Physics 605/480: Math Methods I

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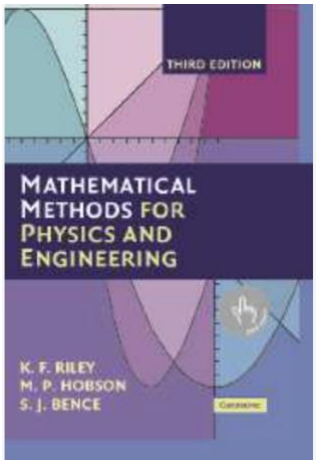
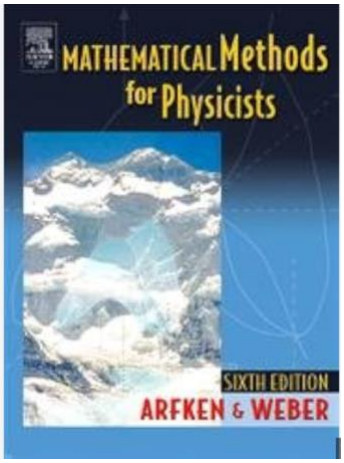
Scope

Course content is comprised of the following topics: linear algebra, normal modes, tensors, group theory, Green's functions, complex analysis, calculus of residues, and statistics. Subtopics are provided on the schedule. As many of these topics will be covered as time permits. The content of this course will be useful in your other physics courses and research.





The primary textbook is Mathematical Methods for Physics and Engineering by Riley, Hobson, and Bence. Mathematical Methods for Physicists by Arfken and Weber is a secondary reference. Arfken's book is especially good for complex analysis. The chapters covered in each book are given in the schedule.

Homework

Homework assignments will be posted on blackboard. Homework assignments will be collected and checked for completion. Homework is due on the date given in the schedule in the syllabus. On the day homework is due, ***there will be a graded quiz*** taken from the homework problems at the beginning of class. The completed homework must be turned in on time in order to take the quiz.

Grading

There will be three midterms, worth 20% each, covering each topic. The weekly homework-based quizzes are worth 20%. The final exam is worth 20%. Exam dates are given on the

schedule and highlighted in red. You can check on grades at any time using the course site on blackboard.

Weeks	**Topics Covered**	**Chapters**	**Homework Due Date** *(mostly Mondays)*
1-4	vector spaces, matrices and operations, SVD, linear equations, normal modes application Tensor application Group theory Green's functions	RHB: 7,8 RHB 9 RHB 26.12 Arfken: 4.7-4.9 RHB: 15.2.5	1. 9-5 (F) 2. 9-12 (F) 3. 9-17 (W) 4. 9-22
5	Midterm		9-26 (Friday)
6-9	complex numbers, arithmetic, infinite series, singularities contour integration, calculus of residues	RHB: 3,24 Arfken: 6,7	5. 10-6 6. 10-13 7. 10-20 8. 10-27
10	Midterm		10-29 (Wednesday)
11-14	probability and permutations common PDFs: binomial, Gaussian, Poisson, and gamma. estimation theory, maximum likelihood, linear regression, Spearman rank correlation, Bayesian analysis *Optional*: Markov chain Monte-Carlo, K means clustering, PCA	RHB: 30,31 Arfken: 19	9. 11-10 10. 11-17 11. 11-24 12. 12-3 (W)
15	Midterm		12-5 (Friday)
	Final exam		12-12 (Friday) 1 – 3pm