.edu/policies/add_drop.asp

Attendance Policy
Regular attendance is expected in MATH 3330. Attendance and Excused Absences Policy can be found at http://www.sfasu.edu/policies/class_attendance_excused_abs.asp

Withheld Grades Semester Grades Policy (A-54)
Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

The circumstances precipitating the request must have occurred after the last day in which a student could withdraw from a course. Students requesting a WH must be passing the course with a minimum projected grade of C.

Students with Disabilities
To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices/

Acceptable Student Behavior
Classroom behavior should not interfere with the instructor's ability to conduct the class or the ability of other students to learn from the instructional program (see the Student Conduct Code, policy D-34.1). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic or other penalties. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Students who do not attend class regularly or who perform poorly on class projects/exams may be referred to the Early Alert Program. This program provides students with recommendations for resources or other assistance that is available to help SFA students succeed.

You are off the grid in MATH 3330. You may use your tablet or notebook computer to access the textbook in class; otherwise, consider yourself off the grid when you are in MATH 3330. Please be respectful of your fellow students and your instructor. Cell phone use and texting are not allowed in class. Remember to turn your cell phone off and place it in your bag or backpack before entering the classroom. Any cell phone that is visible will be collected and
Differential Equations—Syllabus

Page 4 of 4

returned to you at the end of class. Exceptions to this rule include volunteer firemen, physicians on-call, those who are on the shortlist to receive an organ transplant, etc.

**Academic Integrity (A-9.1)**

Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

**Definition of Academic Dishonesty**

Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit.

Any acts of academic dishonesty will be dealt with according to University policy. Penalties for academic dishonesty may result in a failing grade for the assignment, failing the course, or even dismissal from the university.


**Mental Health and Wellness**

SFA values students' mental health and the role it plays in academic and overall student success. SFA provides a variety of resources to support students' mental health and wellness. Many of these resources are free, and all of them are confidential.

- **On-campus Resources:**
  SFA Counseling Services
  [www.sfasu.edu/counselingservices](http://www.sfasu.edu/counselingservices)
  Rusk Building, 3rd Floor
  936.468.2401
- **SFA Human Services Counseling Clinic**
  [www.sfasu.edu/humanservices/139.asp](http://www.sfasu.edu/humanservices/139.asp)
  Human Services, Room 202
  936.468.1041
- **Crisis Resources:**
  Burke 24-hour crisis line: 1.800.392.8343
  Suicide Prevention Lifeline: 1.800.273.TALK (8255)
  Crisis Text Line: Text HELLO to 741-741

_Last modified: August 24, 2021_
### MATH 3330. Differential Equations—Calendar

**Professor:** Thomas W. Judson  
**Department:** Department of Mathematics and Statistics

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<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Notes and What to Do Before Class</th>
</tr>
</thead>
</table>
| 1    | Tuesday    | Course Orientation—Introduction to CoCalc, LaTeX, and Jupyter Notebook | - Read *Guidelines For Good Mathematical Writing* by Francis Su.  
   | 8/24/21    |                                                                       | - Watch the Jupyter Notebook tutorial videos on YouTube *Introduction—Jupyter Tutorial* and *Markdown and LaTeX—Jupyter Tutorial*.  
   |            |                                                                       | - Take a selfie (in front of my office door if you are on campus) and fill out the course questionnaire (*course-questionnaire.pdf*) and submit both to the appropriate D2L dropbox.  
   |            |                                                                       | - Make sure that you have a CoCalc account under your SFA email address. See Using Technology in the syllabus ([http://faculty.sfasu.edu/judsontw/math337/syllabus.html](http://faculty.sfasu.edu/judsontw/math337/syllabus.html)).  
   |            |                                                                       | - Assignment 0 due in CoCalc (on Thursday, August 26 at 11:59 PM) |
| 2    | Thursday   | §1.1. Modeling with Differential Equations                            | - The prep assignment for §1.1 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.  
   | 8/26/21    |                                                                       | - Last day to change schedules other than to drop courses. |
| 3    | Tuesday    | §1.2. Separable Differential Equations                                | - The prep assignment for §1.2 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox. |
   | 8/31/21   |                                                                       |                                     |
| 4    | Tuesday    | §1.3. Geometric and Quantitative Analysis                            | - The prep assignment for §1.3 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.  
   | 9/7/21    |                                                                       | - Assignment 1 due in CoCalc (on Friday, September 3 at 11:59 PM) |
   |            |                                                                       |                                     |
| 5    | Tuesday    | §1.4. Analyzing Equations Numerically                                | - Read it again, *Guidelines For Good Mathematical Writing* by Francis Su.  
   | 9/14/21   |                                                                       | - The prep assignment for §1.4 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.  
   |            |                                                                       | - Assignment 2 due in CoCalc (on Tuesday, September 7 at 11:59 PM) |
   |            |                                                                       |                                     |
| 6    | Thursday   | §1.5. First-Order Linear Equations                                   | - The prep assignment for §1.5 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.  
   | 9/21/21   |                                                                       | - Assignment 3 due in CoCalc (on Friday, September 10 at 11:59 PM)  
   |            |                                                                       | - Project 1 Due (on Friday, September 9, 2021) |
| 7    | Tuesday    | §1.6. Existence and Uniqueness of Solutions                          | - The prep assignment for §1.6 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.  
   | 9/21/21   |                                                                       | - Assignment 4 due in CoCalc (on Tuesday, September 14 at 11:59 PM) |
| 8    | Thursday   | §1.7. Bifurcations                                                  | - The prep assignment for §1.7 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.  
   | 9/21/21   |                                                                       | - Assignment 5 due in CoCalc (on Friday, September 16 at 11:59 PM) |
| 9    | Tuesday    | §2.1. Modeling with Systems                                         | - The prep assignment for §2.1 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.  
   | 9/21/21   |                                                                       | - Assignment 6 due in CoCalc (on Friday, September 24 at 11:59 PM) |

http://faculty.sfasu.edu/judsontw/math3330/calendar.html
<table>
<thead>
<tr>
<th>Date</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/23/21</td>
<td><strong>Exam I</strong> (Chapter 1)</td>
</tr>
<tr>
<td>9/28/21</td>
<td>§2.2. Geometry of Systems</td>
</tr>
<tr>
<td>9/30/21</td>
<td>§2.3. Numerical Techniques for Systems</td>
</tr>
<tr>
<td>10/5/21</td>
<td>§2.4. Solving Systems Analytically</td>
</tr>
<tr>
<td>10/7/21</td>
<td>§3.1. Linear Algebra in a Nutshell</td>
</tr>
<tr>
<td>10/12/21</td>
<td>§3.2. Planar Systems</td>
</tr>
<tr>
<td>10/14/21</td>
<td>§3.3. Phase Plane Analysis of Linear Systems</td>
</tr>
<tr>
<td>10/19/21</td>
<td>§3.4. Complex Eigenvalues</td>
</tr>
<tr>
<td>10/21/21</td>
<td><strong>Exam II</strong> (Chapter 2 and Chapter 3 (Sections 3.1–3.3))</td>
</tr>
<tr>
<td>10/26/21</td>
<td>§3.5. Repeated Eigenvalues</td>
</tr>
<tr>
<td>10/28/21</td>
<td>§3.6. Changing Coordinates</td>
</tr>
<tr>
<td>11/2/21</td>
<td>§3.7. The Trace-Determinant Plane</td>
</tr>
<tr>
<td>11/4/21</td>
<td>§4.1. Homogeneous Linear Equations</td>
</tr>
<tr>
<td>11/9/21</td>
<td>§4.2. Forcing</td>
</tr>
<tr>
<td>11/11/21</td>
<td>§4.3. Sinusoidal Forcing</td>
</tr>
<tr>
<td>11/16/21</td>
<td>§4.4. Forcing and Resonance</td>
</tr>
</tbody>
</table>

- The prep assignment for §2.2 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- The prep assignment for §2.3 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- The prep assignment for §2.4 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- Assignment 7 due in CoCalc (on Tuesday, October 5 at 11:59 PM)
- The prep assignment for §3.1 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- The prep assignment for §3.2 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- Assignment 8 due in CoCalc (on Tuesday, October 12 at 11:59 PM)
- The prep assignment for §3.3 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- Assignment 9 due in CoCalc (on Friday, October 15 at 11:59 PM)
- The prep assignment for §3.4 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- Assignment 10 due in CoCalc (on Tuesday, October 19 at 11:59 PM)
- The prep assignment for §3.5 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- Project 3 Due (on Tuesday, October 26, 2021)
- The prep assignment for §3.6 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- The prep assignment for §3.7 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- Assignment 11 due in CoCalc (on Tuesday, November 2 at 11:59 PM)
- The prep assignment for §4.1 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- Assignment 12 due in CoCalc (on Friday, November 5 at 11:59 PM)
- The prep assignment for §4.2 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- Assignment 13 due in CoCalc (on Tuesday, November 9 at 11:59 PM)
- The prep assignment for §4.3 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- The prep assignment for §4.4 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.
- Assignment 14 due in CoCalc (on Tuesday, November 16 at 11:59 PM)
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday 11/18/21</td>
<td>Exam III (Chapters 3 and 4)</td>
<td></td>
</tr>
<tr>
<td>Tuesday 11/23/21</td>
<td>Thanksgiving Recess (No class)</td>
<td></td>
</tr>
<tr>
<td>Thursday 11/25/21</td>
<td>Thanksgiving Recess (No class)</td>
<td></td>
</tr>
<tr>
<td>Tuesday 11/30/21</td>
<td>§5.1. Linearization</td>
<td></td>
</tr>
<tr>
<td>Tuesday 11/30/21</td>
<td>Project 4 Due (on Tuesday, November 30, 2021)</td>
<td>Monday, November 29 is the last day to drop courses.</td>
</tr>
<tr>
<td>Thursday 12/2/21</td>
<td>§5.2. Hamiltonian Systems</td>
<td></td>
</tr>
<tr>
<td>Tuesday 12/7/21</td>
<td>Final Exam at 10:30–12:30</td>
<td></td>
</tr>
</tbody>
</table>

The prep assignment for §5.1 is due on Monday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.

The prep assignment for §5.2 is due on Wednesday at 11:59pm. Prep assignments can be found in D2L. You should submit your solutions to the D2L dropbox.

Assignment 15 due in CoCalc (on Friday, December 3 at 11:59 PM)