UCLouvain

lmat1261

2019

In view of the health context linked to the spread of the coronavirus, the methods of organisation and evaluation of the learning units could be adapted in different situations; these possible new methods have been - or will be - communicated by the teachers to the students.

5 credits	22.5 h + 30.0 h	Q1

Teacher(s)	Hagendorf Christian ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	*The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.*
Main themes	
Aims	*The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** • The student is evaluated through a written exam. • Through the active participation during the exercise sessions, any student may obtain a bonus of at most two points. These points are added to his exam's grade.
Content	This course is a follow-up of LMAT1161 "Notions de physique mathématique". Its aim is to present an overview of the concepts of analytical mechanics. The course's topics play an important role in other disciplines of the bachelors in physics and mathematics. Their presentation is adapted to the students of both these bachelors. The course treats the following topics: 1. Lagrangian mechanics • constrained systems, generalised coordinates; • d'Alembert principle, the Euler-Lagrange equations; • Hamilton's principle, elements of the calculus of variations; • symmetries and conservation laws. 2. Hamiltonian mechanics • the Legendre transformation; • canonical equations of motion; • Poisson brackets; • canonical transformations. 3. Hamilton-Jacobi theory • the Hamilton-Jacobi equation; • separation of variables; • action-angle variables; • towards quantum mechanics.
Inline resources	The course's Moodle website provides lecture notes, exercise sheets, a detailed syllabus and an ample bibliography.

Bibliography	• Arnold, *Mathematical methods of classical mechanics.* Springer 1997 Ouvrage à recommander aux étudiants avec une préférence pour la rigueur mathématique. Il est très détaillé et dépasse largement le cadre du cours. • Fomin, *Calculus of variations.* Dover Publications 2000. Ouvrage classique sur le calcul variationnel et ses applications à la mécanique classique, contient de nombreux exemples et exercices. • Landau, Lifshits, *Cours de physique théorique. Tome 1 : Mécanique*. Edition Mir 1994. Ceci est une référence standard pour physiciens. Il couvre tous les sujets des cours LMAT1161 et LMAT1261 (et bien plus), contient des exercices et leurs solutions. • Morin, *Introduction to Classical Mechanics: With Problems and Solutions.* Cambridge University Press 2008. Ouvrage récent très pédagogique, contient beaucoup d'exercices et leurs solutions. • Nolting, *Theoretical Physics 2: Analytical mechanics.*Springer-Verlag 2016. Ouvrage très pédagogique, contient beaucoup d'exercices et leurs solutions. • Goldstein, *Classical mechanics*. Addison-Wesley 2007. Référence classique pour physiciens avec de nombreux exemples, applications et exercices (sans solutions).
Faculty or entity in charge	SC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Mathematics	MATH1BA	5	LMAT1121 AND LMAT1161	
Bachelor in Physics	PHYS1BA	5	LPHYS1111	
Additionnal module in Mathematics	LMATH100P	5		
Minor in Mathematics	LMATH100I	5		