

MATH305

STUDENT WARNING: This course syllabus is from a previous semester archive and serves only as a preparatory reference. Please use this syllabus as a reference only until the professor opens the classroom and you have access to the updated course syllabus. Please do NOT purchase any books or start any work based on this syllabus; this syllabus may NOT be the one that your individual instructor uses for a course that has not yet started. If you need to verify course textbooks, please refer to the online course description through your student portal. This syllabus is proprietary material of APUS.

Course Summary

Course : MATH305 **Title :** Real Analysis

Length of Course : 8

Prerequisites : MATH227, MATH240, MATH320 **Credit Hours :** 3

Description

Course Description: This course provides a theoretical foundation for single-variable calculus concepts and introduces higher level abstraction of these concepts. Topics include the structure of the real numbers, sequences, continuity, and metric spaces. This course will be run as a seminar that emphasizes mathematical constructs of real analysis and proof writing. Prerequisite: MATH227 AND MATH240 AND MATH320

Course Scope:

MATH305 is a distance learning course designed to help students achieve a thorough understanding of the mathematical concepts and proof writing techniques important for higher level mathematics. 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 introductory mathematics. Topics include the constructs of logic and set theory; the properties of sets of numbers, including the real numbers, natural numbers and other sets; sequences of numbers; limits; continuity of functions; and metric spaces.

Objectives

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

CO-1 Explain the axiomatic foundation of the real number system in particular the notion of completeness and some of its consequences;

CO-2 Explain principles of sequences and apply concepts of convergence and limits in the context of sequences;

CO-3 Explain the concepts of limits, continuity, and compactness;

CO-4 Apply the results and techniques involving the concepts of limits, continuity, and compactness, to solve a variety of problems;

CO-5 Explain how completeness and continuity are generalized from the real line to metric spaces;

CO-6 Develop mathematical arguments.

Outline

Week 1: Logic

Learning Objectives

CO-6

Readings

Text Readings:

(Steven R. Lay)

Chapter 1: § 1.1-1.2

Assignment

» Introduction Forum

» Forum #1

» Quiz #1

» Homework:

§1.1: 3, 7, 9, 11

§1.2: 3, 5, 7ab, 9, 11, 13, 15, 17, 19

Week 2: Writing Proofs and Sets

Learning Objectives

CO-1

CO-6

Readings

Text Readings:

(Steven R. Lay)

Chapter 1: § 1.3-1.4

Chapter 2: § 2.1

Assignment

» Forum #2

» Writing Assignment #1

» Homework:

§1.3: 3, 6, 7, 8

§1.4: 3, 5, 7, 9, 15, 17, 19, 27

§2.1: 4, 6, 14, 15, 16, 19, 21, 25, 26a

Week 3: Relations and Functions

Learning Objectives

CO-1

CO-6

Readings

Text Readings:

(Steven R. Lay)

Chapter 2: § 2.2-2.4

Assignment

» Forum #3

» Quiz #2

» Homework:

§2.2: 7, 8, 11abce, 15, 17, 23

§2.3: 3, 5ab, 7, 9, 11a, 21abc, 34

§2.4: 4, 5, 9, 11, 15, 16

Week 4: The Real Numbers

Learning Objectives

CO-1

CO-5

CO-6

Readings

Text Readings:

(Steven R. Lay)

Chapter 3: § 3.1-3.3

Assignment

» Forum #4

» Writing Assignment #2

» Homework:

§3.1: 3, 6, 7, 11, 13, 19, 23a, 27

§3.2: 4, 6, 7, 12, 13

§3.3: 3, 4, 5, 7a, 9, 10, 12, 13, 15

Week 5: Topology, Compactness and Metric spaces

Learning Objectives

CO-3

CO-4

CO-5

CO-6

Readings

Text Readings:

(Steven R. Lay)

Chapter 3: § 3.4-3.6

Assignment

» Forum #5

» Quiz #3

» Homework:

§3.4: 3, 4, 5, 11, 13, 15

§3.5: 3, 5, 6, 7, 8

§3.6: 3, 5, 7, 9, 11

Week 6: Sequences and Limits

Learning Objectives

CO-2

CO-3

CO-6

Readings

Text Readings:

(Steven R. Lay)

Chapter 4: § 4.1-4.4

Assignment

» Forum #6

» Writing Assignment #3

» Homework:

§4.1: 6, 7, 8, 11

§4.2: 4a, 5, 7, 8, 12, 15

§4.3: 3, 4, 6, 15

§4.4: 6, 7

Week 7: Limits and Continuity

Learning Objectives

CO-3

CO-4

CO-5

CO-6

Readings

Text Readings:

(Steven R. Lay)

Chapter 5: § 5.1-5.3

Assignment

» Forum #7 Post

» Quiz #4

» Homework:

§5.1: 3, 4 (typo), 5, 6ab, 7, 9, 15

§5.2: 3, 4, 5, 6, 14, 16

§5.3: 3, 5, 7

Week 8: Uniform Continuity

Learning Objectives

CO-1

CO-2
CO-3
CO-4
CO-5
CO-6

Readings

Text Readings:

(Steven R. Lay)
Chapter 5: § 5.4-5.5

Assignment

- » Feedback Forum
 - » Writing Assignment #4
 - » Final Exam
 - » Homework:
§5.4: 3, 4
§5.5: 3, 10, 11
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Evaluation

Reading Assignments and Homework:

Reading assignments are provided each week. These assignments flow into the Forum discussions and homework problems. Reading assignments are not graded directly; however, **required homework problems must be submitted via the Messages by Sunday at midnight**. Homework problems and Forum discussion are graded jointly. Your conceptual understanding, ability to solve problems, and ability to synthesize material will be evaluated using quizzes, writing assignments, and a final exam.

Forum and Homework Assignments:

Mathematics is not a spectator sport. In order to learn the language of Mathematics, you must be engaged with the material. It is critical that you spend time thinking, considering examples, working problems, and discussing ideas with others.

- + The Homework are graded for completeness, correctness, and clarity.
- + The Forums are evaluated in three areas: quantity of posts, quality of posts, and value.

Quantity – The initial post for each Forum includes at least 250 words, and a minimum of two interaction posts are required per Forum using at least 100 words each.

Quality – High quality posts are critical to the development of everyone in the course. The overall quality of your posts is evaluated.

Value – Banal posts such as “Good work” and “Nice conclusion” provide no value to the Forum conversations. The key to the Forums is quality interaction. Superior posts promote a valuable conversation and meaningful interaction.

Evaluation criteria	Descriptive adjectives	Scoring
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Evaluation criteria	Descriptive adjectives	Scoring
Quantity	First post (>250 words) Two interaction posts (>100 words each)	33%
Quality	Accuracy, logical presentation, organization, clarity, completeness, proper terminology	34%
Value	Contributing to the conversation, useful to your colleagues, valuable feedback	33%

Forum Note: you cannot score points for the quality and value of a post if you fail to meet the minimum quantity.

Writing Assignments:

Written communication is a key piece of modern mathematics. The Forums as well as many of the homework problems ask you to develop an argument or proof and write it clearly. In addition to the Forums and homework, you are required to several formal proofs via four writing assignments. These assignments are evaluated according to their validity, readability, and fluency. The definitions for those concepts are given here:

Validity – Validity corresponds to the validity of your arguments. It addresses the extent to which your method is appropriate, your calculations are correct, and your deductions follow the rules of logic.

Readability – If your written work is not readable it cannot be assessed. Since the ability to communicate Mathematics is a focal point for this class, special attention will be paid to the readability of your work.

Fluency – Mathematics is a concise and precise language, and I wish to enhance your fluency. Therefore, part of every assessment will focus on your ability to incorporate correct, established notation and terminology into your written work.

Evaluation criteria	Descriptive adjectives	Scoring
Validity	logical arguments, deductive reasoning, proper conclusions, complete reasoning	43%

Evaluation criteria	Descriptive adjectives	Scoring
Readability	organization, presentation, format, clarity, effectiveness	35%
Fluency	proper notation, proper terminology, appropriate definitions, conciseness	22%

Quizzes:

Quizzes are the core assessment tools for the assigned readings and homework. Your work will be graded for correctness, completeness, and clarity.

Final Exam:

The final exam will be completed during the last week of the term. It will be a three-hour online exam and may include written work as well. The final exam will be open-book and open-notes *but you may not receive help from anyone*. The final will consist of all material covered during the term. You will not need a proctor to take the final exam.

Grading Scale:

Please see the [Student Handbook](#) to reference the University's [grading scale](#).

Grading:

Name	Grade %
Forums	23.00 %
Honor Pledge	0.96 %
Introduction Forum	0.96 %
Week 1 Forum & HW	2.88 %
Week 2 Forum & HW	2.88 %
Week 3 Forum & HW	2.88 %
Week 4 Forum & HW	2.88 %
Week 5 Forum & HW	2.88 %
Week 6 Forum & HW	2.88 %
Week 7 Forum & HW	2.88 %
Week 8 Feedback	0.96 %
Quizzes	27.00 %
Quiz 1	3.00 %
Quiz 2	8.00 %
Quiz 3	8.00 %
Quiz 4	8.00 %
Writing Assignments	30.00 %
Writing Assignment 1	7.00 %
Writing Assignment 2	7.00 %
Writing Assignment 3	8.00 %
Writing Assignment 4	8.00 %
Final Exam	20.00 %

Materials

Book Title: Analysis with an Introduction to Proof, 5th ed. - The VitalSource e-book is provided via the APUS Bookstore

Author: Lay

Publication Info: Pearson

ISBN: 9780321747471

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

Student Study Material:

A link to online lectures and practice problems via PowerPoint slides are included in the Resources and also within the Lesson Units provided in the classroom. Plan to thoroughly review each week's material, including new concepts and vocabulary, as well as all proofs. The textbook, PowerPoints, and forum interaction will all be crucial parts of your learning.

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.

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.

University Policies

[Student Handbook](#)

- [Drop/Withdrawal policy](#)
- [Extension Requests](#)
- [Academic Probation](#)

- [Appeals](#)
- [Disability Accommodations](#)

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