

## Syllabus

### Course description

<b>Course title</b>	<b>Network Thinking and Agent-based modeling</b>
<b>Course code</b>	25556
<b>Scientific sector</b>	ND
<b>Degree</b>	Master in Entrepreneurship and Innovation
<b>Semester and academic year</b>	1st semester, a.y. 2024-25
<b>Year</b>	1st study year
<b>Credits</b>	2
<b>Modular</b>	No

<b>Total lecturing hours</b>	15
<b>Total lab hours</b>	Not foreseen
<b>Total exercise hours</b>	Not foreseen
<b>Attendance</b>	not required
<b>Prerequisites</b>	Not foreseen
<b>Course page</b>	<a href="#">Course Offering - enrolled from 2022 / Free University of Bozen-Bolzano (unibz.it)</a>

<b>Specific educational objectives</b>	<p>Network thinking and agent-based modeling (ABM) are conceptually related to the Growth mindset course, where students have been introduced to algorithmic thinking and design thinking as ways to conceptualize complexity in the phenomena they observe. The main objective is to approach different phenomena with a complexity lens and understand how current behaviors and patterns emerge. In this regard, network thinking and agent-based modeling provide a third logic to tackle the complexity of adaptive systems, in the context of business (e.g. innovation and entrepreneurship). The lecturer will introduce the students to ABM thinking and to the NetLogo as a simulation environment to describe and analyze open innovation phenomena.</p>
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<b>Lecturer</b>	Roberto Gabriele
<b>Scientific sector of the lecturer</b>	Applied Economics
<b>Teaching language</b>	English
<b>Office hours</b>	please refer to the lecturer's web page
<b>Lecturing assistant</b>	Not foreseen
<b>Teaching assistant</b>	Not foreseen
<b>Office hours</b>	6
<b>List of topics covered</b>	<ul style="list-style-type: none"> <li>• Introduction to systems and complexity</li> <li>• Introduction to agent-based modeling</li> <li>• Introduction to Netlogo</li> <li>• Proposal of some models dealing with complexity</li> </ul>

<b>Teaching format</b>	hybrid lectures: frontal teaching combined with lab sessions.
<b>Learning outcomes</b>	<p>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.</p> <p>During this course, students will be given a framework with which they can assess innovation phenomena as well as how to apply a complex adaptive system perspective.</p> <p>Students will be introduced to agent-based modeling via the NetLogo program, which is a widely used, arguably, easy software with which they can further simulate and explore complex adaptive systems.</p>
<b>Assessment</b>	<p><u>Attending students:</u></p> <p>Written exam with three "open answers questions" about the topics covered during the course</p> <p><u>Non-attending students:</u></p> <p>Written exam with three "open answers questions" about the topics covered during the course. Together with a project work (model proposal)</p>
<b>Assessment language</b>	English
<b>Evaluation criteria and criteria for awarding marks</b>	<p><u>Attending students:</u></p> <p>Participation: 20%, Exam 80%</p> <p><u>Non-attending students:</u></p> <p>Exam 80%, project work 20%.</p> <p><b>Assessment criteria:</b> knowledge of the topic and the models covered in the course, clarity of the exposition.</p>
<b>Required readings</b>	<ul style="list-style-type: none"> <li>• <i>Wilensky, U., Rand W. (2015). An Introduction to Agent-Based Modeling: Modeling Natural, Social, and Engineered Complex Systems with Netlogo. The MIT Press.</i></li> <li>• <i>Holland, J.H., 2014. Complexity: A very short introduction. Oxford.</i></li> <li>• <i>Mitchell, M., 2009. Complexity: A guided tour. Oxford</i></li> </ul>

	<i>university press.</i>
<b>Supplementary readings</b>	<ul style="list-style-type: none"> <li>• <i>Arthur, W.B., 2021. Foundations of complexity economics. Nature Reviews Physics, 3(2), pp.136-145.</i></li> <li>• <i>Newman, M., 2018. Networks. Oxford university press.</i></li> <li>• <i>Garcia, R., 2005. Uses of agent-based modeling in innovation/new product development research. Journal of Product Innovation Management, 22(5), pp.380-398.</i></li> <li>• <i>Arthur, W.B., 1999. Complexity and the economy. science, 284(5411), pp.107-109.</i></li> <li>• <i>Rogers, E.M., 2010. Diffusion of innovations. Simon and Schuster.</i></li> <li>• <i>Schelling, T.C., 1969. Models of segregation. The American Economic Review, 59(2), pp.488-493.</i></li> <li>• <i>Schelling, T. C. "Dynamic models of segregation." Journal of mathematical sociology 1, no. 2 (1971): 143-186.</i></li> </ul>