Mathematics at Utrecht University elective package

Mathematics at Utrecht University	
Offered by	Department of Mathematics and Computer Science
Language	Dutch/English
Primarily interesting for	All students, but most relevant for students with background in Mathematics
Prerequisites	Required courses: Depends on courses Recommended courses: Depends on courses
Contact person	H.J.M. Sterk (h.j.m.sterk@tue.nl)

Content and composition

The major Mathematics at TU/e is a wonderful program with lots to offer. But, as you can imagine, not all fields of mathematics can be represented in the same depth. In Eindhoven the focus is on a wide range of mathematics that is known to have applications in various areas. Topics with a more theoretical flavor like topology are less prominent in our program. Through our cooperation with the University of Utrecht (UU) we offer the option to take courses in Utrecht and use them to compose an elective package. Note that these courses in Utrecht are 7.5 ects courses. The courses available in this elective package are listed below. Any choice of (at least) two of such courses forms an elective package. If you are interested in such a package and need more information regarding the contents, please contact Hans Sterk (h.j.m.sterk@tue.nl). If needed, contact your academic advisor (Academic.Advisor.BAM@tue.nl) for information regarding your mathematics study program. Note that the schedule of courses in Utrecht differs from that in Eindhoven.

Course code	Course name	Level classification
WISB 243 (UU)	Inleiding topologie	-
WISB 224 (UU)	Lichamen en Galoistheorie	-
WISB 342 (UU)	Differentieerbare variëteiten	-
WISB 323 (UU)	Grondslagen van de Wiskunde	-
WISB 341 (UU)	Topologie en meetkunde	-

Course description

Topology discusses in an abstract setting notions like `neighbourhood', `compactness', `connectedness', that you came across in Analysis 1 and 2. Central is the notion of a topological space, in which metric notions are ignored (so two spaces that can be transformed in a `continuous' way into another are topologically the same, for example a circle and an ellipse). It deals with notions like `open set' and `closed set' in an abstract way and with constructions like the so-called one point compactification of a non-compact space. For instance, the one-point compactification of a line is a circle, the one-point compactification of the plane is topologically a sphere. One of the aims of topology is to develop tools that enable you to distinguish spaces like a sphere and a doughnut. An easy example: a circle is a compact space, the real line is not, so they are topologically different.

The course on differentiable manifolds deals with properties of `smooth' geometric objects like spheres, using tools from topology and analysis. For instance, the curvature of a manifold is such a property typically studied in the field called differential geometry. The course Fields and Galois theory (taught as of 2020—2021) deals (mainly) with the relation between so-called field extensions, where inclusions of fields are studied, and the `symmetries' of such extensions.

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These symmetries require the language of group theory. It is at the heart of understanding why certain straightedge and compass constructions, like `squaring the circle' (given a circle, construct a square with the same area, using only a ruler and a compass and obeying certain rules), are impossible, and why there are no analogues for the quadratic formula (for solving quadratic equations) for polynomial equations of degrees 5 and higher.

Finally, although the course Set theory and Algebra from the TU/e mathematics curriculum touches upon foundational issues in mathematics, the course in Utrecht explores this branch much further.

See https://students.uu.nl/beta/wiskunde for a description of the courses (and, if needed, consult Hans Sterk). Note that the information on the Utrecht site may change. Also note that courses are not necessarily taught in English.