Fayetteville State University
College of Arts and Sciences
Department of Mathematics & Computer Science
MATH 461-01 Theory of Real Variables
Spring 2011

I. Locator Information:

Instructor: **Dr. Deepthika Senaratne**
Office Location: **SBE 344** Office Phone: **910- 672-1668**
Semester Credit Hours: **3**
Day and Time Class Meets: **TR 12:30—12:45pm**
Where Class Meets: **SBE 116**
Total Contact Hours for Class: 45
Email address: dsenaratne@uncfsu.edu
Office Hours: **MWF 11am-12pm, 2-3 pm, R 10am-12 pm**

Final Exam: 12:00-1:50pm Tuesday, May 01, 2012

FSU Policy on Electronic Mail: Fayetteville State University provides to each student, free of charge, an electronic mail account that is easily accessible via the Internet. The university has established email as the primary mode of communicating with enrolled students about impending deadlines, upcoming events, and other information important to student progression at the university. Students are responsible for reading their email on a regular basis to remain aware of important information disseminated by the university. The university maintains open-use computer laboratories throughout the campus that can be used to access electronic mail.

Students making inquiries via email to FSU faculty and staff about academic records, grades, bills, financial aid, and other matters of a confidential nature are required to use their FSU email account.

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http://www.uncfsu.edu/PDFs/EmailPolicyFinal.pdf

II. Course Description:

A study of real variables, incorporating a rigorous treatment of limits, functions, continuity, differentiability, infinite series, and introducing the Riemann-Stieltjes integral and Lebesgue integral. Prerequisite: Math412.

III. Disabled Student Services:

In accordance with Section 504 of the 1973 Rehabilitation Act and the Americans with Disabilities Act (ACA) of 1990, if you have a disability or think you have a disability to please contact the Center for Personal Development in the Spaulding Building, Room 155 (1st Floor); 910-672-1203.

IV. Textbook:

James R. Kirkwood, *An Introduction to Analysis*. Waveland Press, INC. 2002. 2nd Edition.

V. BEHAVIORAL OBJECTIVES:

To provide necessary background in analysis for students in mathematics computer science, engineering, physics, chemistry, and other sciences. After the completion of this course, students will have a working knowledge of the basic concepts in analysis described in II and be able to use Maple, a mathematical software, to solve practical problems.

VI. STUDENT LEARNING OUTCOMES:

Upon completing this course students should be able to:

- Understand and apply the definition of the Riemann integral
- Demonstrate the ability to prove elementary properties of the Riemann integral.
- Use various criteria to test the convergence of series.

- Describe the point wise and uniform convergence.
- Demonstrate the ability to manipulate and use power series.
- Know how to expand a function in Taylor series or Fourier series.
- Understand the construction of Lebesgue measure.

VII. COURSE COMPETENCIES:

Competencies (DPI)

(3.1) Use graphs, tables, and formal methods to evaluate limits involving elementary functions such as polynomial, rational, trigonometric, exponential, logarithmic functions.
(3.2) Demonstrate an understanding of limit definitions of derivatives and definite integrals.
(3.3) Know the relationship between differentiability and continuity.
(3.4) Know the notations and fundamental concepts used in studying sequences and series.
(3.5) Know the basic properties of power series.
(3.6) Know the relationship between infinite series and improper integrals.
(3.7) Use the comparison, ratio and alternating series tests for convergence of infinite series.
(3.8) Possess knowledge of the Taylor series representations of elementary functions.
(3.9) Know the Fundamental Theorem of Calculus.
(4.2) Evaluate integral using symbolic methods and technology.
(4.4) Solve maximum-minimum and related rates problems.
(4.7) Use graphs to understand and analyze properties of functions and their relationships to concepts of calculus.

NCATE Standards

(1.1.1) Use a problem-solving approach to investigate and understand mathematical concept.
(1.1.2) Formulate and solve problems from both mathematical and everyday situations.
(1.2.1) Communicate mathematical ideas in writing, using everyday and mathematical language, including symbols.
(1.3.0) Make and evaluate mathematical conjectures/arguments and validate their own mathematical thinking.
(1.4.1) Show an understanding of interrelationships within mathematics.
(1.4.2) Connect mathematics to other disciplines and real- world situations.
(1.6.1) Use calculators in computational and problem-solving situations.
(1.6.2) Use computer software to explore and solve mathematical problems.
(2.2.2) Use graphing calculators, computers and other technologies as tools for teaching mathematics.
(2.4.0) Use a variety of resource materials such as software, print materials, technology, and activity files to enhance the learning of mathematics.
(2.5.0) Select appropriate mathematical tasks that will stimulate students' development of mathematical concepts and skills.

VIII. EVALUATION CRITERIA/GRADING SCALE:

Tests	**40%**
Homework	**20%**
Instructor option	**10%**
Final	**30%**

There will be a test at the end of each chapter. The lowest test score will be dropped and
NO MAKE UP TESTS WILL BE GIVEN.
Final grades will be assigned on the basis of academic performance in the following manner:
Grading Scale
A = 90-100%, B = 80-89%, C = 70-79%, D = 60-69%, F= below 60%

IX. COURSE REQUIREMENTS:

Conduct of Course/Classroom Decorum:

1. Students are expected to attend all class sessions. Excessive absences may result in a reduction of your final grade.

2. Students are expected to enter the classroom on time, and remain for the full class period. Students should not make other appointments in conflict with their class schedule. Three late arrivals and early departures will constitute an absence from the class.

3. All tests will be announced prior to their administration. A make-up exam will be given only if the student has a documented and valid written justification for unavoidable absence from the exam. There is no more than one make-up exam for each student during the semester. Each student is required to attend the departmental colloquium at least three times during the semester as part of the project.

4. The Instructor's office hours are times when you may seek assistance without prior appointment. You are encouraged to seek help as needed.

5. Students must refrain from smoking, eating and drinking in the classroom. The rights of others must be respected at all times.

6. Students are encouraged to ask questions of the instructor in class and to respond to those posed by the instructor. They should not discourage others from asking or answering questions. Other students often have the same questions on their minds, but are hesitant to ask.

7. Students are expected to complete all class assignments, to spend adequate time on their class work, and to read each topic prior to class discussion to insure that the course outcomes are met. At least two hours of home study is expected for each class.

8. Talking in class between students is strictly prohibited. Discussions should be directed to the instructor. Unacceptable behavior in the class will result in a reduction of your final grade.

9. Dishonesty on graded assignments will not be tolerated. Students must neither give nor receive help on any work to be graded. The university policy on cheating will be applied to any violations. The minimum penalty will be a grade of zero on the assignment.

X. TEACHING STRATEGIES:

The majority of the material of the course will be given in lecture format. There is a short review before and after each lecture. There will be a comprehensive review after the completion of each chapter. Graphing calculators and Maple (mathematical software) will be used in the class to help students develop a firm grasp of the underlying mathematical concepts. Selected student research project will be introduced during the semester.

XI. COURSE OUTLINE:

LECTURE	SECTIONS
1	[6.1] The Riemann Integral
2	[6.1] The Riemann Integral
3	[6.1] The Riemann Integral
4	[6.2] Some properties & applications of the Riemann Integral.
5	[6.2] Some properties & applications of the Riemann Integral.
6	[6.2] Some properties & applications of the Riemann Integral.
7	[6.3] The Riemann-Stieltjies Integral
8	[6.3] The Riemann-Stieltjies Integral
9	[6.3] The Riemann-Stieltjies Integral
Test#1	
10	[7.1] Test for convergence of series (Comparison)
11	[7.1] Test for convergence of series (Ratio & Root Tests)
12	[7.1] Test for convergence of series (Integral Test)
13	[7.2] Operations involving series
14	[7.2] Operations involving series
Test#2	
15	[8.1] Sequence of functions
16	[8.1] Sequence of functions
17	[8.2] Series of functions
18	[8.2] Series of functions
19	[8.3] Taylor series
20	[8.3] Taylor series
Test#3	
21	[9.1] Fourier Coefficients
22	[9.1] Fourier Coefficients
23	[9.2] Representation by Fourier series
24	[9.2] Representation by Fourier series
25	[9.2] Representation by Fourier series
Test#4	
Final Review	
Final Exam	**12:00-12:50pm Tuesday, May 01, 2012.**

XII. REFERENCES:

1. Fitzpatrick, P., Real Analysis, PWS Publishing Company, 1996.
2. Gaskill, Herbert S. and Narayanaswami, P. P., Elements of Real Analysis, Prentice-Hall, 1998.
3. James R. Kirkwood, An Introduction to Analysis, PWS Publishing Company, 1995.
4. Marsden, J. R., Elementary Classical Analysis, Freman and Co. publishers, 1990.
5. Rudin, W., Principles of Mathematical Analysis, McGraw- Hill, 1976.
6. Wade, W. R., An Introduction to Analysis, Prentice Hall, 2000.
7. Herbert S. Gaskill and P.P. Narayanaswami, Elements of Real Analysis, Prentice-Hall, 1998.

8. K. R. Davidson and A. P. Donsig, Real Analysis with Real Applications, Prentice Hall, 2002.