Syllabus for Math 422X, Mathematical Principles of Data Science

Spring Semester, 2020

Instructor:	Eric Weber	Email:	esweber@iastate.edu
Office:	Carver Hall 454	Phone:	294-8151
Office Hours:	M 9:00-10:00; W 10:00-11:00; R 11:00-12:00; or by appointment		

Class Homepage: https://faculty.sites.iastate.edu/esweber/page/math422x
This page will contain a copy of this syllabus, a detailed calendar of the semester's material, links to other relevant information, and assignments when they are given. There is also a Canvas course that I will use for posting grades and information.

Course Description: MATH 422X (3-0) Cr. 3. S. Prereq: MATH 414

Riemann-Stieltjes integration, Riesz-Markov theorem, Stone-Weierstrass theorem, Universal Approximation theorem, reproducing kernel Hilbert spaces, Cauchy and Fourier kernels, convergence of clustering algorithms, topological persistence.

Learning Outcomes:

(1) Students will understand the following mathematical principles:
   (a) Riemann-Stieltjes integration
   (b) Riesz-Markov theorem
   (c) Stone-Weierstrass theorem
   (d) Heine-Borel and Bolzano-Weierstrass theorems
   (e) reproducing kernel Hilbert spaces
   (f) Cauchy and Fourier kernels

(2) Students will understand how mathematical principles undergird the following Data Science principles and algorithms:
   (a) neural networks
   (b) Universal Approximation theorem
   (c) convergence of clustering algorithms
   (d) kernel methods for clustering and segmentation
   (e) topological persistence

(3) In addition, students registered for graduate credit will gain experience with applying data science techniques to real datasets.

Grading: For those registered for undergraduate credit, grades will be determined as follows:

Assignment:	Percentage:
Homework	50%
Midterm Exam	20%
Final Exam	30%

For those registered for graduate credit, grades will be determined as follows:

Assignment:	Percentage:
Homework	30%
Midterm Exam	20%
Final Exam	30%
Data Science Project	20%