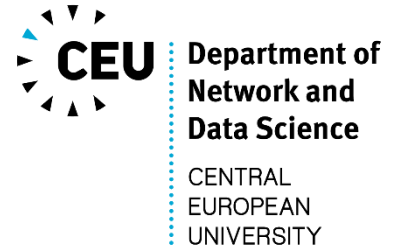CENTRAL EUROPEAN UNIVERSITY PRIVATE UNIVERSITY

Department of Network and Data Science

Master of Science in Social Data Science (2-year)

PROGRAM HANDBOOK

Address: Quellenstraße 51-55, 1100 Vienna, Austria

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Website: https://networkdatascience.ceu.edu/

This information package contains all essential information about the Master's studies at CEU Department of Network and Data Science. Please read it thoroughly and carefully and consult it first in case of any questions.

Last updated on 9 February 2024

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BASIC PROGRAM INFORMATION

Institution Responsible: Central European University Private University

Name of Unit: Department of Network and Data Science

Degree to be Awarded: Master of Science in Social Data Science

Address: Quellenstraße 51-55, 1100 Vienna, Austria

Mailing Address: Quellenstraße 51-55, 1100 Vienna, Austria

Program Website: https://networkdatascience.ceu.edu/msc-social-data-science

Head of Department: János Kertész (kerteszj@ceu.edu)

Master Program Director: Márton Karsai (karsaim@ceu.edu)

Program Coordinator: Christy Leung (leungc@ceu.edu)

ABOUT THE TWO-YEAR MS SDS

PROGRAM CHARACTERISTICS

The Master of Science program in Social Data Science (MS SDS) is a multi-disciplinary research-oriented program in which students learn the core and advanced mathematical, statistical and computational tools to collect, curate, manage, and analyze massive datasets of human actions and interactions via a methodological training in Data Science. Working across disciplines they will obtain an overall view on the application landscape of these methods in various social science disciplines and in-depth knowledge about disciplinary questions closest to their personal interest. Students will be confronted with state-of-the-art opportunities and challenges of Big Data technologies, which will help them develop a reflexive and critical thinking about such technologies and their role in shaping human behavior and social phenomena. In the end of the training, they will be able to design data-driven projects and digital social experiments to measure, interpret, model and understand social phenomena. Graduates will be well equipped to participate in interdisciplinary teams working on social problems with computational methods in academia, the public sector, civic organizations, and industry.

The courses of the MS SDS program are organized in three main modules on Fundamental Methods of Data Science, Advanced Methods and Concepts and Specialization. This modular structure offers flexible choices of elective courses for students who will be able to specialize according to their interest. Every student will undergo a research internship in the end of the first year and will complete a capstone project in the end of the second year. These training opportunities will enable them to apply their knowledge and to do research in a new environment, gain experience and build connections in an academic research group or in a data-oriented company.

The graduates will represent a new generation of scientists, entrepreneurs, and policy makers with knowledge about the fundamental questions and cutting-edge methods in data science with simultaneous sensitivity to socially relevant issues. The program will help them develop independent and critical thinking and actionable skills to address actual social problems like inequalities and segregation, migration, corruption, populism, fake news, environmental problems, and the social consequences of Artificial Intelligence.

ACCREDITATION

The two-year Master of Science degree in Social Data Science was introduced at CEU in 2022 as an interdisciplinary initiative of the Department of Network and Data Science, Department of Economics and Business, Department of Environmental Sciences and Policy, Department of Political Science and Department of Public Policy. A number of courses are offered by faculty of these departments.

The MS SDS program is registered by the Board of Regents of the University of the State of New York (US) for and on behalf of the New York State Department of Education. It is assured by the Agency for Quality Assurance and Accreditation Austria (Agentur für Qualitätssicherung und Akkreditierung Austria) from 2023.

PROGRAM DESCRIPTION

PROGRAM PURPOSES, GOALS AND OBJECTIVES

Social data science is a promising field to ask and answer new questions about human behavior and social processes in the digital era. Socially responsible and critical approaches are the most wanted skills in Social Data Science on the market, which could be obtained only in schools where this way of thinking is traditional. CEU is one of the leading social science universities and its mission is to train students with critical and reflexive thinking. The MS SDS program at CEU can combine experience in obtaining data science skills at the CEU Department of Network and Data Science (DNDS) and reflexive thinking about society provided by other departments with a focus on inequalities, discrimination, and dynamics of participation and activism in public spheres. It would help translate CEU's mission of promoting openness and equity into the digital realm, by training professionals and academics who can not only use data science techniques but are also able to relate to our digital society critically.

The MS SDS program is expected to meet considerable demand in expertise in data science and the expanding interdisciplinary field of social data science in the labour market. The program taught in English at CEU in Vienna would provide skills for those intending to pursue doctoral studies, and an academic career, while it would also contribute vital skills to others interested in business or public service careers.

The MS SDS program aims to train a new generation of social data scientists via a rich curriculum in data ethics; data collection, curation, and analysis; and an acute sense of asking relevant and pressing questions about the society. It will empower students to build towards a career in academia, or a career in the digital industry. The graduates will be able to work towards the solution of pressing problems including but not limited to inequalities and segregation, migration, corruption, populism, fake news, environmental problems, and the social consequences of Artificial Intelligence.

PROGRAM LEARNING OUTCOMES

The students will acquire knowledge:

- of an arsenal of tools of quantitative and data-driven approaches to study social phenomena in a specialized field;
- of the fairness and biases of social data science methods;
- of the legal and ethical framework of data collection and analysis in social sciences, including specificities of Big Data;
- about main concepts, ideas and challenges in at least one field of social sciences, as well as the important special quantitative and qualitative methods;
- of the new possibilities that socially related big data types enable for studying contemporary problems in business and academic research;
- to identify the societal potential of and challenges to working with Big Data.

The students will be equipped with the following skills:

- Understand and model complex, networked, dynamic, social, economic, political, technological, or ecological systems depending on their specialization;
- Have a critical and reflexive view on the advantages and dangers of data driven methodologies in real world applications observing and predicting human behavior;
- Master the state-of-the-art programming language for collection, curation, processing, preparation, and analysis of data;

- Employ state of the art data science tools, including methods from supervised and unsupervised machine learning, web mining, network analysis, visualization, spatial analysis, natural language processing etc. to the analysis of societal and organizational problems of a specific field;
- Collect data in various ways using tracking, monitoring, crawling or transactional data collection methods or social experiments;
- Analyze data of various kind recording temporal, spatial, relational, feature etc. information
- Design online or digital social experiments, execute, measure, and interpret their results
- Identify correlation patterns and causal relationships in social data and to build predictive models using human behavioral datasets;
- Combine quantitative and empirical methods from social sciences, including statistical analysis, digital methods, and experimental methods with Data Science tools in order to analyze societal and organizational problems;
- Communicate with researchers both in social sciences and data science;
- Communicate research-based knowledge in writing, visualization, and verbal presentation.

The students will be equipped with the following competencies:

- Planning and completing social data science studies/examination/research of social phenomena at least in one field of social sciences;
- Manage the ethical aspects of collecting and processing personal data as well as making decisions based on the data;
- Participate and coordinate cooperation in interdisciplinary teams with people from other scientific fields and traditions to work on research problems of social data science;
- Independently take responsibility for further personal scientific development and specialization in the academic and private sectors or in governance and NGOs.

ENTRY REQUIREMENTS

General Requirements
- Completed online CEU application form
- Academic records (academic transcripts and graduation certificates)
- Proof of English proficiency:
    - Applicants whose first language is not English must submit the score report of a standardized English language test, e.g., the Test of English as a Foreign Language (TOEFL). The language test types and the respective minimum test scores required by Master's programs are listed in CEU's Application Checklist (https://www.ceu.edu/admissions/how-to-apply/checklist).
    - If the applicant's first language is English, he/she will normally be exempted from this requirement. An applicant may also be exempted if he/she has obtained a Bachelor's or a Master's degree taught exclusively in English.
- Two letters of recommendation
- CV

Program-Specific Requirements
- 3-year or 4-year BSc or BA degree in one of a broad range of related disciplines:
    - Eligible applicants must have earned a first degree (Bachelor's or equivalent which is not less than 3 years of full-time studies) from a recognized university or institution of higher education, or provide documentation indicating that they will earn their first degree from such an institution by the time of enrolling in MS SDS program.

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- o This first degree should be in computer science, social science, data science, physics, economics, environmental science, other natural sciences, political science, and sociology or closely related fields which should present the applicants' background and interest in quantitative analysis and interdisciplinary research and in studying social phenomena. Candidates with first degrees in other fields will also be considered but will be evaluated individually.
- Strong interest in interdisciplinary research
- Proof of GMat/GRE exam or proof of relevant Math training during university studies, or CEU math exam (except for students with degrees from quantitative studies programs such as Mathematics, Physics, Computer Science, Statistics, etc.; exemption of this provision also depends on evaluation of Individual applications on the personal base.)
- Proof of previous training in programming
- Willingness and ability to do quantitative studies
- Details of achievements and/or activities related to the MS SDS program
- Motivation letter
- Choice of specialization with short explanation:
    - o Applicants must indicate the specialization they would like to get enrolled in.
- Admission interview

MODE AND DURATION OF STUDIES

The MS SDS program is offered in full-time mode of study. In each academic year, there are three terms: Fall, Winter and Spring Terms. Students are required to complete 24 ECTS per Fall Term and per Winter Term, as well as 12 ECTS per Spring Term.

The duration of the programmes is two years.

MASTER SCHEDULE

Students are expected to use the shared **DNDS calendars** for up-to-date information on classes, colloquia/seminars, and other events organized by the Department: https://networkdatascience.ceu.edu/schedule.

ACADEMIC CALENDAR AND TERMS

The university calendar, and the start and end dates of Fall, Winter and Spring Terms, can be accessed at https://www.ceu.edu/calendar.

The duration of a teaching term (Fall Term and Winter Term) at CEU is 12 weeks. The duration of the Spring Term is 11 weeks.

REGISTRATION PERIOD and COURSE REGISTRATION

Fall Term	September 11 – 25, 2023
Winter Term	December 11, 2023 – January 15, 2024

Spring Term	March 25, 2024 – April 8, 2024

During the course registration period between September 11 and 25, students will be required to register for all courses throughout the academic year, including their Fall, Winter and Spring Terms.

During the registration period, students can add and drop courses, and register audit courses. Changes to course registration are not possible after the end of the registration period. Once the registration closes, changes will no longer be possible. The registration will open again for the Winter and Spring Terms when students will be able to update their registration for the respective terms.

Students may be allowed to drop a mandatory course or register it as an audit course during the registration period in case they meet the criteria of credit transfer regulations under the Student Rights, Rules and Academic Regulations but the credits cannot be transferred (please refer to the details about credit transfer in the regulations.). If the dropping of a course is successful, it will not appear in their transcript, even the dropped course was a mandatory course; if they decide to audit it by fulfilling the auditing requirements of the course, it will appear with an "AU" (Audit) grade.

Registration deadlines are not flexible. Late add and drop of courses will result in a financial penalty of 15 EUR per course.

Students are responsible for making sure they fulfill all module, specialization and graduation requirements. Students who register a course but neither take the final exam, nor drop the course or change it to audit in time will receive an Administrative Fail (AF).

EXAM PERIOD

Different assessment methods are adopted for different courses. Please consult individual course instructors about exam being part of the assessment and the date of exam.

GRADUATION REQUIREMENTS

The graduation requirements for the MS SDS program is successfully completing the taught component of the courses with GPA over 2.33 (C+ or above 50%), an internship (pass grade), and a captstone project with thesis written and defended orally (C+ or above 50%), as well as collecting a total of 120 ECTS.

PROGRAM STRUCTURE

Curriculum Structure

The MS SDS program includes the following core modules: **Fundamental Methods of Data Science, Advanced Methods and Concepts, Specialization**, in addition to the modules of Academic Writing, Seminar, Projects and Free Electives.

There are three types of courses in the program: **Mandatory (M), mandatory elective (ME), and free elective (FE)**.

Each core module in the program consists of multiple Mandatory (M) courses that students are required to take and complete, and Mandatory Elective (ME) courses from which students need to choose and complete according to the given number of ECTS prescribed in the program and module

descriptions. Free Elective (FE) courses can be chosen from any master level courses at CEU which MS SDS students are allowed to take.

Participation of MS SDS students in the ME courses cross-listed from or FE courses offered by other academic programs is at the discretion of the respective course instructors.

YEAR	TERM	MODULE	COURSE	ECTS
Pre-term	*Pre-training*	Bootcamp – remedial courses required depending on existing qualifications	Conceptions of Social Dynamics	0
			Introduction to Computer Science	0
			Pre-session in Mathematics	0
Year 1 60 ECTS	Fall: 24 ECTS	Fundamental Methods of Data Science	Applied Statistics	4
			Data Analysis in Python	4
			Machine Learning 1	4
		Specialization	Social Networks 1	4
			Mandatory Elective	4
		Adv. Methods & Concepts	Topics of Social Data Science	4
	Winter: 24 ECTS	Fundamental Methods of Data Science	Social Data Mining	4
		Specialization	Debate and Contradictions in Social Data Science	4
		Adv. Methods & Concepts	Digital Data Collection Methods: Opportunities and Risks	4
			Data Visualization	4
		Free Elective	Free Elective	4
		Academic Writing	Academic Writing for MS in SDS	4
	Spring: 12 ECTS	Project	Research Internship	12
Year 2 60 ECTS	Fall: 24 ECTS	Specialization	Mandatory Elective	4
		Adv. Methods & Concepts	Network Science	4
			Ethics of Big Data	4
			Mandatory Elective	4
		Free Elective	Free Elective	4
		Seminar	Research Seminar	4
	Winter: 24 ECTS	Fundamental Methods of Data Science	Mandatory Elective	4
		Specialization	Mandatory Elective	4
		Adv. Methods & Concepts	Mandatory Elective	4
		Free Elective	Free Elective	4
		Seminar	Thesis Seminar	4
		Project	Capstone Project 1	4
	Spring: 12 ECTS	Project	Capstone Project 2	12

Course Code

The prefix of the course code denotes the course offering unit/department of CEU. The prefixes of the subject codes and the corresponding course offering units are presented below:

Prefix	Course offering unit/department
DNDS	Department of Network and Data Science
CAW	Center for Academic Writing
CDCR	Cognitive Development Center (Department of Cognitive Science)
DOPP	Department of Public Policy
DSPS	Doctoral School of Political Science, Public Policy and International Relations
ECBS	Department of Economics and Business
ENVS	Department of Environmental Sciences and Policy
POLS	Department of Political Science
UGST	Undergraduate Studies
UWC	*[University-wide Course that is open to all CEU students]*

Credits Requirements

Students are required to successfully complete a total of 120 ECTS (equivalent to 60 US graduate course credits) within the two years of studies: 24 ECTS for each Fall or Winter Term and 12 ECTS for each Spring Term.

The minimum number of credits registered is 10 US / 20 ECTS per Fall/Winter term, and 6 US / 12 ECTS per Spring Term. Taking fewer or more credits than is required in a term requires permission from the MS Program Director and/or the Head of Department and is granted only in exceptional cases.

Students shall complete all Mandatory (M) courses assigned to a term in the curriculum. They are required to retake any failed Mandatory course in the earliest term when the same course is available.

Possible deviations from the scheduled credit requirements are as follows:

- Mandatory Elective (ME) courses: Students are allowed to take up to 4 US / 8 ECTS credits more than is required in the assigned term, unless they have already done so for Free Elective courses in the same term.
- Free Elective (FE) courses: Students are allowed to take up to 4 US / 8 ECTS credits more than is required in each academic year. Students may make use of the obtained credits from Mandatory Elective courses taken beyond the minimum requirement to fulfill the Free Elective requirement.

  Please note that up to 4 US/ 8 ECTS credits per academic year in Free Elective courses from outside of the MS SDS program can be taken without a formal approval.

- Students can take up to 6 US / 12 ECTS credits per year in Free Elective courses from outside of their specialization without a formal approval from their home unit. The results of the additional ECTS attained will appear on their transcripts of records and be counted for the GPA. However, the credits will not count towards their degree.

Specialization Requirement

Choosing a specialization is mandatory. Students have to choose among the below list of four Social Science specializations when they apply for the master studies depending on their personal interest and prior training:

- Economics
- Environmental Science
- Political Sciences and Policy
- Applied Social Data Science

Students can request for change in their specialization during the course registration period in the Fall Term of their first year if they meet the specialization requirements in terms of prior training and are able to follow the required mandatory and elective courses of the target specialization. Request for the change has to be approved by the MS Program Director and the Interdisciplinary SDS Committee.

COURSE LIST

Bootcamp Module (Remedial Courses)

The remedial courses aim to effectively prepare the students from various disciplines to start the MS SDS program. They are remedial courses for certain students depending on their disciplinary background. They will take place during the Orientation Week and the Zero Week of the Fall Term, i.e. the two weeks before the first term of the first year.

- **Pre-session in Mathematics** is a remedial course for the students who did not receive formal mathematic training during their earlier studies, such as that in Mathematics, Computer Science, Physics, Statistics, etc.
- **Introduction to Computer Science** targets students from social science disciplines including but not limited to Economics, Sociology and Environmental Science, etc.
- **Conceptions of Social Dynamics** targets students from natural science disciplines, such as in Mathematics, Computer Science, Physics and Statistics, etc.

These courses taken as remedial courses carry neither US graduate course credits nor ECTS; they shall not be counted towards the fulfilment of the 120 ECTS required for the MS SDS program.

Fundamental Methods of Data Science Module

The module consists of four mandatory courses (in total 16 ECTS) and requires completing 4 ECTS from a mandatory elective course during the two years.

Course code	Course Name	ECTS	Yr	Term	Type	Host dept.	Instructor
DNDS6005	Social Data Mining	4	1	Winter	M	DNDS	Márton Karsai
DNDS6288	Data Analysis in Python	4	1	Fall	M	DNDS	Márton Pósfai
UGST4086	Applied Statistics	4	1	Fall	M	DNDS	Elisa Omodei
UGST4088	Machine Learning 1	4	1	Fall	M	DNDS	Petra Kralj Novak

UGST4181	Mathematics for Advanced Methods and Concepts	4	1/2	Winter	ME	DNDS	Imre Fekete
UGST4184	Machine Learning 2	4	1/2	Winter	ME	DNDS	Petra Kralj Novak
CDCR6031	Bayesian Data Analysis	4	1/2	Winter	ME	Cog Sci	József Fiser
ECBS5146	Data Engineering 1: SQL and Different Shapes of Data	4	1/2	Fall	ME	ECBS	László Salló

Advanced Methods of Data Science Module

The module provides five mandatory courses (in total 20 ECTS) and requires completing 8 ECTS from the list of mandatory elective courses.

Course code	Course Name	ECTS	Yr	Term	Type	Host dept.	Instructor
DNDS6002	Data Visualization	4	1	Winter	M	DNDS	Tiago Peixoto
DNDS6007	Digital Data Collection Methods: Opportunities and Risks	4	1	Winter	M	DNDS	Márton Karsai
DNDS6014	Topics of Social Data Science	4	1	Fall	M	DNDS	Gerardo Iñiguez
TBA	Ethics of Big Data	4	2	Fall	M	TBA	TBA
UGST4143	Network Science	4	2	Fall	M	DNDS	Tiago Peixoto
DNDS6008	Agent-Based Models	4	2	Winter	ME	DNDS	János Kertész
DNDS6022	Dynamical Systems on Networks	4	2	Winter	ME	DNDS	Federico Battiston
ECBS5147	Data Engineering 2: Cloud Computing	4	1/2	Fall	ME	ECBS	Zoltán Csaba Tóth
ECBS6071	Introduction to Data Analysis in R	4	1/2	Winter	ME	ECBS	Marc Kaufmann
TBA	Social Dynamics	4	2	Winter	ME	DNDS	Federico Battiston

Specialization Module

Each specialization provides courses on the general social science concepts of the given fields and methodological courses relevant to the actual specialization. The module comprises of 8 ECTS obtained from two mandatory courses) and requires completing at least 12 ECTS from mandatory elective courses under the specialization. The grouping of courses in specializations are listed below.

List of courses for the specialization in Economics

Course code	Course Name	ECTS	Yr	Term	Type	Host dept.	Instructor
DNDS6012	Social Networks 1	4	1	Fall	M	DNDS	Elisa Omodei

UWC5029	Debates and Contradictions in Social Data Science	4	1	Winter	M	UWC	Márton Karsai
ECBS5019	Econometrics 1	8	1/2	Fall	ME	ECBS	Róbert Pál Lieli & Ádám Reiff
ECBS5035	Microeconomics for Economic Policy	8	1/2	Fall	ME	ECBS	Mats Köster & Paul Voss
ECBS5061	Econometrics 2	8	1/2	Winter	ME	ECBS	Sergei Lychagin & Arieda Muco
ECBS5138	Data Analysis 1: Exploration - Economic Policy track	4	1/2	Fall	ME	ECBS	Gábor Békés
ECBS5145	Data Analysis 2: Finding Patterns with Regressions - Economic Policy Track	4	1/2	Fall	ME	ECBS	Tímea Laura Molnár
ECBS5181	Financial Econometrics	4	1/2	Winter	ME	ECBS	Tomy Lee
ECBS5215	Fintech in Depth	4	1/2	Winter	ME	ECBS	Tomy Lee
ECBS5246	Theory and Practice of Economic Forecasting	4	1/2	Winter	ME	ECBS	Klaus Weyerstrass
ECBS5349	Entrepreneurship and Innovation	4	1/2	Winter	ME	ECBS	Andrea Kozma
ECBS5401	Sustainable Finance	4	1/2	Spring	ME	ECBS	Christian Schopper
ECBS6065	Psychology and Economics	8	1/2	Winter	ME	ECBS	Marc Kaufmann
ECBS6067	Prediction with Machine Learning for Economists	4	1/2	Fall	ME	ECBS	Gábor István Békés
ECBS6253	Machine Learning for Natural Language Processing 1	4	1/2	Spring	ME	ECBS	Arieda Muco
DNDS6023	Social Networks 2	4	1/2	Winter	ME	DNDS	Balázs Vedres
DNDS6032	Data Science for the Sustainable Development Goals	4	1/2	Winter	ME	DNDS	Elisa Omodei

List of courses for the specialization in Environmental Science

Course code	Course Name	ECTS	Yr	Term	Type	Host dept.	Instructor
DNDS6012	Social Networks 1	4	1	Fall	M	DNDS	Elisa Omodei
UWC5029	Debates and Contradictions in Social Data Science	4	1	Winter	M	UWC	Márton Karsai
ENVS5132	Introduction to Geospatial Analysis	6	1/2	Winter	ME	DESP	Viktor Lagutov
ENVS5190	Humans and the Biosphere	2	1/2	Fall	ME	DESP	Ruben Mnatsakanian
ENVS5191	The Non-human Biosphere	2	1/2	Fall	ME	DESP	Ruben Mnatsakanian

DNDS6023	Social Networks 2	4	1/2	Winter	ME	DNDS	Balázs Vedres
DNDS6032	Data Science for the Sustainable Development Goals	4	1/2	Winter	ME	DNDS	Elisa Omodei
UWC5010	Introduction to Geospatial Data Visualization I	2	1/2	Fall	ME	UWC	Viktor Lagutov
UWC5020	Introduction to Geospatial Data Visualization II	2	1/2	Fall	ME	UWC	Viktor Lagutov

List of courses for the specialization in Political Science and Policy

Course code	Course Name	ECTS	Yr	Term	Type	Host dept.	Instructor
DNDS6012	Social Networks 1	4	1	Fall	M	DNDS	Elisa Omodei
UWC5029	Debates and Contradictions in Social Data Science	4	1	Winter	M	UWC	Márton Karsai
DOPP5078	Impact Evaluation: Policy Applications with R	4	1/2	Fall	ME	DPP	Anand Murugesan
DOPP5360	Applied Regression Analysis for Public Policy	4	1/2	Fall	ME	DPP	Ljubica Nedelkoska
DOPP5383	Advanced Impact Evaluation	4	1/2	Winter	ME	DPP	Anand Murugesan
DOPP5384	Big Data for Public Policy	4	1/2	Winter	ME	DPP	Mihály Fazekas
DOPP5664	Microeconomics, Behavior and Public Policy	4	1/2	Fall	ME	DPP	Anand Murugesan
DOPP5665	Macroeconomics and Public Policy	4	1/2	Winter	ME	DPP	Martin Kahanec
DSPS6570	Domestic Politics in the Global Economy	4	1/2	Winter	ME	DSPS	Michael Dorsch
ECBS5138	Data Analysis 1: Exploration - Economic Policy track	4	1/2	Fall	ME	ECBS	Róbert Pál Lieli
ECBS5145	Data Analysis 2: Finding Patterns with Regressions - Economic Policy Track	4	1/2	Fall	ME	ECBS	Tímea Laura Molnár
POLS5194	Social Media and Democracy	4	1/2	Fall	ME	DPS	Mariyana Angelova
POLS5814	Introduction to Public Opinion, Political Communications, Political Behavior	4	1/2	Fall	ME	DPS	Gábor Simonovits
DNDS6023	Social Networks 2	4	1/2	Winter	ME	DNDS	Balázs Vedres
DNDS6032	Data Science for the Sustainable Development Goals	4	1/2	Winter	ME	DNDS	Elisa Omodei

List of courses in the specialization in Applied Social Data Science

Course code	Course Name	ECTS	Yr	Term	Type	Host dept.	Instructor
DNDS6012	Social Networks 1	4	1	Fall	M	DNDS	Elisa Omodei
UWC5029	Debates and Contradictions in Social Data Science	4	1	Winter	M	UWC	Márton Karsai
DNDS6023	Social Networks 2	4	1/2	Winter	ME	DNDS	Balázs Vedres
DNDS6032	Data Science for the Sustainable Development Goals	4	1/2	Winter	ME	DNDS	Elisa Omodei
DOPP5384	Big Data for Public Policy	4	1/2	Winter	ME	DPP	Mihály Fazekas
ECBS5138	Data Analysis 1: Exploration - Economic Policy track	4	1/2	Fall	ME	ECBS	Gábor Békés
ECBS5145	Data Analysis 2: Finding Patterns with Regressions - Economic Policy Track	4	1/2	Fall	ME	ECBS	Tímea Laura Molnár
ECBS5215	Fintech in Depth	4	1/2	Winter	ME	ECBS	Soomin Lee
ECBS5349	Entrepreneurship and Innovation	4	1/2	Winter	ME	ECBS	Andrea Kozma
ECBS6253	Machine Learning for Natural Language Processing 1	4	1/2	Spring	ME	ECBS	Arieda Muco
ENVS5132	Introduction to Geospatial Analysis	6	1/2	Winter	ME	DESP	Viktor Lagutov
UWC5010	Introduction to Geospatial Data Visualization I	2	1/2	Fall	ME	UWC	Viktor Lagutov
UWC5020	Introduction to Geospatial Data Visualization II	2	1/2	Fall	ME	UWC	Viktor Lagutov

Free Elective Module

The Free Elective (FE) courses totaling 12 ECTS are recommended be taken during the Winter Term of the first year, and the Fall and Winter Terms of the second year. Students should attain 4 ECTS each in these terms. To complete this module, elective courses which are at Master level from any academic programs at CEU and are listed in SITS can be taken. Students should pay attention to the pre-requisites of the courses.

Academic Writing Module

Taking and completing a course on Academic Writing for 4 ECTS is a university-wide requirement. It takes place during the Winter Term of the first year of the MS SDS program.

Course code	Course Name	ECTS	Yr	Term	Type	Host dept.	Instructor
CAW5044	Academic Writing for MS in Social Data Science	4	1	Winter	M	CAW	Ágnes-Diós Tóth

Seminar Module

The seminar module ranges over the first two terms of the second year and involves two seminar courses. It accounts for 8 ECTS in total. The first seminar course takes place during the Fall Term, delivered by invited researchers from the different fields of social data science and computational social science. The second one is a thesis seminar course, where students will present their thesis proposal and receive comments.

Course code	Course Name	ECTS	Yr	Term	Type	Host dept.	Instructor
TBA	Research Seminar	4	2	Fall	M	DNDS	Federico Battiston
TBA	Thesis Seminar	4	2	Winter	M	DNDS	TBA

Project Module

The main goal of the research internship and the capstone project is to train students how to develop and carry-out a social data science research project in an academic or a company environment. Students will be trained to participate in interdisciplinary teamwork. They will also contribute to the development of the students' skills in communication, research design, programing, data analysis and academic writing. They will be organized with the involvement of other academic units or companies, where students will spend up to 10 weeks and up to 9 weeks respectively during the spring semester of their first year and the second year respectively to carry out their research projects. This experience will enable them to explore their scientific and professional interest and gain experience in academic and industrial environment, which will help them develop a career or achieve their academic goals in the field of social data science after their studies.

Project Module (Research Internship)

Students are required to participate in a research internship during the Spring Term of their first year at any research unit of CEU, other academic institutions, or in private or public organizations in Austria or elsewhere. The duration of the internship is 10 weeks.

Course code	Course Name	ECTS	Yr	Term of 2023/24	Type	Host dept.	Advisor
DNDS5021	Research Internship	12	1	Spring	M	TBC	TBC

During the internship students are required to carry out a research project related to a topic in her/his specialization by participating in the hypothesis development, methodological design, implementation, and the analysis of observations. Internships focusing only on one or a few steps (e.g. implementation) of this research cycle may not be eligible.

It is the responsibility of the student to identify and organize the internship with the host organization. Some internship topics will be proposed by the MS SDS program. The internship, whether it is taken at an academic or a non-academic unit, has to focus on a SDS research project related to the specialization of the student.

The research projects can be carried out at:

- DNDS
- DNDS's partner departments including Department of Economics and Business, Department of Environmental Science and Policy, Department of Political Science, or Department of Public Policy at CEU
- other CEU departments
- other universities or research institutes
- public or private companies or organizations in Austria or elsewhere
- an organization identified by the student.

A **supervisor** shall be assigned by the host organization for each internship.

In addition, an **internal academic advisor** from CEU shall be assigned for non-academic internships so that the research progress and academic quality of the internship are assured. Arrangement of meetings with the internal academic advisor should be made by the students.

Students are required to submit an **internship proposal** three months before the first day of the Spring term. The proposal should include a title, a short summary of the motivation, research questions, research methodology and expected outcome, the name, job title and contact information of host organization, and the name and contact of the internal advisor (if applicable) (Internship proposal form will be provided.).

An **internship agreement** outlining the specific dates and duties of the internship must be signed two months before the start date of the internship (standard agreement form will be provided).

The internship at the host organization should start from the first day of the Spring Term. During the **internship period** the student is expected to work full-time during the official office hours on the research project under the supervision of the host organization. In case of any issue with non-academic internship, students should first discuss with their supervisor, and if needed, should contact the internal academic advisor or the MS SDS program coordinator.

In the end of the internship, students are required to submit a **15-page internship report** about their project work and present the research results orally in front of the internship committee.

The report should cover the following:

- Introduction including general motivation, literature review, research question/hypothesis statement
- Methodology description
- Result summary
- Conclusions
- Bibliography

Further, the supervisor will be requested to send a short assessment report about the intern.

The internship report, the assessment report and the presentation will be evaluated by an internship committee.

12 ECTS shall be attained upon satisfactory completion of the report and the presentation.

Project Module (Capstone Project)

The master capstone project requires from students to carry out a research project in the discipline of their specialization during the Spring Term of their second year at any research unit of CEU, other academic institutions, or in private or public organizations in Austria or elsewhere. The duration of the internship is 9 weeks.

Course code	Course Name	ECTS	Yr	Term	Type	Host dept.	Advisor

TBA	Capstone Project 1	4	2	Winter	M	TBC	TBC
TBA	Capstone Project 2	12	2	Spring	M	TBC	TBC

During Capstone Project 2 students are required to carry out a research project related to a topic in her/his specialization by participating in the hypothesis development, methodological design, implementation, and the analysis of observations. Internships focusing only on one or a few steps (e.g. implementation) of this research cycle may not be eligible.

It is the responsibility of the student to identify and organize the capstone project with the host organization. Some internship topics will be proposed by the MS SDS program. The capstone project, whether it is taken at an academic or a non-academic unit, has to focus on a SDS research project related to the specialization of the student.

The research projects can be carried out at:

- DNDS
- DNDS's partner departments including Department of Economics and Business, Department of Environmental Science and Policy, Department of Political Science, or Department of Public Policy at CEU
- other CEU departments
- other universities or research institutes
- public or private companies or organizations in Austria or elsewhere
- an organization identified by the student.

A **supervisor** shall be assigned by the host organization for each capstone project.

In addition, an **internal academic advisor** from CEU shall be assigned for non-academic capstone projects so that the research progress and academic quality of the internship are assured. Arrangement of meetings with the internal academic advisor should be made by the students.

Students are required to submit a **capstone proposal** by the beginning of the Winter term of the second year of the program. The proposal should include a title, a short summary of the motivation, research questions, research methodology and expected outcome, the name, job title and contact information of host organization, and the name and contact of the internal advisor (if applicable) (capstone project proposal form will be provided.).

During the Winter Term, capstone proposal development, literature review, initial research or data collection or equivalent tasks will be carried out as part of the Capstone Project I and the Thesis Seminar course. For each of these two courses, 4 ECTS shall be attained upon satisfactory submission of a thesis proposal at the end of the Winter Term.

An **agreement** outlining the specific dates and duties for the research project must be signed two months before the start date of the capstone project (standard agreement form will be provided).

The capstone project at the host organization should start from the first day of the Spring Term. During the project period the student is expected to work full-time during the official office hours on the research project under the supervision of the host organization. In case of any issue with non-academic capstone project, students should first discuss with their supervisor, and if needed, should contact the internal academic advisor or the MS SDS program coordinator.

In the end of the capstone project, students are required to submit a **25-page master thesis** about their project work and present the research results orally in front of the capstone project committee.

The report should cover the following:

- Introduction including general motivation, literature review, research question/hypothesis statement
- Methodology description
- Result summary
- Conclusions
- Bibliography

Students are required to submit their MS thesis according to the guidelines (which will be provided in due course).

Further, the supervisor will be requested to send a short assessment report about the intern.

The thesis will be evaluated by a thesis committee. The research results will be presented orally during a short talk in front of a committee during the last week of the Spring term. 12 ECTS shall be attained upon successful completion of the report and the presentation at the end of the Spring Term.

ATTENDANCE

Presence at CEU is required throughout term time. Students are expected to attend all scheduled classes and seminars they have registered. They shall comply to the requirements regarding attendance set by the respective course instructors, which is informed in the course syllabus. Course instructors are responsible for keeping track of students' attendance.

If and when there is no absence policy specified by course instructors for individual courses, students may miss not more than two sessions (100 minutes per session) of a course during a term with permission.

Permission for absence should be sought from the course instructor in advance for any reason. In case of absence for medical reasons, students should inform course instructors as soon as possible. Relevant documentation (e.g. doctor's note if sick for more than two days) must be submitted to the Program Coordinator who will keep it on file. Class absence(s) that have not been approved may result in a failing grade for the course.

Students are responsible for their own scheduling and selection of courses, ensuring that they are able to attend all sessions of the courses for which they have registered. Students should consider the overall workload and refrain from overcommitting to courses.

RETAKING A COURSE

Students have to pass all the mandatory courses including the pre-term remedial courses. Students who fail to achieve the minimum pass grade during an examination or for course work are allowed one retake for these courses. Only one retake is allowed for any given course.

If a student fails all permitted retakes of a mandatory course, including remedial course, their enrolment should be terminated, since the student will not be able to fulfil the degree requirements without the course in question.

Students who fail a mandatory-elective course are allowed to retake the same course (if it will be available during the master studies) or to take a different mandatory-elective course. The required number of ECTS under different modules shall be obtained in order to graduate from the master studies.

AUDITING A COURSE

If students are interested to attend a class without earning a letter grade or credit, they can register as an audit student. Exemption from the written, oral or attendance requirements of the class must be clarified in advance with the course instructor. The course will appear on their official transcript with the symbol AUD if attendance was regular, or W if the attendance was unsatisfactory. No credit is earned, nor is the GPA affected.

GRADING SYSTEM

Please refer to Student Rights, Rules, and Academic Regulations at https://documents.ceu.edu/documents/p-1105-2v2304. Students should also consult the course instructors if there is any question about the grading of individual courses.

COURSE EVALUATION

Central European University uses an online system, CoursEval, for course and teacher evaluations. Students are asked to evaluate their courses at the end of each. The CoursEval system is entirely independent of all other university systems. It is managed solely by the Institutional Research Office at the Office of the Provost. All surveys are anonymous; neither the numeric nor the text answers can be linked to the individual respondents. Faculty members receive a report on their evaluations after they have uploaded all the grades to Infosys, they do not have access to the names of individual students.

ACADEMIC ADVISING

At the beginning of the program, students will be invited for an individual meeting with the Head of Department and/or the MS Program Director, who will give advice in selecting appropriate classes from the elective program and in finding academic advisors among the CEU faculty.

Academic advising means to introduce the program details to students, and to advise them on their academic development and the academic aspects of their study program. Any other inquiries should be addressed to the Program Coordinator who will involve the MS Program Director if necessary.

STUDENT ABROAD POLICY

The Department of Network and Data Science has study agreements with various institutions across Europe. Students can apply for Erasmus+ Student Mobility for study for the Winter Term during their second year or for traineeship for the Spring Term during their first or second year at another institution.

- In order to be eligible, students should:
  - be in good academic standing, having a minimum accumulative GPA of 2.66 and having no incomplete or failed mandatory courses; and

- o not have any record of misconduct or be subject to disciplinary action.
- Students must ensure that they will fulfil all the credit requirements of the master program, in particular those for the mandatory and the mandatory elective courses. They should seek confirmation from course instructor and/or MS Program Director, as appropriate, regarding the possibility of credit transfer by providing the course.
- Prior to the application submission, students must seek approval from the MS Program Director by providing a study plan which (1) explains how the courses to be taken in the exchange institution fit into their master program requirements and (2) includes a balance of ECTS credits equivalent to those required for the master degree.
- Students must take courses which are at a graduate level.
- Students must also make sure that any variation between the schedule of the teaching terms/semesters in the exchange institution and that of CEU does not have any adverse impact on their academic progress. They must ensure satisfactory academic progress according to the program.
- Before applying for Erasmus+ traineeship, which is taken to fulfil the credit requirement for Research Internship or Capstone Project 2, students should have sought their Specialization Responsible's approval of the research topic and plan.
- Once enrolled in an exchange institution, students will have to provide the proof of the courses/traineeship they have enrolled in to the Program Coordinator.

ACADEMIC HONESTY

The offense of academic misconduct includes plagiarizing, that is, using the ideas or words of another person, without specifying their source appropriately. Content obtained fully or partially with the use of generative AI systems falls in the category of academic misconduct unless the instructor or the university regulation determines otherwise.

Additionally, students may not submit an assignment or part of an assignment for credit in more than one course, nor reuse assignments that were presented in an academic framework outside CEU, unless approved by both course instructors. However, course papers may be incorporated into the MS thesis.

Acts of academic misconduct will result in serious consequences such as a failing grade for the assignment, the course or even removal from the program. For further information, please refer to the university's Code of Ethics, http://documents.ceu.edu/documents/p-1009-1v1402-0.

PLAGIARISM POLICY

In case plagiarism is detected in the assignments, thesis or in any publication of a master student, the Head of Department has to be informed, who submits the case to the Academic Integrity Committee. This Committee will evaluate the case and take actions according to the CEU's Policy on Student Plagiarism and the CEU's Code of Ethics. All cases of plagiarism have to be recorded.

STUDENT RIGHTS, RULES, AND ACADEMIC REGULATIONS

Please find the most updated version of the document at https://documents.ceu.edu/documents/p-1405-1v2201.

CEU DEPARTMENT OF NETWORK AND DATA SCIENCE

The Department of Network and Data Science at the Central European University carries out research in network science, with a special focus on the foundations and applications of network science to practical data-driven problems. The Department organizes a BA/BSc in Data Science and Society as well as hosts 1- and 2-year MS programs in Social Data Science and a PhD Program and various Advanced Certificate Programs for CEU master's and/or doctoral students.

DEPARTMENTAL FACULTY

Faculty

János Kertész, Professor, Head of Department, kerteszj@ceu.edu

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Departmental Staff

Christy Leung, Department Coordinator, MSc in Social Data Science Coordinator, leungc@ceu.edu

Olga Peredi, Department Coordinator, PhD in Network Science Coordinator, peredio@ceu.edu

INTERDEPARTMENTAL SDS COMMITTEE

A curriculum committee called Interdepartmental SDS Committee was formed in order to assess and ensure the continuous high quality of the degree program and to develop its short- and long-term structure and content in a reflective way.

The MS SDS program is an interdisciplinary program per se, which builds on the effort of multiple departments at CEU. To reflect this multidisciplinary endeavor and to ensure balanced representation in decisions, the Interdepartmental SDS Committee consists of faculty members delegated by each participating department and other advisory faculty members from CEU working on quantitative research. This board contains the following faculty members:

- Márton Karsai – MS SDS Program Director – Department of Network and Data Science
- Petra Kralj Novak - Department of Network and Data Science
- Miklós Koren – Department of Economics and Business
- Viktor Lagutov – Department of Environmental Sciences and Policy
- Mariyana Angelova – Department of Political Science
- Anand Murugesan – Department of Public Policy

STUDENT REPRESENTATIVES

Students of the Department of Network and Data Science elect *program representatives*, for the PhD program, and each of the two (two-year and one-year) MS programs. They represent common concerns of students with the Head of Department and the Program Directors, as well as in the departmental meetings. Elections should be held during the first month of each academic year.

CHANNELS OF COMMUNICATION

- CEU emailing system
- Departmental website: https://networkdatascience.ceu.edu/
- Facebook group of DNDS: https://www.facebook.com/DNDS.CEU/
- Twitter page of DNDS: https://twitter.com/DNDS_CEU
- SITS (Strategic Information Technology Services): https://sits.ceu.edu/urd/sits.urd/run/siw_lgn
- E-learning site: https://ceulearning.ceu.edu