



Institute of Mathematical Research

Department of Mathematics

Topics in Geometry II

Dr. Wing-Sum Cheung
The University of Hong Kong

In this series of lectures we will give an exposition of Griffiths' formalism of the Calculus of Variations of 1 independent variable via the theory and techniques of Exterior Differential Systems, which is more general than customary and is most effective in intrinsic geometric problems. We will discuss the Euler-Lagrange Equations, Euler-Lagrange Differential System, Cartan System, momentum space, nondegeneracy, Noether's Theorem, End-point conditions, well-posedness, and if time permits, the 2nd variation and sufficient conditions for a local minimum. Emphasis of these lectures will be on examples.

In order to better understand the formalism, inevitably we have to dig into some structure theory of Exterior Differential Systems. This includes the concepts of Cauchy characteristics, the derived flag, Cartan integer, prolongation, etc. Because of the time constraint these will not be treated separately but instead, they will be blended into the flow of the formalism and the illustrative examples on an as-needed basis.

There will be a total of 6 lectures of 90 minutes each. This series of lectures is also offered as the second half of the graduate course MATH6201.

References:

1. Bryant, Chern, Gardner, Goldschmidt and Griffiths: Exterior Differential Systems, Springer Verlag.
2. Griffiths: Exterior Differential Systems and the Calculus of Variations, Birkhäuser.
3. Ivey and Landsberg: Cartan for beginners: Differential Geometry via Moving Frames and Exterior Differential Systems, Graduate Text in Mathematics Vol. 61, AMS.

Lecture 1:	March 10, 2004	(Wednesday)	3:00 – 5 :00pm
Lecture 2:	March 24, 2004	(Wednesday)	3:00 – 5 :00pm
Lecture 3:	March 31, 2004	(Wednesday)	3:00 – 5 :00pm
Lecture 4:	April 7, 2004	(Wednesday)	3:00 – 5 :00pm
Lecture 5:	April 21, 2004	(Wednesday)	3:00 – 5 :00pm
Lecture 6:	April 28, 2004	(Wednesday)	3:00 – 5 :00pm

Lectures will be held in Room 517, Meng Wah Complex

All are welcome