

## INTRO TO MATH METHODS II – ACMS20750 – CRN 15842

### Course Summary

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The fundamental methods of applied mathematics are continued in this course.

Topics include: variational calculus, special functions, series solutions of ordinary differential equations (ODE), orthogonal functions in the solution of ODE, basic partial differential equations and modeling heat flow, vibrating string, and steady-state temperature. Topics in complex function theory include contour integrals, Laurent series and residue calculus, and conformal mapping. The course concludes with a basic introduction to probability and statistics. Credit is not given for both ACMS 20750 and PHYS 20452.

PREREQUISITES – ACMS 20550 -or- Physics 20451 -or- Mathematics 20550

BOOK – Mathematical Methods in the Physical Sciences, third edition by Mary L. Boas.

TIME AND PLACE – MWF 8:20 - 9:10 am, Pasquerilla 107.

INSTRUCTOR – Daniel Brake. Office 152B Hurley. [dbrake@nd.edu](mailto:dbrake@nd.edu)

OFFICE HOURS – Monday 9:30-10:30, Friday 10:00-11:00, and by appointment.

### Tutorial

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ASSISTANT – Alicia Specht. Office 215 Hayes-Healey. [aspect2@nd.edu](mailto:aspect2@nd.edu)

ALICIA'S OFFICE HOURS – Monday 3:00-4:00, Tuesday 4:30-5:30.

MEETING TIMES – Tuesdays 2:00-2:50, 3:30-4:20

### Grade

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Homework	100
Midterm 1	100
Midterm 2	100
Final exam	150
Total	450

HOMEWORK – assigned weekly, and turned in by paper the class session following tutorial. We will use the Computer Algebra System called Maple for computer-assisted calculations and explorations. If you prefer a different system, use it; know that assistance will be given for Maple only. **Homework will be graded in two ways.** First, for genuine effort. If your homework demonstrates a strong effort to understand the material, you will receive full credit. Lackluster effort will be noticed. Second, for correctness. Your submitted homeworks will be returned with marks for in/correct methods and answers. The number of points on homework assignments will not sum to 100. Rather, you will be given a number of points toward your final score, which are the percentage you earned out of the total number available.

EXAMS – two midterms and a final. The exams will be challenging, and not allow the use of any device more sophisticated than a TI-8X calculator. Hence, do not use Maple to solve your homework problems, except to verify solutions, as a hinting system when you are stuck, or for a comparison between computer results and manual methods. Dates for the midterms will be announced in class and online at least two weeks prior. The final is Monday, December 14 from 8-10 am. A student who misses an examination will receive zero points for that exam unless he or she has written permission from the Vice president for residential life. In such a situation, please contact instructor before the exam to schedule a makeup exam.

LETTER GRADE – will be assigned on the percentage of points you earned, out of the total available, with a scale no more stringent than the typical 90-80-70 scale. The cutoffs for  $\pm$  grades are  $\pm 3\%$  of the respective letter grade boundary.

## Policies

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ATTENDANCE – You are expected to attend every lecture and tutorial session in which you are enrolled. Lack of attendance is not a valid excuse for missed material or course announcements. If you miss a lecture, it is your responsibility to obtain notes from a reliable classmate.

GROUP WORK – Group work to solve homework problems is encouraged. **You must write your own solutions for homeworks.**

HONOR CODE – The ND honor code is in full effect for all work related to this course. The instructor takes this seriously.

LATE WORK – Late homework is not accepted, except for pre-arranged university excused absences.

## Detailed Course Syllabus

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Broadly speaking, we will cover chapters 8, 9, 11, 12, 13, and 14. In more detail, here is a tentative list of what will be covered:

- Ordinary Differential Equations – Chapter 8
  - The entire chapter
- Calculus of Variations – Chapter 9
  - Sections 1-3, focusing on the Euler Equation
- Special Functions – Chapter 11
  - Factorial, erfc, Stirling's formula
- Series Solutions of Differential Equations – Chapter 12
  - Legendre's Equation, Polynomials
  - Briefly, Power Series and Bessel functions
- Partial Differential Equations – Chapter 13
  - Sections 1-8, the Heat Equation and the Wave Equation
- Functions of a Complex Variable – Chapter 14
  - Sections 1-9, Contour integrals, Laurent Series, Residues.

If there are topics in the book which you would like the instructor to cover in particular depth, just ask.