Colorado State University GLOBAL CAMPUS

MTH530: Foundation and Application of Analysis I

Credit Hours: 3

Contact Hours: This is a 3-credit course, offered in accelerated format. This means that 16 weeks of material is covered in 8 weeks. The exact number of hours per week that you can expect to spend on each course will vary based upon the weekly coursework, as well as your study style and preferences. You should plan to spend 14-20 hours per week in each course reading material, interacting on the discussion boards, writing papers, completing projects, and doing research.

Faculty Information

Faculty contact information and office hours can be found on the faculty profile page.

Course Description and Outcomes

Course Description:
This graduate-level course provides an overview of analysis principles and implications. The topics covered by this extended course range from differential and integral calculus, to differential equations and analysis of complex variables. The course material covers the first half of the traditional graduate-level calculus sequence, selected linear algebra and differential equations concepts. This course will also offer best practices for dual credit course instruction and discussions of standard pedagogy. Previous undergraduate coursework (at least 12-credits of undergraduate calculus) is assumed (3 credits total).

Course Overview:
In this course, students will investigate ordinary differential equations (ODEs) of the first order, second order, and higher order. They will solve problems involving systems of ODEs, series solutions of ODEs, special functions, and Laplace transforms. They will also investigate matrix manipulations and eigenvalues.

Course Learning Outcomes:

1. Solve problems involving first order and second order linear differential equations (ODEs).
2. Explain systems of ordinary differential equations (ODEs).
3. Analyze higher order linear ordinary differential equations (ODEs).
4. Apply series solutions of ordinary differential equations (ODEs) and special functions in the context of real world problems.
5. Discuss Laplace transforms.
6. Solve equations involving matrices, vectors, determinants, and linear systems.
7. Solve problems using matrices and eigenvalue equations.
8. Reflect on implications for application of mathematical concepts in the classroom.

Participation & Attendance

Prompt and consistent attendance in your online courses is essential for your success at CSU-Global Campus. Failure to verify your attendance within the first 7 days of this course may result in your withdrawal. If for some reason you would like to drop a course, please contact your advisor.

Online classes have deadlines, assignments, and participation requirements just like on-campus classes. Budget your time carefully and keep an open line of communication with your instructor. If you are having technical problems, problems with your assignments, or other problems that are impeding your progress, let your instructor know as soon as possible.

Course Materials

Required:

Kreyszig, E. (2011). *Advanced engineering mathematics* (10th ed.). Hoboken, NJ: John Wiley & Sons, Inc. ISBN 9780470458365

Suggested:

NOTE: All non-textbook required readings and materials necessary to complete assignments, discussions, and/or supplemental or required exercises are provided within the course itself. Please read through each course module carefully.

Course Schedule

Due Dates
The Academic Week at CSU-Global begins on Monday and ends the following Sunday.

- Discussion Boards: The original post must be completed by Thursday at 11:59 p.m. MT and Peer Responses posted by Sunday 11:59 p.m. MT. Late posts may not be awarded points.
- Students have one attempt on the midterm and final exams. The time limit is 400 minutes for each exam, and the exam must be completed in one sitting.
- Critical Thinking: Assignments are due Sunday at 11:59 p.m. MT.
- Live Classroom: Although participation is not required, Live Classroom sessions are held during Weeks 3 and 6. There are two total sessions.

Week #	Readings	Assignments
1	• Chapter 1.1 – 1.5 in *Advanced Engineering Mathematics*	• Discussion (25 points)
2	• Chapter 2.1 – 2.8 in *Advanced Engineering Mathematics*	• Discussion (25 points) • Critical Thinking (65 points)
3	• Chapter 3.1 – 3.3 in *Advanced Engineering Mathematics*	• Discussion (25 points) • Critical Thinking (65 points)
4	• Chapter 4.1 – 4.6 in *Advanced Engineering Mathematics*	• Discussion (25 points) • Critical Thinking (65 points) • Midterm Exam (200 points)
5	• Chapters 5.1 – 5.4 in *Advanced Engineering Mathematics*	• Discussion (25 points) • Critical Thinking (65 points)
6	• Chapter 6.1 – 6.9 in *Advanced Engineering Mathematics*	• Discussion (25 points) • Critical Thinking (65 points)
7	• Chapters 7.1 – 7.8 in *Advanced Engineering Mathematics*	• Discussion (25 points) • Critical Thinking (75 points)
8	• Chapters 8.1 – 8.4 in *Advanced Engineering Mathematics*	• Discussion (25 points) • Final Exam (200 points)

Assignment Details

This course includes the following assignments/projects:

Module 1

> **None**

Module 2

> **CRITICAL THINKING ASSIGNMENT (65 points)**
> Choose one of the following two assignments to complete this week. Do not complete both assignments. Identify your assignment choice in the title of your submission.
>
> Note that while there are two options for the Critical Thinking Assignment, there is only one rubric. Review the rubric to confirm you are meeting the assignment requirements.
>
> **Option #1: Basic Modeling and Direction Fields**
> Two of the learning outcomes from Module 1 are:
> - Solve problems involving basic modeling.
> - Solve problems involving direction fields.
>
> Your assignment this week is to demonstrate that you are proficient in these outcomes.
>
> Review the **Module 2 Critical Thinking Rubric** for full details on how you will be graded on this assignment.
>
> **Option #2: Separable and Exact Order Differential Equations (ODEs)**
> Two of the learning outcomes from Module 1 are:

- Solve problems involving separable ordinary differential equations (ODEs)
- Solve problems involving exact order differential equations (ODEs)

Your assignment this week is to demonstrate that you are proficient in these outcomes by solving a minimum of two problems for each outcome.

Review the **Module 2 Critical Thinking Rubric** for full details on how you will be graded on this assignment.

Module 3

CRITICAL THINKING ASSIGNMENT (65 points)
Choose one of the following two assignments to complete this week. Do not complete both assignments. Identify your assignment choice in the title of your submission.

Note that while there are two options for the Critical Thinking Assignment, there is only one rubric. Review the rubric to confirm you are meeting the assignment requirements.

Option #1: Homogenous Linear Ordinary Differential Equations (ODEs)
Compare and contrast a minimum of one problem of these types:
- Homogeneous linear ODEs of the second order.
- Homogeneous linear ODEs with constant coefficients.
- Differential operators.

Review the **Module 3 Critical Thinking Rubric** for full details on how you will be graded on this assignment.

Option #2 Modeling of Free Oscillations, Exact Order Differential Equations (ODEs), and Separable Ordinary Differential Equations (ODEs)

Compare and contrast a minimum of one problem of each type:
- Modelling of free oscillations
- Exact ODEs
- Separable ODEs

Review the **Module 3 Critical Thinking Rubric** for full details on how you will be graded on this assignment.

Module 4

MIDTERM EXAM (200 points)

CRITICAL THINKING ASSIGNMENT (65 points)
Choose one of the following two assignments to complete this week. Do not complete both assignments. Identify your assignment choice in the title of your submission.

Note that while there are two options for the Critical Thinking Assignment, there is only one rubric. Review the rubric to confirm you are meeting the assignment requirements.

Option #1: Midterm Exam Questions
For this assignment, your task is to create a five-question midterm exam for this class. What sorts of questions do you think will actually be on the midterm?
- Create actual questions, and then complete an answer key with a full solution to each question.
- Questions can be multiple choice, short answer, true/false, computational questions, and so forth.
- A minimum of one computational question is required.
- For multiple choice, short answer, and true/false questions, an explanation for why the answers are correct must be included.

Review the **Module 4 Critical Thinking Rubric** for full details on how you will be graded on this assignment.

Option #2: Sample Practice Problems
For this assignment, your task is to create five questions that you think would make good practice problems for this week.

Create actual questions, and then complete an answer key with a full solution to each question. Questions can be multiple choice, short answer, true/false, computational questions, and so forth. A minimum of one computational question is required.

For multiple choice, short answer, and true false questions, an explanation for why the answers are correct must be included. Also, be sure to discuss the rationale for your selection of questions.

Review the **Module 4 Critical Thinking Rubric** for full details on how you will be graded on this assignment.

Module 5

CRITICAL THINKING ASSIGNMENT (65 points)
Choose one of the following two assignments to complete this week. Do not complete both assignments. Identify your assignment choice in the title of your submission.

Note that while there are two options for the Critical Thinking Assignment, there is only one rubric. Review the rubric to confirm you are meeting the assignment requirements.

Option #1: Lesson on Linear Independence
Teach a lesson on linear independence. For this assignment, your task is to create a lesson that could be delivered to a group of college math majors who have completed Calculus I, II, and III.

Requirements:
  * A PowerPoint presentation of 15 slides for a 35-minute presentation
  * In the presentation, incorporate two fully solved example problems.

The rest of the presentation is up to you. Include whatever background information you think the students need, either something informative or something that will hold their attention, or a combination of both.

Some suggestions to enhance your presentation include the use of video, audio, animations of mathematical concepts, calculator applications, and so forth. Be innovative!

Review the **Module 5 Critical Thinking Rubric** for full details on how you will be graded on this assignment.

Option #2: Lesson on Nonhomogeneous Linear Ordinary Differential Equations (ODEs)
Teach a lesson to students so that they solve problems involving nonhomogeneous linear ordinary differential equations (ODEs). For this assignment, your task is to create a lesson that could be delivered to a group of college math majors who have completed Calculus I, II, and III.

Requirements:
  * A PowerPoint presentation of 15 slides for a 35-minute presentation
  * In the presentation incorporate two fully solved example problems.

The rest of the presentation is up to you. Include whatever background information you think the students need, either something informative or something that will hold their attention, or a combination of both.

Some suggestions to enhance your presentation include the use of video, audio, animations of mathematical concepts, calculator applications, and so forth. Be innovative!

Review the **Module 5 Critical Thinking Rubric** for full details on how you will be graded on this assignment.

Module 6

CRITICAL THINKING ASSIGNMENT (65 points)
Choose one of the following two assignments to complete this week. Do not complete both assignments. Identify your assignment choice in the title of your submission.

Note that while there are two options for the Critical Thinking Assignment, there is only one rubric. Review the rubric to confirm you are meeting the assignment requirements.

Option #1: Overview Presentation of Chapter 6
For this assignment, your task is to create a PowerPoint presentation that provides an overview of Chapter 6.1 in your textbook.

Requirements:
- A minimum of 10 slides
- At least two example problems to illustrate the content presented.

The rest of the presentation is up to you. Include whatever background information you think the students need, either something informative or something that will hold their attention, or a combination of both.

Some suggestions to enhance your presentation include the use of video, audio, animations of mathematical concepts, calculator applications, and so forth. Make the presentation engaging!

Review the **Module 6 Critical Thinking Rubric** for full details on how you will be graded on this assignment.

Option #2: Overview Presentation of Chapter 5
For this assignment, your task is to create a PowerPoint presentation that provides an overview of Chapter 5.1 in your textbook.

Requirements:
- A minimum of 10 slides
- At least two example problems to illustrate the content presented.

The rest of the presentation is up to you. Include whatever background information you think the students need, either something informative or something that will hold their attention, or a combination of both.

Some suggestions to enhance your presentation include the use of video, audio, animations of mathematical concepts, calculator applications, and so forth. Make the presentation engaging!

Review the **Module 6 Critical Thinking Rubric** for full details on how you will be graded on this assignment.

Module 7

CRITICAL THINKING ASSIGNMENT (75 points)

Option 1
One of the topics studied in this module is Gaussian Elimination. Write a biography on **Johann Carl Friedrich Gauss.** Focus on why he developed Gaussian Elimination and what was going on in his life at the time. Argue for and against this statement "Johann Gauss was the greatest mathematician of all time."
1. Your written paper should be 4-6 pages in length, not counting the title and reference pages, which you must include.
2. You need to cite 4 – 6 sources. The CSU-Global Library is a great place to find resources.
3. You should have an introduction, which will tell the reader what your paper is about. You should have a conclusion paragraph, which will summarize your paper.

4. Your paper must be formatted according to CSU-Global Guide to Writing and APA Requirements.
5. If you need assistance with your writing style, start with the links under the Research Help and Writing Help tabs on the CSU-Global Library's homepage.

Option 2
Find a journal article published within the last 12 months which uses Vector Spaces in some way. Read the article and explain what the authors found. Create a list of five research questions that would use this article and another scholarly source as primary resources.

1. Your written paper should be 4-6 pages in length, not counting the title and reference pages, which you must include.
1. You need to cite 4 – 6 sources. The CSU-Global Library is a great place to find resources.
2. You should have an introduction, which will tell the reader what your paper is about. You should have a conclusion paragraph, which will summarize your paper.
3. Your paper must be formatted according to CSU-Global Guide to Writing and APA Requirements.
4. If you need assistance with your writing style, start with the links under the Research Help and Writing Help tabs on the CSU-Global Library's homepage.

Module 8

   FINAL EXAM (200 points)

Course Policies

Course Grading

20% Discussion Participation
0%   Opening Exercises
40% Critical Thinking Assignments
40% Midterm and Final Exams

Grading Scale and Policies

A	95.0 – 100
A-	90.0 – 94.9
B+	86.7 – 89.9
B	83.3 – 86.6
B-	80.0 – 83.2
C+	75.0 – 79.9
C	70.0 – 74.9
D	60.0 – 69.9
F	59.9 or below

In-Classroom Policies
For information on late work and incomplete grade policies, please refer to our **In-Classroom Student Policies and Guidelines** or the Academic Catalog for comprehensive documentation of CSU-Global institutional policies.

Academic Integrity
Students must assume responsibility for maintaining honesty in all work submitted for credit and in any other work designated by the instructor of the course. Academic dishonesty includes cheating, fabrication, facilitating academic dishonesty, plagiarism, reusing /re-purposing your own work (see *CSU-Global Guide to Writing and APA Requirements* for percentage of repurposed work that can be used in an assignment), unauthorized possession of academic materials, and unauthorized collaboration. The CSU-Global Library provides information

on how students can avoid plagiarism by understanding what it is and how to use the Library and Internet resources.

Citing Sources with APA Style
All students are expected to follow the *CSU-Global Guide to Writing and APA Requirements* when citing in APA (based on the APA Style Manual, 6th edition) for all assignments. For details on CSU-Global APA style, please review the APA resources within the CSU-Global Library under the "APA Guide & Resources" link. A link to this document should also be provided within most assignment descriptions in your course.

Disability Services Statement
CSU–Global is committed to providing reasonable accommodations for all persons with disabilities. Any student with a documented disability requesting academic accommodations should contact the Disability Resource Coordinator at 720-279-0650 and/or email ada@CSUGlobal.edu for additional information to coordinate reasonable accommodations for students with documented disabilities.

Netiquette
Respect the diversity of opinions among the instructor and classmates and engage with them in a courteous, respectful, and professional manner. All posts and classroom communication must be conducted in accordance with the student code of conduct. Think before you push the Send button. Did you say just what you meant? How will the person on the other end read the words?

Maintain an environment free of harassment, stalking, threats, abuse, insults or humiliation toward the instructor and classmates. This includes, but is not limited to, demeaning written or oral comments of an ethnic, religious, age, disability, sexist (or sexual orientation), or racist nature; and the unwanted sexual advances or intimidations by email, or on discussion boards and other postings within or connected to the online classroom.

If you have concerns about something that has been said, please let your instructor know.