Learning objectives for the study program Applied Physics and Mathematics

The technology master in physics and mathematics has thorough knowledge within mathematics and physics, as well as chemistry, statistics, and computational science, and profound knowledge within selected areas of industrial mathematics, technical physics, or biophysics and medical technology. The study provides generic and analytical competence that can be applied in industry, research, consulting, education, and the public sector. This competence creates a platform for further studies and research, within mathematics or physics in particular, but also within other fields of science and technology. The technology master in physics and mathematics has the knowledge and skills required to meet continuous change within modern technology. In addition, the candidate possesses the general competence common to all technology master programs at NTNU.

Knowledge

The technology master in physics and mathematics has

(P-K1) a solid basic knowledge in physics and mathematics.

(P-K2) a broad mathematical, scientific, technological, and computational knowledge base, for method comprehension, applications, professional renewal, and readjustment.

(P-K3) in-depth knowledge within a restricted field connected to active research, and sufficient disciplinary insight to take advantage of novel research results.

Skills

The technology master in physics and mathematics can

(P-F1) define, model, and analyze complex scientific and technological problems, make well founded choices of relevant methods and instruments, and apply them accordingly.

(P-F2) contribute to integrated solutions of scientific and technological problems, and develop solutions within a crossdisciplinary context.

(P-F3) make an independent and critical evaluation of analysis tools, methods, technical models, computations, and solutions.

(P-F4) carry out independent research and development projects as part of a disciplinary environment.

(P-F5) develop her disciplinary competence further, through PhD studies and research within mathematics, physics, or other branches of science and technology.

(P-F6) renew and adapt professionally, and take initiative to develop the professional competence and transfer knowledge between different disciplines.

Industrial Mathematics

The technology master in industrial mathematics can contribute to the solutions of a wide spectrum of scientific problems, of interest within industry, business sector, and public administration, with a rigorous and practical utilization of knowledge in mathematics.

Specific knowledge and skills

The technology master in industrial mathematics

(IM1) has thorough knowledge within mathematical modeling and analysis, numerical methods, statistics, and data processing.

(IM2) has expert knowledge within selected areas of statistics, numerical mathematics, or mathematical disciplines applicable within industry, commerce and the public sector.

(IM3) has in-depth knowledge within a restricted area of the mathematical disciplines that is closely connected to active research and provides the competence to use novel research results.

(IM4) is able to establish mathematical and statistical models for comprehensive scientific and technological problems, perform rigorous qualitative analyses of these, and discretize and realize simulations.

(IM5) is able to apply his/her expert knowledge of mathematics on a broad range of applications within science and technology.

Technical Physics

The technology master in technical physics can contribute to the solutions of a wide spectrum of scientific problems of interest to industry and commerce and the public sector, using his/her knowledge of theoretical and experimental physics.

Specific knowledge and skills

The technology master in technical physics

(TF1) has broad and thorough knowledge within physics and mathematics, based on the introductory courses in mathematics, classical and quantum physics, and the subsequent compulsary courses that cover general theory (quantum mechanics, statistical physics, electromagnetic theory) and key topics that combine theory and experiment (solid state physics, optics, nuclear and radiation physics, measurement techniques, and instrumentation).

(TF2) has expert knowledge within selected areas of experimental and/or theoretical physics, based on elective courses in the final part of the curriculum.

(TF3) has in-depth knowledge within a restricted area of physics that is closely connected to active research in the Department of Physics, in other departments at NTNU, or within relevant external activity.

(TF4) is able to keep an integrated perspective and attack scientific and technological problems with a broad spectrum of methods based on theory, experiments, and modeling/simulations, or a combination of these.

Biophysics and Medical Technology

The technology master in biophysics and medical technology has, in addition to his/her in-depth knowledge, sufficient biological and medical knowledge to work independently with biophysical and medical-technological problems of relevance for industry, the national health service, and the public sector.

Specific knowledge and skills

The technology master in biophysics and medical technology

(BM1) has broad and thorough knowledge within physics and mathematics, based on the introductory courses in mathematics, classical and quantum physics, and the subsequent compulsary courses that cover biotechnology and cell biology and key topics that combine theory and experiment of relevance for biophysics and medical technology (optics, nuclear and radiation physics, measurement techniques, instrumentation, molecular biophysics).

(BM2) has expert knowledge within selected areas of biophysics and medical technology, based on elective courses in the final part of the curriculum, such as specialization in physics and technology being used to characterize the structure and function of biological systems, including various methods for microscopic and macroscopic biomedical imaging, or knowledge about biological effects of physical influences, including ionizing radiation, and application of physics based methods within medical diagnostics and therapy.

(BM3) has in-depth knowledge within a restricted area of biophysics or medical technology that is closely connected to active research in the Department of Physics, in cooperating institutions, or within relevant external activity.

(BM4) is able to keep an integrated perspective and attack scientific and technological problems with a broad spectrum of methods based on theory, experiments, and modeling/simulations, or a combination of these.