Syllabus for the First Degree Programme in Mathematics of the University of Kerala

Semester VI
Real Analysis-II

CODE: MM 1641 — Instructional hours per week: 5
No. of credits: 4

This part of the course builds on the first course and concentrates on real valued functions. We discuss the three properties of continuity, differentiability and Riemann integrability.

Module 1 Continuity must be first intuitively introduced as the geometric notion of an unbroken curve and then the discussion should gradually lead to the ϵ-δ definition, as an effort to make this notion formal and rigorous. The connection between continuity and existence of limit should be emphasized. The material contained in Sections 5.1–5.4, excluding 5.4.14 of the textbook, forms the core of this part of the course.

Module 2 Differentiation and integration are extensively discussed in an earlier Calculus course, with a strong emphasis on computation. Here we take another look at these from a conceptual point of view. Chapter 6 of the textbook, excluding the last part on convex functions, forms the contents of differentiation and Sections 7.1–7.3 of Chapter 7, that of integration. The history of how calculus developed must also be discussed. (See `en.wikipedia.org/wiki/History_of_calculus`, for example.)

Module 3 Since students have already seen and studied integration as anti-differentiation in earlier courses, the differences between anti-differentiation and Riemann's theory of integration should be stressed. The historical evolution of the ideas leading to Riemann integral can be found in the web-page `en.wikipedia.org/wiki/Integral#History`. Section 7.3 of the textbook must be seen as establishing the links between anti-differntiation and Riemann integration, Examples 7.3.2(e) and 7.3.7(a), (b) are significant in this context.

TEXT: Robert G Bartle: Introduction to Real Analysis, Third Ed., John Wiley & Sons

References

1. A. D. ALEXANDROV et al., *Mathematics*:*Its Content, Methods and Meaning*, Dover
2. R. DEDEKIND, *Essays on The Theory of Numbers*, available as a freely dowloadable e-book at `http://www.gutenberg.org/etext/21016`)
3. W. RUDIN, *Principles of Mathematical Analysis*, Second Edition, McGraw-Hill
4. A. E. TAYLOR, *General Theory of Functions and Integration*, Dover

DISTRIBUTION OF INSTRUCTIONAL HOURS:

Module 1: 30 hours; Module 2: 30 hours; Module 3: 30 hours