Programme syllabus

Degree Programme in Engineering Physics
Civilingenjörsutbildning i teknisk fysik

270.0 credits

Valid for students admitted to the education from autumn 05 (HT - Autumn term; VT - Spring term).

This is a translation of the Swedish, legally binding, programme syllabus.

Programme objectives

The programme’s aim

Engineering physics comprises basic mathematics and natural science and their technical applications. The study programme gives a broad knowledge base which can be applied within widely varying fields.

The programme’s objectives

For the Master of Science in Engineering Physics degree, the student must fulfil the objectives which are stated in the Higher Education Degree Ordinance for Masters degrees.

Knowledge and understanding

For the Master of Science in Engineering degree, the student should:

- show such knowledge and abilities which are needed in order to independently work as a Master of Science in Engineering
- show knowledge about the chosen specialisation area’s scientific foundation and its tested experience and insight into current research and development work
- Show such a broad ability within the chosen technical area including knowledge in mathematics and natural science as well as essentially deepened knowledge within certain parts of the area.

In addition, students in Master of Science in Engineering Physics should:

- show broad ability which can be applied even within areas beyond the chosen specialisation
- Be a master of advanced mathematical methods and their applications within the different areas.

Skills and abilities

For a Master of Science in Engineering degree, the student should:

- show an ability to identify, formulate and handle complex problems creatively, critically and independently, analyze and critically evaluate different technical solutions and participate in research and development work and, with that, contribute to knowledge development.
- show an ability to critically and systematically integrate knowledge and show an ability to model, simulate, predict and assess occurrences, even with limited information
- show an ability to plan and with adequate methods carry out sophisticated assignments within given boundaries
- show an ability to develop and manufacture products, processes and systems with regards to humanity’s conditions and needs and society’s goals for sustainable development.
• Show an ability to present and discuss one’s conclusions, knowledge, and arguments that founded the conclusion clearly in writing and orally in both a national and international settings, and in dialogue with different target groups.

For a Master of Science in Engineering Physics, the should especially:

• be able to quickly recognise technical and natural scientific information even within an unknown area and apply this to problems/inquiries within certain broad fields
• show an ability for problem solving even within areas beyond the chosen specialisation
• show an ability to choose and apply advanced mathematical methods within certain broad fields
• Show an ability to plan, choose methods for and carry out investigations through modelling and simulation or through measurement, and assessment of results.

**Ability to make judgements and adopt a standpoint**

For a Master of Science in Engineering degree, the student should:

• show the ability to make judgments with regards to relevant scientific, social, and ethical aspects and show awareness of ethical aspects of research and development work.
• show insight into the technology’s possibilities and limitations, its role in society and humanity’s responsibility for how it is used, including social, economical and environmental aspects
• show insight about and ability to work as a team and cooperate as a team with different groups
• Show the ability to identify one’s needs for further knowledge and continuously develop one’s skills and abilities

**Extent and content of the programme**

The Bachelor of Science programme in Engineering Physics consists of 270 credits, which at a normal study pace, corresponds to 4.5 years of full-time study. The programme’s first three years are in the first cycle and can, if the student applies to do so, be concluded with a technology bachelor’s degree. The last 1.5 years are in the second cycle.

The first three years of the programme are mainly in Swedish, with certain English literature included. The last 1.5 years are mainly in English.

**Eligibility and selection**

For eligibility requirements and selection methods, see KTH’s admission policy [http://www.kth.se/info/kth-handboken/II/11/1.html](http://www.kth.se/info/kth-handboken/II/11/1.html)

**Implementation of the education**

**Structure of the education**

The study year for KTH’s education is divided into four periods. The study periods correspond to roughly seven weeks with at least 33 study days. Every study period is followed by an exam period consisting of two rest days and at least five test days. Beyond the four ordinary exam periods, there are three re-exam periods given: after Christmas, after the study year’s last ordinary exam period and directly before the study years first study period.

The study year consists of 40 weeks. Under certain circumstances, studies can take place outside the study year.

**Courses**

The programme is course-based. Lists of courses are included in [appendix 1](#).

The programme is composed of obligatory, selectable (specialisation courses) and optional courses. The obligatory courses are defined for every course and specialization in the teaching and time schedules. The different courses’ goals, prerequisites, contents and course examination specifications, can be found in the course plans.

**Optional Courses**
In Engineering Physics, there is a maximum of 22.5 credits which can be allocated to optional courses. This applies to cycle and depth requirements for the degree to be fulfilled. Optional courses can be taken at KTH or at another university and be credited (see section about recognition of previous studies). However, the following restrictions apply:

- Optional courses may not overlap a large portion of the existing program courses
- Preparatory courses for higher education may not count as optional courses
- Courses within the subject on a lower level than the existing program courses may not be counted as optional courses.

**Grading system**

Courses in the first and the second cycle are graded on a scale from A to F. A-E are passing grades, A is the highest grade. The grades pass (P) and fail (F) are used for courses under certain circumstances.

When the grading systems differ very much between different countries, the grades from studies abroad will not be transferred to the KTH grading system.

**Conditions for participation in the programme**

**Description of term enrolment and registration**

Before every term (at the latest May 15th and November 15th, respectively), all students planning to continue studying must submit their term enrolment notification. This notification allows the student to be promoted to next level, if eligible, and to be registered on the correct term. The registration means that the student is active and has the proper prerequisites to ensure that the study results must be able to be reported and so that CSN may be able to distribute awarded student aid. If possible, changed plans must be submitted to the study plan leadership at the latest within three weeks after the start of the course.

**Course selection and specialisation selection**

In the fall of study year 3, the student will choose a specialisation, using a special application form. The student must choose the courses, for the spring term, within the chosen specialization in the course selection system via Mina sidor at latest November 15th. The last day to apply for courses for the fall term is May 15th. In a few courses and specialisations, the number of available spots is limited. The selection is done through an evaluation of merits such as grades and credits for the students who applied during the time frame. Selection is done by the institution with which the specialization is concerned.

**Conditions for being promoted to the next level**

The following conditions apply in order to participate in the next study year: For studies in year 2: At least 45 credits from study year 1 must be completed up to the August period. For studies in year 3: At least 90 credits from study years 1 and 2 must be completed up to the August period. Students who have not met the requirements above must meet with a study plan counsellor and create an individual study plan in order to continue.

**Temporary Postponement**

Temporary postponement means that the student does not participate in courses during at least one term. Approved temporary postponement gives the student the right to return to the studies at a given point in time. During the temporary postponement, the student is able to complete courses and participate in exams in unfinished courses. The application for temporary postponement is submitted to the programme office, which approves or denies the application. When the student intends to return to the studies, a new application must be submitted.

**Course registration**
Registration of a course assumes course selection in Ladok. The course selection process can be done on the web or through the student’s programme office. Registration of a course is done by the institution giving the course. Registration must be finished by around three weeks after the course’s start. If the student decides to withdraw from a course, the student must notify the institution of this.

**Recognition of previous academic studies**

The right to the recognition of previous academic studies is an important element in order to support the mobility within the country and between countries, for the higher education’s internationalization work, and for “life-long” learning. KTH must have an open method to recognize previous academic studies. Recognition must therefore happen even if the exact programme does not exist at KTH or if the contents in, for example, the course plans does not exactly correspond to KTH’s. The requirements which KTH normally applies to programme level and quality will be considered in the recognition of previous academic studies. Recognition which is decided at another institution in Sweden will normally be accepted by KTH.

A student at KTH who carries out studies at another university within the boundaries of an exchange agreement has the right to receive advanced notification about recognition of previous studies. Such a notification can, for example, be given through a Learning Agreement which must be established and signed by the coordinator at KTH, contact person at the university abroad and the student.

The student at KTH has the right to receive a trial recognition of previous academic studies.

Even degree project work can be recognized. KTH considers it, nevertheless, appropriate that the degree project work is performed at KTH (within a school or at a company with a supervisor from KTH).

The decision about the recognition of courses can be appealed at the Board of Appeals of higher education. The appeal must be submitted to KTH, at the latest, three weeks from the day that the student received the decision.

In order for a trial recognition of previous academic studies, the applicant must normally be able to document that he/she has graduated in courses (corresponding) with at least passing results. The study performance is graded by the university where the exam was taken, not by the recognition of KTH.

http://www.kth.se/info/kth-handboken/II/13/3.html

**Studies abroad**

As a student in Engineering Physics, there is the unique possibility to study abroad at top universities throughout the world. Studies abroad mean that the student allocates a portion of his/her study time at KTH to studies at another university abroad with which KTH has a contract. The student can choose if she/he wants to study one term, one year, or towards dual degrees. Dual degrees mean that the student may receive a degree both from KTH and from the corresponding university, which can be very valuable for the student if he/she has thought to work abroad after graduation. Some businesses and companies actively recruit students who have attained dual degrees. In order to work abroad, speaking the language of that country is a requirement. For more information, contact the office’s international supervisor (Patrik Gärdénäs, tel 08-790 8495, e-mail patrikg@kth.se).

**Degree project**

In the programme, a degree project must be done corresponding to a course of 30 credits which implies around 5 months of full-time studies.

- The degree project is normally carried out within the central subject for the programme’s technical area
- The degree project may not be started before the assignment is approved by the examiner at the chosen institution and is submitted to the programme office using a special form.
- The main part of the studies, at least 210 credits, must be completed. The student may not have more than two unfinished courses of the obligatory base block in years 1-3.
- The examiner is responsible to ensure that the student the appropriate knowledge for the chosen assignment.
- The degree project is founded on that knowledge which has been attained throughout the entire study time and must normally be carried out during the term within the specialisation which the student chose. If the student
wishes to carry out the degree project within another subject area, this must be approved by the programme office.

- The degree project is done at the end of the programme in order to show that the student is capable of independently applying his/her knowledge attained during the study time.
- The degree project should show evidence of an independent, engineering-related/scientific work consisting of theoretical and/or experimental work with a corresponding written report. The degree project can include other items, for example, seminars, information gathering, student teaching, opposition, or other elements which the examiner or supervisor deems to be appropriate.
- The degree project is carried out individually or together with another student. In the latter case, the examiner ensures that each student’s work corresponds to the demands for an individual project work.
- The supervisor is appointed by the examiner.

The application form for the degree project (link) must be signed by the student and the examiner, before submitted to the programme office. More detailed rules and guidelines for the degree project can be found at the respective institution. http://www.kth.se/info/kth-handboken/II/15/1.html Link to grading of diploma work: http://www.kth.se/info/kth-handboken/II/15/Bilaga%A.html.

Degree

Conditions for the degree

The 270 credit degree

The Master of Science in Engineering degree is received after completing the programme. The programme is designed so that the student receiving the degree fulfils the national degree requirements and has fully completed courses corresponding to 270 credits, whence

- technically scientific and mathematical-natural scientific courses consist of at least 150 credits, while courses within the mathematical-natural scientific subjects consist of 45 credits and courses within the technically scientific subjects consist of at least 75 credits
- At least 22.5 credits of courses on the D-level
- A degree project worth 30 credits on the D-level

The name of the degree is a Master of Science in Engineering Degree.

Application for the degree

The student has the possibility to apply for three different degrees: Bachelor of Technology, Master of Science in Engineering, and Master’s Degree.

The application for the degree is done on a special form (link) and is submitted to the School of Engineering Sciences. Proof of the paid student union fee must be attached to the application.

http://www.kth.se/info/kth-handboken/II/19/1.html
Appendix 1 - Course list
Appendix 2 - Programme syllabus descriptions
Appendix 1: Course list
Degree Programme in Engineering Physics (F), Programme syllabus for studies starting in autumn 2005

**General courses**

**Year 1**

**Mandatory courses (82.5 credits)**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
<th>Edu. level</th>
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<tbody>
<tr>
<td>2D1339</td>
<td>Program Construction</td>
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<tr>
<td>5A1201</td>
<td>Physics, Basic Course I</td>
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<td></td>
</tr>
<tr>
<td>5A1202</td>
<td>Physics, Basic Course Part II</td>
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</tr>
<tr>
<td>5A1203</td>
<td>Physics, Basic Course I</td>
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<tr>
<td>5A1204</td>
<td>Physics, Basic Course II</td>
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<tr>
<td>5B1106</td>
<td>Calculus II, part 1</td>
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<td>5B1107</td>
<td>Calculus II, part 2</td>
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<tr>
<td>5B1109</td>
<td>Linear Algebra II</td>
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<tr>
<td>5C1103</td>
<td>Mechanics, Basic Course</td>
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**Optional courses**

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<th>Credits</th>
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<tr>
<td>5B1137</td>
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<tr>
<td>5B1138</td>
<td>Real Analysis II</td>
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<tr>
<td>5B1139</td>
<td>Linear Algebra</td>
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<tr>
<td>5B1203</td>
<td>Discrete Mathematics</td>
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## Year 2

### Mandatory courses (85.5 credits)

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<tbody>
<tr>
<td>2A1840</td>
<td>Electromagnetic Theory</td>
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<tr>
<td>2D1240</td>
<td>Numerical Methods, Basic Course II</td>
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<tr>
<td>2D1242</td>
<td>Numerical Analysis, Supplementary Course</td>
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<tr>
<td>4C1055</td>
<td>Strength of Materials and Solid Mechanics, Basic Course</td>
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<tr>
<td>5A1245</td>
<td>Modern Physics</td>
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<td>5A1247</td>
<td>Modern Physics</td>
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<tr>
<td>5A1306</td>
<td>Mathematical Methods in Physics</td>
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<tr>
<td>5A1931</td>
<td>Experimental Methods in Physics</td>
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<td>5B1201</td>
<td>Complex Analysis</td>
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<td>5B1202</td>
<td>Differential Equations and Transforms II</td>
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<tr>
<td>5B1506</td>
<td>Mathematical Statistics, Basic Course</td>
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<tr>
<td>5C1113</td>
<td>Mechanics, Continuation Course</td>
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### Optional courses

<table>
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<th>Credits</th>
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<tbody>
<tr>
<td>2A6840</td>
<td>Electromagnetic Theory - with Honours</td>
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<tr>
<td>5B1216</td>
<td>Complex Analysis, Specialized Course</td>
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<td>5B1217</td>
<td>Differential Equations, Specialized Basic Course</td>
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<td>5B1218</td>
<td>Methods of Transformations, Specialized Course</td>
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<tr>
<td>5B1309</td>
<td>Algebra, Basic Course</td>
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<tr>
<td>5U1201</td>
<td>Advanced Problems A</td>
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## Year 3

### Mandatory courses (73.5 credits)

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<tbody>
<tr>
<td>2B1507</td>
<td>Semiconductor Electronics</td>
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<tr>
<td>2D1344</td>
<td>Fundamentals of Computer Science</td>
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<td>2E1200</td>
<td>Automatic Control, General Course</td>
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<tr>
<td>Course code</td>
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<td>Credits</td>
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<tr>
<td>5A1301</td>
<td>Mathematical Methods in Physics, Course I</td>
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<tr>
<td>5A1450</td>
<td>Quantum Physics</td>
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<tr>
<td>DD1344</td>
<td>Fundamentals of Computer Science</td>
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<tr>
<td>EL1000</td>
<td>Automatic Control, General Course</td>
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<td>First cycle</td>
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<tr>
<td>IM2601</td>
<td>Solid State Physics</td>
<td>6.0</td>
<td>Second cycle</td>
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<tr>
<td>SF1901</td>
<td>Probability Theory and Statistics</td>
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<tr>
<td>SI1161</td>
<td>Statistical Physics</td>
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**Optional courses**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>5U1202</td>
<td>Advanced Problems B</td>
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<tr>
<td>DD2385</td>
<td>Software Engineering</td>
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<td>DN2255</td>
<td>Numerical Solutions of Differential Equations</td>
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<td>Second cycle</td>
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<tr>
<td>IM2602</td>
<td>Solid State Physics, Extended Course</td>
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<tr>
<td>SD1115</td>
<td>Fundamentals of Noise and Vibration Control</td>
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<td>SD1120</td>
<td>Noise and Vibration Control</td>
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<tr>
<td>SF1630</td>
<td>Discrete Mathematics</td>
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<tr>
<td>SF1811</td>
<td>Optimization</td>
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<td>SF1821</td>
<td>Optimization, Specialized Part of the Basic Course</td>
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<td>SF2700</td>
<td>Analysis, Basic Course</td>
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<td>Second cycle</td>
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<tr>
<td>SF2701</td>
<td>Financial Mathematics, Basic Course</td>
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<tr>
<td>SH2101</td>
<td>Subatomic Physics</td>
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<tr>
<td>SI2370</td>
<td>Relativity Theory</td>
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<td>SI2510</td>
<td>Statistical Mechanics</td>
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<tr>
<td>SI2920</td>
<td>Advanced Problems A</td>
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<tr>
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<td>Advanced Problems B</td>
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<tr>
<td>SK2410</td>
<td>Laser Physics I</td>
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### Conditionally elective courses

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<tbody>
<tr>
<td>5A1326</td>
<td>Relativity</td>
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<tr>
<td>5A1350</td>
<td>Statistical Mechanics</td>
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<tr>
<td>5A1400</td>
<td>Subatomic Physics</td>
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<td>5B1712</td>
<td>Optimization</td>
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<tr>
<td>5C1202</td>
<td>Fluid Mechanics, Introductory Course</td>
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### Recommended courses

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<tr>
<td>SF1831</td>
<td>Optimization and Markov Processes</td>
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<tr>
<td>SG2223</td>
<td>Fluid Mechanics</td>
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<tr>
<td>SI2170</td>
<td>Quantum Physics</td>
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### Year 4

#### Optional courses

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<td>AK1202</td>
<td>History of Science and Technology</td>
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<td>DA2190</td>
<td>General Cultural Knowledge</td>
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<tr>
<td>DD2257</td>
<td>Visualization</td>
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<td>Second cycle</td>
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<td>DD2387</td>
<td>Program System Construction Using C++</td>
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<td>DD2390</td>
<td>Internet Programming</td>
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<tr>
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**Year 5**

**Atomic and Subatomic Physics (ATSF)**

**Year 1**

**Year 2**

**Year 3**

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**Year 5**

**Computational Mathematics (BERT)**

**Year 1**

**Year 2**

**Year 3**

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Year 5

**Biological Physics and Medical Technology (BFMT)**

Year 1

Year 2

Year 3

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Year 4

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**Year 5**

**Biomedical Engineering (BMT)**

**Year 1**

**Year 2**

**Year 3**

**Recommended courses**

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**Discrete Mathematics and Computer Science (DM)**

#### Year 1

#### Year 2

#### Year 3

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### Year 5

### Solid Mechanics (HLF)

### Year 1

### Year 2

### Year 3

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### Year 5

**Condensed Matter and Nanostructure Physics (KOMF)**

### Year 1

### Year 2

### Year 3

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<td>SK2400</td>
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### Recommended courses

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### Year 5

#### Laser Physics and Optics (LAKV)

### Year 1

### Year 2

### Year 3

#### Conditionally elective courses

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### Year 4

#### Optional courses

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--- | --- | --- | ---
SK2700 | Mesoscopic Physics | 8.0 | Second cycle
SK2710 | Spin Electronics | 8.0 | Second cycle

**Recommended courses**

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### Year 5

**Noise, Vibrations and Signals (LOV)**

### Year 1

### Year 2

### Year 3

**Recommended courses**

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**Optional courses**

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<td>SD2170</td>
<td>Energy Methods</td>
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<td>Numerical Methods for Acoustics and Vibration</td>
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<td>Non-linear Acoustics</td>
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#### Year 5

**Applied mathematics (MA)**

Year 1

Year 2

Year 3

Optional courses

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Year 4

Year 5

**Mathematics (MAMA)**

Year 1

Year 2

Year 3

Optional courses

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**Year 4**

**Optional courses**

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### Year 5

**Material Physics (MF)**

### Year 1

### Year 2

### Year 3

#### Optional courses

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### Year 4

#### Optional courses

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<td>Semiconductor Theory and Device Physics, Advanced Course</td>
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**Year 5**

**Micro Electronics (MIEL)**

**Year 1**

**Year 2**

**Year 3**

**Recommended courses**

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**Year 4**

**Mandatory courses (7.5 credits)**

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**Optional courses**

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<td>Methods and Instruments of Analysis</td>
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<td>IH2653</td>
<td>Simulation of Semiconductor Devices</td>
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<td>Nanoelectronics</td>
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<td>Design and Characterisation of Nano- and Microdevices</td>
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**Recommended courses**

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**Supplementary information**

Only one of IH1611 and IH2651 can be studied.

**Year 5**

**Mathematical Statistics and Financial Mathematics (MSFI)**

**Year 1**

**Year 2**

**Year 3**

**Recommended courses**

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## Year 4

### Optional courses

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Year 5

Nuclear Energy Engineering (NUCL)

Year 1

Year 2

Year 3

Optional courses

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Year 4

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**Optimisation and Systems Theory (OS)**

#### Year 1

#### Year 2

#### Year 3

**Optional courses**

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#### Year 4

**Optional courses**

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#### Year 5

**Fluid Mechanics (STME)**

#### Year 1

#### Year 2

#### Year 3

### Recommended courses

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#### Year 4

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**Year 5**

**Theoretical Physics (TEOF)**

**Year 1**

**Year 2**

**Year 3**

**Optional courses**

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**Year 4**

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**Year 5**

**Theoretical and Applied Mechanics (TTME)**

**Year 1**

**Year 2**

**Year 3**

**Recommended courses**

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**Year 4**

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**Year 5**
Appendix 2: Specialisations

Degree Programme in Engineering Physics (F), Programme syllabus for studies starting in autumn 2005

Atomic and Subatomic Physics (ATSF)
Computational Mathematics (BERT)
Biological Physics and Medical Technology (BFMT)
Biomedical Engineering (BMT)
Discrete Mathematics and Computer Science (DM)
Solid Mechanics (HLF)
Condensed Matter and Nanostructure Physics (KOMF)
Laser Physics and Optics (LAKV)
Noise, Vibrations and Signals (LOV)
Applied mathematics (MA)
Mathematics (MAMA)
Material Physics (MF)
Micro Electronics (MIEL)
Mathematical Statistics and Financial Mathematics (MSFI)
Nuclear Energy Engineering (NUCL)
Optimisation and Systems Theory (OS)
Fluid Mechanics (STME)
Theoretical Physics (TEOF)
Theoretical and Applied Mechanics (TTME)