MAST90029 Differential Topology and Geometry

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	This subject is not offered in 2016.
Time Commitment:	Contact Hours: 36 hours comprising three 1-hour lectures per week Total Time Commitment: 170 hours
Prerequisites:	Both of the following, or equivalent.

Subject	Study Period Commencement:	Credit Points:
MAST20009 Vector Calculus	Semester 1, Semester 2	12.50
MAST30026 Metric and Hilbert Spaces	Semester 2	12.50

Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	

Subject	Study Period Commencement:	Credit Points:
MAST90054 Differential Topology	Not offered 2016	12.50

Core Participation Requirements:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Student Support and Engagement Policy, academic requirements for this subject are articulated in the Subject Overview, Learning Outcomes, Assessment and Generic Skills sections of this entry. It is University policy to take all reasonable steps to minimise the impact of disability upon academic study, and reasonable adjustments will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact on meeting the requirements of this subject are encouraged to discuss this matter with a Faculty Student Adviser and Student Equity and Disability Support: http://services.unimelb.edu.au/disability
Contact:	Paul Norbury Email: **norbury@unimelb.edu.au (mailto:norbury@unimelb.edu.au)** Craig Hodgson Email: **craigdh@unimelb.edu.au (mailto:craigdh@unimelb.edu.au)**
Subject Overview:	This subject extends the methods of calculus and linear algebra to study the geometry and topology of higher dimensional spaces. The ideas introduced are of great importance throughout mathematics, physics and engineering. This subject will cover basic material on the differential topology of manifolds including integration on manifolds, and give an introduction to Riemannian geometry. Topics include: Differential Topology: smooth manifolds, tangent spaces, inverse and implicit function theorems, differential forms, bundles, transversality, integration on manifolds, de Rham cohomology; Riemanian Geometry: connections, geodesics, and curvature of Riemannian metrics; examples coming from Lie groups, hyperbolic geometry, and other homogeneous spaces.
Learning Outcomes:	After completing this subject, students will gain: # an understanding of the basic notions of Differential Topology, including smooth manifolds, vector bundles, differential forms and integration on manifolds; # an understanding of the basic notions of Riemannian Geometry, including connections, curvature and geodesics;

	# the ability to work with smooth manifolds, smooth maps, differential forms and Riemannian metrics; # the ability to do geometric calculations in local coordinates; # a knowledge of important examples of Lie groups and symmetric spaces; # the ability to pursue further studies in this and related areas.
Assessment:	Up to 60 pages of written assignments (60%: three assignments worth 20% each, due early, mid and late in semester), a two-hour written examination (40%, in the examination period).
Prescribed Texts:	None
Recommended Texts:	N. Hitchin. Differentiable Manifolds, available online at: people.maths.ox.ac.uk/~hitchin/hitchinnotes/hitchinnotes.html M. P. do Carmo, Riemannian Geometry, Birkhäuser (1992).
Breadth Options:	This subject is not available as a breadth subject.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	In addition to learning specific skills that will assist students in their future careers in science, they will have the opportunity to develop generic skills that will assist them in any future career path. These include: # problem-solving skills: the ability to engage with unfamiliar problems and identify relevant solution strategies; # analytical skills: the ability to construct and express logical arguments and to work in abstract or general terms to increase the clarity and efficiency of analysis; # collaborative skills: the ability to work in a team; # time-management skills: the ability to meet regular deadlines while balancing competing commitments.
Related Course(s):	Doctor of Philosophy - Engineering Master of Philosophy - Engineering Master of Science (Mathematics and Statistics)
Related Majors/Minors/ Specialisations:	Mathematics and Statistics