BSc in Mechatronics Engineering

The programme leading to a BSc degree in Mechatronics Engineering is 180 ECTS credits. Students take 84 ECTS credits in fundamental courses that are the same for all three-year BSc engineering programmes, 66 ECTS credits in courses that are specific to their chosen discipline (Mechatronics Engineering) and 30 ECTS credits in elective courses. The main aim of the program is to prepare students for studies in engineering at the MSc level.

Mechatronics is a multidiciplinary field that combines knowledge and skills from mechanical engineering, electrical engineering, and computer science. The main focus is on the design and implementation of engineering cybernetic equipment such as robots, production systems and consumer electronics. The program in mechatronics engineering equips students to deal with the range of problems and challenges within the field. The program is based on a rigorous foundation in mathematical and scientific practices that lead to training in engineering design processes and traditions.

Upon completion of the BSc programme, the following criteria shall be fulfilled:

1. KNOWLEDGE

Upon completion of the BSc programme 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, 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, fluid dynamics.
	1.7. Main areas of applied chemistry, including 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. Theory and application of signal processing concepts, methods and algorithms.
	1.12. Structural analysis and strength of materials, idealization of complex structures, differential analysis of simple structures and safety of structures.
	1.13. Design of common machine elements and machine design using computer-aided design software.
	1.14. Dynamical systems, system identification and control engineering.
	1.15. Properties of electric circuits.
	1.16. Computer organization and system architecture.
	1.17. Sustainability, environmental impact and life cycle assessment of engineering projects and products.

SKILLS Upon completion of the programme, the student should have gained the skills to:	
2. Disciplinary skills	2.1. Apply methods from physics, mathematics and computer science to model systems in electrical and electronic engineering. 2.2. Use mathematical methods and tools to analyse and develop electrical and mechanical engineering systems. 2.3. Use the combination of mathematical modelling and computer programming to build and develop intelligent sensors and actuators for electronic systems. 2.4. Plan, manage and analyse projects, using current best-practice methods. 2.5. Devise lab experiments, collect and analyse data from physical and simulated test systems and use the results to solve technical problems. 2.6. Design mechatronics systems to meet or exceed a set of performance specification. 2.7. The basic principles of engineering computer programming using low- and high-level compilers and interpreters. 2.8. Use lab equipment effectively and safely to analyse electrical circuits, instrumentation, sensors and actuators. 2.9. Analysis and design of electric circuits. 2.10. Program central processing units using assembly language and low-level translators. 2.11. Analyse and communicate experimental, numerical and statistical data. 2.12. Analyse and design automatic control systems with respect to fundamental principles.
3. Personal skills	3.1. Apply engineering methods to 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. 3.2. Formulate and work on open-ended problems, including creative thinking. 3.3. Apply research methodology, including the fundamentals of technical writing and information finding, including literature search. 3.4. Apply standard scientific principles to develop engineering solutions to a range of practical problems. 3.5. Realise the limits of his/her expertise and know when it is necessary and appropriate to seek specialist advice.

4. Interpersonal skills	4.1.	Read and write in English, and in Icelandic if a native student.
	4.2.	Communicate effectively and professionally and formulate sound arguments, both in writing and by means of presentations, using appropriate professional language, including statistics, figures, illustrations, equations, tables and video.
	4.3.	Use time management and work planning related to the organization, implementation and successful completion and reporting of a project.
	4.4.	Be an effective team member and contribute to the management of team projects.
5. COMPETENCE Upon completion of the BSc programme, the student should be able to utilise 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.	Apply standard scientific principles to develop engineering solutions to a range of practical problems.
	5.3.	Appreciate the importance of keeping up with evolving technologies and research, and of lifelong learning to maintain and expand professional competence.
	5.4.	Use design standards and safety codes as an integral part of the design and the implementation process.
	5.5.	Undertake further studies towards a graduate level degree.