UiT

NORGES ARKTISKE UNIVERSITET

STUDY PLAN

Aerospace Control Engineering - master

120 ECTS

Narvik

Based on the document "Vilkår for bruk av tilleggsbetegnelsen Sivilingeniør (siv.ing.)" approved by The Norwegian Association of Higher Education Institutions spring 2016.

The programme description has been approved by the board of Faculty of Engineering Science and Technology on 25.09.2017, and by Rector Decision 02.01.2018.

UNIVERSITETET I TROMSØ

Study programme name	Bokmål: - Aerospace Control Engineering Nynorsk: - Aeropace Control Engineering Engelsk: - Aerospace Control Engineering
Obtained degree	Master of Science
Target group	The master program in Aerospace Control Engineering is applicable for students with interest in learning, developing, and applying state-of-the-art control technology for aerospace-related purposes. The type of technology has also large similarities with technologies for extreme environments, such as in arctic regions and subsea, and students with interest in development of technologies in such fields will also find this program as relevant.
Admission requirements	To be applicable for the master program in Aerospace Control Engineering (Satellite Engineering), you must have a relevant undergraduate **bachelor in engineering, primarily within electronics or space technology, but it may also be within related fields such as automatic control, communications, power electronics or computer science.** You must however have a sufficient background in electronics and communications. There is also a requirement of 30 points with preliminaries in mathematics/statistics, equivalent to the Norwegian courses Mathematics 1, 2, and 3, as well as Statistics. Knowledge in Physics (7,5 - 10 ects) on a higher level is recommended to be able to follow different courses on the master programme. Some of the courses in the bachelor programme have a certain amount of physics included and can be accepted.
Academic content and description of the study programme	The master program in Aerospace Control Engineering at IVT-faculty, UiT Narvik Campus provides a unique education in Norway, where you as a student will learn about the most relevant technologies necessary for design, construction, and utilization of control systems in aerospace applications. Through the two-year program, important theoretical preliminaries such as applied mathematics, digital system and signal theory, embedded systems, navigation and automatic control are covered, as well as more specialized topics on system identification, artificial intelligence, and modeling, guidance and control. Through a multidisciplinary program, students learn the relevant methods and skills in various technological fields, with a commonality through its application in aerospace-related systems. The program involves lectured courses, as well as a high degree of problem-based education (i.e. learning by doing), where the students spend their time working on relevant projects under

supervision of a highly qualified staff. The project topics are chosen from ongoing internal research projects, as well as national and international aerospace related projects that UiT participates in. Therefore, several projects has ended in results at a high international level, published in international scientific journals. The students have also been able to present their results for international audiences at scientific conferences and workshops. In the last few years, such projects have included:

- Attitude determination and control system design for the European Student Earth Orbiter (ESEO) and European Student Moon Orbiter (ESMO) spacecraft under the SSETI-project initiated by the European Space Agency (ESA).
- Development of an Aerosol detector rocket payload for collection of ionized dust particles, under the ESPRIT project by NASA.
- Design, implementation and testing of all subsystems (ground station, power supply, data handling, control, communication and payload) in UiTs own spacecraft HiNCube.
- Mathematical modelling, synchronization and coordinated control of small spacecraft in formation, in cooperation with internal PhD-students and supervisors.
- Mathematical modelling, guidance and control of unmanned aerial vehicles (UAVs), in cooperation with internal PhD-students and supervisors.

To provide a high-quality education with relevance to industry, UiT is cooperating with the national universities in Oslo (UiO), Bergen (UiB), Trondheim (NTNU), as well as European Space Agency, Norwegian Space Centre and the Norwegian Centre for Space-related Education (NAROM).

The program covers the following disciplines:
- Linear Algebra and Numerical Methods
- Classical Mechanics
- Control Engineering
- Instrumentation and Measurement
- Discrete-Time Signal Processing
- Knowledge-based Systems (AI)
- System Identification
- Mathematical Modeling and Simulation
- Spacecraft System Engineering
- Embedded systems
- Master thesis

See additional information in the different course descriptions.

	The program is uniform and does not include different modules or electives, and all teaching is on campus. Mandatory tasks are described in the different course descriptions. The program can be done part-time over four years. It will be possible to take part of the studies abroad, provided that external courses are similar in content and scope to those specified in the study plan.
Table: programme structure	See table 1 at the bottom of this document
The study programme's Learning Outcome	**Knowledge:** • has advanced knowledge within the academic field of mathematics, physics and engineering and specialized insight in a limited area within the field of aerospace engineering • has thorough knowledge of different theories and methods in the field of control engineering • can apply knowledge in electronics, automatic control and systems engineering to areas within aerospace engineering • can analyze academic problems within aerospace control engineering on the basis of the history, traditions, distinctive character and place in society of the academic field **Skills:** • can analyze and deal critically with various sources of information and use them to structure and formulate scholarly arguments • can analyze existing theories, and interpretations in the field of satellite engineering and work independently on practical and theoretical problems • can use relevant methods for research and scholarly work in an independent manner • can carry out an independent, limited research or development project under supervision and in accordance with applicable norms for research ethics • can develop the cooperation skills to work in inter-disciplinary projects and to work in team **General competence:** • can analyze relevant academic, professional and research ethical problems • can apply the knowledge and skills within aerospace control engineering in new areas in order to carry out advanced assignments and projects

	• can communicate extensive independent work and masters language and terminology of the academic field of aerospace engineering • can communicate about academic issues, analyses and conclusions in the field of aerospace control engineering, both with specialists and the general public • can contribute to new thinking and innovation processes
The study programme's relevance	Successfully qualified candidates can acquire jobs in a range of Norwegian businesses, which contribute technical products and services within aerospace technology, but also within fields as subsea engineering, systems engineering, or robotics and automation. The program also provides a basis for working with project management and marketing, or teaching in technical subjects at Bachelor's level. The program also qualifies for doctoral studies in related fields.
Work scope and learning activities	Most courses are based on lectures, self-study and assignments or small projects, individually or in groups. Each 5 ECTS course usually includes 40 lectures, plus supervision time. The hand-outs can be voluntary or mandatory. Mandatory lab exercises are included in some topics. Scientific theory application and analysis is emphasized in assignment and project solution. The different course descriptions provide additional information.
Examination and assessment	Different assessment methods are applied through the study program. In most cases the assessment is based on a written exam. In some cases an overall assessment is applied, combining a written exam with assignments or projects, or a final report combined with an oral exam. The different course descriptions provide additional information.
For master's theses/ independent work in master's degrees	The final master thesis (diploma) can be carried out in close collaboration with industry partners and/or on the basis of existing research and development projects. The work is usually performed individually. Regular status meetings will be held through the entire project period. The diploma will be evaluated solely on the basis of a final written report.
Language of instruction and examination	English

Internationalisation and student exchange	It is possible to study the parts of the master's program at other universities. An individual plan must then be drawn up in consultation with the study coordinator. Administrativ
Supervised professional training	
Administrative responsibility and academic responsibility	Faculty of Engineering Science and Technology, Department of Electrical Engineering
Quality assurance	By the end of each course the students are offered a QuestBack survey with an electronic questionnaire. Various forms of alternative evaluations are offered, including reference groups.
Other regulations	

Table 1, study program

Term	10 Ects		10 Ects		10 Ects	
First semester (Autumn)	STE63XX Classical Mechanics	SMN6195 Complex Analysis	STE6XXX Control Engineering		SMN6191 Numerical Methods	SMN6190 Linear algebra 2
Second semester (Spring)	STE6296 Systems Engineering		STE6246-001 Knowledge-based systems	STE6304 Mathematical modeling and simulation	STE6219 Discrete-time signal processing	SAD6210 Innovation and economics
Third semester (Autumn)	SHO6300 Master thesis M-ST		STE63XX System Identification	STE6302 Embedded systems	STE6251 Spacecraft control	SAD6211 Innovation and management
Fourth semester (Spring)	SHO6300 Master thesis M-ST					