## Syllabus

### Course description

<table>
<thead>
<tr>
<th>Course title</th>
<th>Network Thinking and Agent-based modeling</th>
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<tbody>
<tr>
<td>Course code</td>
<td>25556</td>
</tr>
<tr>
<td>Scientific sector</td>
<td></td>
</tr>
<tr>
<td>Degree</td>
<td>Master in Entrepreneurship and Innovation</td>
</tr>
<tr>
<td>Semester and academic year</td>
<td>1st semester, a.y. 2022-23</td>
</tr>
<tr>
<td>Year</td>
<td>1st study year</td>
</tr>
<tr>
<td>Credits</td>
<td>2</td>
</tr>
<tr>
<td>Modular</td>
<td>No</td>
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</tbody>
</table>

| Total lecturing hours        | 12                                        |
| Total lab hours              | Not foreseen                              |
| Total exercise hours         | Not foreseen                              |
| Attendance                   | not required                              |
| Prerequisites                | Not foreseen                              |
| Course page                  | Course Offering - enrolled from 2022 / Free University of Bozen-Bolzano (unibz.it) |

### Specific educational objectives

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. In addition, the lectures introduce a few models, such as organizational learning in innovation networks, coalitions in networked innovation, and diffusion of innovation on social networks. Last but not least, the application of complexity and simulation on applied projects will be introduced.

### Lecturer

Siavash Farahbakhsh

### Scientific sector of the lecturer

Business Economics

### Teaching language

English

### Office hours

please refer to the lecturer’s web page

### Lecturing assistant

Not foreseen

### Teaching assistant

Not foreseen

### Office hours

6
### List of topics covered
- Introduction to systems and complexity
- Introduction to networks
- Introduction to agent-based modeling
- Modeling Diffusion dynamics
- Application of complexity on timely topics such as sustainability

### Teaching format
Frontal lectures, combined with a few exercises.

### Learning outcomes
This course will provide knowledge and understanding of complex adaptive systems, networks and their properties, and how patterns are emerging in systems. In the context of innovation and entrepreneurship, emerging patterns are related to innovation diffusions under different mechanisms.

During this course, students will be given a framework with which they can assess innovation diffusion phenomena as well as how to apply a complex adaptive system perspective.

With this approach, students will be able to critically assess and judge different phenomena given the complexity and systems perspective lens rather than linear thinking rooted in micro-level views.

Moreover, using the complexity framework students will be able to communicate their assessments in a systemic way starting from identifying the problem, agents’ heterogeneity and behaviors, dynamics and interaction, and emerging outcomes.

Last but not least, 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.

### Assessment
**Attending students:**
Project work and oral: a group work will be assigned to the students and the final evaluation will be made through the presentation of the assigned work and oral questions during the presentation.

**Non-attending students:**
Project work and oral: a project will be assigned to the non-attending student to be carried on individually and the final evaluation will be based on the written report of the work and oral test related to the assigned work.
<table>
<thead>
<tr>
<th>Assessment language</th>
<th>English</th>
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</table>
| Evaluation criteria and criteria for awarding marks | **Attending students:**  
Participation: 20%, project work presentation 80%  
**Non-attending students:**  
Project work presentation 100%  
**Assessment criteria:** clarity of the project work presentation, correct application of the complexity framework and simulation approach, show critical views on the topic of the project work, sound argumentations. |
| Required readings |  
| Supplementary readings |  