Literature	MAIN REFERENCES Jacob Lurie, "On the classification of topological field theories", preprint (2009) Available at http://www.math.harvard.edu/~lurie/papers/cobordism.pdf J. Baez et J. Dolan, "Higher-Dimensional Algebra and Topological Quantum Field Theory", J. Math. Phys. 36 (11), 1995, 6073-6105. Available at arXiv:q-alg/9503002 OTHER REFERENCES *Origin of the subject* M. Atiyah, "Topological quantum Field theories", Publ. Math. IHES 68 (1988), 175-186. Available at http://archive.numdam.org/ARCHIVE/PMIHES/PMIHES_1988__68_/PMIHES_1988__68__175_0/PMIHES_1988__68__175_0.pdf *On the 2-dimensional case* Lowell Abrams, "Two-dimensional topological quantum Field theories and Frobenius algebras", J. Knot Theory and its Ramifications 5 (1996), 569--587. Available at http://home.gwu.edu/~labrams/docs/tqft.ps C. J. Schommer-Pries, "The Classification of Two-Dimensional Extended Topological Field Theories", PhD thesis, 2009. Available at arXiv:1112.1000 *On higher categories* Julia Bergner, "Models for (∞,n)-categories and the cobordism hypothesis", in Mathematical Foundations of Quantum Field Theory and Perturbative String Theory, Proceedings of Symposia in Pure Mathematics, AMS. Available at arXiv:1011.0110 *On homotopy theory* P. Goerss and J.F. Jardine, "Simplicial Homotopy Theory", Progress in Mathematics, Birkhauser, Boston, 1999. If you read french, there are some interesting lecture notes from a workshop on Lurie & Baez-Dolan in Paris, that are available on at http://www.math.jussieu.fr/~maltsin/Gtcobord.html

401-3370-62L	**Invariant Manifolds in Dynamical Systems**	**W**	**4 credits**	**2S**	**K. Nipp**, **D. Stoffer**

401-2650-62L	**Proseminar: Hierarchical Matrices** *Meant for BSc students of mathematics 3rd semester and later*	**W**	**4 credits**	**2S**	**R. Hiptmair**
Abstract	This seminar is dedicated to the modern concept of hierarchical matrices (H-matrices), which provides the characterization of matrices with local low rang structure. It discusses matrix compression leading to H-matrices and approximate operations in this class.				
Objective	Insight into the considerations and design principles underlying modern algorithms for matrix compression and handling of compressed matrices.				
Lecture notes	Siehe http://www.sam.math.ethz.ch/~hiptmair/Seminars/HMAT/HS12/desc.pdf fuer weitere Information.				
Literature	[1] M. Bebendorf, Hierarchical Matrices: A Means to Efficiently Solve Elliptic Bounda- ry Value Problems, vol. 63 of Lecture Notes in Computational Science and Engineering (LNCSE), Springer-Verlag, 2008. ISBN 978-3-540-77146-3. [2] S. Börm, L. Grasedyk, and W. Hackbusch, Hierarchical matrices, Lecture note 21/2003, Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany, 2003. http://www.mis.mpg.de/preprints/ln/lecturenote-2103.pdf. [3] W. Hackbusch, Hierarchische Matrizen. Algorithmen und Analysis, Springer, Heidel- berg, 2009.				
Prerequisites / notice	Prerequisite: Numerical Mathematics I / Introduction to Numerical Methods				

401-3650-62L	**Numerical Analysis Seminar: Sparse and Redundant Representations**	**W**	**4 credits**	**2S**	**P. Grohs**
Abstract	In this seminar we will work through the book "Sparse and Redundant Representations: From Theory to Applications in Signal and Image Processing" by M. Elad				
Literature	M. Elad. Sparse and Redundant Representations. Springer (2010).				
Prerequisites / notice	Linear Algebra, Numerical Analysis 1				

401-3050-62L	**Student Seminar in Combinatorics: The Sylvester-Gallai Theorem and Its Relatives**	**W**	**4 credits**	**2S**	**K. Fukuda**
Abstract	The Sylvester-Gallai Theorem states that every finite set of at least three points in the plane is either collinear or admits a line containing exactly two of the points. It has been a great source of inspirations for finding different proofs, generalizations, extensions and algorithmic results. We study some of these developments together.				
Content	The Sylvester-Gallai Theorem states that every finite set of at least three points in the plane is either collinear (i.e. contained in a line) or admits an ordinary line (i.e. a line containing exactly two of the points). It was foreseen by Sylvester in 1893 and proven by Gallai in 1943. Since then, it has been a great source of inspirations for finding different proofs, generalizations, extensions and algorithmic results, see for example the Wikipedia page: http://en.wikipedia.org/wiki/Sylvester%E2%80%93Gallai_theorem and the recent work by Barak-Dvir-Wigderson-Yehudayoff: http://arxiv.org/abs/1009.4375 . Please also take a look at a blog by Terence Tao: http://terrytao.wordpress.com/2012/08/24/on-sets-defining-few-ordinary-lines/ . In this seminar, we study some of these developments together in the form of reading seminar and learn from interesting mathematical ideas.				

Literature	Mathematical papers for the seminar presentations will be available on line from the first day of the seminar, September 18. One or two lectures on the seminar theme will be given by the lecturer on September 18 and possibly on September 25. During the first two weeks, each student is expected to select a paper to read and to present. The first student presentation starts on October 2. Articles and Schedule: http://www.inf.ethz.ch/personal/fukudak/lect/sgsemi/sgseminar_ref.pdf Submitted Final Reports: http://www.inf.ethz.ch/personal/fukudak/lect/sgsemi/reports
Prerequisites / notice	Prerequisites: Maturity in proving theorems, discovering a new proof or a simpler proof, in understanding why a specific assumption is necessary or not necessary. Also, some experiences in conjecturing and in finding counterexamples for non-theorems would be a big plus to benefit from this research oriented seminar. Students should be able to acquire basic knowledge of graph theory, polyhedral geometry, algorithms and combinatorial geometry (matroid theory) by themselves, whenever necessary.

263-4200-00L	**Seminar SAT**	**W**	**2 credits**	**2S**	**E. Welzl**
Abstract	Study and presentation of research papers from the literature on "Boolean Satisfiability-Combinatorics and Algorithms".				
Objective	Goal of this seminar is to study and present, in continuation of the course "Boolean Satisfiability-Combinatorics and Algorithms", research papers from the literature.				
Literature	A list of papers for presentations will be distributed at the beginning of the seminar.				
Prerequisites / notice	The seminar builds heavily on the material covered in the course "Boolean Satisfiability-Combinatorics and Algorithms." Successful completion of that course (or parallel attendance) is a prerequisite for participation in the seminar.				

263-4203-00L	**Computational Geometry and Graph Drawing**	**W**	**2 credits**	**2S**	**B. Gärtner**, **M. Hoffmann**, **E. Welzl**
Abstract	This seminar is held once a year and complements the courses Computational Geometry, Discrete Geometry, and Graph Drawing. Students of the seminar will present original research papers, some classic and some of them very recent. The seminar is a good preparation for a master, diploma, or semester thesis in the area.				
Objective	Each student is expected to read, understand, and elaborate on a selected research paper. To this end, (s)he should give a 45-min. presentation about the paper. The process includes * getting an overview of the related literature; * understanding and working out the background/motivation: why and where are the questions addressed relevant? * understanding the contents of the paper in all details; * selecting parts suitable for the presentation; * presenting the selected parts in such a way that an audience with some basic background in geometry and graph theory can easily understand and appreciate it.				
Prerequisites / notice	To attend the seminar, some basic knowledge in (discrete and computational) geometry and graphs and algorithms is required. Thus, previous participation in some of the courses "Graphs and Algorithms", "Computational Geometry", "Discrete Geometry", "Graph Drawing", or similar courses is strongly encouraged. It is also possible to take this seminar in parallel to the lecture "Computational Geometry".				

Seminars (Mathematics Master)

► Bachelor Thesis

Number	Title	Type	ECTS	Hours	Lecturers
401-3990-10L	**Bachelor Thesis** ■ *Every thesis must be registered with us via the corresponding form before the thesis begins. Collect the registration form from the pigeon holes in front of the student administration offices HG G 33.1 and HG G 33.2. Further information www.math.ethz.ch/studiensekretariat/bsc-msc-theses*	**O**	**8 credits**	**11D**	Professors
Abstract	The purpose of the BSc thesis is to deepen knowledge in a certain subject chosen by the student. In their BSc thesis, students should demonstrate their ability to carry out independent work in mathematics and to organize results in a written report.				

► Compulsory Electives in Humanities, Social and Political Sciences

see Compulsory Electives in Humanities, Social and Political Sciences

► Additional Courses

Number	Title	Type	ECTS	Hours	Lecturers
401-5000-00L	**Zurich Colloquium in Mathematics**	**E-**	**0 credits**		**P. L. Bühlmann**, **T. Kappeler**, **H. Knörrer**, **A. Kresch**, **D. A. Salamon**, **V. Schroeder**, **A.S. Sznitman**
401-5990-00L	**Zurich Graduate Colloquium**	**E-**	**0 credits**	**1K**	**A. Iozzi**
Abstract	The Graduate Colloquium is an informal seminar aimed at graduate students and postdocs whose purpose is to provide a forum for communicating one's interests and thoughts in mathematics.				
401-5960-00L	**Colloquium on Mathematics, Computer Science, and Education** *Subject didactics for mathematics and computer science teachers.*	**E-**	**0 credits**	**1K**	**N. Hungerbühler**, M. Akveld, J. Hromkovic, H. Klemenz
Abstract	Didactics colloquium				
402-0101-00L	**The Zurich Physics Colloquium**	**E-**	**0 credits**	**1K**	**R. Renner**, C. Anastasiou, B. Batlogg, N. Beisert, G. Blatter, M. Carollo, M. Christandl, C. Degen, G. Dissertori, R. J. Douglas, K. Ensslin, T. Esslinger, J. Faist, M. Gaberdiel, T. K. Gehrmann, A. Gehrmann-De Ridder, G. M. Graf,