Course content for MT1940, Numbers and Functions

Prerequisites:
A-level Mathematics or equivalent

Aims:
To kindle an interest in analysis, and to provide a taste of what the subject is about;
To give a user-friendly introduction to key ideas of analysis, illustrated with copious examples;
To provide a structure that enables students to gain confidence in handling concepts in analysis.

Learning outcomes:
On completion of the course, the student should be able to:
- appreciate the significance of the completeness property distinguishing R from Q;
- find sups and infs of elementary sets;
- determine whether a given (simple) sequence tends to a limit, using monotonicity when appropriate;
- find limits of sequences defined recursively.

Course content:
The real number system: The natural numbers N. The integers Z and the rational field Q. Order properties, manipulation of inequalities, the triangle inequality. Irrationality of the square root of 2. Decimal representation of real numbers. Null sequences. Subsets, maximum, upper bound, least upper bound. Every non-empty subset of the reals which is bounded above has a least upper bound. Bernoulli's inequality with applications.
Sequences: convergence of sequences, criteria for convergence, Cauchy sequences, an introduction to series as sequences of finite sums, the geometric series; the harmonic series; the summands of a convergent sum form a null sequence.