COURSE SPECIFICATION FORM

for new course proposals and course amendments

Department/School:	**Mathematics**	**Academic Session:**	**2017-18**
Course Title:	Applications of Field Theory	**Course Value:** (UG courses = unit value, PG courses = notional learning hours)	0.5 unit
Course Code:	MT3850	**Course JACS Code:** (Please contact Data Management for advice)	G100
Availability: (Please state which teaching terms)	Term 1	**Status:**	Optional Condonable
Pre-requisites:	MT2800 and MT2830	**Co-requisites:**	-
Co-ordinator:	Prof S R Blackburn		
Course Staff:	-		
Aims:	To introduce some of the basic theory of field extensions, with special emphasis on applications in the context of finite fields.		
Learning Outcomes:	1. understand simple field extensions of finite degree; 2. classify finite fields and determine the number of irreducible polynomials over a finite field; 3. state the fundamental theorem of Galois theory; 4. compute in a finite field; 5. understand some of the applications of fields.		
Course Content:	**Extension theory:** Polynomial factorisation. Field extensions. Simple extensions. The degree of an extension. Applications to ruler and compass constructions. **Classifying finite fields:** Existence and uniqueness of finite fields of a given size. Concrete representations of a finite field. Finite field multiplication using logarithm tables. The number of irreducible polynomials. **The structure and applications of (finite) fields:** The Frobenius automorphism. Cyclotomic polynomials and cyclotomic fields. The Galois correspondence for finite fields. An indication of the Galois correspondence for general fields, e.g. cyclotomic fields. The normal basis theorem and applications to multiplication in finite fields. Further topics, such as: algorithms for factoring polynomials over finite fields, for example the Cantor-Zassenhaus algorithm; the norm and trace of an element; applications to m-sequences; dual and self-dual bases.		
Teaching & Learning Methods:	The total number of notional learning hours associated with this course are 150 hours. 3 hours of lectures a week over 11 weeks. 33 hours total. 117 hours of private study, including work on problem sheets and examination preparation. This may include discussions with the course lecturer if the student wishes.		
Key Bibliography:	Introduction to Finite Fields and their Applications – R. Lidl and H. Niederreiter (Cambridge UP 1994); Library reference 512.4 LID. Galois Theory – I. Stewart (Chapman and Hall 2003); Library reference 512.4 STE.		
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:** 100% Written exam. A two hour paper.		

Updated September 2017