

King Fahd University of Petroleum and Minerals
Department of Mathematics & Statistics
MATH 506 Syllabus, Term 211

Code: MATH 506

Title: Fundamentals of Data Science

Credit Hours: 3-0-3

Instructor: Dr. Ali N. Duman

E-mail: aliduman@kfupm.edu.sa (Use your KFUPM e-mail to communicate)

Office Hours:

Time: Monday and Wednesday 2:00pm – 4:00pm

Thursday 10:00am-11:00am or by appointment

Venue: 5-325

Lectures:

- Section 1
MW 5:20pm – 6:35pm
Room: 58-1045

- Section 2
MW 6:45pm – 8:00pm
Room: 58-1053

Objective: The main objective of the course is to

- Introduce to the mechanism of the learning process;
- Implement solutions using data scientific software, toolboxes, and libraries.

Description: All aspects of the data science pipeline using the software, toolboxes, and libraries like NumPy, SciPy, Pandas, SymPy, Matplotlib, and Seaborn: Data acquisition, cleaning, handling missing data, EDA, visualization, feature engineering, modeling, model evaluation, bias-variance tradeoff, sampling, training, testing, experimenting with a classical model.

Learning Outcomes: Upon completion of the course, students should be able to:

- Describe the learning process.
- Distinguish data science tasks.
- Prepare data for analysis.
- Build a model in a computer environment.

Textbook [TB]: Data Science using Python and R by C. Larose and D. Larose, Wiley

Supplementary Material:

1. [S1] Introduction to Data Science: A Python Approach to Concepts, Techniques and Applications by Igual, Laura, Seguí, Santi, Springer
2. [S2] A Hands-On Introduction to Data Science, by Chirag Shah, Cambridge University Press

Grading Policy: Projects (30%), Quizzes (20%), CLW (10%), Exam (15%), Final Exam (25%)

Attendance: Attendance is a University Requirement. A DN grade will be awarded to any student who accumulates 6 unexcused absences.

Academic Integrity: All KFUPM policies regarding ethics apply to this course.

Schedule:

Weeks	Topics	Reference
1	Introduction to Data Science What is Data Science? Data Science Methodology, Data Science Tasks	Ch 1 [TB], [S1],[S2]
2-3	Tools for Data Scientists Python, SQL, Libraries	Ch 2.1, 2.2 [TB] Ch 2.1-2.6 [S1] Ch 5.1-5.3 [S2]
4-5	Data Data Types, Data Sources, Data Formats, Data Pre-Processing	Ch 3 [TB] Ch 2 [S2]
6-7	Data Analysis Techniques Descriptive, Multivariate Analysis, Feature Engineering	Ch 4 [TB] Ch 3 [S1] Ch 3 [S2]
8	Visualization, Reporting	Instructor Notes
9-10-11	Introduction to Modeling What is a dataset?, What is learning?, What is a model?, Regression, Classification, Bias vs Variance, Training-Testing-Validation	Ch 5, Ch 11 [TB] Ch 6.1 [S1] Ch 8.1 – 8.3, Ch 9.4 [S2]
12-13	Evaluating Models Metrics, Cross-Validation, Hyperparameters	Ch 7 [TB] Ch 12.4 [S2]
14	Automating Models Building Pipelines, Joining Pipelines, Saving Models	Instructor Notes
15	Catch-Up & Project Presentations	

Important Dates:

Exam 1: 7th week

Final Exam: During final exam week. Check registrar's website.