Course Information

Registration
Units: 3-0-9, Graduate H-level Credit

Lectures
Mondays and Wednesdays, 9:30-11:00am in Room 24-121

Description
A presentation of the fundamentals of modern numerical techniques for a wide range of linear and nonlinear elliptic, parabolic and hyperbolic partial differential equations and integral equations central to a wide variety of applications in science, engineering, and other fields. Topics include: mathematical formulations, finite difference and finite volume discretizations, finite element discretizations, boundary element discretizations, direct and iterative solution methods.

Prerequisites
18.03 or 18.06 or equivalent; and familiarity with MATLAB®.

Instructors
Professor Qiqi Wang
Room: 37-447 · Tel: (617) 253-0921 · Email: qiqi@mit.edu

Professor Jacob K. White
Room 36-817 · Tel: (617) 253-2543 · Email: white@mit.edu

There will also be guest lecturers.

Teaching Assistant
Han Chen
Room tbd · Email: voila@mit.edu

Assessment
Project 1 – Finite Differences and Solution Methods 25%
Project 2 – Hyperbolic Problems and Level Sets 22%
Project 3 – Finite Element Method 25%
Project 4 – Boundary Element Methods 23%

Course Materials
Primary Source
http://stellar.mit.edu/S/course/16/fa13/16.920/
- lecture notes will be available online before class
- project handouts will be posted online

Reference Texts
The following reference texts are available on reserve at the MIT libraries. In addition, the COOP and several other fine bookstores in your local neighborhood should carry most, if not all of the titles.
List of Reference Texts (in no particular order)

Call Number: QA 184.T74 1997
Author: Trefethen, Bau III
Title: Numerical Linear Algebra
Ed.: 1997
Publisher/ISBN: SIAM, 0-89871-361-7

Call Number: QA 377.L4157 1990
Author: Leveque
Title: Numerical Methods for Conservation Laws
Ed.: 1990
Publisher/ISBN: SPRINGER, 0-8176-2723-5

Call Number: TA 335.S897 1973
Author: Strang, Fix
Title: Analysis of the Finite Element Method
Ed.: 1973
Publisher/ISBN: Prentice-Hall, 0130329460

Call Number: QA 377.Q37 1994
Author: Quarteroni, Valli
Title: Numerical Approximation of Partial Differential Equations
Ed.: 1994
Publisher/ISBN: SPRINGER, 0-387-57111-6

Call Number: QA 431.A837 1997
Author: Atkinson
Title: The Numerical Solution of Integral Equations of the Second Kind
Ed.: 1997
Publisher/ISBN: CAMBRIDGE, 0-521-58391-8

Call Number: QA 377.B75 2000
Author: Briggs
Title: A Multigrid Tutorial
Ed.: 2000
Publisher/ISBN: SIAM 0-89871-462-1

Call Number: QA 377.T9 1998
Author: Tveito, Winther
Title: Introduction to Partial Differential Equations : A Computational Approach
Ed.: 1998
Publisher/ISBN: SPRINGER, 0-387-98327-9

Call Number: QA320.O29 1996
Author: Oden, Demkowicz
Title: Applied Functional Analysis
Ed.: 1996
Publisher/ISBN: CRC Press, 084932551X

Call Number: QA329.2.N333 1982
Author: Naylor, Sell
Title: Linear Operator Theory in Engineering and Science
Ed.: 1982
Publisher/ISBN: SPRINGER, 038797483