MATH 6320: Mathematical Modeling for Educators, Summer 2019

Contact Information

Instructor: Karl Havlak
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Office Hours:
9:00 – 10:00 a.m., TR;
1:00 – 3:00 p.m., MTWR;
or by appointment

Textbook

A First Course in Mathematical Modeling (5th ed.) by Giordano, Fox, and Horton.

Blackboard

This course has an associated Blackboard page where you will have access to grades, assignments, videos, handouts, and other course-related items.

Course Content

Selected sections from Chapters 1 – 5 and 11 will be studied.

Grading System

The final average will be determined according to the weights in the table that follows.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>40%</td>
</tr>
<tr>
<td>Unit Projects</td>
<td>40%</td>
</tr>
<tr>
<td>Final Project</td>
<td>20%</td>
</tr>
</tbody>
</table>

Grading Policy

To determine the average needed to ensure that you obtain the grade that you want in this course, consult the table that follows.

<table>
<thead>
<tr>
<th>Average</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>89.5 and above</td>
<td>A</td>
</tr>
<tr>
<td>79.5 to 89.5</td>
<td>B</td>
</tr>
<tr>
<td>69.5 to 79.5</td>
<td>C</td>
</tr>
<tr>
<td>59.5 to 69.5</td>
<td>D</td>
</tr>
<tr>
<td>below 59.5</td>
<td>F</td>
</tr>
</tbody>
</table>

Homework Policy

Homework sets will be assigned for every lesson and will account for 40% of the final grade. Please consult the course calendar to see each assignment’s due date. Late assignments will not be accepted. Please be sure to include the work needed to obtain your solutions and do not simply include answers. If you have trouble completing a homework assignment, please contact me for assistance before it is due. I will make an effort to answer emails within the hour that I first view them during normal business hours.
Unit Projects
There will be 6 unit projects in this course that will account for 40% of the final grade. You are expected to do a professional job on these projects submitting typed final reports (where possible) that are neat, thorough, mathematically correct, and grammatically correct.

Final Project
The final project will require you to create an activity, experiment, or project for each of the first five units of this course for the students that you teach. The goal is for the students to engage in a significant activity and obtain a feel for how mathematics can be used in real-world situations. Again, you are expected to do a professional job on the final project and submit a typed final report that is neat, thorough, mathematically correct, and grammatically correct. The final project will account for 20% of the final grade.

Student Responsibilities
The student is solely responsible for:
- Completing each assignment by the specified due date.
- Obtaining assignments and other materials for classes from which they are absent.
- Utilizing, as needed, all available study-aid options (including meeting with the instructor, referring to outside texts, etc.) to resolve any questions that they might have regarding homework, course material, etc.

Student Disability Services
ASU is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments of 2008 (ADAAA), and subsequent legislation.

The Office of Student Affairs is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability, and it is the student’s responsibility to initiate such a request by contacting:

Dallas Swafford
Director of Student Disability Services
Office of Student Affairs
325-942-2047
dallas.swafford@angelo.edu

Title IX at Angelo State University
Angelo State University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from sex discrimination of any kind. Sex discrimination, sexual misconduct, public indecency, interpersonal violence, sexual assault, sexual exploitation, sexual harassment, and stalking are not tolerated at ASU. As a faculty member, I am a Responsible Employee meaning that I will report any allegations I am notified of to the Office of Title IX Compliance in order to connect students with resources and options
in addressing the allegations reported. You are encouraged to report any incidents to ASU’s Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator. You may do so by contacting:

Michelle Boone  
*Director of Title IX Compliance/Title IX Coordinator*  
Mayer Administration Building, Room 200  
325-942-2022  
michelle.boone@angelo.edu

You may also file a report online 24/7 using the incident form inii.

If you are wishing to speak to someone about an incident in confidence you may contact the University Health Clinic and Counseling Center at 325-942-2173 or the ASU Crisis Helpline at 325-486-6345.

The Office of Title IX Compliance also provides accommodations related to pregnancy (such as communicating with your professors regarding medically necessary absences, modifications required because of pregnancy, etc.). If you are pregnant and need assistance or accommodations, please contact the Office of Title IX Compliance utilizing the information above.

For more information about Title IX in general you may visit the Title IX website iniii.

### Student Absence for Observance of Religious Holy Days

A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. The full details can be found in ASU Operating Policy OP 10.19 Observance of Religious Holy Days iniv.

### Incomplete Grade Policy

It is policy that incomplete grades be reserved for student illness or personal misfortune. Please contact faculty if you have serious illness or a personal misfortune that would keep you from completing course work. Documentation may be required. See ASU Operating Policy 10.11 Grading Procedures iv for more information.

### Student Conduct Policies

#### Academic Integrity

Students are expected to maintain complete honesty and integrity in all work. Any student found guilty of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from ASU.

The College of Science and Engineering adheres to the Statement of Academic Integrity ivi.
Plagiarism

Plagiarism is a serious topic covered in ASU’s Academic Integrity policy in the Student Handbook. Plagiarism is the action or practice of taking someone else’s work, idea, etc., and passing it off as one’s own. Plagiarism is literary theft.

In your discussions and/or your papers, it is unacceptable to copy word-for-word without quotation marks and the source of the quotation. It is expected that you will summarize or paraphrase ideas giving appropriate credit to the source both in the body of your paper and the reference list.

Papers are subject to be evaluated for originality via Turnitin. Resources to help you understand this policy better are available at the ASU Writing Centervii.

Copyright Policy

Students officially enrolled in this course should make only one printed copy of the given articles and/or chapters. You are expressly prohibited from distributing or reproducing any portion of course readings in printed or electronic form without written permission from the copyright holders or publishers.

General Policies Related to this Course

- All students are required to follow the policies and procedures presented in these documents:
  - Angelo State University Student Handbookviii
  - Angelo State University Catalogix

- Feel free to contact me with any questions you may have. I will make an effort to answer emails within the hour that I first view them during normal business hours. I will check emails less frequently on weekends, so I cannot promise a prompt response, or maybe any response at all, on weekends.
- All correspondence between the instructor and students should be courteous, clear, and professional.
- Feel free to use the discussion board to seek help on homework problems. Please do not post your solution when asking for help or when offering help. The discussion board is intended for students to get ideas on how to work toward a solution.
- Good luck. I sincerely hope you do well in this course, and I strongly encourage you to use me as a resource outside of class to help you succeed.

All items contained in this syllabus are subject to change as the semester progresses. Students will be notified in advance of any changes.

Mathematics 6320 – Mathematical Modeling for Educators

Student Learning Outcomes

1. Students will demonstrate factual knowledge including the mathematical notation and terminology used in this course. Students will be able to demonstrate an understanding of the basic terminology and concepts that are associated with mathematical modeling
including but not limited to equilibrium values, qualitative modeling, quantitative modeling, interpolation, difference equations, differential equations, model fitting, geometric similarity.

2. **Students will describe the fundamental principles including the laws and theorems arising from concepts covered in this course.** Students will discuss features of models including relationships between the variables, long-term behavior of the model, and an analysis of equilibrium values.

3. **Students will apply course material along with procedures and techniques covered in this course to solve problems.** Students will be able to create and analyze discrete and continuous models for real-world phenomena.

4. **Students will develop specific skills, competencies, and thought processes sufficient to support further study or work in this field or related fields.** Students will collect data, create a model based on that data, and produce a high-quality technical document incorporating an analysis of the model with results from Octave and Excel.

**Textbook**

**Course Content**
Content consists of the following topics, listed according to the corresponding chapters in the text. (See textbook “Contents.”)

1. **Modeling with Difference Equations:** introduction to difference equations, applying difference equations in modeling, solving dynamical systems, systems of dynamical systems

2. **Modeling Process, Proportionality, and Geometric Similarity:** modeling process, proportionality, geometric similarity, applications of proportionality and geometric similarity

3. **Model Fitting:** graphical model fitting, Chebyshev and least-squares criterion, applications of least-squares criterion

4. **Experimental Modeling:** one-term models and the ladder of powers, high-order polynomial models, transcendental models

5. **Simulation Modeling:** simulating random events, simulating probabilistic behavior, estimating area and definite integrals

11. **Modeling with Differential Equations:** exponential growth and decay, applications of exponential growth and decay, graphical solutions of differential equations, numerical approximation methods
Anticipated Daily Schedule

The table indicates the assignment that will be due on the date listed. All course materials will be available from the beginning of the course and assignments can be completed early; however, late assignments will not be accepted. All assignments, handouts, and the course calendar can be accessed in Blackboard.

<table>
<thead>
<tr>
<th>Day</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 4</td>
<td>Intro 1</td>
</tr>
<tr>
<td>June 6</td>
<td>Unit 1-1</td>
</tr>
<tr>
<td>June 9</td>
<td>Unit 1-2</td>
</tr>
<tr>
<td>June 11</td>
<td>Unit 1-3</td>
</tr>
<tr>
<td>June 13</td>
<td>Unit 1-4</td>
</tr>
<tr>
<td>June 16</td>
<td>Unit 2-1</td>
</tr>
<tr>
<td>June 18</td>
<td>Unit 1 Project</td>
</tr>
<tr>
<td>June 20</td>
<td>Unit 2-2</td>
</tr>
<tr>
<td>June 23</td>
<td>Unit 2-3</td>
</tr>
<tr>
<td>June 25</td>
<td>Unit 3-1</td>
</tr>
<tr>
<td>June 27</td>
<td>Unit 2 Project</td>
</tr>
<tr>
<td>June 30</td>
<td>Unit 3-2</td>
</tr>
<tr>
<td>July 2</td>
<td>Unit 3-3</td>
</tr>
<tr>
<td>July 7</td>
<td>Unit 3-4</td>
</tr>
<tr>
<td>July 9</td>
<td>Unit 4-1</td>
</tr>
<tr>
<td>July 11</td>
<td>Unit 3 Project</td>
</tr>
<tr>
<td>July 14</td>
<td>Unit 4-2</td>
</tr>
<tr>
<td>July 16</td>
<td>Unit 4-3</td>
</tr>
<tr>
<td>July 18</td>
<td>Unit 5-1</td>
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<tr>
<td>July 21</td>
<td>Unit 4 Project</td>
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<tr>
<td>July 23</td>
<td>Unit 5-2</td>
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<tr>
<td>July 25</td>
<td>Unit 5-3</td>
</tr>
<tr>
<td>July 28</td>
<td>Unit 6-1</td>
</tr>
<tr>
<td>July 30</td>
<td>Unit 5 Project</td>
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<tr>
<td>August 1</td>
<td>Unit 6-2</td>
</tr>
<tr>
<td>August 4</td>
<td>Unit 6-3</td>
</tr>
<tr>
<td>August 6</td>
<td>Unit 6-4</td>
</tr>
<tr>
<td>August 7</td>
<td>Unit 6 Project / Final Project</td>
</tr>
</tbody>
</table>

Works Cited