# *MSc in Financial Engineering*

The programme leading to an MSc degree in Financial Engineering 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 Financial Engineering 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 natural sciences, engineering and social sciences to create a knowledge-base that equips students to deal with a range of problems and challenges characterised by increasing interdisciplinary, international and cross-cultural activities. The student must combine a broad knowledge with a deep understanding of the core discipline of financial engineering. The knowledge imparted to the student is transferable across many types of projects, organisations and environments.

The aim of the program is to prepare students for careers in designing, pricing and managing a diverse range of financial instruments suited for the financing and the risk management of projects as well as whole corporations. Students will be trained to apply engineering, mathematical and simulation based methods to the analysis of these instruments, such as their performance and suitability for specific tasks. Due to the multidisciplinary nature of the training, the skill set acquired by the students is suitable for a range of jobs in different employment sectors, including industrial and manufacturing firms, financial institutions including advisory and investment activities, financial and scenario analysis including risk assessment, risk quantification and risk management.

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

## 1. KNOWLEDGE

Upon completion of both the BSc programme and the MSc programme, a total of 300 ECTS credits, the student should possess understanding and knowledge 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, 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 be able to work with engineers of different disciplines. |
| | 1.12. Basic principles, theories and applications in the field of Financial Engineering. |

## 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. Quantify and model the financial structure of projects and corporations and for that purpose apply suitable techniques.

2.2. Design mathematical models of the financial functions of organisations and solve the formulated problems by a range of quantitative techniques, including simulation and optimisation techniques.

2.3. Plan, manage and analyse financial and operational structures in projects, using recognised financial engineering techniques as well as other current best-practice methods.

2.4. Define and discuss corporate finance, asset and liability management, accounting principles and cost management.

2.5. Create a relational database schema in SQL and retrieve information from a database using SQL.

2.6. Describe and interpret the main principles of micro and macroeconomics.

2.7. Apply the statistical and data mining methods in order to analyse and interpret statistical data.

2.8. Carry out risk assessment by disciplines of risk management and decision analysis.

2.9. Understand the different risk sources affecting projects and corporations, including market risk, interest rate risk, credit risk, reputational and legal risk and be able to implement procedures to manage these risks.

2.10. Apply methods of stochastic processes and Markovian models to solve practical financial and operational problems, including the pricing of a whole range of financial contracts.

2.11. Carry out feasibility assessment for projects and understand the implications of different methods of financing and capital structures.

| | |
|---|---|
| **3. Personal skills** | 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 a solution.<br><br>3.2. Formulate and work on open-ended problems, including creative thinking.<br><br>3.3. Apply research methodology, including the fundamentals of technical writing and information finding, including literature search.<br><br>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.<br><br>3.5. Identify and appreciate key professional and ethical issues in engineering including the social responsibility of engineering practice.<br><br>3.6. Realize the limits of his/her expertise and know when it is necessary and appropriate to seek specialist advice.<br><br>3.7. Manage and motivate people by disciplines of human resource management and provide leadership. |

| | |
|---|---|
| **4. Interpersonal skills** | 4.1. Read and write in English and in Icelandic if a native student.<br><br>4.2. Give an oral, scientific presentation and write a research report, and be able to communicate in English.<br><br>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.<br><br>4.4. Use time management and work planning related to the organisation, implementation and successful completion and reporting of a project.<br><br>4.5. Propose, plan, structure and manage well defined projects involving a team of individuals from different professional disciplines. Prioritise, organise and schedule work activities effectively.<br><br>4.6. Recognise the interdisciplinary nature of technical problems and work with other professions to arrive at a solution for complex engineering problems.<br><br>4.7. Be an effective team member and contribute to the management of team projects.<br><br>4.8. Work with and recognise the importance of involving a range of different stakeholders and interests.<br><br>4.9. Apply negotiation skills and conflict resolution. |

## 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. Apply analytical skills and modelling methodologies to recognise, analyse, synthesise and implement operational solutions to engineering problems. |
| | 5.2. Design conceptual solutions to diffuse problems i.e. clarify the financial, technical, social and managerial approaches to the problem. |
| | 5.3. Adapt quickly to new problems and challenges arising within the context of engineering. |
| | 5.4. Apply professional judgement and recognised conventions which are relevant to problem solving. |
| | 5.5. Interpret and apply existing theories, models, methods and results, both qualitatively and quantitatively, within the field of engineering. |
| | 5.6. Participate in product development and research within the broad field of engineering, recognising their roles in the innovation process. |
| | 5.7. Apply standard scientific principles to develop engineering solutions to a range of practical problems. |
| | 5.8. Appreciate the importance of keeping up with evolving technologies and research, and of lifelong learning to maintain and expand professional competence. |
| | 5.9. Use design standards and safety codes as an integral part of the design and the implementation process. |
| | 5.10. 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. |