

PHY370 Advanced Mathematical Methods of Physics

Gustavus Adolphus College Spring 2008

Instructor: Dr. Steven Mellema

Office: Olin Hall 210

Office Hours: MTWRF 8:10-8:45am, 10:30-11:20am

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Textbooks:

Required – *Mathematical Methods for Scientists and Engineers*, by Donald McQuarrie, University Science Books, ©2003

Recommended - *Mathematical Handbook of Formulas and Tables*, by Murray R. Spiegel
(Schaum's Outline Series)

Course Description and Objectives:

In this course we extend the development of mathematics to topics essential in advanced physics and engineering. The course includes topics in linear algebra, differential equations, Sturm-Liouville theory, and special functions, and explores both analytical and numerical techniques. Practical objectives are:

1. to expose the student to the formalism of the theories and involve them in handling the operational techniques of problem solving;
2. to prepare students for the study of quantum mechanics in their senior year, using both the matrix and eigenfunction representations; and
3. to build upon the mathematical techniques introduced in previous mathematics and physics courses, and to prepare the student for the mathematical level of introductory graduate courses in physics and engineering.

Course Policy and Evaluation:

1. **Class Meetings and Reading Assignments:** The class will meet five days a week from 11:30AM-12:20PM for lecture, small-group problem solving, homework review and, occasionally, for exams. Attached is a daily calendar of activities for the course. When reading assignments are made for a class session, the reading is expected to be completed **before** coming to the class.
2. **Homework:** Homework problems will be assigned according to chapters in the textbook, and are due at the beginning of class on the due date listed on the calendar. Late homework may be accepted at the discretion of the instructor with a reduction in credit.
3. **Group Problems:** Frequently in class, students will work together, in assigned groups of 3-4 members, to cooperatively solve problems. A group solution will be submitted, with all group members receiving the same grade. There will be no make-up for group problems missed due to absence.

4. **Problem Presentations:** After completing the lectures for each chapter in the textbook, we will take one day to have example problem solutions presented to and discussed by the class. These problems will be assigned to specific student presenters approximately one week in advance, and all students will take turns to present problem solutions. Students will earn credit both for their presentations and for their thoughtful discussion of others' presentations.
5. **Attendance :** Regular attendance at all class meetings is expected. Students will be held responsible for informing themselves of all announcements/assignments made in class.
6. **Academic Honesty:** Having signed and agreed to abide by the College's Honor Code, students thereby pledge that, in all academic exercises, examinations, papers, and reports, they shall submit their own work. Footnotes, or some other acceptable form of citation must accompany any use of another's words or ideas. In the context of this course, students are expected to collaborate and to discuss their out-of-class assignments. However, submitting under one's own name work that is merely copied from another is a violation of the Honor Code. (The full text of the Gustavus Academic Honor Code Policy may be found in the Gustavus Academic Bulletin 2004-2005, p. 32).
7. **Exams :** There will be four hour exams and a two-hour final exam (see the calendar below). Students must arrange **in advance** to take an exam at other than the scheduled time, and may do so **only** for a valid health or school-related reason. (It is the responsibility of the student to inform the instructor during the first week of the semester regarding any anticipated absences due to required field trips, athletic events, musical performances, or other extra-curricular activities.) Exams missed without pre-arrangement are entered as zero credit and cannot be made up.
8. **Evaluation :**

Homework	25%
Group Problems	7.5%
In-Class Problem Presentations	7.5%
Hour Exams	10% each
Final Exam	20%

Assignment of final letter grades will be based upon the following guidelines:

A = 94-100%	B+ = 86-90%	C+ = 74-78%	D+ = 62-66%
A- = 90-94%	B = 82-86%	C = 70-74%	D = 58-62%
	B- = 78-82%	C- = 66-70%	

9. **Incompletes :** A grade of incomplete will **only** be given for work not completed due to circumstances beyond the control of the student (*this is the College policy*).

February

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
					1	2
3	4	5	6	7	8	9
10	11 McQuarrie 2.1-2.2	12 McQuarrie 2.3	13 McQuarrie 2.4-2.5	14 McQuarrie 2.6	15 McQuarrie 2.7-2.8	16
17	18 McQuarrie 2.9	19 Problem Discussion Chapter 2	20 McQuarrie 3.1-3.2 Chapter 2 Homework due	21 McQuarrie 3.3	22 McQuarrie 3.5	23
24	25 McQuarrie 3.6	26 Problem Discussion Chapter 3	27 McQuarrie 9.1 Chapter 3 Homework due	28 McQuarrie 9.2	29 McQuarrie 9.3	

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March

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
						1
2	3 Hour Exam: Chapters 2-3	4 McQuarrie 9.4	5 McQuarrie 9.5-9.7	6 Problem Discussion Chapter 9	7 McQuarrie 10.1 Chapter 9 Homework due	8
9	10 McQuarrie 10.2	11 McQuarrie 10.3	12 McQuarrie 10.4	13 McQuarrie 10.5	14 McQuarrie 10.6	15
16	17 Problem Discussion Chapter 10	18 McQuarrie 12.1-12.2 Chapter 10 Homework due	19 McQuarrie 12.3	20 Hour Exam: Chapters 9-10	21 No Class: Spring Break	22
23	24 No Class: Spring Break	25 No Class: Spring Break	26 No Class: Spring Break	27 No Class: Spring Break	28 No Class: Spring Break	29
30	31 McQuarrie 12.4					

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April

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
		1 McQuarrie 12.5	2 McQuarrie 12.6	3 Problem Discussion Chapter 12	4 McQuarrie 13.1	5
6	7 McQuarrie 13.2 Chapter 12 Homework due	8 McQuarrie 13.3	9 McQuarrie 13.4	10 McQuarrie 13.5	11 Problem Discussion Chapter 13	12
13	14 McQuarrie 14.1 Chapter 13 Homework due	15 McQuarrie 14.2	16 McQuarrie 14.3	17 McQuarrie 14.4	18 Hour Exam: Chapters 12- 13	19
20	21 McQuarrie 14.5	22 Problem Discussion Chapter 14	23 McQuarrie 15.1 Chapter 14 Homework due	24 McQuarrie 15.2	25 McQuarrie 15.3	26
27	28 McQuarrie 15.4	29 Problem Discussion Chapter 15	30 MayDay! (12:10-12:40) McQuarrie 16.1-16.2			

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May

<i>10.Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
				1 McQuarrie 16.3 Chapter 15 Homework due	2 McQuarrie 16.4	3
4	5 McQuarrie 16.5	6 McQuarrie 16.6	7 McQuarrie 16.7	8 Problem Discussion Chapter 16	9 McQuarrie 17.1 Chapter 16 Homework due	10
11	12 McQuarrie 17.2	13 McQuarrie 17.3	14 Hour Exam: Chapters 14- 16	15 McQuarrie 17.4	16 McQuarrie 17.5	17
18	19 McQuarrie 17.6	20 Problem Discussion Chapter 17	21 Final Review Chapter 17 Homework due	22 Reading Day	23	24
25	26	27 8:00-10:00 am Final Exam (30% Chapter 17, 70% Comprehensive Review)	28	29	30	31

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