

# CAPITOL COLLEGE - DEPT. OF COMPUTERS & MATHEMATICS

**MA 360 E01 LAPLACE AND FOURIER ANALYSIS**  
**Spring Semester 2006 Wednesdays 7:45-10:25pm LAU MCI 134**

**Instructor :** William Kallfelz

**Office Hours:** Wednesdays 6:45pm-7:45pm or by appointment.<sup>1</sup>

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Note: Email is the best way to get in touch with me.

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(Effective Jan. 25<sup>th</sup>: [MA360](#) course website will be created—just click the link on my homepage, which you'll find under the **Recent Courses Taught** heading.)

## I.) OBJECTIVES AND GOALS OF THIS COURSE:

To obtain grounding in some of the essential concepts and computational techniques in the following areas:

1. Applying Laplace Transform methods to solve differential equations.
2. Finding the Inverse Laplace Transform.
3. Relating Laplace Transform methods with delta functions, periodic functions, and the Gamma function.
4. Applying Laplace transform methods to network, signal and systems problems.
5. Expanding functions in Fourier Series and finding complex Fourier coefficients.
6. Understand the Fourier transform and its properties.<sup>2</sup>

## II.) COURSE INFORMATION AND POLICIES:

- **Text (required)** Frank D. Sheng (1996) *Laplace and Fourier Analysis* (Second Edn.)
- **Optional Text(s) / URLs**  
I will occasionally cite other texts and URLs in Handouts and Problem Sets 1,2,3 for the interested student. (See **Information Literacy** below)
- **Prerequisite** MA 340
- **Software & Lab Facilities:** MATLAB (v 5.3)<sup>3</sup>, available on library computers.

- **Academic Integrity:**

<sup>1</sup> Location: Puente Library. I am available for appointments after 5:30pm Mondays, Tuesdays

<sup>2</sup> Time permitting, this may include FFT (Fast Fourier Transform) methods

<sup>3</sup> The most recent version. Depending on availability, other version(s) may be introduced.

***From the Adjunct Faculty Handbook: (§H)***

“At Capitol College, academic dishonesty consists of:

- ***Cheating:*** using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
- ***Fabrication:*** falsification or invention of any information or citation in an academic exercise.
- ***Facilitating Academic Dishonesty:*** helping or attempting to help another to violate any provision of this code.
- ***Plagiarism:*** representing the words or ideas of another as one’s own in an academic exercise.  
...Details are outlined in the Student Handbook.”

Homework I assign for credit will be accompanied by a statement, which you must read and sign and attach as a cover sheet in order to receive a grade for the assignment. This statement will specify explicitly all resources you may consult (e.g. the instructor, text(s), notes, URLs, depending on the nature of the assignment.)

- **Writing Requirements**

Certain assignments will involve some technical writing. In any technical assignment, clear and concise communication is an obvious must. This can only occur through proper usage of grammar and spelling, along with an appropriate writing style. Should you find it necessary, feel free to visit the tutoring resource center. In addition, please consult the following writing guidelines posted at: <http://www.capitol-college.edu/administrativeoffices/library/tutorials/writingguide/index.shtml>

- **Incomplete Policy:** College regulation specifies that an incomplete grade may be awarded only if the student has completed almost all the work for a course and has a valid, institution-approved, reason for being unable to complete it. If you are awarded an incomplete grade, it is your responsibility to complete all work for the course within the first four weeks of the next semester or summer term. After this time, the Registrar automatically converts the incomplete to an F.
- **Information Literacy:** Given the magnitude of information that we are expected to deal with in the performance of our tasks, it is important to learn the proper ways of finding, retrieving, storing, processing and incorporating the right type of information. This course may include assignments that would require the use of on-campus and on-line libraries, the Internet or other sources of publicly available information.

### **III.) GRADING:**

A.) Two exams (worth 150 pts) = 300 total

B.) Three problem sets (worth 100 points) =300 total

D.) The final exam is worth 200points.

F.) The total possible points a student can earn is 800. Final letter grade is decided on a 12.5% scale as listed below:

<b><u>Total Points (Pts)</u></b>	<b><u>FINAL LETTER GRADE</u></b>
<b>700 ≤ Pts ≤ 800</b>	<b>A</b>
<b>600 ≤ Pts &lt; 700</b>	<b>B</b>
<b>500 ≤ Pts &lt; 600</b>	<b>C</b>
<b>400 ≤ Pts. &lt; 500</b>	<b>D</b>
<b>Below 400</b>	<b>F</b>

### **IV.) IMPORTANT DATES:**

January 9	Classes begin, Last day for 100% refund, First tuition installment due, Library opens Cooperative education work period begins
<b>January 16</b>	<b>Martin Luther King Jr. Day</b> <b>college closed</b>
January 17	Electronics, physics/chemistry and computer labs open Tutoring Resource Center opens
January 24	Last day to <a href="#">add a course</a> Last day to <a href="#">change status to audit</a> Last day for 75% refund
January 31	Last day for 50% refund
February 7	Last day for 25% refund
February 10	Second tuition installment due
<b>March 5-12</b>	<b>Spring recess (service offices open)</b>
March 6-10	Financial Aid Disbursement Week/Pell Census
March 10	Final tuition installment due
March 13	Classes resume
<b>March 28</b>	<b>Last day to <a href="#">drop a course</a></b> Registration for summer session begins
April 10	Pre-registration for fall semester begins for continuing students
May 1	Classes end Electronics and physics/chemistry labs close Tutoring Resource Center closes All library materials are due Last day for cooperative education work
May 2-8	Final examinations
May 8	Library, computer labs close
May 9	Residence halls close at 5 p.m.
May 13	<a href="#">Commencement</a>

## **V.) COURSE PLAN/CONTENT**

- **Detailed Lesson Plan**

The lesson plan will follow the timetable below. Time permitting, I may cover optional material further extending and/or specializing the general topic(s) covered in text. Such optional material may appear in your problem sets and exams to give you opportunity to earn bonus points. **In general, the assignments you hand in and the Exams are based on the Exercises in Sheng.** Each week, I will assign problems from these exercises, which you're free to ask about/discuss the first 60-90 minutes of class (you need not hand these in, that I assign on a weekly basis.) Where relevant, some of the problems you'll encounter in the Assignments that you hand in will involve some MATLAB applications.

**IMPORTANT:** No class meetings Jan 11<sup>th</sup> and Jan 18<sup>th</sup>. I will email handouts to guide you through the topics. Beginning the week of Jan 23, (when we first meet) the course website will be ready (see page 1 above), which will include weekly handouts, exam reviews, hints on assignments, etc.

Week of	Chapters covered in text	Topics/assignments/exams
1. Jan 9 <b>No class meeting: Handout 1 emailed out</b>	I	Review (relevant integration techniques & integrals), motivation for Laplace transforms, linearity
2. Jan 16 <b>No class meeting: Handout 2 emailed out</b>	I	Inverse Laplace Transform, Transform of Integral and Derivative, Scale change, Shifting Theorems,
3. Jan 23 <b>Handouts 3, etc. and other documents posted on course website</b>	I	Transform of Periodic Functions, Convolution Theorem, Transform of Periodic Functions <b>Assignment 1 handed out</b>
4. Jan 30	II	Step and Impulse Functions
5. Feb 6	III	Inverse Transform by Partial Fractions <b>Assignment 1 due</b>
6. Feb 13	<b>EXAM I (Topics covered: chs I, II or weeks 1.-4.)</b>	
7. Feb 20	IV, V	Review of Differential Equations Differential Equations by Laplace Transforms <b>Assignment 2 handed out</b>
8. Feb 27	V	Differential Equations by Laplace Transforms (cont.)
9. March 13	V	Applications
10. March 20	VI	Fourier Series <b>Assignment 2 due</b>
11. March 27	<b>EXAM II (Topics covered: chs III-V or weeks 5., 7.-9.)</b>	
12. April 3	VI, VII	Fourier, and Complex Fourier Series <b>Assignment 3 handed out</b>
13. April 10	VII	Complex FS, FT
14. April 17	VII	Fourier Transform Graphical Convolution, FFT (time permitting)
15. April 24		Course review, catch-up <b>Assignment 3 due</b>
16. May 1	<b>FINAL EXAM (cumulative, equally weighted) (May 3, in class)</b>	