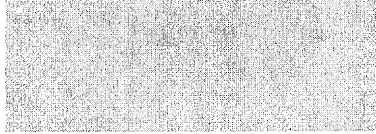

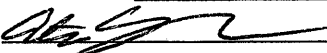
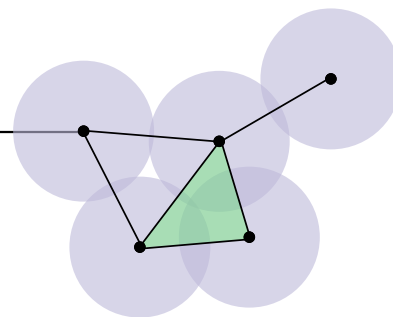
 FLORIDA ATLANTIC UNIVERSITY	NEW COURSE PROPOSAL Undergraduate Programs		UUPC Approval _____ UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner Posted _____ Catalog _____
	Department Mathematical Sciences College Science (To obtain a course number, contact erudolph@fau.edu)		
Prefix MTG Number 4328	(L = Lab Course; C = Combined Lecture/Lab; add if appropriate) Lab Code	Type of Course Lecture	Course Title Topology for Data Science
Credits (Review <i>Provost Memorandum</i>) 3	Grading (Select One Option) Regular <input checked="" type="radio"/> Pass/Fail <input type="radio"/> Sat/UnSat <input type="radio"/>	Course Description (Syllabus must be attached; <i>Syllabus Checklist recommended; see Guidelines</i>) Introduction to concepts and methods in applied topology and topological data analysis tools, including persistent homology, and their uses in data science: topological spaces, metric spaces, continuity, simplicial complexes, vector spaces, and simplicial homology. Mathematical concepts are grounded by discussions of efficient implementations of computational algorithms and applications.	
Effective Date (TERM & YEAR) Fall 2020	Prerequisites, with minimum grade* MAS 2103, MAD 2104, AND (MAD 2502 OR COP 2220)	Corequisites 	Registration Controls (Major, College, Level)
<i>*Default minimum passing grade is D-. Prereqs., Coreqs. & Reg. Controls are enforced for all sections of course</i>			
WAC/Gordon Rule Course <input type="radio"/> Yes <input checked="" type="radio"/> No WAC/Gordon Rule criteria must be indicated in syllabus and approval attached to proposal. See WAC Guidelines .		Intellectual Foundations Program (General Education) Requirement (Select One Option) None General Education criteria must be indicated in the syllabus and approval attached to the proposal. See GE Guidelines .	
Minimum qualifications to teach course Terminal degree in the subject area or closely related field.			
Faculty Contact/Email/Phone Francis Motta / fmotta@fau.edu / 7-4825		List/Attach comments from departments affected by new course None - approved by BSDSA steering committee	
Approved by Department Chair  College Curriculum Chair <u>Jerry Haky (via email confirmation)</u> College Dean  UUPC Chair <u>Jerry Haky (via email confirmation)</u> Undergraduate Studies Dean <u>Edward Pratt (via email confirmation)</u> UFS President _____ Provost _____		Date <u>2/25/20</u> <u>3-27-20</u> <u>3/3/20</u> <u>3/30/20</u> <u>3-31-20</u> _____ _____	

Email this form and syllabus to mjenning@fau.edu seven business days before the UUPC meeting.



COURSE

MTG 4328

Topology for Data Science

LOCATION

TBA

INSTRUCTOR

Dr. Francis C. Motta, fmotta@fau.edu

Office hours: TBA

DESCRIPTION

This course is an introduction to concepts and methods in applied topology. It covers the mathematical topics needed to develop a practical understanding of major topological data analysis tools, including persistent homology, and their uses in data science: topological spaces, metric spaces, continuity, simplicial complexes, vector spaces, and simplicial homology. Mathematical concepts are grounded by discussions of efficient implementations of computational algorithms and applications.

TEXT

► *Computational Topology: An Introduction*, Edelsbrunner & Harer, American Mathematical Society, 2009

► *Topology (Classic Version) 2nd edition*, Munkres, Pearson, 2017

REFERENCES

- *Topology for Computing*, Zomorodian, Cambridge University Press, 2009
- *Computational Homology*, Kaczynski, Mischaikow, & Mrozek, Springer 2004
- *Elementary Applied Topology*, Ghrist, ISBN 978-1502880857, 2014

GRADING

► **Homework (50%)**

► **In-class quizzes (20%)**

► **Group project (30%)**

Final letter grades will be determined by the total percent earned with cutoffs **no larger than A: ≥ 90 , B: ≥ 80 , C: ≥ 70 , D: ≥ 60** . A grade of **I** (incomplete) will only be given under University-sanctioned circumstances.

COURSE

MAS 2103 (Matrix Theory) & MAD 2104 (Discrete Mathematics) & (COP 2220

PREREQS

(Introduction to Programming in C) or MAD 2502 (Introduction to Computational Mathematics) or equivalent)

TENTATIVE

SCHEDULE

Week 1: Topological spaces

Week 2: Metric spaces/metric topology

Week 3: Continuity, Lipschitz continuity

Week 4: Compactness, connectedness

Week 5: Surfaces, triangulations

Week 6: Complexes (simplicial, cubical, types)

COURSE
POLICIES

Week 7: Vector spaces, quotient spaces

Week 8: Linear maps, image/kernel, matrix reduction

Week 9: Simplicial homology

Week 10: Filtrations of topological spaces

Week 11: Reeb graphs

Week 12: Clustering & Mapper algorithm

Week 13: Persistent homology

Week 14: Vinyards (time series of diagrams)

Week 15: Metric space of persistence diagrams and stability

- **Academic Integrity:** The full content of the FAU Regulation 4.001 Code of Academic Integrity applies to this course.
See <http://www.fau.edu/ctl/AcademicIntegrity.php>
- **Absences:** Missed course work due to extenuating circumstances such as illness or family emergencies will be accommodated provided that the student notifies the instructor prior to anticipated absences or soon after an unanticipated absence. Please notify the instructor of scheduled participation in University-approved activities or religious observances so reasonable accommodations can be made.
- **University Policies:** Please familiarize yourself with the other university policies concerning course withdrawals, course credits and levels, course letter grades and GPA, etc. by visiting
<http://www.fau.edu/academic/registrar/FAUcatalog/academics.php>
- **Disabilities:** In compliance with the Americans with Disabilities Act (ADA), students who, due to a disability, require reasonable accommodations to properly execute coursework must register with Student Accessibility Service (SAS)—in Boca Raton, SU 133 (561-297-3880); in Davie, LA 203 (954-236-1222); or in Jupiter, SR 110 (561-799-8585)—and follow all SAS procedures.
- **CAPS Center** Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <http://www.fau.edu/counseling/>