

MSc in Civil Engineering (Cycle 2, level 4)

Specialisation: Transport and Urban Planning

MSc in Civil Engineering with specialization in Transport and Urban Planning is a 2 year full-time graduate study programme of 120 ECTS credits (4 semesters, 30 ECTS each semester). Students can either take 90 ECTS in specialized courses and a 30 ECTS MSc thesis, or 60 ECTS in courses and a 60 ECTS MSc thesis with a stronger research focus.

The programme focuses on both practical and theoretical aspects of transport engineering and spatial planning. Emphasis is on specialized aspects of analysing, modelling, safety and environmental issues, as well as the interaction between transport and land use. Students are introduced to evolving theories and methods in transport engineering and spatial planning, as well as established theories and methods, with special consideration to sustainability and inter-disciplinary approaches. The research emphasis is on applied research in cooperation with with key stakeholders in the practice of transport engineering.

The programme leading to MSc in Civil Engineering with specialization in Transport and Urban Planning at Reykjavik University runs parallel to a programme leading to MSc degree in Urban Planning and Transport. Reykjavik University offers programmes leading to the MSc degree in Civil Engineering in four different fields of specialization: Transport and Urban Planning, Construction Management, Structural Design and Concrete Technology. Emphasis is on interdisciplinary cooperation between these MSc Civil Engineering programmes. In the case of specialization in Transport and Urban Planning, students are encouraged to take elective courses from the Construction Management programme.

Admission requirements are a BSc degree in engineering. Minimum requirements in applied sciences (i.e. mathematics, physics) have to be fulfilled. Minimum requirements in basic subjects fundamental to Civil Engineering generally (i.e. mechanics, material sciences, etc.) as well as to Transport Engineering specifically have to be fulfilled.

After successful completion of the programme the student is awarded the degree Master of Science in Civil Engineering with specialization in Transport and Urban Planning. The programme is designed to meet the curriculum requirements for the professional title of Chartered Engineer (Icelandic: verkfræðingur), as defined by the Ministry of Industry and the Association of Chartered Engineers in Iceland.

On the completion of the MSc programme in addition to relevant undergraduate studies, the following criteria shall be fulfilled, in addition to the criteria fulfilled at former levels. For further information, i.e. learning outcomes for each course, see the Course Catalogue www.ru.is

KNOWLEDGE AND UNDERSTANDING

On completion of the MSc programme, the student shall possess a systematic generalized understanding and knowledge of the following topics:

- Basic principles and more important theories relevant to transport engineering and their application and interaction with spatial planning.
- Behaviour of transport systems and the formulation of policy and technical design of transport infrastructure for all transport modes and users.
- Advanced calculation methods used in transport engineering for modelling and analyzing traffic.
- Environmental impacts of traffic and transport.
- Current standards, handbooks and guidelines and the development of new methods and practice.
- Different aspects of the role of planning procedures and steps regarding transport.
- Basic research and development principles and practices relevant to transport and planning work.
- Role of the transport engineer as an important professional in society and the interaction of the transport engineer with other professions.
- Key professional, safety and ethical issues arising in transport engineering.
- Time-management and work planning issues related to the organization, implementation and successful completion and reporting of an individual Masters level research project.
- Research methodology, including the fundamentals of scientific writing, literature search, how to give a scientific presentation, how to evaluate a scientific paper, and research ethics.

TYPE OF KNOWLEDGE

On completion of the MSc programme, the student should have developed advanced knowledge and understanding in all of the following fundamental engineering subjects and should be able to make use of that knowledge in exercising engineering methodology and judgement in all tasks:

- Mathematics: Calculus in one and more dimensions, statistics, linear algebra and geometry, ordinary differential equations, numerical analysis.
- Physical sciences: Statics, dynamics, hydraulics, thermodynamics, electronics, chemical sciences, materials science, structural mechanics, soil mechanics.
- Technology: Programming, computer aided design, numerical modelling, design according to standards, project management.

Most of the above the student will have acquired in previous studies but some of it the student will acquire in the MSc program.

On completion of the MSc programme, the student shall possess specific, advanced knowledge and understanding of the following topics:

- Transport analysis, forecasting and modelling, traffic management and safety, transport and land use policy-making and planning,, interaction between transport and land use and sustainable mobility.

On completion of the MSc programme, the student shall possess the following significant, in-depth knowledge and understanding of the research leading to his or her MSc thesis:

- The theories introduced during specialized courses and the application of these to analyzing and solving problems in the field of transport engineering.
- The background and theoretical base in the chosen research area.
- State-of-the-art knowledge in the chosen research area.
- The student will have established knowledge of and be competent in applications of methods and techniques developed within the chosen area of research.

PRACTICAL SKILLS

On completing the programme students should have acquired and maintain the skills necessary to practice as transport engineers; more specifically be able to:

- Analyze complex real-world problems and devise efficient and well-documented computer-based solutions for those. Use mathematical models and their associated analysis techniques in the design and evaluation of solutions for problems.
- Analyze, model, plan and design transport policy measures and infrastructure, appreciating the interaction of transport and land use and the values of sustainability.
- Complete road design projects and traffic calculations according to current standards, guidelines and relevant regulations.
- Use advanced transport engineering software in the analysis of transport systems.
- Propose, plan and manage well defined research projects involving a team of individuals.
- Prioritise, organise and schedule work activities effectively and comply with project deadlines.
- Work effectively in a team of individuals.
- Interpret and critically assess existing theories, models, methods and results, both qualitatively and quantitatively, within a broad engineering and physical science framework.
- Recognize and appreciate problems inherent in a given engineering system or approach, and be able to synthesise, and propose evaluation methods or develop alternative solution strategies.
- Have the ability to assess engineering projects, identify the key factors in a given situation, and develop an approach to a solution.
- Work with technical uncertainty.
- Appreciate the meaning and importance of professionalism, including integrity and adherence to independent informed judgement.

THEORETICAL SKILLS

On completion of the MSc programme, the students shall have sufficient, comprehensive understanding to be able to:

- Assimilate and integrate their knowledge, make assessments and utilize their knowledge and understanding in solving relevant problems in the field of civil engineering generally and transport and urban planning specifically.
- Identify, adapt and develop models appropriate to the study of a wide-range of different transport engineering problems.
- Apply standard scientific principles and theories to develop engineering solutions to a range of practical problems.
- Demonstrate effective research and appraisal skills, evident in data sourcing, collection, investigation, quantitative and qualitative analysis, weighing evidence and reaching sound conclusions.

COMMUNICATION SKILLS AND INFORMATION LITERACY

On completion of the MSc programme, the student should be able to:

- Work as a part of a planning/design or research team.
- Communicate effectively and professionally and formulate sound arguments, both in writing, graphically and by means of oral presentations, using appropriate technical language.
- Work with and recognise the importance of the range of different stakeholders and interests in transportation planning.
- Find information that is relevant to research using search engines, on line libraries and repositories.

Effectively utilize modern information resources and technologies.

- Analyze and communicate statistical data.
- Report on their work, and that of others, both to a specialist and a general audience.
- Report on a research project and execute a research report.
- Discuss ethical issues in research work with their peers in an informed and reasoned fashion and apply an ethical approach to all work.
- Understand the use of technical literature and other information sources.

LEARNING SKILLS

On completion of the MSc programme, the student should be able to:

Use engineering judgement in analysis and design of transport systems and infrastructure.

- Solve non-trivial problems independently using the acquired skills or knowledge.
- Ask new questions based on available information and knowledge and use known facts to create new ones.
- Make creative use of known information, methods, concepts and theories in new situations.
- Generalize from a collection of specific instances. Infer possible causes from available data, discovering patterns in the available information.
- Interpret facts by comparing them and contrasting them with one another, drawing conclusions and predicting possible outcomes.
- Make choices based on reasoned arguments, and evaluate the outcomes of those choices by comparing them with alternative solutions.
- Know how to assess one's own work against accepted standards of performance. Appreciate the factors that evaluators look for when considering proposals, including proposals for research work.
- Understand the need for, and the basis of, peer-group assessment. Understand how performance in a research project is judged and the basis of the criteria for judgement.
- Recognise and apply different approaches to learning.
- Appreciate the importance of continuing education and lifelong learning and undertake the study required to maintain and expand professional competence and keep up with evolving technology.
- Continue studies within this field towards an advanced degree i.e. at PhD level, having developed the necessary personal autonomy and knowledge to do so.