

Programme description

PhD programme in Mechatronics

The following document is a translation of a document originally written in Norwegian. If dispute arises as to the interpretation of the programme description, the Norwegian version takes precedence.

PhD programme - 180 ECTS - 3 years - Grimstad

Educational requirements

To be admitted to the PhD programme the applicant must meet one of the following requirements to competence in mechatronics:

- Hold a master's degree in a relevant subject area from a Norwegian university or qualifications approved as equivalent.
- Have different educational qualifications and credentials at master's degree level which upon individual evaluation are approved as a basis for admission.
- Have an educational qualification from an institution abroad (full degree) which is equivalent to minimum 4 years in the Norwegian university system and which formally qualifies for admission to doctorate studies in the country where the degree was awarded. The Faculty determines the number of credits that the qualification corresponds to at the Faculty of Engineering and Science. Applicants with an education of less than 5 years must expect that additional requirements will be imposed upon them, and that they will only receive a conditional offer of admission.

As a general rule, the following should apply:

- The average grade for courses included in the bachelor's degree (or equivalent) should be C or higher.
- The average grade for courses included in the master's degree (or equivalent) should be B or higher.
- The master's thesis (or equivalent) should have the grade B or higher.

In those instances where the applicant's average grades are lower than normally required, the research group must document the probability of the applicant completing the PhD programme. In such an event, the Department may recommend extra requirements to be included in the basis for admission.

Competence in English is a requirement for all applicants to the PhD programme. International students that are not exempt from the English language requirements pursuant to the guidelines of the Norwegian Agency for Quality Assurance in Education (NOKUT) must document this through one of the following tests with the stated results or better:

- TOEFL – Test of English as a Foreign Language med with a minimum score of 550 for the Paper-based Test (PBT), or 80 for the Internet-based Test (iBT)
- IELTS – International English Language Testing System, with the result of 6.0

Recommended previous knowledge

The course programme presupposes knowledge at the master's level in mechatronics. Applicants who lack such prior knowledge can compensate for this by completing other courses at the Faculty for Science and Engineering and may be imposed to participate in such training. Applicants with little or no training in research work from their earlier education or work experience have to anticipate extra large work load to carry out the programme within 3 years.

General description of the programme

The doctoral programme is a research education. The main objective of the PhD programme is that the student attain a high level of scientific expertise in mechatronics. The PhD students will receive formal training and supervision, providing him/her with a broad scientific knowledge and a further depth and give them the ability to do his/her own independent research. The student attain scientific expertise through accomplishing an independent research work leading to a scientific dissertation in mechatronics. The research work and dissertation should be of international standard.

The PhD degree is awarded on the basis of:

1. Approved completion of the coursework component
2. Scientific dissertation
3. Doctoral degree trials

The doctoral degree trials consist of a trial lecture on a prescribed topic and defence of the dissertation (disputation).

The coursework component (theoretical curriculum) should usually correspond to 30 credits, and never less than 30 credits. The coursework component is individual for every PhD student. However, the content of the coursework component must be such that it, along with the dissertation, provides professional breadth and depth in the academic field.

The trial lecture on the prescribed topic comes in addition to the coursework component. The same is active participation in the Faculty's Forum with 2-3 presentations.

The programme's structure

The courses included in the coursework component should be advanced courses taken at the University of Agder or other universities. At the Faculty of Engineering and Science the courses will usually be PhD courses (as opposed to master's level courses).

The Faculty offers the following PhD level courses in mechatronics:

Code	Title	ECTS	Comments
MAS601	Design, Modelling and Simulation of Mechatronic Systems	5	Compulsory
MAS602	Advanced Control and Robotics	5	Compulsory
EX-601	Theory and Ethics of Science	5	Compulsory
MAS701	Fluid Power Systems Design – Selected Topics	5	Elective
MAS702	Electromagnetic Modelling	5	Elective
MAS703	Analysis of Dynamic Mechanical Systems – Selected Topics	5	Elective
MAS704	Energy Conversion	5	Elective

The courses MAS601 and MAS602 form the multi-disciplinary common core material and must be included in the coursework component of all PhD students in mechatronics. The course EX-601 is also compulsory.

The courses MAS701, MAS702, MAS703 and MAS704 build on the common core and form the specialist foundation in the coursework component. Normally, three of these courses will be included

in the coursework component of each PhD student. In the selection of specialist courses it must be considered that, together with the research work, the student should gain the required multi-disciplinary and specialist skills for the PhD education.

Specialised courses at other universities or university colleges may be included as electives in the coursework component. Relevant courses may be found for example at Aalborg University or Telemark University College.

Up to 10 credits of the elective courses may be taken as national or international research courses or through a special syllabus in the form of literature, or as methodological studies which are relevant to the research programme.

The researcher course should be evaluated by the Department with regard to the extent and academic level of the course. The following norm should apply: 25-30 hours student input are credited with 1 credit (pursuant to the European Credit Transfer System – ECTS). In order to have a researcher course approved, the student must hold a seminar following completion of the course. The seminar should be evaluated by an examiner appointed by the Faculty. Exceptions can be made for researcher training courses which are regulated at other universities and which have a final examination.

Researcher course or special syllabus mentioned above represents national or international researcher courses, or is covered through a special syllabus in the form of literature or methodology studies which are relevant to the research programme.

Courses taken in the form of special syllabus are to be described in an appropriate form where the content, level and extent correspond to other course descriptions as given on the Faculty's web pages. The type of examination must be stated. The description of the syllabus must be approved by the Department prior to the examination.

The Faculty credits researcher courses and special curricula with credits only in whole units.

The coursework component must be completed successfully and passed in its entirety before the student can apply to the Faculty to have the dissertation assessed.

Learning outcomes

After accomplishing the PhD degree, the students should have scientific competence at highest level in mechatronics. The students shall have acquired multi-disciplinary competence in mechatronics as well as specialist competence in at least one of the following areas: analysis of mechanical systems, fluid power systems, electromagnetic modelling, and energy conversion. The students will be able to conduct independent research in mechatronics and to independently evaluate and assess other researchers' work in the subject area. Graduate candidate shall be qualified for research activities and other types of work in which a high degree of academic expertise and scientific competence are required.

Teaching methods

The PhD programme is designed to encompass a three-year period of full-time study. Plans for completion of the PhD programme over a period longer than six (6) years will not be approved.

The PhD programme is a research education consisting of a coursework component of at least 30 ECTS and a research task, the doctoral dissertation, which amounts to 150 ECTS credits (2,5 years of work). The dissertation is prepared under the supervision of two highly qualified scientists.

The teaching methods in the coursework component appear from the course descriptions. In the event of several courses offered in the same semester, the teaching arrangement will be coordinated.

The courses will usually be taught in English.

Evaluation methods

All courses or other activities included to be in the coursework component must have a final evaluation. Most courses are concluded with an oral examination, possibly in combination with a project report or an essay. The evaluation method in the courses appears in the course descriptions.

The evaluation expression is Pass/Fail, where pass corresponds to the grade B or higher.

The doctoral programme concludes with a trial lecture on a prescribed topic and a public defence (disputation) where the candidate gives an account of the results of the scientific investigations in the dissertation, etc. The disputation is further described in the *Supplementary regulations for the PhD Degrees in Information and Communication Technology and Mechatronics at the University of Agder*.

Student exchange

All PhD students with previous education from Norway should include a stay at a foreign university with a recognized research environment within the research field of the individual student. The stay may be of 3-6 months duration, preferably at an institution recommended by the supervisors.

Research will be the main goal of the stay abroad, but additionally, PhD students may complete some of their courses at the foreign institution. Passed examinations in courses completed abroad can substitute corresponding mandatory and specialisation courses in the course programme and thus form part of the coursework component. In addition, credits may be awarded for research training courses etc. completed abroad, as described above.

Professional goal and access to further studies

The PhD programme is the highest education in the country, and qualifies for university and college appointments at the associate professor level. Alternative career paths are found in research institutes, as well as research departments in industry and business, and other types of work in which a high degree of academic expertise is required.

Qualification awarded

Philosophiæ doctor (PhD) in mechatronics.

Responsible Faculty

Faculty of Engineering and Science

Contact person

For additional information, please contact the scientific administrator of the programme, Professor Michael Rygaard Hansen (phd-mechatronics@uia.no).