MATH0116 Riemann Surfaces

Year:	2026–2027
Code:	MATH0116
Level:	7 (UG), 7 (PG)
Normal student group(s):	UG: Y4 Mathematics programmes PG: MSc Mathematics
Value:	15 credits (7.5 ECTS credits)
Term:	2
Assessment:	90% examination, 10% coursework
Normal Pre-requisites:	MATH0013 (Analysis 3: Complex Analysis) MATH0051 (Analysis 4: Metric Spaces)
Lecturer:	Dr A Doan

Course Description and Objectives

Riemann surfaces lie at the intersection of complex analysis, geometry, topology, and number theory. They arise naturally in various contexts such as the study of analytic functions and ordinary differential equations. The goal of the module is to discuss the definition and basic properties of Riemann surfaces, focusing on examples and advancing to topics such as branched covering maps and the Riemann–Hurwitz theorem, meromorphic functions and 1-forms, and classification results.

Recommended Texts

- AF Beardon, *Primer on Riemann Surfaces* (Cambridge)
- S Donaldson, *Riemann Surfaces* (Oxford)
- N Greenberg and A Nerode, *Algebraic Curves and Riemann Surfaces for Undergraduates* (Springer)
- R Miranda, *Algebraic Curves and Riemann Surfaces* (AMS)

Detailed Syllabus

- Review of complex analysis and motivation for Riemann surfaces.
- Definition and basic examples of Riemann surfaces.
- Holomorphic maps and their properties.
- Group actions and quotient constructions.
- Ramified coverings and the Riemann–Hurwitz formula.
- Meromorphic functions and one-forms.
- Introduction to the Riemann–Roch theorem and applications.
- Complex tori and elliptic curves.

– Advanced topics: disc quotients, the uniformization theorem, and insights into the proof of the Riemann–Roch theorem.

September 2026