COURSE SPECIFICATION FORM
for new course proposals and course amendments

Department/School:	**Mathematics**	Academic Session:	**2017-18**
Course Title:	From Euclid to Mandelbrot	**Course Value:** (UG courses = unit value, PG courses = notional learning hours)	0.5 unit
Course Code:	MT1100	**Course JACS Code:** (Please contact Data Management for advice)	G100
Availability: (Please state which teaching terms)	Term 1	**Status:**	Mandatory for G100, G103, G1G3,
Pre-requisites:	Mathematics A-level or equivalent	**Co-requisites:**	None
Co-ordinator:			
Course Staff:			
Aims:	This course aims to show how mathematics has been used to describe space over the last 2500 years and use this to motivate the study of various aspects of the subject.		
Learning Outcomes:	On completion of the course, students should be able to • Appreciate what can be done with ruler and compass constructions; • Sketch simple curves using plane polar coordinates; • Sketch and classify conics, and find their foci and directrices; • Understand the concepts of self-similarity and fractal dimension; • Use simple arguments to distinguish between countable and uncountable sets; • Analyse the logistic map and similar iterated maps; • Explain the period-doubling route to chaos.		
Course Content:	**Geometry.** Ruler and compass constructions (up to the regular pentagon). Platonic solids. Euler's formula. Plane polar coordinates. Conics: Cartesian and polar forms, focus and directrix. **Fractals.** Self-similarity, fractal dimension, Koch snowflake, Cantor dust, Sierpinski gasket. **Countability** Countability of rationals, uncountability of reals and of the Cantor set. **Iteration.** Iterative maps, cobwebbing, fixed points, limit cycles, stability, logistic equation, period doubling. Chaos. The Mandelbrot set. Bilinear transformations. Fibonacci numbers, the golden mean.		
Teaching & Learning Methods:	33 hours of lectures and examples classes, 6 hours tutorials. 111 hours of private study, including work on problem sheets and examination preparation. This may include discussions with the course leader if the student wishes.		
Key Bibliography:	Geometry for College Students -- I.M. Isaacs (AMS 2009) Library reference 516 ISA. Calculus -- J. Stewart (Thomson Brooks/Cole 2009). Library reference 515.34 STE. Chaos and Fractals: An Elementary Introduction -- D.P. Feldman (Oxford, 2014). Library reference: Online access, and 514.742~FEL. Fractals, Chaos, Power Laws -- M. Schroeder (Freeman 1991) Library reference 513.15 SCH.		
Formative Assessment & Feedback:	Formative assignments in the form of 11 problem sheets. The students will receive feedback as written comments on their attempts.		
Summative Assessment:	**Exam** (90%) A two-hour paper. **Coursework** (10%) Attempting problem sheets		