

MET CS544 A1 (Spring 2024) - Foundations of Analytics and Data Visualization (Mondays, 6 PM)

Instructor

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Course Description

The goal of this course is to provide students with the mathematical and practical background required in the field of data analytics. Probability and statistics concepts will be reviewed as well as the R tool for statistical computing and graphics. Different types of data are investigated along with data summarization techniques and plotting methods. Data populations using discrete, continuous, and multivariate distributions are explored. Sampling methods and errors during measurements and computations are analyzed in the course. String manipulations and data wrangling methods are examined in detail. The concepts covered in the course are demonstrated using R. Laboratory Course.

Course Prerequisites

MET CS 546 - Introduction to Probability and Statistics, or equivalent

Course Grading Policy

The course grade will be based on class participation and in-class labs (20%), in-class quizzes (30%), mid term exam (20%), and final exam (30%).

Course Web Site

- <https://learn.bu.edu>

References

Reference Books

- "Introduction to Probability and Statistics Using R", by G. Jay Kerns, 2010. ISBN13: 978-0-557-24979-4. **(Reference book)**
<https://ipsur.r-forge.r-project.org/book/download/IPSUR.pdf>
- "Using R for Introductory Statistics, 2nd edition", by John Verzani, CRC Press, 2014. ISBN13: 978-1466590731. **(Reference book)**
- "R for Everyone: Advanced Analytics and Graphics, 2nd Edition", by Jared P. Lander, Addison-Wesley Professional, 2017. ISBN13: 978-0134546926. **(Reference book)**

Student Conduct Code

[Please review the academic conduct code](#)

Tentative Course Schedule

- **Module 1 -- Introduction (1/22, 1/29)**
 - Introduction to Statistics
 - Basic Concepts of R -- Data Types and Structures
 - *In class lab and In Class Quiz*
- **Module 2 -- Probability (2/5, 2/12)**
 - Probability
 - Conditional Probability
 - Basic Concepts of R -- Programming Constructs
 - *In class lab & In Class Quiz*
- **Module 3 -- Data Description & Visualization (2/21, 2/26)**
 - Univariate Data, Bivariate Data, Multivariate Data
 - Visualization using Base R
 - Using Plotly & ggplot2 for Visualization
 - *In class lab & In Class Quiz*
- **Mid Term Exam (March 4th)**
- **Module 4 -- Distributions (3/18, 3/25)**
 - Discrete Distributions
 - Continuous Distributions
 - *In class lab & In Class Quiz*
- **Module 5 -- Central Limit Theorem, Sampling, Dashboards (4/1, 4/8)**
 - Central Limit Theorem
 - Sampling & Resampling Methods
 - Errors
 - RMarkdown and Dashboards
 - *In class lab*
- **Module 6 -- Data Wrangling, Strings (4/22, 4/29)**
 - Data Wrangling -- dplyr and tidyr
 - Summarizing, Grouping, and Joining Data
 - Strings and Regular Expressions
 - *In class lab & In Class Quiz*
- **Final Exam (May 6th)**