MATH 5301: Fourier Series and Orthogonal Functions

Sul Ross State University ~ Rio Grande College
Summer I 2015

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Course Description	MTH 5301 is intended as an introduction to function spaces, orthogonal functions, Fourier series, Legendre polynomials, spherical harmonics, heat and temperature, and waves and vibrations.
Class Time	Monday and Wednesday, 1:00 – 4:45 p.m.
Class Location	Del Rio 101; Eagle Pass B114; Uvalde B111; Castroville 108
Required Text	Harry F. Davis, *Fourier Series and Orthogonal Functions*, ISBN 9780486659732
Office Hours	Monday – Thursday, 10:00 a.m. – 12:00 p.m., or by appointment.

Course Policies

Attendance Policy

Attendance is mandatory. You will be held responsible for all material covered in class or in the reading assignments. If you have to miss a class, it is your responsibility to obtain all notes, assignments, and announcements from someone else in the class. Make-up exams will be given only in the event of an emergency, in which case written justification and/or documentation must be provided and approved.

Communication

I will post course documents, reminders, announcements, and assignments on the Blackboard system. You will also submit homework on Blackboard. I may also occasionally send announcements via e-mail. You should make sure you know how to access and use these tools. E-mail is the best way to contact me.

You are welcome to stop by my office if you wish to speak about the content or your progress in the course. I am here to help you. Ask questions in class, call me, e-mail me, or come to my office. If you don't communicate with me, then I can't help you.

Homework

You will turn in homework assignments several times a week. Exercises from the text will be prepared as Microsoft Word documents. You will need to use a recent version of Word, such as is available on school computers.

In addition, you will complete a number of small projects on GeoGebra. To obtain GeoGebra, navigate to www.geogebra.org.

Exams

There will be one midterm exam. Its tentative date is Wednesday, June 17. This is subject to change. You will be notified of a change at least one week in advance. Make-up exams will be given only in the event of an emergency, in which case written justification and/or documentation must be provided and approved.

The final exam is scheduled for Monday, July 6. It will be comprehensive.

Grading Policy

Your grades will be weighted as follows:

Homework	30%
Midterm Exam	30%
Final Exam	40%

Subject Outline

I. Linear Spaces: *functions – vectors – linear spaces – finite-dimensional linear spaces – infinite dimensional linear spaces*

II. Orthogonal Functions: *inner products – orthogonal functions and vectors – orthogonal sequences – differential operators – integral operators – convolution and the Dirichlet kernel*

III. Fourier Series: *definitions – examples – sine and cosine series – the Gibbs phenomenon – uniform convergence*

IV. Legendre Polynomials and Bessel Functions: *PDEs – the Laplacian – Legendre polynomials – Laplace's equation in spherical coordinates – spherical harmonics – Bessel functions*

V. Waves and Vibrations; Quantum Theory: *the vibrating string – the one-dimensional wave equation – vibrating membranes – waves in two and three dimensions – the hydrogen atom*

VI. Heat and Temperature: *the theory of heat conduction – the temperature of plates – the temperature of solids*

Schedule

This schedule is tentative only. The unit numbers refer to the above outline.

June 1	Unit I
June 3	Units I – II
June 8	Units II – III
June 10	Unit III
June 15	Units III – IV
June 17	Midterm Exam; Unit IV
June 22	Units IV – V
June 24	Unit V
June 29	Units V – VI
July 1	Unit VI
July 6	Final Exam

Americans With Disabilities Act

Sul Ross State University is committed to equal access in compliance with the Americans With Disabilities Act of 1973. It is the student's responsibility to initiate a request for accessibility services. Students seeking accessibility services must contact Kathy Biddick, Student Services Administrative Secretary.