

Pure Mathematics 315 / 317

Algebra I / Honours Algebra I

(see Course Descriptions under the year applicable: <http://www.ucalgary.ca/pubs/calendar/>)

Syllabus

<u>Topics</u>	<u>Number of hours</u>
Sets and Functions; induction; proof by contradiction and contrapositive	3
Number systems: integer, rational, real complex; definitions of rings and fields	3
Divisibility, greatest common divisor and Euclidean algorithm; fundamental theorem of arithmetic	3
Equivalence relations and the integers modulo n ; congruences and equations in $\mathbb{Z}/n\mathbb{Z}$	3
Solving equations in $\mathbb{Z}/n\mathbb{Z}$; the Chinese remainder theorem; $\mathbb{Z}/n\mathbb{Z}$ is a field if and only if p is prime	3
The ring of polynomials over a field; greatest common divisor and the Euclidean algorithm; irreducible polynomials	3
Unique factorization; recall of ring axioms; ideals; \mathbb{Z} and $F[x]$ are principal ideal rings	3
Homomorphisms and kernels; quotients, first isomorphism theorem; $F[x]/f(x)$ is a field iff f is irreducible	3
Adjoining the root of an irreducible polynomial; construction of finite fields	3
Group axioms; cyclic and dihedral groups; matrix groups; permutations and the symmetric group	3
Subgroups; cosets and Lagrange's theorem; normal subgroups	3
Homomorphisms and kernels; quotient groups; examples	3
Group actions and Cayley's theorem; orbit counting formula; combinatorial applications (time permitting)	3
TOTAL HOURS	36

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