



## ***MSc in Engineering Management***

The programme leading to an MSc degree in Engineering Management is 300 ECTS credits, a 5 year full-time study programme which can be divided into a 180 ECTS BSc degree programme at undergraduate level, and a 120 ECTS MSc degree programme at graduate level. The degree Master of Science in Engineering Management provides education fulfilling the 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.

The programme draws on science, engineering and social sciences to create a knowledge-base that equips students to deal with a range of problems and challenges characterized by increasing interdisciplinary, international and cross-cultural activities. The student must combine broad knowledge with a deep understanding of the core discipline of Engineering Management. The knowledge imparted to the student is transferable across many types of projects, organizations and environment.

The aim of the programme is to prepare students for careers in management by applying engineering methods to finding solutions relevant to society and industry in a broad manner. There is emphasis on assimilating a broad scope of diverse disciplines - i.e. fundamental applied science, advanced mathematics, statistical analysis, engineering science, business management, production management, strategic planning, optimisation methods, finance, economics, and human relations - through interdisciplinary, practically oriented project work in close cooperation with real life companies and organizations.

Upon completion of both the BSc programme and the MSc programme, a total of 300 ECTS credits, the following criteria shall be fulfilled:

## 1. KNOWLEDGE

Upon completion of both the BSc and the MSc programme, a total of 300 ECTS credits, the student should possess knowledge and understanding of the following:

- 1.1. Mathematical analysis common to most engineering disciplines, multivariable calculus, including differentiation and integrals, and differential equations.
- 1.2. Principles of linear algebra, vectors, matrices, determinants, eigenvalues and eigenvectors, and of solving systems of linear equations.
- 1.3. Complex numbers and exponentials, Laplace and Fourier transforms.
- 1.4. Numerical methods to solve problems in calculus, differential equations and linear algebra.
- 1.5. Basic probability theory and statistics including data analysis, error analysis, hypothesis testing and linear regression.
- 1.6. Calculus based physics common to most engineering disciplines, including a practical foundation in classical dynamics, electromagnetism, thermodynamics and fluids dynamics.
- 1.7. Main areas of applied chemistry, including atomic structure, phases of matter, reactions and equilibrium, and introduction to bio- and organic chemistry.
- 1.8. Basic understanding of engineering programming in common languages, such as Matlab and C++, and spreadsheet applications.
- 1.9. Basic project management methods, how projects arise and the different stages in the life-cycle of a project.
- 1.10. Basic understanding of innovation and entrepreneurship, techniques of idea generation, launching a new company and business plans.
- 1.11. Insight into some of the fundamental engineering subjects in order to being able to work with engineers of different disciplines.
- 1.12. Basic principles, theories and applications in the field of Operations Management.

## SKILLS

Upon completion of both the BSc programme and the MSc programme, a total of 300 ECTS credits, the student should possess skills to be able to:

### 2. Disciplinary skills

- 2.1. Describe organisational behavioural science and underlying features and forces and human behaviour in company operations.
- 2.2. Design mathematical models of the functions of companies and organizations and solve problems by applying systems thinking and methods of optimisation and simulation.
- 2.3. Plan, manage and analyse projects, also large and complicated projects, using recognized conventions as well as current best-practice methods.
- 2.4. Define and discuss corporate finance, asset management, book-keeping principles and cost management.
- 2.5. Describe and interpret the main principles of micro and macroeconomics.
- 2.6. Apply the statistical and data mining methods and implement machine learning algorithms in order to analyse and interpret statistical data.
- 2.7. Carry out risk assessment by disciplines of risk management and decision analysis.
- 2.8. Apply methods of production and inventory management, supply chain management & logistics and lean manufacturing.
- 2.9. Apply methods of Total Quality Management including Statistical Process Control.
- 2.10. Create a relational database schema in SQL and retrieve information from a database using SQL.
- 2.11. Apply methods of stochastic processes and Markovian models to solve practical problems.
- 2.12. Understand Organizational Psychology and Human Resource Management.
- 2.13. Identify the process of innovation and the main factors of entrepreneurship and creative thinking and apply methods of product development.
- 2.14. Carry out feasibility assessment for projects and understand financing of projects.
- 2.15. Describe the nature of sustainability and the principles of environmental protection and can apply these to the solutions of technical problems.

<b>3. Personal skills</b>	<ol style="list-style-type: none"><li>3.1. Apply engineering methods to complex projects, i.e. have the ability to assess engineering projects, identify the key factors in a given situation, and develop an approach to solution.</li><li>3.2. Formulate and work on open-ended problems, including creative thinking.</li><li>3.3. Apply research methodology, including the fundamentals of technical writing and information finding, including literature search.</li><li>3.4. Apply research methodology and critical thinking, including the fundamentals of scientific writing, literature search, evaluate a scientific paper, and be aware of research ethics.</li><li>3.5. Identify and appreciate key professional and ethical issues in engineering including the social responsibility of engineering practice.</li><li>3.6. Realize the limits of his/her expertise and know when it is necessary and appropriate to seek specialist advice.</li><li>3.7. Manage and motivate people by disciplines of human resource management and provide leadership.</li></ol>
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<b>4. Interpersonal skills</b>	<ul style="list-style-type: none"><li>4.1. Read and write in English and in Icelandic if a native student.</li><li>4.2. Give an oral scientific presentation and write a research report, and be able to communicate in English.</li><li>4.3. Communicate effectively and professionally and formulate sound arguments, both in writing and by means of presentations, using appropriate professional language, including figures, illustrations, equations and tables.</li><li>4.4. Use time management and work planning related to the organization, implementation and successful completion and reporting of a project.</li><li>4.5. Propose, plan, structure and manage well defined projects involving a team of individuals from different professional disciplines. Prioritize, organize and schedule work activities effectively.</li><li>4.6. Recognize the interdisciplinary nature of technical problems and work with other professions to arrive at a solution for complex engineering problems.</li><li>4.7. Be an effective team member and contribute to the management of team projects.</li><li>4.8. Work with and recognize the importance of involving a range of different stakeholders and interests.</li><li>4.9. Apply negotiation skills and conflict resolution.</li></ul>
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## 5. COMPETENCE

Upon completion of both the BSc programme and the MSc programme, a total of 300 ECTS credits, the student should be able to utilize the knowledge and skills he/she has acquired to:

- 5.1. Upon completion of both the BSc programme and the MSc programme, a total of 300 ECTS credits, the student should be able to utilize the knowledge and skills he/she has acquired to:
- 5.2. Apply analytical skills and modelling methodologies to recognize, analyse, synthesize and implement operational solutions to engineering problems.
- 5.3. Design conceptual solutions to diffuse problems i.e. clarify the financial, technical, social and managerial approaches to the problem.
- 5.4. Adapt quickly to new problems and challenges arising in the context of engineering.
- 5.5. Apply professional judgement and recognized conventions that are relevant to problem solving.
- 5.6. Interpret and apply existing theories, models, methods and results, both qualitatively and quantitatively, within the field of engineering.
- 5.7. Participate in product development and research within the broad field of engineering, recognizing their roles in the innovation process.
- 5.8. Apply standard scientific principles to develop engineering solutions to a range of practical problems.
- 5.9. Appreciate the importance of keeping up with evolving technologies and research, and of lifelong learning to maintain and expand professional competence.
- 5.10. Use design standards and safety codes as an integral part of the design and the implementation process.
- 5.11. Appreciate the role of the manager as an important professional in society and the duties, responsibilities, role and liabilities of experts such as engineers, designers and other stakeholders in companies and projects.