Syllabus

Course Description

Course Title	Network Thinking and Agent-based modeling
Course Code	25556
Course Title Additional	
Scientific-Disciplinary Sector	NN
Language	English
Degree Course	Master in Entrepreneurship and Innovation
Other Degree Courses (Loaned)	
Lecturers	Prof. Roberto Gabriele, Roberto.Gabriele@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/48130
Teaching Assistant	
Semester	First semester
Course Year/s	1
CP	2
Teaching Hours	15
Lab Hours	-
Individual Study Hours	-
Planned Office Hours	6
Contents Summary	This course will provide knowledge and understanding of complex adaptive systems and their properties, and how patterns are emerging in systems. In the context of innovation and entrepreneurship, emerging patterns are related to innovation. Students will be: • given a framework with which they can assess innovation phenomena as well as how to apply a complex adaptive system perspective; • introduced to agent-based modeling; • acquire knowledge of the NetLogo platform, which is a widely used, arguably, easy software with which they can further simulate

	and explore complex adaptive systems.
Course Topics	The course proposes an approach to understand different phenomena using a "complexity" lens and understand how current behaviors and patterns emerge. The course tackles the complexity of adaptive systems in the context of business (e.g., innovation and entrepreneurship). The lecturer will introduce students to ABM thinking and to NetLogo as a simulation environment to describe and analyze open innovation phenomena.
Keywords	Complex system, Agent-based models, computational approach.
Recommended Prerequisites	Basic knowledge of computer usage.
Propaedeutic Courses	
Teaching Format	In-Person "Mixed" sessions with theoretical tractation and laboratory applications of the topics covered
Mandatory Attendance	75% mandatory presence
Specific Educational Objectives and Learning Outcomes	INTENDED LEARNING OUTCOMES (ILO) ILO1: KNOWLEDGE AND UNDERSTANDING ILO 1.a The student acquires knowledge and understanding of theories and tools for the economic analysis of the market, at the level of the individual enterprise and the supply system; ILO 1.b The student acquires knowledge and understanding of the theories and tools of statistical analysis for making market forecasts; ILO 1.c The student acquires advanced knowledge and understanding of business analysis tools and solutions for the development of innovations and organisational knowledge; ILO 1.d The student acquires advanced knowledge and understanding of innovation economics models and systems for regional innovation development; ILO 1.e The student acquires knowledge of quantitative models for the formulation of forecasts necessary to guide management decisions and to predict the life cycle of a product and a sector; ILO2: ABILITY TO APPLY KNOWLEDGE AND UNDERSTANDING ILO 2.a ability to acquire and select information that may be relevant from an entrepreneurial point of view, also in economic-productive contexts different from those studied; ILO 2.b ability to analyse the combination of market opportunities

	and resources of the enterprise and to identify entrepreneurial formulas, also with the elaboration of original, compatible and sustainable solutions and combinations; ILO 2.c ability to acquire and select relevant information to frame cases of innovation (product, service, social, managerial organisational), also different from the studied contexts; ILO 2.d Ability to assess the potential of an innovation within existing companies compared to the creation of a new company (e.g., intrapreneurship, open innovation, etc.). ILO3: AUTONOMY OF JUDGEMENT ILO 3.a Acquire the ability to analyse complex entrepreneurial problems, such as the elaboration and evaluation of an entrepreneurial project (business plan) or the development of a new product; ILO 3.bAcquire the ability to make predictions, such as analysing the future consequences of entrepreneurial, managerial and operational choice; ILO 3.c Autonomy of judgement is developed in the training activities carried out for the preparation of the thesis, as well as in the exercises that accompany the lectures and that involve group discussions and the comparison of individual analyses carried out by students in preparation for the lecture. ILO4: COMMUNICATION SKILLS ILO 4.a Acquire the ability to describe and communicate in an intercultural context, in a clear and precise manner, problematic situations typical of the management of a new enterprise and the development of innovation, such as, for example, the conditions for the validation of a problem or solution, the prospects and risks associated with a business model or an innovation project. The development of communication competences assumes heterogeneous situations such as, for example, the presence of internal stakeholders (e.g. colleagues, managers, owners), or external stakeholders (e.g. potential investors, suppliers and other business partners) and the ability to sustain an adversarial process; ILO 4.b The achievement of these objectives is assessed in the course of the training activities already mentioned, as well as in the discussion of the final thesis;

	ILO5: LEARNING SKILLS ILO 5.a Acquire the ability to study independently, to prepare summaries; ILO 5.b Acquire the ability to identify thematic connections and to establish relationships between different cases and contexts of analysis; ILO 5.c Acquire the ability to frame a new problem systematically and to generate appropriate taxonomies; ILO 5.d Acquire the ability to develop general models from the phenomena studied.
Specific Educational Objectives and Learning Outcomes (additional info.)	This course will provide knowledge and understanding of complex adaptive systems and their properties, and how patterns are emerging in systems. In the context of innovation and entrepreneurship, emerging patterns are related to innovation. Students will be introduced to agent-based modeling using the NetLogo program, a widely used, easy-to-use software platform that allows them to further simulate and explore complex adaptive systems.
Assessment	Written exam with three "open-answer questions about the topics covered during the course (ILOS 1a-1e; 2a-2d;3a-3c;4a and 4b;5a-5d) No exam for non-attending students. Students attending less than 75% of the lectures will automatically fail the course.
Evaluation Criteria	The written exam will consist of three open-answer questions and aims at checking the knowledge of the topic and of the models covered in the course. Clarity of the exposition is also evaluated.
Required Readings	· *Wilensky, U., Rand W. (2015). An Introduction to Agent-Based Modeling: Modeling Natural, Social, and Engineered Complex Systems with Netlogo. The MIT Press. (selected chapters);*
Supplementary Readings	*Optional readings:* · *Holland, J.H., 2014. Complexity: A very short introduction. Oxford;* · *Mitchell, M., 2009. Complexity: A guided tour. Oxford University Press.*
Further Information	No exam for non-attending students.
Sustainable Development	Quality education, Industry, innovation and infrastructure, Decent

Goals (SDGs)	work and economic growth, Gender equality