BSc in Biomedical Engineering

The programme leading to a BSc degree in Biomedical 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 (Biomedical Engineering) and 30 ECTS credits in elective courses. The main aim of the programme is to prepare students for studies in engineering at the MSc level.

The program in biomedical engineering draws on natural science, engineering, biology and medicine to create a knowledge-base that equips students to deal with a range of problems and challenges in biomedicine, characterized by increasing interdisciplinary and international activities. The student must be able to combine broad knowledge with a deep understanding of the core discipline of biomedical engineering.

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. Structural mechanics, stress theory, safety of structures, and basic use of computational tools in design, including 3D CAD.

1.12. Analysis and design of electric circuits, electronics and digital electronics.

1.13. Fundamentals of control theory.

1.14. Theory and application of signal processing concepts, methods and algorithms.

1.15. Electrical measuring techniques.

1.16. Properties, structure and application of selected material groups.

1.17. Modern physics, including photons, radiation and relativity, and basic principles of geometric optics.

	1.18. Fundamentals of molecular- and cell biology, physiology, and the function of physiological systems. 1.19. Medical technology, technical challenges and use in clinical environment.
SKILLS Upon completion of the programme, the student should have gained the skills to:	
2. Disciplinary skills	2.1. Design, and to some extent implement biomedical engineering devices. 2.2. Carry out measurements of biosignals and describe the underlying mechanisms and processes, including EEG, EMG and ECG. 2.3. Describe the underlying physical process of the main modalities of medical imaging, describe some applications, describe and apply basic image processing. 2.4. Design lab experiments, collect and analyze data from physical and simulated test systems and use the results to solve technical problems. 2.5. Apply project management methods to the planning of projects.
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.