

Faculty of Science and Technology

Programme-specific part to the programme section of the students' charter, including the education and examination regulations of the

Advanced Technology

Bachelor's Programme

as of 1 September 2024

(Article 7.13 and 7.59 WHW)

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Preamble

1. The rules in this programme-specific part apply to the full-time Advanced Technology bachelor's programme.
2. Unless otherwise specified, reference to 'the (study) programme', 'the programme committee' or 'the examination board', refers to the Advanced Technology bachelor's programme, the programme committee or examination board of the Advanced Technology bachelor's programme, respectively.
3. Together with the general section of the Education and Examination Regulations (TNW/24.1016) this programme-specific part forms the programme section of the students' charter for the bachelor's programme Advanced Technology of the faculty of Science and Technology at the University of Twente.
4. The examination board has set rules for the purpose of the conduction of its tasks and prerogatives (Article 7.12 WHW) in the "Rules and regulations of the examination board of Advanced Technology".

Reference: TNW/24.1018

Date: July 11, 2024

Article 1a Definitions

In addition to the definitions as stated in Article 1.2 of the general section of the Education and Examination Regulations, a practical exercise as referred to in Article 7.13, paragraph 2d of the WHW, is a study unit or part thereof, where the emphasis lies on the personal activity of the student, such as:

1. performing a literary study, performing an assignment, creating a test design, writing a thesis, article or position paper or preparing a public presentation,
2. completing a design or research project, performing tests and experiments, participating in practicals, practising skills,
3. performing an internship, participating in field work or an excursion,
4. participating in other educational activities that are deemed necessary, focused on achieving the intended skills, for example, focused practice of clinical skills in a skills lab specifically equipped for that purpose.

Article 1b Programme objectives

The international bachelor's programme Advanced Technology aims to impart knowledge, skills, and insight to the graduate in the field of Science and Technology by means of a broad-based and exploratory science and engineering programme. The graduate is able to apply knowledge, skills and insights in a global context to develop new technologies that are both economically and socially viable. The graduate is also able to make a well-considered choice for one of the University of Twente master's programmes or a master's programme at another university in the Netherlands or abroad. The programme offers students who wish to enter the labour market after acquiring their bachelor's degree the opportunity to gear their third and final year programme to that purpose.

Article 2 Admission to master's programmes

The programme does not have its own master's programme. However, the third year of the bachelor's programme is designed to let students participate in study units in order to become admissible to the master's programme of their choice. Students need to approach the admission committee of the master's programme of their choice to agree on the study units that are required to become admissible. Furthermore, the selected study units need to meet the requirements of the examination board. Therefore, a course list needs to be submitted to the examination board. The conditions for this course list are specified in Article 8 of the Rules and Regulations of the examination board of Advanced Technology. In case of a deviation or non-compliance, the assessments are made by the admission committee.

It is not allowed to take first-year modules from another bachelor's programme in your third year of AT, unless this is part of the admission requirements of your master's programme. Overlap in content between the modules of your choice and previously taken modules isn't allowed.

Article 3 Language

1. The language used in the study units of the programme is English. This applies to both teaching and examination.
2. Articles 3.3, 4.1 paragraph 19 and 4.4 paragraph 2c of the general section apply *mutatis mutandis*¹ to this article.
3. Teachers are required to adhere to the requirement as stipulated in the UT Language policy. In a case where a teacher's language proficiency is not up to standard, the programme director contacts the Faculty Board for intervention.

Article 4 Programme intended learning outcomes

The following learning outcomes need to be obtained to be able to graduate the programme.

1. Domain knowledge & skills

The student can apply basic theoretical concepts, important methods and techniques in the fields listed below and has skills to increase and develop this through study:

- a. Elements from mechanical engineering, electrical engineering, physics, chemistry (Newtonian dynamics)
- b. Thermodynamics, Material Science, Mechatronic systems, Electromagnetism, System Engineering;
- c. Mathematics and programming;
- d. Innovation, entrepreneurship and development/trends of technology on a local and a global level;
- e. Analysis of societal impact of technology on a local and a global level;
- f. Experimentation in the technical sciences.

2. Research & Design

- a. The student is able to apply the scientific research method.
- b. The student is able to apply the scientific design methods and is able to divide a design problem in different sub problems.

3. Organize

The student is able to organize work both independently and as a member of an international project group. In project work, the student is able to define separate problems for team members, to assure the interconnection between these entities and to implement a timeline.

¹ *Mutatis mutandis* is a Latin term commonly used in legal text. It is used when comparing two or more things to say that although changes will be necessary in order to take account of different situations, the basic point remains the same.

4. Report & Presentation

The student is capable of communicating on technical-scientific issues both in writing and orally in a clear, concise and professional manner.

5. Problem solving

The student is capable of analysing, modelling, interpreting and solving technical-scientific problems with an academic approach, i.e., formulating a problem definition, selecting scientific information and processing it, conducting research and critically evaluating the subsequent results, and formulating conclusions.

6. Personal Development

The student is able to recognize personal strengths and weaknesses as well as personal interests that are necessary to opt for either a follow-on study, in particular an academic master's programme which requires a high level of autonomy or a job in the labour market.

Article 5 The bachelor's curriculum

The final examination of the programme consists of the joint examinations of the programmes of the first, second and third course year (B1, B2 and B3). The core programme consists of the B1- and B2-programme plus 30 EC of the B3 programme (total 150 EC) of the AT curriculum.

The teaching methods used in the programme are lectures, tutorials, lab work, assignments, project work, presentations and problem based learning. Subjects are tested in the form of written exams, oral exams, reports, presentations and posters. The module intended learning outcomes of each module of the AT programme can be found in the OSIRIS Course Catalogue. Also further information on the contents and subjects is available in the OSIRIS Course Catalogue.

The B1 programme has a study load of 60 EC and consists of 4 modules, with the study units defined below:

| Module | Name | Course code | Study units | Category ² | EC |
|--------|---------------------------|-------------|---------------------------------------|-----------------------|-----|
| 1 | Mechanics | 202001212 | Calculus 1 | A | 4.0 |
| | | 202000611 | Mechanics | B | 4.5 |
| | | 202300117 | Laboratory Practice | | 2.0 |
| | | 202300118 | Error analysis & programming skills | C | 1.5 |
| | | 202000613 | Project Mechanics | D | 3.0 |
| 2 | Thermodynamics | 202200179 | Calculus 2 | A | 4.0 |
| | | 202200185 | Thermodynamics | B | 4.0 |
| | | 202300117 | Laboratory Practice | C | 1.5 |
| | | 202300118 | Error analysis & programming skills | C | 1.5 |
| | | 202000617 | Project Thermodynamics | D | 4.0 |
| 3 | Fundamentals of Materials | 202200189 | Vector Calculus | A | 2.0 |
| | | 202400642 | Structure and Properties of Materials | B | 3.0 |
| | | 202000620 | Quantum Matter | E | 3.0 |
| | | 202000621 | Organic Chemistry | E | 3.0 |
| | | 202400643 | Materials Project | D | 4.0 |
| 4 | Dynamics | 202001208 | Linear Algebra | A | 3.0 |
| | | 202000623 | Dynamical Systems* | B | 4.0 |
| | | 202000624 | Basic Electronics and Instrumentation | C | 4.0 |
| | | 202000625 | Project Accelerometer | D | 4.0 |
| | Total B1 | | | | 60 |

*Dynamical systems 20200623 (M4) is an entry requirement for Models 202000628 (M5) and Project 202000693 (M5)

For students of cohorts 2023 and before, transitional arrangements (as referred to in Article 7) are in effect.

² Categories are defined for the determination of the binding recommendation on continuation of studies as stated in Article 11, paragraph 1b.

The B2 programme has a study load of 60 EC. The second module of the second year (module 6) consists of a one out of four choice. The choices 6a, 6b and 6c each consist of 15 EC. Choice 6d has a different structure. AT students cannot do the entire Software Systems module as there is overlap in the Mathematics part. Therefore, AT students take a reduced version of the module (12 EC) and take an elective instead.

The modules of the B2 programme with the study units defined below are:

| Module | Name | Course code | Content / Study units | EC |
|--|---|----------------------------------|---|-------------------|
| 5 | Signals, Models and Systems | 202000627 | Signals | 4.0 |
| | | 202000628 | Models** | 4.0 |
| | | 202000693 | Project SMS** | 3.0 |
| | | | <i>elective 1 of 4</i> | |
| | | 202000695 | Engineering Solid Mechanics | 4.0 |
| | | 202400546 | Computational Thinking | 4.0 |
| | | 202000694 | Classical Mechanics | 4.0 |
| | 202000644 | Electronics | 4.0 | |
| 6a | Materials Science and Engineering | 202000634 | Advanced Materials | 3.5 |
| | | 202000635 | Fundamentals of Solids | 3.5 |
| | | 202000636 | Chemistry and Technology of Materials | 4.0 |
| | | | <i>elective 1 of 2</i> | |
| | | 202000637 | Semiconductor Devices | 4.0 |
| | 202000638 | Physical Chemistry of Interfaces | 4.0 | |
| 6b | Physical Transport (from B-Chemical Science and Engineering (CSE)) | 202000737 | Physical Transport Phenomena | 7.5 |
| | | 202000738 | Project Transport Phenomena | 4.0 |
| | | 202000739 | Numerical Methods | 3.5 |
| 6c | Systems and Control (from B-Electrical Engineering (EE)) | 202001141 | Engineering System Dynamics | 5.0 |
| | | 202001140 | Control Engineering | 5.0 |
| | | 202001142 | Project S&C | 5.0 |
| 6d | Software Systems (from B-Technical Computer Science (TCS)) | 202400356 | - Design Theory - Programming Theory - Academic and project skills | 4.0 |
| | | 202400357 | - Object-oriented programming | 8.0 |
| An option for AT students is to enrol for Software Development (202001064). This module has approximately the same technical content as Software Systems (202400355) but it provides more support and guidance to students with no background in computer programming. Take note: Software Development (202001064) will not provide a student access to all Master programmes e.g. Computer Science | | | | |
| 6d | Software Development | 202001064 | - 202001065 System Design - 202001066 Programming - 202001194 Calculus 1B for BIT | 4.0 8.0 3.0 |
| 7 | Fields and Waves | 202000653 | Electro- and Magnetostatics and Dynamics | 9.0 |
| | | 202000654 | Project Antenna | 3.0 |
| | | 202000652 | Finite Element Methods | 3.0 |
| 8 | Business & Society | 202000656 | Entrepreneurship and Innovation Management | 6.0 |
| | | 202000657 | Data, Statistics and Probability for Engineers | 5.0 |
| | | 202000658 | Socio-technical Futures | 4.0 |
| | Total B2 | | | 60 |

** Dynamical systems 20200623 (M4) is an entry requirement for Models 202000628 (M5) and Project 202000693 (M5)

For students of cohorts 2022 and before, transitional arrangements (as referred to in Article 7) are in effect.

The B3 programme consists of a compulsory and an elective part and has a study load of 60 EC. The study units of the B3 programme should be chosen in such a way that admission to one of the master's programmes referred to in Article 2 of this appendix is obtained. The admission requirements for a selection of master's programmes are available on the AT website. The selected subjects in the third-year programme require the approval of the examination board. The B3 programme consists of an elective space, a design project, the preparation bachelor assignment, and the bachelor assignment (module 12).

The B3 programme is structured as follows:

| Module | Name | Course code | Study Unit | EC |
|--------|-------------------------------------|-------------|--|-----|
| 9 | Condensed Matter Physics | 202000660 | Introduction to Solid State Physics | 5.0 |
| | | 202000661 | Statistical Physics | 5.0 |
| | | 202000662 | Optics | 2.5 |
| | | 202000663 | Molecular Structure & Spectroscopy | 2.5 |
| 10 | Free choice – Master preparation | | | |
| 11 | Micro System Design and Realization | 202000665 | Micro Electro- Mechanical Systems Design | 5.0 |
| | | 202000666 | Transducers | 3.0 |
| | | 202000667 | Design verification with FEM | 3.0 |
| | | 202000668 | Preparation Bachelor Assignment AT | 4.0 |
| 12 | Bachelor assignment | 202000670 | - Scientific/Design | 6.0 |
| | | | - Communication (report & presentation) | 4.5 |
| | | | - Work process | 4.5 |
| | Total B3 | | | 60 |

The programme is responsible for the third-year elective modules in modules 9 and 11. Advanced Technology students can choose these modules in the elective space in their third-year programme. These modules are also open to students from other educational programmes

The modules Fundamentals of Materials (Module 3), Signals Models & Systems (Module 5), Materials Science & Engineering (Module 6a), and Condensed Matter Physics (Module 9) are available to students from other educational programmes as join-in minor modules. The prerequisite knowledge for these modules can be found in the OSIRIS Course Catalogue.

Article 6 Period of validity of parts of study units

1. The rules of validity of parts of study units of module 6b Physical Transport are determined by the Chemical Science and Engineering programme. The rules of validity of parts of study units of module 6c Systems and Control are determined by the Electrical Engineering programme. The rules of validity of parts of study units of module 6d Software Systems are determined by the Technical Computer Science programme.
2. For the elective modules that can be taken in the third year, the rules of validity of parts of study units of the programme that offers the elective module apply.
3. In all other situations, the examination board may grant an extension of the validity of parts of study units, at the request of the student, on an individual basis and depending on the circumstances.

Article 7 Transitional arrangements

1. If the study programme in Article 5 of this appendix is changed, or if one of the articles included in the general section of the Education and Examination Regulations or programme-specific part changes, the programme board will stipulate and publish transitional arrangements.
2. The transitional arrangements have to comply with the conditions set in Article 8.4 of the general section of the Education and Examination Regulations.
3. The transitional arrangements are valid for the year of publication and are updated every academic year.
4. The transitional arrangements are published on the programme's website.
5. In M3 XRD is moved from SPM to project.

Article 8 Safety

Before being allowed to work in a laboratory space, students are required to take note of the safety rules³ and to adhere to them.

Article 9 Sequence of study units

1. Before starting a study unit, students must meet the prior knowledge requirements of that study unit.
2. Students may only take the study units of the (Module 6a) Materials Science and Engineering module when the study units of the (Module 3) Fundamentals of Materials module have been passed.
3. Students may only take the study units of (Module 6c) Systems and Control for AT module when the study units of the (Module 1) Mechanics, (Module 4) Dynamics, and (Module 5) Signals, Models & Systems modules have been passed.
4. Students may only take the study units of the (Module 6b) Physical Transport module when the study units of the (Module 2) Thermodynamics module and the Vector Calculus study unit of the (Module 3) Fundamentals of Materials module have been passed.
5. Students can only enrol in Models (202000628) and Project SMS (202000693) with a pass for Dynamic Systems (202000623)
6. Students can only enrol in Module 7 with a pass for Vector calculus (202200189)
7. Students may only start with B2 or B3 study units when the B1 study units of the same quarter have been completed.
8. Students may only start with B3 study units when the B2 study units of the same quarter have been completed.
9. Students may only start the bachelor assignment after completion of the core programme (the core programme consists of the B1- and B2-programme plus 30 EC of the B3 programme), total 150 EC. Students can submit a request to the examination board to deviate from this requirement.
10. The programme director is authorised to deviate from the requirements set in paragraph 9.1, 9.2 and 9.3 of this Article, in the event that strict adherence would result in an unreasonable delay in study progress. Students can submit a request for this to the programme board.

Article 10 Student guidance

In addition to paragraph 5 of the general section of the Education and Examination Regulations:

1. The study adviser is responsible for individually advising students on all aspects of their study and informing the programme director on the study progress of the students.
2. The study adviser monitors and approaches students with a progress rate less than 75% of the nominal rate of 60 EC per year.
3. After the first year, the study adviser invites the students at least once a year for a progress meeting.

Article 11 (Binding) recommendation on continuation of studies (BSA)

1. In accordance with Article 6.2.2.b of the general section of the Education and Examination Regulations the programme director is allowed to set additional content-related requirements for the binding recommendation. A student can receive a binding recommendation on discontinuation of studies if:
 - a. the student has obtained less than 75% of the first-year study load, counted by the ECs of the study units as mentioned in the B1 programme in Article 5;
 - b. the student has obtained more than one insufficient grade (grade of 5.0 or lower) in one or more of the categories A, B, C, D and E as mentioned in the B1 programme in Article 5.

Article 12 Cum Laude

1. In accordance with art. 4.3.5 of the general part of the EER, a special distinction (e.g. cum laude) can be awarded on the BSc diploma Advanced Technology.
2. The Examination Board is charged with considering and awarding of a special distinction.
3. The requirements for the distinction cum laude are:
 - a. The grade for the bachelor assignment is at least a 9.0;
 - b. The EC-weighted average of the subjects in the bachelor's final examination without rounding is at least 8.0.
 - c. On the transcript are no grades less than 6.0;
4. No more than 15 EC has been graded with a pass ("voldaan"). In case that more than 15 EC has been graded with a pass ("voldaan") and part or all have been obtained during an exchange program, the examination board will take the results on the original transcript of records into account in the decision.
 - a. The courses with a pass are not taken into account in calculating the average grade.
 - b. The study programme needs to be finished within 4 years.

³ For B1 and B2 laboratory practice work, see the 'Health & Safety and Environmental Regulations' on <https://www.utwente.nl/tnw/intranet/diensten/amh/> and the information of the Science and Technology Laboratory Practice Group, on <https://www.utwente.nl/tnw/slt/>. For other labs different safety requirements may be in effect.

5. The Examination Board can on own initiative or on the request of the student or others deviate from the rules in 12.3. Special attention will be given to students with circumstances of study delay acknowledged by FOBOS.
6. A request of the student for a deviation from the guidelines for Cum Laude ('with distinction') must be made to the Examination Board before the first of the following events:
 - a. Declaration of graduation DUO
 - b. Signing of the in diploma
7. The request must include a clear motivation as to why the requester deems the deviation reasonable. Requests for a deviation from the guidelines for Cum Laude will be evaluated by the Examination Board on a per case base.

Article 13 Quality assurance

1. Quality assurance is the total of all activities and processes that a study programme organizes to ensure, evaluate, improve and justify the quality of education in a structural manner, with the aim that education is carried out with the predetermined (intended) quality.
2. The programme director is responsible for the quality of the content and the structure and organisation of the programme, including the organisation and execution of quality assurance.
3. The quality assurance is coordinated and managed by the Quality Assurance Coordinator of the Science & Technology faculty. The quality assurance coordinator advises the programme (staff) on the internal quality assurance processes.
4. The AT Quality assurance committee (QAC) is tasked with the evaluation of the programme by means of Panel meetings with students.
5. The Programme coordinator and Quality Assurance Coordinator are responsible for planning and executing the Lecture Panel meetings and finalising the evaluation report. The report is shared with the relevant lecturers, the staff members of the study programme and the programme committee.
6. The following internal and external evaluations are used to evaluate the curriculum and the degree programme as a whole:
 - a. Internal S&T Evaluation Questionnaire (STEQ)
 - b. the exit survey about the entire bachelor's programme;
 - c. the National Student Survey (NSE)⁴.

Article 14 Changes and transitional arrangements

In case of changes to the programme-specific appendix, Articles 8.3 and 8.4 of the general section of the Education and Examination Regulations apply.

Article 15 Effectuation

These regulations will come into effect on 1 September 2024 and replace the regulations dated 1 September 2023.

Established by the board of the Faculty of Science and Technology, in due consideration of the recommendations of the faculty council and the programme committee, with the consent of the faculty council to Articles 6 and 11 and with the consent of the programme committee to Articles 4, 5, 8 and 13.

⁴ The NSE is conducted annually.