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## MAT 341: Applied Real Analysis
## Fall 2018
## Schedule & Homework



# Schedule

Legend: Red colored homework problems will not be graded, but make sure that you are able to do these problems, which give you an extra practice. The PDF version of the schedule is available for print **here**.

| Dates | Sections covered - assigned reading before and after the class | Homework |
|---|---|---|
| Aug 28 & Aug 30 | Orthogonal functions & Fourier series. Definitions & examples.<br>Ch.0, §§0.3.1-0.3.3 and Ch.1, §§1.1.1-1.1.4 and §1.1.6. | **HW 1; due: Sep 6**<br>p. 33: 1,3,7,8; pp. 44-46: 1,3,4,7,9,30; pp. 33-34: 2,6,11-14; pp. 45-46: 10,13-15,18,19,33,34. |
| Sep 4 & Sep 6 | Pointwise and uniform convergence of Fourier series<br>Ch.1, §1.2.1 (proofs are optional) and §§1.3.3-1.3.4 | **HW 2; due: Sep 13**<br>pp. 54-57: 1,2,3,15-17 and the following **extra problems**; p. 55: 4-7. |
| Sep 11 & Sep 13 | Differentiation and integration of Fourier series. Parseval's Theorem. Complex form of Fourier series.<br>Ch. 0, §§ 0.3.4, 0.3.7, Ch.1, §§1.3.5-1.3.6, §§1.4.1-1.4.2 and §§1.5.1-1.5.3. | **HW 3; due: Sep 20**<br>p. 70: 9,11-13; p. 75: 4,5; p. 83: 1-3; p. 69: 4-6; p. 76: 9; p. 83: 4,5. |
| Sep 18 & Sep 20 | Sturm-Liouville eigenvalue problems.<br>Ch.1, §1.6.1-1.6.6. | **HW 4; due: Sep 27**<br>pp. 96-97: 1-6,7,8,13; pp. 96-97: 10,11,14,15. |
| Sep 25 & Sep 27 | The heat equation. Steady-state and time-periodic solutions. Homegeneous boundary conditions.<br>Ch.2, §§2.1.3-2.1.5 and §2.2.1. | **HW 5; due: Oct 4**<br>pp. 108-109: 1,3,4,10,11; pp. 120-121: 4,10,18. |
| Oct 2 & Oct 4 | Solution of the initial value problem in a slab, relaxation time and uniqueness of solutions.<br>Ch.2, §§2.2.2-2.2.4. | **HW 6; due: Oct 11**<br>pp. 120-121: 2,3,5,7,8,11-14. |
| Oct 11 | **Midterm 1, Oct 11, 10:00 - 11:20, in class.**<br>Covers §§1.1.1-1.1.4, 1.1.6, 1,2.1, 1.3.3-1.3.6, 1.4.1-1.4.2, 1.5.1-1.5.3, 1.6.1-1.6.6, 2.1.3-2.1.5, 2.2.1-2.2.2. | **No HW** |
| | | **HW 7; due: Oct 25** |

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| Oct 16 & Oct 18 | Basic properties of Fourier transform and solution of the heat equation on the real line.<br>Ch.5, §§5.1.1-5.1.3 and §§5.2.1-5.2.6. | p. 292: 1,2,4,13; p.310: 15 and **extra problems**;<br>p. 292: 11,15,16; p.308: 6,7 |
| Oct 23 & Oct 25 | One-dimensional wave equation. The vibrating string and d'Alembert solution.<br>Ch.2, § 2.4.3 and §§2.4.5-2.4.7. | **HW 8; due: Nov 1**<br>p. 150-151:2,11,13 and **extra problems**;<br>pp. 150-151: 4,5, 9-11,14-16. |
| Oct 30 & Nov 1 | Applications of multiple Fourier series to Laplace's, heat and wave equations.<br>Ch.2, §§2.5.1-2.5.5. | **HW 9; due: Nov 8**<br>pp. 168-169: 1,2,4-6,10-13;<br>pp. 168-169: 3,7,8,14. |
| Nov 6 & Nov 8 | Laplace's equation in cylindrical coordinates.<br>Ch.3, §§3.1.1-3.1.3 and §§3.1.6-3.1.9. | **HW 10; due: Nov 15**<br>pp. 181-182: 8,9,13-16,18,19,23. |
| Nov 13 & Nov 15 | Bessel functions.<br>Ch.3, §§3.2.1-3.2.3.<br>**Midterm 2, Nov 15, 10:00 - 11:20, in class.** | **HW 11, due Nov 20**<br>pp. 207-208: 1-5,14,16,18-20; p. 207: 6,7,10-13. |
| Nov 20 | Bessel functions, continued.<br>Ch.3, §§3.2.5-3.2.7. | **HW 12; due: Nov 29**<br>p. 208: 22-24,28-32; p. 208: 33,34. |
| Nov 27 & Nov 29 | Wave equation in polar coordinates. Heat flow in the infinite cylinder<br>Ch.3, §§3.3.1-3.3.2 and §§3.4.1-3.4.2. | **HW 13 due Dec 6**<br>p. 216: 1,4-8 and p. 226: 1-3. |
| Dec 4 & Dec 6 | Legendre functions ans spherical Bessel functions. Boundary-value problems in a sphere.<br>Ch. 4, § §4.1.1, 4.2.1-4.2.2 and §4.3.1. | **Extra HW**<br>p. 250: 8-10, p. 266: 3-7,11,12 and p. 275: 1-3. |
| Dec 20 | **Final exam, 8:00am - 10:45am in class.** | |