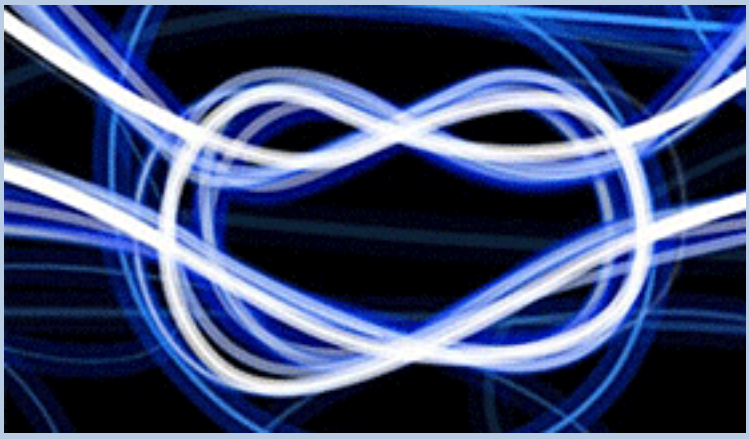
Virtual Exchange Global Alliance

TU Delft	Topology in Condensed Matter (AP3202)		
Course description	Get a simple and hands-on overview of topological insulators, Majoranas, and other topological phenomena.		
Domain	Applied Physics		
Prerequisites	General knowledge of condensed matter theory and quantum mechanics on at least an advanced bachelor level.		
Level	Master/PhD		
Language	English		
Number of credits and workload	6 credits	3-6 hrs per week	36-72 hrs in total
Semester period and Start date course	Semester 1	Start date: TBA	
Application deadline	TBA		

Full course description	The idea behind topological systems is simple: if there exists a quantity, which cannot change in an insulating system where all the particles are localized, then the system must become conducting and obtain propagating particles when the quantity (called a "topological invariant") finally changes. The practical applications of this principle are quite profound, and already within the last eight years they have lead to prediction and discovery of a vast range of new materials with exotic properties that were considered to be impossible before. What will you gain from this course? • Learn about the variety of subtopics in topological materials, their relation to each other and to the general principles. • Learn to follow active research on topology, and critically understand it on your own. • Acquire skills required to engage in research on your own, and to minimize confusion that often arises even among experienced researchers. What is the focus of this course? • Applications of topology in condensed matter based on bulk-edge correspondence. • Special attention to the most active research topics in topological condensed matter: theory of topological insulators and Majorana fermions, topological classification of "grand ten" symmetry classes, and topological quantum computation Extensions of topology to further areas of condensed matter, such as photonic and mechanical systems, topological quantum walks, topology in fractionalized systems, driven or dissipative systems. • What tools does this course use? • Simple thought experiments that rely on considerations of symmetry or continuity under adiabatic deformations • Computer simulations similar to those used in actual research will give a more detailed and visual understanding of the involved concepts • Dissecting research papers that teaches you to simply understand the idea even in the rather involved ones.	
Platform and link to course description	EdX	https://www.edx.org/course/topology-condensed-matter-tying-quantum-delftx-topocmx-0
Course description in study guide	http://www.studiegids.tudelft.nl/a101_displayCourse.do?course_id=43751	

Lecturer(s)	Anton Akhmerov Jay Sau Bernard van Heck Muhammad Irfan Bas Nijholt Tómas Örn Rosdahl
Picture of course	
Final examination date and time /period	TBA
Examination registration deadline or drop-out deadline	Examination registration before: TBA Drop- out deadline: TBA
Type of examination	Assignments, peer-review
Midterm examination?	☐ yes ☐ no
Previous exam papers available	☐ yes ☐ no
Specific rules for examinations	
Resit? and date	☐ yes ☐ no
Grade release and transcript release	TBA