Module Description 24-M-OuD Optimization and Dynamics for Quantitative Economics

Faculty of Mathematics

Version dated Feb 11, 2026

This module guide reflects the current state and is subject to change. Up-to-date information and the latest version of this document can be found online via the page

https://ekvv.uni-bielefeld.de/sinfo/publ/modul/27461018

The current and valid provisions in the module guide are binding and further specify the subject-related regulations (German "FsB") published in the Official Announcements of Bielefeld University.

24-M-OuD Optimization and Dynamics for Quantitative Economics

Faculty

Faculty of Mathematics

Person responsible for module

Prof. Dr. Dr. Sc. h. c. Michael Röckner, MAE

Regular cycle (beginning)

Every summer semester

Credit points

7 Credit points

Competencies

Non-official translation of the module descriptions. Only the German version is legally binding.

This module gives an introduction to dynamical systems, both discrete and continuous. Students shall learn the basic quantitative and qualitative methods to solve problems occurring when studying dynamical systems and shall become acquainted with the typical phenomena arising in linear and non linear systems.

Content of teaching

In this lecture the following topics are treated:

1. Dynamic Systems with Continuous Time: we look at the geometrical preliminaries, linear differential equations, systems of linear differential equations, non-linear autonomous systems, etc.
1. Dynamic Systems with Discrete Time: We will look at one-dimensional dynamics, multi-dimensional dynamics, etc.
1. Introduction to Dynamic Optimization: We will look at value functions, the principle of optimality, the maximum principle, solving by backward induction, etc.

Recommended previous knowledge

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Necessary requirements

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Explanation regarding the elements of the module

Module structure: 1 SL, 1 bPr [1]

Courses

Title	Type	Regular cycle	Workload [5]	LP [2]
Optimization and Dynamics	lecture	SoSe	90 h (60 + 30)	3 [Pr]
Excercise on Optimization and Dynamics	exercise	SoSe	60 h (30 + 30)	2 [SL]

Study requirements

Allocated examiner	Workload	LP [2]
Teaching staff of the course **Excercise on Optimization and Dynamics (exercise)** *Regular completion of exercises with a recognisable solution approach. Participation in exercise groups (presentation of calculation exercises twice when asked. The organiser may replace some of the exercises by exercises in attendance).*	see above	see above

Examinations

Allocated examiner	Type	Weighting	Workload	LP [2]
Teaching staff of the course **Optimization and Dynamics (lecture)** *Written examination of usually 90 minutes or oral examination of usually 20-30 minutes.*	Klausur o. mündliche Prüfung	1	60h	2

Legend

1	The module structure displays the required number of study requirements and examinations.
2	LP is the short form for credit points.
3	The figures in this column are the specialist semesters in which it is recommended to start the module. Depending on the individual study schedule, entirely different courses of study are possible and advisable.
4	Explanations on mandatory option: "Obligation" means: This module is mandatory for the course of the studies; "Optional obligation" means: This module belongs to a number of modules available for selection under certain circumstances. This is more precisely regulated by the "Subject-related regulations" (see navigation).
5	Workload (contact time + self-study)
SoSe	Summer semester
WiSe	Winter semester
SL	study requirement
Pr	Examination
bPr	Number of examinations with grades
uPr	Number of examinations without grades