COURSE SPECIFICATION FORM

for new course proposals and course amendments

Department/School:	Mathematics	Academic Session:	2017-18
Course Title:	Groups and Group Actions	**Course Value:** (UG courses = unit value, PG courses = notional learning hours)	0.5 unit
Course Code:	MT2860	**Course JACS Code:** (Please contact Data Management for advice)	G100
Availability: (Please state which teaching terms)	Term 2	**Status:**	Optional Condonable
Pre-requisites:	MT1810 and MT1820	**Co-requisites:**	-
Co-ordinator:	-		
Course Staff:	-		
Aims:	Recognising the symmetries of a mathematical, physical or chemical structure, such as a crystal or a molecule, is fundamental to our understanding of these objects. A group is the mathematical object that encodes symmetry. The course develops the basic theory of finite groups of symmetries, emphasising concrete examples which are often geometrical in nature. By means of group actions, we can solve various types of counting problems concerning discrete patterns. Finally, we explore the subgroup structure of finite groups, in order to classify groups in important situations. Key aims of the course include: to provide an introduction to groups and group actions; to develop the skill of connecting concrete examples with general mathematical concepts, and to apply algebraic reasoning.		
Learning Outcomes:	On completion of the course, students should be able to: understand and apply the fundamental concepts of group theory; recognise and construct group homomorphisms and quotients; know basic examples of groups and group actions; count the number of orbits and determine their sizes in specific group actions; apply the concept of a group action to count discrete patterns.		
Course Content:	Groups: cycle structure and sign of a permutation; symmetric and alternating groups; group axioms; subgroups; order of a group and of group elements; cosets and Lagrange's theorem; homomorphisms, normal subgroups, quotient groups; isomorphism theorems; key examples, such as: cyclic groups, dihedral groups (symmetries of regular polygons) and symmetries of the Platonic solids, matrix groups. Group actions: definition of a group action and connection with permutations; Cayley's theorem; orbits and stabilisers; the size of an orbit and the number of orbits; Burnside's lemma. Applications such as: conjugacy classes and centralisers; counting problems concerning discrete patterns,. Further topics as time permits, such as: p-groups, Sylow theorems; simplicity of the alternating groups.		
Teaching & Learning Methods:	33 hours of lectures and examples classes. 117 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:	Introduction to Algebra - P.J.Cameron (Oxford Univ Press) 512.11 CAM A First Course in Abstract Algebra with Applications -- J.J. Rotman (Pearson Prentice Hall) 512.02 ROT The Theory of Groups: an Introduction -- J.J. Rotman (Springer) 512.51 ROT		
Formative Assessment & Feedback:	Formative assignments in the form of 8 problem sheets. The students will receive feedback as written comments on their attempts.		
Summative Assessment:	**Exam:** A two hour paper (100%) **Coursework:** None		

Updated September 2017