

## New Course Proposal

Proposed by: Mohammad Kafai  
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 Phone:

APD only  
 MATH 748  
 Catalog number: \_\_\_\_\_  
 Processed by/date: \_\_\_\_\_  
 Bulletin year: FALL 2017

Course ID	MATH 748
Type	Regular
CEL Only?	No
Abbreviated course title	Stat and Machine Learning
Course long title	Theory and Applications of Statistical and Machine Learning
How will this course advance student time to the degree?	Required in major/minor: One of the major requirement for Stat MS
Access Restrictions	Intended for all students
Grading system	P – Plus-minus letter, CR/NC
Repeatable	No
Anticipated frequency of offering	Once a year, Spring
Staffing classification	C4 Discussion (3 units)
Cross-listing	None
Course funding	Tenured or tenure-track faculty, lecturer, other: Tenure or tenure-track faculty

### Long description

Learn the fundamental concepts of statistical and machine learning theory.

### Prerequisites

MATH 448 with grade of C or better and MATH 441 with a grade of C or better; or consent of instructor

### Concurrent enrollment

*None specified*

## New Course Proposal – Course Outline

### Course outline

Support Vector Machines  
Flexible Discriminants  
Neural Networks  
Ensemble Learning  
Mixture Models and EM  
Unsupervised Learning  
Feature Selection

### Student learning outcomes

1. Students will demonstrate an understand the statistical principals and reasoning behind modern supervised & unsupervised learning methods by providing presentations and a written report.
2. Students will create data models, by using data pre-processing, feature selection, model fitting, and model selection & evaluation.
3. Master the skills to perform data analysis using computer software, to interpret results and to communicate results effectively.
4. Obtain the hands-on experience by analyzing real data sets and make decent presentation about the results to audiences.

### Program Learning Objectives

- Introduce to the students the fundamental concepts of statistical and machine learning theory. **(Associated with SLO 1,2)**
- Help students to gain experience of using various software such as R and/or Python to conduct predictive modeling in real-world applications. **(Associated with SLO 2,3,4)**
- Help students to learn how clearly present analysis results in both written and oral formats. **(Associated with SLO 3,4)**
- Prepare students to do quantitative research in various areas such as biology, engineering, business, and social science. **(Associated with SLO 3,4)**

### Evaluation procedure to be used in determining final grades

Students will be graded on quizzes, homework assignments, data analysis project, and examinations.

### List of textbooks/reading assignments

An Introduction to Statistical Learning, with applications in R (2013), G. James, D. Witten, T. Hastie, R. Tibshirani.  
The Elements of Statistical Learning, Data Mining, Inference and Prediction (2nd edition), Trevor Hastie, Robert Tibshirani, Jerome Friedman  
Applied Predictive Modeling (2013), Max Kuhn, Kjell Johnson  
R, by R Development Core Team

### Instructions and Signatures

In order to have your course proposal approved, you must submit the form to your department chair or director for his/her signature on this page. The form must then be forwarded to your associate dean for approval. If you need to revise this form after printing, you can login at <https://courseproposal.sfsu.edu/submissions/10912> to view, edit, and print this submission.

#### Consultations

Department/Program \_\_\_\_\_ Chair/Director \_\_\_\_\_ Date \_\_\_\_\_

Department/Program \_\_\_\_\_ Chair/Director \_\_\_\_\_ Date \_\_\_\_\_

#### Approvals

Department/Program Chair/Director \_\_\_\_\_ Date 13 Feb 2017

College Dean (or Designee) \_\_\_\_\_ Date 2/14/17

University Provost (or Designee) \_\_\_\_\_ Date \_\_\_\_\_