

ROWAN UNIVERSITY
Department of Mathematics

Master Syllabus

STAT 02.265 – Basics of Statistical Computing (3sh)

CATALOG DESCRIPTION:

This is an introductory course in programming-based statistical software packages. Students will learn core ideas of programming such as objects, data structures, looping, and functions. Students will also learn how to read data from different types of files, format them appropriately, and use them to perform basic statistical analysis, such as graphing and computing numerical summaries, or more advanced statistical analyses, such as one or two sample T-tests, z-test for proportions, correlation analysis, and multiple linear regression.

OBJECTIVES:

Students will demonstrate the ability to

- Propose an appropriate statistical analysis for a given situation
- Check the assumptions of a proposed analysis and confirm its validity
- Use relevant command-based software packages to perform statistical analysis
- Interpret the results of a given statistical analysis in context
- Communicate effectively using appropriate statistical terminology

PREREQUISITES:

C- or better in STAT 02260 Statistics I OR STAT 02320 Concepts in Statistical Data Analysis
OR STAT 02284 Statistics for the Biomedical Sciences OR STAT 02280 Biometry

CONTENT:

- Introduction:
 - Structure and type of data
 - Rules and syntax of commands
 - Creating objects
 - Creating, editing, and running a program
- Advanced programming:
 - User defined functions
 - Vectorization
 - Running programs in batch mode
 - Creating tables for Word, the Web, or Latex
- Working with data sets:
 - Reading data from files (Plain text, Excel)
 - Cleaning data

- Restructuring data
- Manipulating data (creating additional variables, transformation)
- Merging, sorting, and splitting data sets
- Exporting datasets to files (excel, plain text)
- Comparing datasets
- Basic statistical analyses:
 - Creating basic graphical displays (Pie/Bar charts, Histograms, Boxplots, Scatterplots)
 - Embellishing graphs
 - Saving graphs in files (PDF, EPS, JPG)
 - Computing and interpreting numerical summaries (mean, median, mode, SD, IQR, kurtosis, skewness, etc.)
 - Computing frequency tables.
- Advanced statistical analyses:
 - Assessing Normality
 - One and Two sample t-tests
 - Crosstabulation and Chi-square tests for categorical data
- Correlation Analysis:
 - Simple Linear Regression
 - Assessing Model fit/Diagnostics (residual plot, NQQ plots, etc.)
 - Data transformations
 - Multiple Linear Regression
 - Models with categorical predictors (dummy)

SUGGESTED TEXTS:

There is no single text which contains both the programming and statistical topics. A collection of open-source materials is recommended instead.

- [Python for Everybody](#)
- [Linked-In Learning Python Essentials Course](#)
- [W3 School Python Tutorials](#)
- [OpenIntro Textbooks](#)
- [Openstax Textbooks](#)
- [StatKey Applets](#)

Edited: 10/2024