**Course Syllabus**

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| Title of the course | Theory Construction and Model Building (offered in English) |
| Title of the Academic Programme  | Bachelor’s Programme 'Sociology and Social Informatics' |
| Type of the course  | Elective |
| Prerequisites | Sociological Theory, Information Systems, Data Analysis |
| ECTS workload | 5 |
| Total indicative study hours | Directed Study | Self-directed study  | Total |
| 70 | 120 | 190 |
| Course Overview | The course aimed at equipping students with tools to transform ideas into formal theories.Based on concepts from Sociological Theory and specifically of Analytical Sociology, students will get experience in working with theoretical constructs and relationships in order to generate, adapt and build on theoretical models. The main focus is on the progression from modelling individual and group decision making to mechanism-based explanation in social science using agent-based models. The course includes a large practical part which covers working with different decision modelling approaches, including decision trees, finite state machines, participatory simulations, and agent-based models.The course is targeted to students considering research or analytical career. |
| Intended Learning Outcomes (ILO) | As a result of this course, students will:* Thoroughly understand the role of theory in sociological research
* Understand the link between theorizing and modelling
* Generate research ideas
* Translate research ideas into formal theories
* Appropriately apply decision modelling approaches to research and analytics tasks
* Interpret modelling results in sociological terms
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| Teaching and Learning Methods | Teaching and learning methods include a lecture, seminars, group work, practical home assignments (NetLogo, R, spreadsheets). |
| Content and Structure of the Course |
| **№** | **Topic / Course Chapter** | **Total** | **Directed Study** | **Self-directed Study** |
| **Lectures** | **Seminars** |
| 1 | Course Intro. Theory, Decisions and Models | 25 | 2 |  | 15 |
| 2 | Individual Decision Making - Optimization, Rationality, Utility, Cognitive Biases. Tools for Modelling Individual Decisions - Tables, Rules, Trees, FSMs | 23 |  | 12 | 15 |
| 3 | Micro-Macro links in Complex Adaptive Systems. What is Agent-Based Model? Introduction to NetLogo - My first ABM | 23 |  | 12 | 15 |
| 4 | Exploring and Extending ABMs - Fire in the Forest. Creating ABM from scratch. Design Principles | 23 |  | 8 | 15 |
| 5 | ABM сomponents. Agents and Environments. Analysing ABMs. Verification, Validation and Replication. Extending Schelling’s Segregation model | 23 |  | 8 | 15 |
| 6 | ABM-based Theory Construction and validation. Micro-Macro Link and Sociological Explanation | 23 |  | 8 | 15 |
| 7 | Participatory simulation of interaction and group decision making. Emergence of Friendship | 25 |  | 10 | 15 |
| 8 | Modelling Emergence of Inequality. Advanced Topics - ML, Networks, Maps, Extensions, Reinforcement learning | 25 |  | 10 | 15 |
| **Total study hours** | 190 | 2 | 68 | 158 |
| Indicative Assessment Methods and Strategy  | * Preparation for Seminars and in-class Participation (30% of the cumulative grade)
* Essay I (Individual Decisions) (10% of the cumulative grade)
* Test (Basics of Decision Theory and ABM) (20% of the cumulative grade)
* Group project (Participatory Simulation Design) (20% of the cumulative grade)
* Essay II (ABM Simulation) (20% of the cumulative grade)

Final grade equals to cumulative grade. |
| Readings / Indicative Learning Resources | Mandatory* Cioffi-Revilla, Claudio. 2014. Introduction to Computational Social Science: Principles and Applications. 2014 edition. London ; New York: Springer. [https://link.springer.com/book/10.1007%2F978-1-4471-5661-1](https://link.springer.com/book/10.1007/978-1-4471-5661-1)
* Kochenderfer, Mykel J., Christopher Amato, Girish Chowdhary, Jonathan P. How, Hayley J. Davison Reynolds, Jason R. Thornton, Pedro A. Torres-Carrasquillo, N. Kemal Üre, and John Vian. 2015. Decision Making Under Uncertainty: Theory and Application. 1st ed. The MIT Press. <https://www.frontiersin.org/research-topics/295/decision-making-under-uncertainty>
* Wilensky, Uri, and William Rand. 2015. An Introduction to Agent-Based Modeling: Modeling Natural, Social, and Engineered Complex Systems with NetLogo. MIT Press. <https://ebookcentral.proquest.com/lib/hselibrary-ebooks/detail.action?docID=3339969>

Optional* Manzo, Gianluca, ed. 2014. Analytical Sociology: Actions and Networks. 1 edition. Hoboken: Wiley. <https://ebookcentral.proquest.com/lib/hselibrary-ebooks/detail.action?docID=1650830>
* Schlüter, Maja, Andres Baeza, Gunnar Dressler, Karin Frank, Jürgen Groeneveld, Wander Jager, Marco A. Janssen, et al. 2017. ‘A Framework for Mapping and Comparing Behavioural Theories in Models of Social-Ecological Systems’. Ecological Economics 131 (January): 21–35. <https://proxylibrary.hse.ru:2054/science/article/pii/S0921800915306133?via%3Dihub>
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| Indicative Self- Study Strategies | **Type** | **+/–** | **Hours** |
| Reading for seminars / tutorials (lecture materials, mandatory and optional resources) | + | 40 |
| Assignments for seminars / tutorials / labs | + | 60 |
| E-learning / distance learning (MOOC / LMS) | - |  |
| Fieldwork | - |  |
| Project work | + | 58 |
| Other (please specify) | - |  |
| Preparation for the exam | - |  |
| Academic Support for the Course | Academic support for the course is provided via e-mail and Dropbox. In 2018-19 some materials are planned to be delivered in blended mode. |
| Facilities, Equipment and Software | A computer class with NetLogo, R, MS Excel |
| Course Instructor | Sr. Lecturer Ilya Musabirov, Lecturer Viktor Karepin |