

**ADVANCED MATH METHODS (MEEN 5140)**  
**FALL 2017**

Instructor: Prof. Richard Zhang Contact: zihao.zhang@unt.edu Office: Discovery Park F101R.1	Lectures: MWF 8:30 – 9:20 AM Classroom: Discovery Park B140 Office Hours: Mon & Wed 4:00 – 5:00 PM
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**Textbooks:**

1. Advanced Engineering Mathematics, Michael D. Greenberg, 2nd Edition (1998)
2. Heat Conduction, David W. Hahn & M. Necati Özisik, 3rd Edition (2012)

**Course Description:**

Advanced math methods prepares graduate or senior-level undergraduate MEE students in numerical problem solving and modeling. Many other MEE graduate courses rely on knowledge learned from this course. Topics covered include: 1. Solution of ordinary differential equations by power series methods and special functions; 2. Laplace and Fourier transform methods; 3. numerical methods for solving differential equations; 4. solutions of the partial differential equations in various coordinate systems, and separation of variables to boundary value problems.

**Grading:**

A: 90% – 100%	Homework*: 27%
B: 80% – 89%	Midterm: 33%
C: 70% – 79%	Final Exam: 40%
D: 60% – 69%	<u>Total</u> : 100%
F: 59% and below	

*\* The lowest homework grade will be dropped (each homework counts as 3%).*

**Course Requirements:**

- Lecture attendance is highly encouraged, but not strictly enforced. Students with exceptional truancy without an authorized excuse will first receive a verbal warning, then failure of course if uncorrected.
- Homework will be released to students at least one week before they are due. Homework are to be turned in to the instructor by end of class (9:20 AM). Late assignments will receive a zero grade, but will have some corrections/feedback.
- The instructor reserves the right to change the above grade distribution at the end of the semester, to account for student confidence in their performance. If any changes occur, the changes will be less stringent than the distribution above. Graduate level courses are generally B-centered, unless the instructor deems otherwise.
- Zero tolerance for academic misconduct will be enforced. First-time offenses will be reported to the Office of Academic Integrity. The student will receive a grade penalty or failure of class, depending on severity.

**MEEN 5140 Fall 2017 Semester Schedule**  
(Subject to change)

Week 1: 8/28 – 9/1	Week 9: 10/23 – 10/27
<u>M</u> Separable and exact eqs. (AEM 2.4-2.5) <u>W</u> Linear 2nd-order ODEs (3.2-3.4) <u>F</u> Non-homogeneous ODEs (3.7)	<u>M</u> Properties of PDEs and SOV <b>HW6</b> <u>W</u> Nonhomogeneous PDEs (HC Ch. 3) <u>F</u> Laplace and Fourier Methods
Week 2: 9/2 – 9/8	Week 10: 10/30 – 11/3
<u>M</u> <i>No class (Labor Day)</i> <u>W</u> Cauchy-Euler Equations (3.6) <u>F</u> Series solutions to ODEs (4.2) <b>HW1</b>	<u>M</u> PDEs in other coordinate systems <u>W</u> Review of Legendre (HC Ch. 2) <u>F</u> Review of Bessel (HC Ch. 2) <b>HW7</b>
Week 3: 9/11 – 9/15	Week 11: 11/6 – 11/10
<u>M</u> Method of Frobenius I (4.3) <u>W</u> Method of Frobenius II (4.3) <u>F</u> Legendre function (4.4) <b>HW2</b>	<u>M</u> Numerical Methods in PDEs <u>W</u> <i>Make-up Midterm Exam</i> <u>F</u> Spherical diffusion (HC Ch. 5)
Week 4: 9/18 – 9/22	Week 12: 11/13 – 11/17
<u>M</u> Bessel function (4.6) <u>W</u> Properties of Bessel (4.6) <u>F</u> Laplace transform (5.1-5.2) <b>HW3</b>	<u>M</u> Legendre solutions (HC Ch. 5) <b>HW 8</b> <u>W</u> Spherical BVPs (HC Ch. 5) <u>F</u> Associated Legendre (HC Ch. 5)
Week 5: 9/25 – 9/29	Week 13: 11/20 – 11/24
<u>M</u> Properties of Laplace (5.3) <u>W</u> Examples of Laplace (5.4-5.6) <u>F</u> Fourier series (17.2-17.3) <b>HW4</b>	<u>M</u> Cylindrical diffusion (HC Ch. 4) <u>W</u> <i>No class (Thanksgiving travel day)</i> <u>F</u> <i>No class (go shopping)</i>
Week 6: 10/2 – 10/6	Week 14: 11/27 – 12/1
<u>M</u> Fourier integral (17.9) <u>W</u> Fourier transform (17.10) <u>F</u> Numerical methods – Euler's (6.2)	<u>M</u> Bessel solutions (HC Ch. 4) <b>HW9</b> <u>W</u> Modified Bessel functions (HC Ch. 4) <u>F</u> Cylindrical BVPs (HC Ch. 4)
Week 7: 10/9 – 10/13	Week 15: 12/4 – 12/8
<u>M</u> Runge-Kutta methods (6.3) <b>HW5</b> <u>W</u> Systems and difference equations (6.4-6.5) <u>F</u> Review of Midterm Exam topics	<u>M</u> Examples of interest <b>HW10</b> <u>W</u> Review of Final Exam topics <u>F</u> <i>No class (reading day)</i>
Week 8: 10/16 – 10/20	Week 16: 12/11 – 12/15
<u>M</u> Physical problems and PDEs <u>W</u> <b>Midterm Exam</b> (Covers HW1-HW5) <u>F</u> <i>No class (you deserve a break)</i>	<u>M</u> <b>Final Exam</b> (Covers HW6-HW10) 8:00 – 10:00 AM <u>F</u> Pick up Final Exam and grades

**Exam Guidelines:**

- In-class exams are closed book, closed notes, closed cell phones. No calculators.
- You are allowed to bring one (1) page 8.5" x 11" white crib sheet – you can use both sides. You may turn in your crib sheet for a bonus 2% on your exam grade.
- Midterm exam is 50 minutes in duration. The Final is 120 minutes in duration. Please hand your exams in person to the instructor when exam time ends.
- Makeup examinations will not be given, and only be administered under extreme circumstances with a documented university excuse.