

# *MET CS544 A1 (Fall 2022) - 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 (10%), in-class quizzes (40%), assignments (20%), and final exam (30%). Assignments are expected to be submitted by their respective due dates. Late submissions carry a penalty.

### *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://github.com/gjkerns/IPSUR/blob/master/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**
  - Introduction to Statistics
  - Basic Concepts of R -- Data Types and Structures
  - *Assignment1 Due, Quiz1 Due: ...*
- **Module 2 -- Probability**
  - Probability
  - Conditional Probability
  - Basic Concepts of R -- Programming Constructs
  - *Assignment2 Due, Quiz2 Due: ...*
- **Module 3 -- Data Description & Visualization**
  - Univariate Data, Bivariate Data, Multivariate Data
  - Visualization using Base R
  - Using Plotly & ggplot2 for Visualization
  - *Assignment3 Due, Quiz3 Due: ...*
- **Module 4 -- Distributions**
  - Discrete Distributions
  - Continuous Distributions
  - *Assignment4 Due, Quiz4 Due: ...*
- **Module 5 -- Central Limit Theorem, Sampling, Dashboards**
  - Central Limit Theorem
  - Sampling & Resampling Methods
  - Errors
  - RMarkdown and Dashboards
  - *Assignment5 Due, Quiz5 Due: ...*
- **Module 6 -- Data Wrangling, Strings**
  - Data Wrangling -- dplyr and tidyr
  - Summarizing, Grouping, and Joining Data
  - Strings and Regular Expressions
  - *Assignment6 Due, Quiz6 Due: ...*
- **Final Exam**