Course Syllabus
Mathematics 3ff
2017 − 2018, Semester 2

Instructor: Walter Craig
Classroom: ABB 271
Course meeting times:
   Monday 15:30 - 16:20
   Tuesday 16:30 - 17:20
   Thursday 15:30 - 16:20

Lectures:

(1) Introduction

(2) Wave equations

(2.1) transport equations
   - method of characteristics
   - conservation laws
(2.2) wave equation
   - d'Alembert formula
   - Huygens' principles
(2.3) method of images
(2.4) separation of variables
(2.5) Fourier transform
   - Fourier series
   - Fourier integrals

(3) The heat equation

(3.1) Fourier's law of heat flux
(3.2) heat kernel
(3.3) convolution operators
(3.4) method of images
(3.5) maximum principle
(3.6) Hilbert space
(3.7) heat equation in $\mathbb{R}^n$
(3.8) conservation laws and entropy

(4) Laplace's equation

(4.1) boundary value problems
   - Dirichlet problem
   - Neumann problem
   - Poisson problem
(4.2) Green's identities
(4.3) fundamental solution
(4.4) Poisson kernel
(4.5) maximum principles

Optional material (if there is time in our schedule)

(5) Schrödinger's equation

(5.1) quantum mechanics
(5.2) Heisenberg uncertainty principle
(5.3) Schrödinger operators

(6) Hyperbolic conservation laws

(6.1) nonlinear conservation laws
(6.2) Riemann problem
(6.3) shock waves