Syllabus of Measure and Integration

- Lecture time: Monday, Thursday 12:00–14:00
- Lecture room: LT34
- Tutorial time: Wednesday 12:00–13:00, 13:00–14:00
- Tutorial room: Block S17, Room 04–05

- Lecturer and tutor: A/Prof Wang Dong
- Office: Block S17, Room 06–20
- Tel: 6516 2746
- Email: `matwd@nus.edu.sg`

- Prerequsite: MA3209
- Course description: This module is suitable not only for mathematics majors, but also for science and engineering majors who need a rigorous introduction to the concepts of measures and integrals. It covers Lebesgue measure and Lebesgue integral in a rigorous manner. We begin complicated proofs with an introduction which shows why the proof works. Examples are included to show why each hypothesis of a major theorem is necessary. Major topics: Lebesgue measure. Outer measure. Measurable sets. Regularity of Lebesgue measure. Existence of non-measurable sets. Measurable functions. Egoroff's Theorem. Lusin's Theorem. Lebesgue integral. Convergence theorem. Differentiation. Vitali covering lemma. Functions of bounded variation. Absolute continuity. L^p spaces. Holder's inequality. Minkowski's inequality. Riesz–Fischer theorem.
- References:

  - R.G. Bartle, *The elements of integration and Lebesgue measure*, Wiley, 1995. (Main textbook)
  - H.L. Royden and P.M. Fitzpatrick, *Real analysis* (4th edition), Prentice Hall, 2010.
  - D.W. Strook, *A concise introduction to the theory of integration*, World Scientific, 1990.
  - E.M. Stain and R. Shakarchi, *Real analysis: measure theory, integration, and Hilbert spaces*, Princeton, 2005.

- Assessment: Assessment of students will be based on
  - a one-hour test during lecture time (*tentatively* on 1 October 2020), 25%
  - tutorial participation, 5%,
  - four sets of homework, 10%,
  - a two-and-a-half hour final examination, 60%.

  Any student who is absent without a valid reason from an assessment will be given zero mark for that assessment.