Title:
Graded rings and applications to constructing varieties

Abstract:
On the theoretical side, I will explain the construction of Proj, the material surrounding the Hilbert syzygies theorem, criteria for a variety to be projectively Gorenstein, and construction of Gorenstein rings in small codimension. On the applications side, I will treat in detail some cases of algebraic surfaces with small invariants; the model examples for study include cases such as Horikawa's quintic surfaces, with pg=4, K^2=5, where there is a rich and quite complicated interaction between the geometry of surfaces and their moduli and the commutative algebra and deformation theory.

Some references:
For preliminary reading, please see
http://www.warwick.ac.uk/staff/Miles.Reid/surf/
+ Graded rings, ECM4 and the Park City lectures. The website also contains links to other material that I will discuss in the lectures.