LTCC Basic Course

Title: Differential Geometry & Mathematical Physics

Basic Details:
- Core Audience: 1st yr pure and app.
- Course Format: Extended: (5 x 2hr lectures)

Course Description:
- *Keywords:* manifolds, fibre bundles, mechanics, field theory, solitons
- *Syllabus:* We illustrate how concepts in differential geometry arise naturally in various areas of mathematical physics. We will describe manifolds, fibre bundles, (co)tangent bundles, metrics and symplectic structures, and their applications to Lagrangian mechanics, field theory and Hamiltonian systems, including various examples related to integrable systems and topological solitons.
- *Recommended reading:* T. Frankel, The Geometry of Physics. 3rd edition, Cambridge University Press (2012); M. Nakahara, Geometry, Topology and Physics. Graduate Student Series in Physics, 2nd edition, Inst. of Physics (2003).
- *Additional Optional reading:* V.I. Arnold, Mathematical methods of classical mechanics. Graduate Texts in Mathematics 60, Springer-Verlag (1978);
O. Babelon, D. Bernard and M. Talon, Introduction to Classical Integrable Systems. Cambridge Monographs on Mathematical Physics, Cambridge University Press (2007); N.J. Manton and P.M. Sutcliffe, Topological Solitons. Cambridge Monographs on Mathematical Physics, Cambridge University Press (2004).
- *Prerequisites:* Undergraduate/Masters courses in elementary differential geometry, Riemannian geometry, Lie groups/algebras and/or classical mechanics, or quantum mechanics, are desirable but not essential. The course is intended to be accessible to students with a background in pure mathematics who would like to learn about mathematical physics, and students with a more applied background who would like an introduction to differential geometry.

Format:
- *No of discussion/problem sheets:* 4
- *Electronic lecture notes*: provided in advance as a pdf file (LTCC book chapter)

Lecturer Details:
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