# MATH460



## Course Summary

**Course :** MATH460 **Title :** Principles of Applied Mathematics
**Length of Course :** 8
**Prerequisites :** MATH419 **Credit Hours :** 3

## Description

**Course Description:** The process of expressing scientific principles, experiments, and conjectures in mathematical terms. Topics include: gathering reliable data, exposing underlying assumptions, variables, relationships, levels, refining of models, and stochastic models. Deterministic versus stochastic models. (Prerequisite: MATH419)

**Course Scope:**

MATH460 is a distance learning course designed to help students achieve a thorough understanding of the applied mathematical concepts and techniques. It covers a variety of mathematical concepts and techniques relevant to a major in Mathematics with Applied Mathematics focus. The course provides a rigorous treatment of the results from college calculus.

## Objectives

After successfully completing this course, you will be able to:

CO-1: Find the Fourier series of periodic functions and the trigonometric polynomials for which the square error with respect to the function is minimum on a finite interval.

CO-2: Represent a function as a Fourier Sine or Cosine integral to find the transform of a function.

CO-3: Solve a Partial Differential Equation of the one dimensional wave equation by the method of separating variables

CO-4: Examine Heat Equations by Fourier series and Integrals.

CO-5: Differentiate complex valued functions using Cauchy-Riemann Equations, exponentials, logarithms, and general powers.

CO-6: Analyze the Cauchy integral Theorem, Cauchy integral Formula, and the Taylor series expansion of analytic functions to find line integrals.

CO-7: Find the Laurent series of a function to determine the poles and essential singularities.

CO-8: Solve boundary value problems for Laplace's equation by using conformal mapping.

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# Outline

### Week 1: Fourier Series

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Learning Objectives

**CO-1**
Find the Fourier series of periodic functions and find the trigonometric polynomials for which the square error with respect to the function is minimum on a finite interval.

Readings

**Text Readings:** Chapter 11
Sections 1, 2, and 4 (Kreyszig)

**In Course Materials:**

- Practice problems
- Forum discussions and feedback

Assignment

Intro Forum
Forum #1 Post

Quiz #1

### Week 2: Fourier Integral

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Learning Objectives

**CO-2**
Represent a function as a Fourier Sine or Cosine integral to find the transform of a function.

Readings

**Text Readings:** Chapter 11
Sections 7, 8, and 9 (Kreyszig)

**In Course Materials:**

- Practice problems
- Forum discussions and feedback

Assignment

Forum #2 Post

Quiz #2
Test #1

### Week 3: Partial Differential Equations

Learning Objectives

**CO-3**
Solve a Partial Differential Equation of the one dimensional wave equation by the method of separating variables

Readings

**Text Readings:** Chapter 12:
Sections 1, 3, and 4 (Kreyszig)

**In Course Materials:**

- Practice problems
- Forum discussions and feedback

Assignment

Forum #3 Post

Quiz #3

### Week 4: Partial Differential Equation (con't)

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Learning Objectives

**CO-4**
Examine a Heat Equation by Fourier Series, Fourier Integrals.

Readings

**Text Readings:** Chapter 12: Sections 6, 7, and 9 (Kreyszig)

**In Course Materials:**

- Practice Problems
- Forum and feedback

Assignment

Forum #4 Post
Quiz #4
Test #2

### Week 5: Analytic Functions

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Learning Objectives

**CO-5**
Differentiate complex valued functions, use of Cauchy-Riemann Equations, and Exponential, logarithms, and general powers.

Readings

**Text Readings:** Chapter 13:
Sections 2, 3, 4, 5, and 7 (Kreyszig)

**In Course Materials:**

- Practice Problems
- Forum and feedback

Assignment

Forum #5 Post
Quiz #5

**Week 6: Complex Integration**

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Learning Objectives

**CO- 6**
Analyze the Cauchy integral Theorem, Cauchy integral Formula, and the Taylor series expansion of analytic functions to find line integrals.

Readings

**Text Readings:** Chapter 14 and 15 (Kreyszig)

**In Course Materials:**

- Practice problems
- Forum proofs and feedback

Assignment

Forum #6 Post
Quiz #6

**Week 7: Laurent Series and Residue Integral**

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Learning Objectives

**CO- 7**
Find the Laurent series of a function to determine the poles and essential singularities.

Readings

**Text Readings:** Chapter 16:
Sections 1, 2, 3, and 4 (Kreyszig)

**In Course Materials:**

- Practice Problems
- Forum proofs and feedback

Assignment

Forum #7 Post
Quiz #7
Test #3

**Week 8: Final Project**

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Learning Objectives

**CO-8**
Solve boundary value problems for Laplace's equation by using conformal mapping.

Readings

**In Course Materials:**
Week 8: Final Project

Assignment

Forum #8 Post

Final Project

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# Evaluation

**Reading Assignments**:

Please refer to the Course Outline section of this syllabus for the weekly reading assignments. While reading assignments are not graded, it is very important that you read the assigned material and work practice problems as necessary and appropriate.

**Supplemental Readings:**

A link to online lectures and practice problems keyed to the textbook chapters is provided by Connect Math. It will appear near the bottom of the list of tools. Once clicked, a pop-up window will open and silently log the student into the Connect Math site where work can begin without having to login or type in any credentials.

**Forum Assignments:**

The forums are designed for students to provide information and ask questions on course content for the week. Your forum posts must meet the minimum requirement for the number of posts and the content for that assignment. These forums should not be used to discuss specific exam questions, but can be used to ask questions relative to practice exercises, practice tests, and textbook problems.

These forums will be a very important part of your learning. Please plan to spend time working on your answers. Reviewing your classmates' proofs – making corrections and learning the material.

***Three significant posts are required per forum***. Posts should be made as indicated in the forum instructions. Be sure to click on the link "Read Full Description" so that you will be familiar with each forum requirement and the grading rubric. (A significant post generally contains at least 100 words—single sentence responses such as "Now I understand" or "Thank you for your help" do not constitute significant posts.) Your replies should note any confusing steps within a stated proof.

Grading for each forum will follow the point structure outlined in the description for each forum.

***Introductory Forum:*** It is very important that you submit and participate in the Introduction Forum. Please introduce yourself to me and the class. Share where you work or plan to work after completing your program, your family, and any hobbies or special interests. Also tell us why you are taking this course and what you hope to gain from obtaining your degree. In addition, please take a look at the course objectives in the syllabus and discuss the relevance to your career goals.

*Instructions*: Your initial post should be at least 250 words. Please respond to at least 2 other students. Responses should be a minimum of 100 words. This forum submission serves as your official entry into the course and this is why we have drawn special attention to this assignment. You will be reminded of this

Forum again in the Week 1 Lesson Module, but please keep in mind that this Introduction Forum must be submitted by 11:55 p.m., ET, on Sunday of Week 1 to maintain your registration in the course.

**Practice Problems:**

Please be sure to ask each other (and/or your professor) questions about practice problems, practice test questions or other textbook material in the Open Questions Forum! Please do not divulge only answers, but provide assistance in developing solutions for problems as well. This will help you learn through explaining and help your classmates find where they are missing the point. Teamwork is encouraged in working practice problems so that you can learn through sharing problem-solving techniques. If you are unsure of a problem, please ask about it in the Open Questions Forum so that everyone can share in the conversation.

**Unit Tests and Quizzes:**

Numbered unit tests and quizzes are found via the navigation link labeled "Tests & Quizzes." Please complete each test and quiz by the due date noted in the syllabus and in the classroom. These are open-book and open-note tests, but are not collaborative efforts.

**Time Management:**

Students must plan and manage competing demands and priorities on their time and are expected to submit classroom assessment/forums on time. The instructor will post assessment/forum due dates and times in the Weekly Announcements.

Students are expected to submit classroom assignments by the posted due date and to complete the course according to the published class schedule. For late assignments, students need to contact the faculty member ahead of time about their individual situation.

Students' course grades will be posted as soon as the instructor receives and evaluates the Final Project. Official grades will continue to be issued by the University on the grade report form. Instructors have 7 days from the end of the semester to submit their grades to the University.

**Grading Scale:**

Please see the Student Handbook to reference the University's grading scale.

The points earned on the graded course assignments will determine the course grade. The final grade in the course will be based on total points. Grades will be assigned based on the following composite scores:

**Grading:**

| Name | Grade % |
|---|---|
| Quizzes | 35.00 % |
| Quiz 1 | 5.00 % |
| Quiz 2 | 5.00 % |
| Quiz 3 | 5.00 % |
| Quiz 4 | 5.00 % |
| Quiz 5 | 5.00 % |
| Quiz 6 | 5.00 % |
| Quiz 7 | 5.00 % |
| Forum | 20.00 % |
| Forum 1 (Introduction) | 2.00 % |
| APUS Honor Code and Pledge | 1.00 % |
| Week 1- Fourier Series | 2.00 % |
| Forum 2 | 2.00 % |
| Forum 3 | 2.00 % |
| Forum 4 (Mid term check) | 2.00 % |

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|---|---|
| Forum 4 | 2.00 % |
| Forum 5 | 2.00 % |
| Forum 6 | 2.00 % |
| Forum 7 | 2.00 % |
| Forum 8 (Feedback) | 2.00 % |
| Unit Tests | 30.00 % |
| Test 1 | 10.00 % |
| Test 2 | 10.00 % |
| Test 3 | 10.00 % |
| Final project | 15.00 % |
| Final Project | 15.00 % |

# Materials

**Book Title:** Advanced Engineering Mathematics, 10th ed - The VitalSource e-book is provided via the APUS Bookstore

**Author:** Kreyszig

**Publication Info:** Wiley

**ISBN:** 9780470458365

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**Book Title:** You must validate your cart to get access to your VitalSource e-book(s). If needed, instructions are available here - http://apus.libguides.com/bookstore/undergraduate

**Author:** N/A

**Publication Info:** N/A

**ISBN:** N/A

### Web Sites

In addition to the required course texts, the following public domain web sites are useful. Please abide by the university's academic honesty policy when using Internet sources as well. Note web site addresses are subject to change.

| Site Name | Web Site URL/Address |
|---|---|
| MIT Open Courseware | http://ocw.mit.edu/courses/mathematics/18-075-advanced-calculus-for-engineers-fall-2004/lecture-notes/ |
| Advanced Engineering Mathematics | https://course.ie.cuhk.edu.hk/~engg2012a/ |
| Advanced Math For Engineers | http://www-personal.umich.edu/~wangzuoq/450Su11/ |

# Course Guidelines

### Citation and Reference Style

- Attention Please: Students will follow the APA Format as the sole citation and reference style used in written work submitted as part of coursework to the University. Assignments completed in a narrative essay or composition format must follow the citation style cited in the APA Format.

**Tutoring**

- Tutor.com offers online homework help and learning resources by connecting students to certified tutors for one-on-one help. AMU and APU students are eligible for 10 free hours* of tutoring provided by APUS. Tutors are available 24/7 unless otherwise noted. Tutor.com also has a SkillCenter Resource Library offering educational resources, worksheets, videos, websites and career help. Accessing these resources does not count against tutoring hours and is also available 24/7. Please visit the APUS Library and search for 'Tutor' to create an account.

**Late Assignments**

- Students are expected to submit classroom assignments by the posted due date and to complete the course according to the published class schedule. The due date for each assignment is listed under each Assignment.
- Generally speaking, late work may result in a deduction up to 15% of the grade for each day late, not to exceed 5 days.
- As a working adult I know your time is limited and often out of your control. Faculty may be more flexible if they know ahead of time of any potential late assignments.

**Turn It In**

- Faculty may require assignments be submitted to Turnitin.com. Turnitin.com will analyze a paper and report instances of potential plagiarism for the student to edit before submitting it for a grade. In some cases professors may require students to use Turnitin.com. This is automatically processed through the Assignments area of the course.

**Academic Dishonesty**

- Academic Dishonesty incorporates more than plagiarism, which is using the work of others without citation. Academic dishonesty includes any use of content purchased or retrieved from web services such as CourseHero.com. Additionally, allowing your work to be placed on such web services is academic dishonesty, as it is enabling the dishonesty of others. The copy and pasting of content from any web page, without citation as a direct quote, is academic dishonesty. When in doubt, do not copy/paste, and always cite.

**Submission Guidelines**

- Some assignments may have very specific requirements for formatting (such as font, margins, etc) and submission file type (such as .docx, .pdf, etc) See the assignment instructions for details. In general, standard file types such as those associated with Microsoft Office are preferred, unless otherwise specified.

**Disclaimer Statement**

- Course content may vary from the outline to meet the needs of this particular group.

**Communicating on the Forum**

- Forums are the heart of the interaction in this course. The more engaged and lively the exchanges, the more interesting and fun the course will be. Only substantive comments will receive credit. Although there is a final posting time after which the instructor will grade comments, it is not sufficient to wait until the last day to contribute your comments/questions on the forum. The purpose of the forums is to actively participate in an on-going discussion about the assigned content.
- “Substantive” means comments that contribute something new and hopefully important to the discussion. Thus a message that simply says “I agree” is not substantive. A substantive comment

contributes a new idea or perspective, a good follow-up question to a point made, offers a response to a question, provides an example or illustration of a key point, points out an inconsistency in an argument, etc.
- As a class, if we run into conflicting view points, we must respect each individual's own opinion. Hateful and hurtful comments towards other individuals, students, groups, peoples, and/or societies will not be tolerated.

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# University Policies

Student Handbook

- Drop/Withdrawal policy
- Extension Requests
- Academic Probation
- Appeals
- Disability Accommodations

The mission of American Public University System is to provide high quality higher education with emphasis on educating the nation's military and public service communities by offering respected, relevant, accessible, affordable, and student-focused online programs that prepare students for service and leadership in a diverse, global society.