SYLLABUS MATHEMATICS CHALMERS

**1. Goal of the program**

The purpose of the graduate program is to give the student basic knowledge of the various branches of mathematics, orientation about current problems and applications, deeper insight into one or several specialities, and skills in research methodology.

The aim of the licentiate degree is to enable the student to independently participate in research and development work.

The aim of the doctoral degree is to enable the student to critically and independently plan, lead, carry through and present research and development work.

**2. Eligibility and prerequisites**

The normal requirement for being accepted to the graduate school is a Master’s degree in engineering mathematics, engineering physics or mathematics.

Persons who have acquired comparable abilities in a different way are also eligible.

**3. Structure of the program**

The doctoral education comprises 240 credits and the licentiate education 120 credits; one year’s full time studies should give 60 credits.

The graduate education consists of

* A basic study course
* An individual study course
* Participation in seminars and guest lectures
* Scientific work leading to a licentiate thesis for the licentiate degree and a doctoral thesis  for the doctoral degree

Teaching in the graduate program consists of lectures, seminars and possibly advising undergraduate work. The student should contribute to the scientific activities of the department by attending seminars and guest lectures, even if these are not directly related to the study course. The students are also expected to, as a part of their education, actively participate in seminars, for instance by giving survey lectures.

**4. Specializations**

Besides mathematics without specialization, the education may be specialized towards applied mathematics. The choice of specialization should be reflected both in the study course and in the research work.  The specialization towards applied mathematics is aimed at developing and analyzing numerical methods, optimization methods, or some other mathematical methods of relevance to science and technology.

**5. Courses**

**5.1. Basic study course**. The basic study course comprises 45 credits.

The first 30 credits consist of four courses, one from each of the four groups indicated below. Specific courses are chosen by the student, supervisor and examiner in consultation. They are aimed at giving the student a solid foundation in mathematics and preparing the choice of topic for the thesis. These courses should be taken at the Department of Mathematics, though exceptions may be allowed subject to the agreement of the supervisor and examiner, and the consent of the vice-prefect. All four courses must be passed before the licentiate degree.

* Mathematical analysis
* Algebra
* Topology and geometry
* Applied mathematics

Within mathematical analysis, one can choose between the following alternatives:

* Integration theory, 7.5 credits
* Functional analysis, 7.5 credits
* Theory of distributions, 7.5 credits
* Complex analysis, 7.5 credits

Within algebra, one can choose between the following alternatives:

* Galois theory, 7.5 credits
* Commutative algebra, 7.5 credits
* Linear and multilinear algebra, 7.5 credits

Within topology and geometry, one can choose between the following alternatives:

* Higher differential calculus, 7.5 credits
* Topology, 7.5 credits
* Riemann geometry, 7.5 credits

Within applied mathematics, one 7.5-credit course is chosen in accordance with the interests and specialization of the student. Examples are courses in partial differential equations, optimization, mathematical physics, mathematical statistics, computational mathematics etc.

The remaining 15 credits consists of courses from the Chalmers-wide program in Generic and Transferrable Skills (GTS). Of these, 9 credits must be obtained before the licentiate degree. Of these 9 credits, 7.5 consist of the following obligatory courses: Introductory Day for PhD Students (GFOK015, 0 credits), Teaching, Learning and Evaluation (GFOK020, 3 credits), Re- search Ethics and Sustainable Development (GFOK025, 3 credits) and Career Planning – Your Personal Leadership (GFOK010, 1.5 credits). The student must give an oral Popular Science Presentation (GFOK070, 0 credits) in advance of the thesis defence. A written such presentation must also be included on the back of the thesis.

For more information about the GTS program, see http://www.chalmersprofessional.se/en/genericskills#.U5RQAPH7vE4

**5.2. Individual study course.** The student, supervisor and examiner determine in consulta- tion an individual study course, which comprises 75 credits in total, of which at least 21 are taken in advance of the licentiate degree.

Consultancy work related to the student’s research interests can give up to 7.5 credits.

**6. Theses**

**6.1. Licentiate thesis**. For the licentiate degree, the student should write a thesis corresponding to 60 credits. It is presented at a seminar, and graded on a pass/fail basis.

**6.2. Doctoral thesis.** For the doctoral degree, the student should write and publicly defend a doctoral thesis corresponding to 120 credits. The thesis should be of such quality that it fulfils normal requirements for publication, in its entirety or in abridged form, in a scientific journal of good quality. It is graded on a pass/fail basis. The grading is based both on the thesis and on the defence.

**7. Requirements for the degrees**

**7.1. Licentiate degree.** For the licentiate degree, the student must complete

* Courses from the four groups listed above, comprising 30 credits
* 9 credits of GTS courses, as listed above
* At least 21 credits from the individual study course
* The thesis of 60 credits

in total 120 credits.

**7.2. Doctoral degree.** For the doctoral degree, the student must complete

* The basic study course of 45 credits
* The individual study course of 75 credits
* The thesis of 120 credits

in total 240 credits.

**8. Degree names**

The names of the degrees concluding the graduate education are normally

* Licentiate of Engineering in Mathematics
* Licentiate of Engineering in Mathematics with Specialization in Applied Mathematics
* Doctor of Philosophy in Mathematics
* Doctor of Philosophy in Mathematics with Specialization in Applied Mathematics

**9. Supervision**

A student accepted into the graduate school has the right to a supervisor. For full-time students, supervision is guaranteed for four years for the doctoral degree and for two years for the licentiate degree; for part-time students the same amount is distributed over a longer period of time. As soon as possible after admission to the graduate program, the prefect assigns a supervisor and at least one co-supervisor. The prefect also assigns an examiner, who approves the study course and confirms higher education credits and grades on courses. The supervisor and examiner must be two different people. The examiner, supervisor and student work together to plan the student’s progress through the program.

**10. Examination**

Examination is organized for each course. It may be written or oral. Exams are judged on a pass/fail basis by a course examiner.

The grade for the doctoral dissertation is determined by a grading committee, which is chosen separately for each thesis defence. The grade for the licentiate essay is decided by the examiner.

**11. Further instructions**

The student should regularly give an account of his or her progress and plans.