- Title: Introduction to Riemann Surfaces
- Basic Details:
  - Core Audience: beginning graduate/advanced undergraduate: pure
  - Course Format: extended (10 hours at 2 hours per week)
- Course Description:
  - Keywords: Riemann surfaces, complex curves
  - Syllabus:

    A Riemann surface is a smooth 1-dimensional complex space. Examples include the complex plane, the graph of a complex function and the Riemann sphere. As well as being beautiful mathematical objects in their own right, Riemann surfaces have found applications in areas as diverse as number theory and particle physics.

    The course will introduce some of the classical results on Riemann surfaces, emphasizing the interplay between topology, complex analysis and geometry. The aim is to develop an intuition for the geometry and topology that can then be applied to higher dimensional manifolds.

    1. **The topology of surfaces.** An informal treatment of: orientability; Euler characteristic; the classification of surfaces via Morse theory.
    2. **Manifolds:** Riemann surfaces as examples of manifolds; different categories of manifold; products; quotients; analytic continuation
    3. **Local structure of holomorphic functions:** branch points; covering maps; monodromy; compactification
    4. **Calculus on surfaces:** differential forms; Stokes' theorem; de Rham cohomology; Poincareé duality; holomorphic forms; harmonic forms
    5. **The Euler characteristic:** Riemann–Hurwitz formula; degree genus formula; topology of modular curves
    6. **Elliptic functions and integrals:** Elliptic integrals; lattices; the Weierstrass $\wp$ function.
  - Recommended reading:

    S. Donaldson, Riemann Surfaces, Oxford University Press, 2011
  - Additional optional reading:

    F. Kirwan, Complex Algebraic Curves, London Mathematical Society Student Texts, 1992

    M. A. Armstrong, Basic Topology, Springer, 1983

    M. Spivak, A Comprehensive Introduction to Differential Geometry, Vol 1, 3rd edition, Publish or Perish 1999
- Format:
  - No of discussion/problem sheets: 4
  - Necessary support facilities: None.
  - Necessary software requirements for computing facilities: None.
  - Lecture/computer session/tutorial/discussion split (hours of each): 10h lectures
- Lecturer Details:
  - Lecturer: John Armstrong
  - Lecturer home institution: KCL
  - Lecturer e-mail: johnarmstrong5@googlemail.com
  - Lecturer telephone number: 020 78482855