Course Specifications
From the academic year 2016-2017 up to and including the academic year 2018-2019

Mathematics 3: Differential Equations (I001834)

Course size
(nominal values; actual values may depend on programme)

<table>
<thead>
<tr>
<th>Credits</th>
<th>Study time</th>
<th>Contact hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0</td>
<td>150 h</td>
<td>60.0 h</td>
</tr>
</tbody>
</table>

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)  Dutch

- guided self-study 5.0 h
- seminar: practical PC room classes 18.75 h
- lecture: plenary exercises 11.25 h
- lecture 25.0 h

Lecturers in academic year 2018-2019

De Baets, Bernard

LA26 lecturer-in-charge

Offered in the following programmes in 2018-2019

<table>
<thead>
<tr>
<th>Programme</th>
<th>crdts</th>
<th>offering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Science in Bioscience Engineering</td>
<td>5</td>
<td>A</td>
</tr>
<tr>
<td>(main subject Agricultural Sciences)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor of Science in Bioscience Engineering</td>
<td>5</td>
<td>A</td>
</tr>
<tr>
<td>(main subject Cell and Gene Biotechnology)</td>
<td></td>
<td></td>
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<tr>
<td>Bachelor of Science in Bioscience Engineering</td>
<td>5</td>
<td>A</td>
</tr>
<tr>
<td>(main subject Chemistry and Food Technology)</td>
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<td></td>
</tr>
<tr>
<td>Bachelor of Science in Bioscience Engineering</td>
<td>5</td>
<td>A</td>
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<tr>
<td>(main subject Environmental Technology)</td>
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<td></td>
</tr>
<tr>
<td>Bachelor of Science in Bioscience Engineering</td>
<td>5</td>
<td>A</td>
</tr>
<tr>
<td>(main subject Land and Forest Management)</td>
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</tr>
<tr>
<td>Joint Section Bachelor of Science in Bio-Engineering</td>
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<td>A</td>
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</tbody>
</table>

Teaching languages

Dutch

Keywords

Ordinary and partial differential equations, analytical methods, numerical methods, MATLAB, stability

Position of the course

This course bridges the gap between the courses "Mathematics 2: Differential and Integral Calculus" and "Modelling and Simulation of Biosystems" and provides a basis for most of the engineering courses. The student gets familiar with systems of (non-) linear differential equations that play an important role in the description of physical, biological and chemical phenomena, develops a certain routine in the use of some elementary analytical solution techniques, gains insight in the integral transformation of Laplace and gets acquainted with frequently used numerical solution methods.

Contents

Part I: Analytical methods
1. First order differential equations
2. Second and higher order linear differential equations
3. First order linear systems
4. Series solutions
5. Second order partial differential equations
6. Nonlinear systems
7. Laplace transforms
   Part II: Numerical methods
1. Direction fields and equilibrium points
2. Euler’s method

(Approved)
3. Runge-Kutta methods
4. Partial differential equations
5. Systems of differential equations
6. Higher order differential equations

Initial competences
Mathematics 3: Differential Equations builds on certain learning outcomes of course units ‘Mathematics 1: Algebra and Analytical Geometry’, ‘Mathematics 2: Differential and Integral Calculus’, and Scientific Computing; or the learning outcomes have been achieved differently.

Final competences
1. Recognize various types of differential equations.
2. Apply elementary analytical solution techniques routinely.
3. Implement and apply numerical solution methods for (partial) differential equations.
4. Perform correct and critical interpretations of the generated MATLAB-output.
5. Use Mathematica/Maple to solve differential equations analytically.

Conditions for credit contract
Access to this course unit via a credit contract is determined after successful competences assessment.

Conditions for exam contract
This course unit cannot be taken via an exam contract.

Teaching methods
Guided self-study, lecture, lecture: plenary exercises, seminar: practical PC room classes

Learning materials and price
- Presentations are available on Minerva in PDF format.

References

Course content-related study coaching
- The lecturer announces office hours for problems related to the theory.
- The teaching assistants are available for problems related to the exercises.
- Interactive support via Minerva.

Evaluation methods
- end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period
   Written examination with open questions, written examination, open book examination

Examination methods in case of periodic evaluation during the second examination period
   Written examination with open questions, written examination, open book examination

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation
- not applicable

Calculation of the examination mark
Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.

(Approved)