Title of the course	Dynamic Optimisation for Business Research		
Title of the Academic Programme	Management and Analytics for business		
Type of the course	Elective		
Prerequisites	Business research methods, Statistical approaches to data analysis, Machine learning and data mining		
ECTS workload	3		
Total indicative study hours	Directed Study	Self-directed study	Total
	16	98	114
Course Overview	This course covers topics in dynamic optimization methods which might be relevant for applied business research: investment decisions, pricing etc. It discovers and explores cases both in discrete and in continuous time. The methodological approaches address methods in dynamic programming and optimal solutions across infinite/finite time horizons. The course illustrates how dynamic optimization is useful for business strategies development on a rigorous analytical base.		
Intended Learning Outcomes (ILO)	As a result of successful learning students are: 1. to differentiate dynamic optimisation methods 2. to distinguish situations where dynamic optimisation methods can be used 3. to apply dynamic optimization techniques for different business problems 4. to construct Bellman equation and find close-form solution if possible 5. to estimate Bellman equation		
Teaching and Learning Methods	Teaching methods: lectures, problem-solving discussions, workshops, case-studies.		
Course Content	Programming modelling for business solutions Bellman equation for value and profit functions SML and SMM for problems without close-form solutions		
Indicative Assessment Methods and Strategy	Final assessment: 50% exam assessment + 50% intermediate assessment Exam assessment: written examination at the end of the course Intermediate assessment: Control work (20%) Problem-solving discussions (20%) Labs (60%) **Grading policy:** The assessment list with all students' grades will be published in the LMS. All assignments will be assessed on 10-point scale. Cumulative and final grades will be rounded. Curve (rounding) is arithmetical (3.49 equals a 3; 3,501 equals a 4). **List of possible assignments:** <u>In-class assignments</u> (1) Control work. Students will have one control work during the course. Control works will be given for 1 hour 20 minutes. It will be based on seminars and labs activities. The task will be		

	devoted to solving a planning problem taken from business field in continuous time. (2) Problem-solving discussions. All discussions will be based on the application of different techniques used to support managerial decisions. Sources for discussion are top publications in business field where these methods of analysis are used. Also, students will discuss how real companies can use these methods and techniques to tackle their business tasks. (3) Labs. The course will be supplemented by a series of labs on topics covered during the lectures. Labs will include some real examples of how to use some techniques / methods and some exercises for students to practice these methods.
Readings / Indicative Learning Resources	Mandatory 1. Blot, J., & Hayek, N. (2014). *Infinite-horizon optimal control in the discrete-time framework*. New York: Springer. Retrieved from https://proxylibrary.hse.ru:2184/book/10.1007%2F978-1-4614-9038-8 2. Lozovanu, D., & Pickl, S. (2015). *Optimization of Stochastic Discrete Systems and Control on: Complex Networks*. Berlin: Springer. Retrieved from https://link.springer.com/chapter/10.1007/978-3-319-11833-8_1 Optional 1. Chibani, A., Delorme, X., Dolgui, A., & Pierreval, H. (2018). Dynamic optimisation for highly agile supply chains in e-procurement context. *International Journal of Production Research*, 1-26. Retrieved from https://proxylibrary.hse.ru:2103/10.1080/00207543.2018.1458164 2. Delahaye, T., Acuna-Agost, R., Bondoux, N., Nguyen, A. Q., & Boudia, M. (2017). Data-driven models for itinerary preferences of air travelers and application for dynamic pricing optimization. *Journal of Revenue and Pricing Management*, *16*(6), 621-639. Retrieved from https://search.proquest.com/docview/2050758912/fulltextPDF/109351DBE BAD4C1BPQ/1?accountid=45451 3. Chachuat, B., Roche, N., & Latifi, M. A. (2001). Dynamic optimisation of small size wastewater treatment plants including nitrification and denitrification processes. *Computers & Chemical Engineering*, *25*(4-6), 585-593. Retrieved from https://doi.org/10.1016/S0098-1354(01)00638-X 4. Dangl, T., & Wirl, F. (2004). Investment under uncertainty: calculating the value function when the Bellman equation cannot be solved analytically. *Journal of Economic Dynamics and Control*, *28*(7), 1437-1460. Retrieved from https://www.sciencedirect.com/science/article/pii/S0165188903001106?vi %3Dihub
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