



5 credits	30.0 h + 15.0 h	Q2
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Teacher(s)	Van Schaftingen Jean ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	- either LMAT1121 Analyse mathématique 1, LMAT1122 Analyse mathématique 2 et LMAT1131 Algèbre linéaire - or LFSAB1102 Mathématiques 2 <i>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.</i>
Main themes	Mathematical study, performed using algebraic and analytical methods, of some problems about ordinary differential equations and of the qualitative properties of their solutions.
Aims	<p>General learning outcomes. By the end of the course, the student should be able to:</p> <p>1) recognise and understand a basic foundation of mathematics. Choose and use the basic tools of calculation to solve mathematical problems. Recognise the fundamental concepts of important current mathematical theories. Establish the main connections between these theories, analyse them and explain them through the use of examples.</p> <p>2) identify, by use of the abstract and experimental approach specific to the exact sciences, the unifying features of different situations and experiments in mathematics or in closely related fields (probability and statistics, physics, computing).</p> <p>3) show evidence of abstract thinking and of a critical spirit. Argue within the context of the axiomatic method Recognise the key arguments and the structure of a proof. Construct and draw up a proof independently. Evaluate the rigour of a mathematical or logical argument and identify any possible flaws in it. Distinguish between the intuition and the validity of a result and the different levels of rigorous understanding of this same result.</p> <p>1 4) be clear, precise and rigorous in communicating. Write a mathematical text in French according to the conventions of the discipline.</p> <p>Specific learning outcomes. By the end of the course, the student should be able to :</p> <ul style="list-style-type: none"> - Construct mathematically solutions to differential equation problems. - Link properties of a linear map to the properties of solutions of a differential equation in which it appears. - Apply methods for systems of first-order differential equations to higher order differential equations. - Exploit relationships between solutions of a linear differential equation.. - Study the uniqueness of solutions for a differential equations with the help of counterexamples and proofs. - Characterise topologically maximal solutions. - Determine whether a differential equaton problem admits a global solution. - Study the stability of an equilibrium. - Define stability. - Compare and link together definitions and criteria of stability with the help of proofs and counterexamples. - State, prove and apply existence and uniqueness criteri for boundary value problems. - Illustrate definitions and statements by examples and counterexamples. <p>----- <i>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".</i></p>

<p>Evaluation methods</p>	<p>Learning will be assessed by a final examination. The questions will ask students to:</p> <ul style="list-style-type: none"> - reproduce the subject matter, especially definitions, theorems, proofs, and examples - select and apply methods from the course to solve problems and exercises - adapt methods of demonstration from the course to new situations - summarise and compare topics and concepts. <p>Assessment will focus on</p> <ul style="list-style-type: none"> - knowledge, understanding and application of the different mathematical methods and topics from the course - precision of calculations - rigour of arguments, proofs and reasons - quality of construction of answers.
<p>Teaching methods</p>	<p>Learning activities consist of lectures and exercise sessions. The lectures aim to introduce fundamental concepts, to explain them by showing examples and by determining their results, to show their reciprocal connections and their connections with other courses.</p> <p>The exercise sessions aim to teach how to select and use calculation methods and how to construct proofs. The three activities are given in presential sessions.</p>
<p>Content</p>	<ul style="list-style-type: none"> - initial value problems for ordinary differential equations: existence, uniqueness and dependence on the initial data, - structure of solutions for linear equations, - introduction to stability problems, - introduction to boundary value problems.
<p>Inline resources</p>	<p>Site iCampus http://icampus.uclouvain.be/claroline/course/index.php?cid=MAT1223+</p>
<p>Bibliography</p>	<p>Syllabus du cours.</p>
<p>Faculty or entity in charge</p>	<p>MATH</p>

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Mathematics	MATH1BA	5	LMAT1121 AND LMAT1122 AND LMAT1131	
Minor in Engineering Sciences: Mechanics	LMECA100I	5		
Minor in Mathematics	LMATH100I	5		