

# COURSE DETAIL

## LAGRANGIAN DYNAMICS

**Country**

United Kingdom - Scotland

**Host Institution**

University of Edinburgh

**Program(s)**

University of Edinburgh

**UCEAP Course Level**

Upper Division

**UCEAP Subject Area(s)**

Physics

**UCEAP Course Number**

129

**UCEAP Course Suffix****UCEAP Official Title**

LAGRANGIAN DYNAMICS

**UCEAP Transcript Title**

LAGRANGIAN DYNAMICS

**UCEAP Quarter Units**

4.00

**UCEAP Semester Units**

2.70

## Course Description

The principles of classical dynamics, in the Newtonian formulation, are expressed in terms of (vectorial) equations of motion. These principles are recapitulated and extended to cover systems of many particles. The laws of dynamics are then reformulated in the Lagrangian framework, in which a scalar quantity (the Lagrangian) takes center stage. The equations of motion then follow by differentiation, and can be obtained directly in terms of whatever generalized coordinates suit the problem at hand. These ideas are encapsulated in Hamilton's principle, a statement that the motion of any classical system is such as to extremise the value of a certain integral. The laws of mechanics are then obtained by a method known as the calculus of variations. As a problem-solving tool, the Lagrangian approach is especially useful in dealing with constrained systems, including (for example) rotating rigid bodies, and one aim of the course is to gain proficiency in such methods. At the same time, students examine the conceptual content of the theory, which reveals the deep connection between symmetries and conservation laws in physics. Hamilton's formulation of classical dynamics (Hamiltonian Dynamics) is introduced, and some of its consequences and applications are explored.

### Language(s) of Instruction

English

### Host Institution Course Number

PHYS10015

### Host Institution Course Title

LAGRANGIAN DYNAMICS

### Host Institution Campus

Edinburgh

### Host Institution Faculty

School of Physics and Astronomy

### Host Institution Degree

## Host Institution Department

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