



MAP 6506: Mathematical Methods in Physics II

Prerequisites

UF Calculus 3, Linear Algebra, and Introduction to Partial Differential Equations are necessary. UF Advanced Calculus or Mathematical Analysis or their equivalents and Part I of this course are very helpful, but not mandatory. However, basic concepts of the theory of distributions and the Lebesgue integration theory have to be reviewed in order to understand some of the concepts of Part II.

Recommended Texts

V.S. Vladimirov, Equations of Mathematical Physics

F. Riesz and B. Sz.-Nagy, Functional Analysis

I. Stakgold, Green's functions and boundary value problems,

M. Reed and B. Simon, Methods of Modern Mathematical Physics, Vol 1-4 (for advanced reading).

Course Content

The detailed course content is posted in the course webpage along with references to the corresponding topics in the aforementioned textbooks. In brief, the course covers Hilbert and Banach spaces, basic concepts of the theory of operators in Hilbert spaces, in particular, the theory of self-adjoint operators in Hilbert spaces, compact operators, the resolvent of an operator, Fredholm alternative for linear operators on a functional space, bounded and unbounded operators. Some applications to integral equations, boundary value problems for basic PDEs in mathematical physics and engineering, and wave scattering theory. It is also possible to include elements of the Lie group theory and solitons in PDEs (if time permits and all students are interested in such a topic).

Remark: By a request from the students of Part I (Fall 2019), the course in Spring 2020 will start with (1) Green's functions of basic differential operators in physics and engineering; the method of the Fourier transform of tempered distributions and (2) Laplace transform of distributions. Students who did not take Part 1 of the course are advised to review some basic topics on distributions using Chapter II (Sections 5-8) of the textbook by Vladimirov.

Written assignments and Homework

Homework: There will be two homework assignments in early February and late March. The assignments are due in one week after they are posted in the course webpage. Most of homework problems will be formulated in lectures along with hints to solve them. The homework should be done in accord with the student honor code (see the bottom of this page).

Exams: There will be midterm and final exams. The midterm exam will be scheduled either right before or after the spring break. The time and place will be posted in the course webpage 1-2 weeks prior to the exam. The midterm exam covers the material discussed prior to it. The final exam covers the material discussed after the midterm. The exams will have in-class and take-home parts. The take-home parts will be posted in the course page. Your class notes are permitted on the in-class parts (so make sure that your notes are in a good shape!). No books and no electronics devices are permitted on the exams. Make-ups for missed exams only with written medical excuse.

Grades and Ranking

Each problem is valued as one point if solved correctly, unless stated otherwise in the assignment. If N is the maximal number of points (all problems are solved correctly in all assignments) and n is the number of points earned, then your course score is

$$G = (n/N) \cdot 100$$

Extra credit: One or two extra problems will be added to the assignments. If solved correctly, they add 1-2 pts toward your assignment score, i.e. the perfect score can exceed N .

Grading Scale

The grade thresholds

A: $G > 85$; **A-:** $G > 80$; **B+:** $G > 75$; **B:** $G > 70$; **B-:** $G > 65$; **C+:** $G > 60$; **C:** $G > 55$; **C-:** $G > 50$; **D+:** $G > 45$; **D:** $G > 40$; **F:** $G < 40$

Policies

Class attendance: No credit for class attendance. You may leave or come any time without asking my permission. However the class attendance is strongly recommended as the material presented does not follow any particular book, but rather is based on several texts. Your notes should be sufficient for all graded assignments. A brief description of each lecture will be posted in the homework page along with recommended texts useful for further reading on the topic discussed. If you miss a class meeting make sure you have a copy of notes either from your class mates or from me.

Special accommodation: Students requesting special accommodation for exams must first register with the Dean of Student Office. The Dean of Student Office will provide documentation to the student who must then provide this documentation to me when requesting accommodation.

Student honor code: When turning in a homework, please write "I did the assignment myself and received no help from anybody" on the front page and sign it.



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