MATH 3013 FIELDS AND EQUATIONS

Credit Points 10

Legacy Code 301377

Coordinator James East (https://directory.westernsydney.edu.au/search/name/James East/)

Description This subject develops abstract algebraic thought to a higher level. The abstract concepts introduced in the subject, ring theory, field theory and algebraic equations, have many applications in science and technology. The theory of algebraic equations is the study of solutions of polynomial equations. Although the problem originates in explicit manipulations of polynomials, the modern (and far more powerful) treatment is in terms of field extensions. The subject is an introduction to ring theory and field theory; it includes applications to cryptography (RSA) and geometry (proving that it is impossible to trisect an arbitrary angle using only a straightedge and compass).

School Computer, Data & Math Sciences

Discipline Mathematics

Student Contribution Band HECS Band 1 10cp

Check your fees via the Fees (https://www.westernsydney.edu.au/currentstudents/current_students/fees/) page.

Level Undergraduate Level 3 subject

Pre-requisite(s) MATH 3015

Assumed Knowledge

Basic notions in algebra, such as equivalence relations, groups, homomorphisms and isomorphisms.

Learning Outcomes

On successful completion of this subject, students should be able to:

1. Apply fundamental structures in abstract algebra and number theory: rings, integral domains, and fields.
2. Examine practical applications, such as RSA cryptography, based on abstract concepts from ring theory and number theory.
3. Formulate proofs involving rings, integral domains, and fields.
4. Communicate mathematical arguments effectively in both spoken and written format.

Subject Content

- Introduction to rings
- Ideals and factor rings
- Ring homomorphisms, ring isomorphisms, and related theorems
- Rings of integers and their congruences
- Polynomial rings and factorization of polynomials
- Fields and solutions to equations
- Extension of fields
- Application: RSA cryptography
- Application: Ruler and compass, 2000 years of impossible constructions

Assessment

The following table summarises the standard assessment tasks for this subject. Please note this is a guide only. Assessment tasks are regularly updated, where there is a difference your Learning Guide takes precedence.

Type	Length	Percent	Threshold	Individual/ Group Task	Mandatory
Quiz	20 minutes	10	N	Individual	Y
Quiz	20 minutes	10	N	Individual	Y
Essay	3-6 pages	20	N	Individual	Y
Presentatio	15 minutes	10	N	Individual	Y
Final Exam	2 hours	50	N	Individual	Y

Teaching Periods

Autumn (2025)

Campbelltown

On-site

Subject Contact James East (https://directory.westernsydney.edu.au/search/name/James East/)

View timetable (https://classregistration.westernsydney.edu.au/odd/timetable/?subject_code=MATH3013_25-AUT_CA_1#subjects)

Penrith (Kingswood)

On-site

Subject Contact James East (https://directory.westernsydney.edu.au/search/name/James East/)

View timetable (https://classregistration.westernsydney.edu.au/odd/timetable/?subject_code=MATH3013_25-AUT_KW_1#subjects)

Parramatta - Victoria Rd

On-site

Subject Contact James East (https://directory.westernsydney.edu.au/search/name/James East/)

View timetable (https://classregistration.westernsydney.edu.au/odd/timetable/?subject_code=MATH3013_25-AUT_PS_1#subjects)