FLORIDA STATE COLLEGE AT JACKSONVILLE

COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER: COP 2073C

COURSE TITLE: Introduction to Statistical Programming with R

PREREQUISITE(S): COP 1000C

COREQUISITE(S): None

CONDITION(S): Students are strongly recommended to take STA 2023 prior to enrollment in this course.

CREDIT HOURS: 3

CONTACT HOURS/WEEK: 4

CONTACT HOUR BREAKDOWN:

Lecture/Discussion: 3

Laboratory: 1

Other:

FACULTY WORKLOAD POINTS: 3.7

STANDARDIZED CLASS SIZE

ALLOCATION: 24

CATALOG COURSE DESCRIPTION:

This course introduces concepts of statistical programming, with a focus on the use of the R programming language and the RStudio programming environment. Students will learn base R language concepts including data types, functions, and packaging and will work with tidyverse and other packages commonly used in data science applications for data acquisition, analysis, and visualization. Students will develop R applications which use the language for probability and distribution analysis, correlation and linear regression, calculating confidence intervals, and hypothesis testing.

SUGGESTED TEXT(S): Davies, Tilman. The Book of R: A First Course in Programming and Statistics. No Starch Press, latest edition, 978-1593276515  
  
Wickham, H. *R for data science*: Import, tidy, transform, visualize, and model data. Sebastopol, Calif.: O'Reilly Media, latest edition. 978-1491910399

SUGGESTED SUPPLEMENTAL RESOURCES: Web Resource: An introduction to R. *The R Foundation.* Retrieved from doi: cran.r-project.org/doc/manuals/r-release/R-intro.html

IMPLEMENTATION DATE: Fall Term 2018 (2188) - Proposal 2018-32

REVIEW OR MODIFICATION DATE: Spring Term 2020 (2202) - Proposal 2019-42

Fall Term 2022 (2228) – Proposal 2022-10

COURSE TOPICS CONTACT HOURS

PER TOPIC

1. Overview of Statistical Programming Concepts 2

A. The Data Life Cycle in R: Acquisition, Analysis, and Reporting

1. Overview of the R Programming Language 3
2. Using R Packages 3
3. Data Types, Datasets, and Data Structures 6
4. Input, and Output 3
5. Visualization 3
6. Mathematical and Statistical Functions 9

A. Basic Mathematical Functions

B. Basic Statistical Functions

C. Probability Functions and Distributions

D. Correlation and Linear Regression Functions

E. Calculating Confidence Intervals

F. Hypothesis Testing

1. Writing Custom Functions 3
2. Debugging 2
3. Building Custom R Packages 3
4. The Tidyverse 8

A. Tibbles

B. Manipulating data with dplyr

C. Modeling data with Modelr

D. Visualizing Data with ggplot2

E. Pipes

1. Laboratory projects 15

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| **Florida State College at Jacksonville** | **Course Learning Outcomes and Assessment** |

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| **SECTION 1** | | | | | | | | | | | | | | | | | | | | | | | |
| Course Prefix and Number: | | | | | COP 2073C | | | | | | | | | | Semester Credit Hours (Credit): | | | | | | | | 3 |
| Contact Hours (Workforce): | | | | | | | |  |
| Course Title: | | | | | Introduction to Statistical Programming with R | | | | | | | | | | | | | | | | | | |
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| **SECTION 2a *(To be completed for General Education courses only.)*** | | | | | | | | | | | | | | | | | | | | | | | |
| ***TYPE OF COURSE (Place an “X” in the box next to those that are applicable.)*** | | | | | | | | | | | | | | | | | | | | | | | |
|  | General Education Core (If selected, core discipline area will be identified in Section 4.) | | | | | | | | | | | | | | | | | | | | | | |
|  | General Education (If selected, you must also complete Section 4, Section 5, and Section 8) | | | | | | | | | | | | | | | | | | | | | | |
| **SECTION 2b** | | | | | | | | | | | | | | | | | | | | | | | |
| ***TYPE OF COURSE (Place an “X” in the box next to those that are applicable.)*** | | | | | | | | | | | | | | | | | | | | | | | |
| X | A.A. Elective | | | | | | | X | | A.S. Required Course | | | | | | | | | X | A.S. Professional Elective | | | |
|  | A.A.S. Required Course | | | | | | |  | | A.A.S. Professional Elective | | | | | | | | | X | Technical Certificate | | | |
|  | PSAV/Clock Hour/Workforce | | | | | | |  | | Development Education | | | | | | | | |  | Apprenticeship | | | |
| X | Upper Division/Bachelors | | | | | | |  | | Other: | | If selected, use this space to title “other” option. | | | | | | | | | | | |
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| **SECTION 3** | | | | | | | | | | | | | | | | | | | | | | | |
| ***INTELLECTUAL COMPETENCIES (Place an “X” in the box next to those that are applicable.)*** | | | | | | | | | | | | | | | | | | | | | | | |
|  | | Reading |  | Speaking | | |  | | Critical Analysis | | | | |  | | | Qualitative Skills | | | |  | Scientific Method of Inquiry | |
|  | | Writing |  | Listening | | |  | | Information Literacy | | | | |  | | | Ethical Judgement | | | |  | Working Collaboratively | |
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| **SECTION 4 *(To be completed for General Education courses only.)*** | | | | | | | | | | | | | | | | | | | | | | | |
| ***GENERAL EDUCATION DISCIPLINE AREA (Place an “X” in the box next to those that are applicable.)*** | | | | | | | | | | | | | | | | | | | | | | | |
|  | Communications | | | | |  | | | | Humanities | | |  | | | Mathematics | | | | | | | |
|  | Social and Behavioral Sciences | | | | | | | | | | | |  | | | Natural Sciences | | | | | | | |
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| **SECTION 5 *(To be completed for General Education courses only.)*** | | | | | | | | | | | | | | | | | | | | | | | |
| ***GENERAL EDUCATION LEARNING OUTCOME AREA (Place an “X” in the box next to those that are applicable.)*** | | | | | | | | | | | | | | | | | | | | | | | |
|  | Communication | | | | |  | | | | Critical Thinking | | |  | | | Information Literacy | | | | | | | |
|  | Scientific and Quantitative Reasoning | | | | | | | | | | | |  | | | Global Sociocultural Responsibility | | | | | | | |
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| **SECTION 6** | | | | | | | | | | | | | | | | | | | | | | | |
| ***LEARNING OUTCOMES*** | | | | | | | | | | | ***TYPE OF OUTCOME***  ***(General Education, Course or Program)*** | | | | | | | ***METHOD OF ASSESSMENT*** | | | | | |
| Describe and provide examples of statistical programming concepts | | | | | | | | | | | Course | | | | | | | Quiz, test, or assignment | | | | | |
| Describe characteristics of the R programming language, the structure of an R program, and implement a simple R program | | | | | | | | | | | Course | | | | | | | Quiz, test, or assignment | | | | | |
| Describe an R package, list examples of commonly used packages, and implement an R program which utilizes one or more common R packages. | | | | | | | | | | | Course | | | | | | | Quiz, test, or assignment | | | | | |

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| **SECTION 6 (continued)** | | |
| ***LEARNING OUTCOMES*** | ***TYPE OF OUTCOME***  ***(General Education, Course or Program)*** | ***METHOD OF ASSESSMENT*** |
| Describe the data types and structures used by the R programming language and implement an R program which uses R data types and structures | Course | Quiz, test, or lab assignment |
| Describe the Data Life Cycle and how it is implemented in R | Course | Quiz, test, or lab assignment |
| Describe how input and output is performed in R data is managed in R and implement an R program which demonstrates data input and output | Course | Quiz, test, or lab assignment |
| Describe the common mathematical and statistical functions used in R and implement programs which use those functions, including functions related to probability, correlation, linear regression, and confidence intervals | Course | Quiz, test, or lab assignment |
| Describe the process of hypothesis testing using R and implement a program which demonstrates hypothesis testing | Course | Quiz, test, or lab assignment |
| Describe and implement programs using the visualization tools available in R | Course | Quiz, test, or lab assignment |
| Describe the process used to debug an R program | Course | Quiz, test, or lab assignment |
| Describe the process used to build a custom package in R and implement a custom R package | Course | Quiz, test, or lab assignment |
| Describe the tidyverse system | Course | Quiz, test, or lab assignment |
| Describe the dplyr package and implement an R program which uses dplyr to manipulate data | Course | Quiz, test, or lab assignment |
| Describe the modelr package and implement an R program which uses modelr to model data | Course | Quiz, test, or lab assignment |
| Describe the ggplot2 package and implement an R program which uses the ggplot2 package to visualize data | Course | Quiz, test, or lab assignment |
| Describe the pipe operator and implement an R program which uses pipes | Course | Quiz, test, or lab assignment |

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| **SECTION 7** | | | |
| Faculty name(s): | David Singletary | Date: | 2/18/2022 |