



## Advanced Mathematics Syllabus

### Part A: Double Riemann integral

- 1) Definition and interpretation. Mean Value Theorem
- 2) Fubini's Theorem.
- 3) Change of variables.
- 4) Improper integration

#### Reading:

J E Marsden: Elementary Classical Analysis.

J E Marsden and A J Tromba, Vector Calculus.

W W L Chen, .....

### Part B: Introduction to Measure Theory in the real line

- 1) Measurable sets and Lebesgue measure.
- 2) Measurable functions.

Reading: H L Royden, Real Analysis, Chapter 3

Complementary: W W L Chen, .....

### Part C: Lebesgue Integration. Convergence Theorems

- 1) Introduction. The Lebesgue integral of a bounded function on a set of finite measure.
- 3) The Lebesgue integral of a nonnegative function.
- 4) The Lebesgue integral of a general function.

Reading: H L Royden, Real Analysis, Chapter 4

Complementary: W W L Chen, Introduction to Lebesgue Integration, Chapter 4, 5, 6, 7.

### Part D: Continuity and Differentiation of Lebesgue Integrals

- 1) Differentiation of monotone functions.
- 2) Functions of bounded variation.
- 3) Differentiation of the integral.
- 4) Absolute continuity.
- 5) Convex functions

Reading: H L Royden, Real Analysis, Chapter 5

Complementary: W W L Chen, Introduction to Lebesgue Integration, Chapter 9.

Grading: 20% Homework, 20% Tests, 20% class presentations, 40% final exam.