

**STA 503 Introduction to R
Fall Semester**

Professor:	_	Phone: 610-436-__
Email:	_@wcupa.edu	Office: Building Room
Office Hours:	Day 1 Day 2 Day 3	

Prerequisites: None

Required Materials: None

Course Description: This is an introductory course in R programming. The major topics include setting up Rstudio, R data objects, data input/output, built-in and user-defined R functions, control statement and looping, basic R plot functions, commonly used R libraries, and R markdown.

Applicable Programmatic Student Learning Outcomes:

1. Demonstrate an understanding of probability and statistical inference, including the fundamental laws of classical probability, discrete and continuous random variables, expectation theory, maximum likelihood methods, hypothesis testing, power, and bivariate and multivariate distribution theory.
2. Demonstrated the ability to apply the elementary methods of statistical analysis, namely those based on classical linear models, categorical methods, and non-parametric ideas to perform data analysis for the purposes of statistical inference.
3. **Demonstrate proficiency in the effective use of computers for research data management and for analysis of data with standard statistical software packages, particularly SAS.**
4. Learn to develop and critically assess design of experimental studies and the collection of data.
5. Apply one or more methods of statistical inference to a particular area of interest, particularly the program in the elective concentration.
6. Gain practical experience in statistical consulting and communicating with non- statisticians, culminating with interaction with research workers at a local company as part of the internship practicum.

Course Student Learning Outcomes:

Students will be able to: **(All relate to PSLO 3)**

1. Write programs in R to perform sequential execution, arithmetic, and logical expressions.
2. Use standard control structures and functional abstraction.
3. Write programs to achieve data structuring and data visualization.
4. Use the R libraries such as *tidyverse* and *ggplot2* for basic data management.
5. Apply programming knowledge in exploring real-world datasets and writing reusable data tools.

Meeting & Assessing Student Learning Outcomes:

The course learning outcomes will be evaluated in the following components

- (1). 5 coding assignments (15%)
- (2). Final project (20%)
- (3). Class participation (5%).

R Markdown is required for all assignments and the final project.

Attendance Policy: This is an online class. Nonetheless students are still expected to monitor their email regularly as detailed in the Email Policy below.

Tentative Course Outline:

1. Introduction (Weeks 1-2)
 - 1.1. R Language
 - 1.2. R Studio: Installation and introduction
 - 1.3. Running R code
 - 1.4. R libraries
 - 1.5. R Markdown: An analytics communication tool
 - 1.6. R Scripting Workflow
 - 1.6.1. Coding basics – conventions
 - 1.6.2. Calling built-in and user-defined functions
 - 1.7. R library – Tidyverse()
 - 1.8. Pipes in R: what is it? Why use it? How to use it?
2. Import/Output and R Objects (Weeks 3-4)
 - 2.1. R library – Tidyverse()
 - 2.2. Pipes in R: what is it? Why use it? How to use it?
 - 2.3. Reading data into R: different formats from both a local machine and remote servers
 - 2.4. Writing R data to a file (with different formats)
 - 2.5. Overview of R objects: vectors, matrices, data frames, lists, factors, dates, etc.
 - 2.6. Tibbles
3. Basic Data Manipulations (Weeks 5-6)
 - 3.1. Data layouts – only focusing on rectangular layouts (data frames / tibbles)
 - 3.2. Reshaping data frames
 - 3.3. Adding new attributes to data – mutate(),
 - 3.4. Sub-setting and merging data – filter(), arrange(), select(), merge(), which(), etc.
 - 3.5. Working with R strings
4. Vectors (Weeks 7-8)
 - 4.1. Types of atomic vectors
 - 4.2. Working with atomic vectors
 - 4.3. Recursive vectors - list
 - 4.4. Augmented vectors – factors
5. Writing R function (Weeks 9-10)
 - 5.1. What, why and when R functions

- 5.2. Structure of R function
- 5.3. Conditional execution and coding styles
- 5.4. Passing parameters to R functions
- 5.5. Return R objects
- 5.6. Scoping

- 6. Looping (Weeks 11-12)
 - 6.1. For loop and variations
 - 6.1.1. Loop patterns
 - 6.1.2. Loop with unknown output length
 - 6.1.3. Loop with an unknown sequence length
 - 6.2. Map functions: shortcuts and base R functions : lapply() and sapply()
 - 6.3. Implicit loop

- 7. R basic functions for visualizations (Weeks 13-14)
 - 7.1. Plot()
 - 7.2. Arrange plots with par(), layout(), split.screen(), etc
 - 7.3. Basic plot with ggplot2()
 - 7.4. Effective plots: annotations and animations

Evaluation & Grading:

A letter grade will be assigned based on performance in the course, according to the following scale:

Grade	Quality Points	Percentage Equivalents	Interpretation
A	4.00		Superior graduate attainment
A-	3.67		
B+	3.33		Satisfactory graduate attainment
B	3.00		
B-	2.67		
C+	2.33		Attainment below graduate expectations
C	2.00		
C-	1.67		
F	0	< 70%	Failure

D grades are not used. Refer to the Graduate Catalog for description of NG (No Grade), W, & other grades.

Statements Common to All WCU Graduate Syllabi:

ACADEMIC & PERSONAL INTEGRITY

It is the responsibility of each student to adhere to the university's standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Other violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another's work and/or using ideas of another and presenting them as one's own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Proof of academic misconduct can result in the automatic failure and removal from this course. For questions regarding Academic Integrity, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to the Department Graduate Handbook, the Graduate Catalog, the *Ram's Eye View*, and the University website at www.wcupa.edu.

STUDENTS WITH DISABILITIES

If you have a disability that requires accommodations under the Americans with Disabilities Act (ADA), please present your letter of accommodations and meet with me as soon as possible so that I can support your success in an informed manner. Accommodations cannot be granted retroactively. If you would like to know more about West Chester University's Services for Students with Disabilities (OSSD), please visit them at 223 Lawrence Center. The OSSD hours of Operation are Monday – Friday, 8:30 a.m. – 4:30 p.m. Their phone number is 610-436-2564, their fax number is 610-436-2600, their email address is ossd@wcupa.edu, and their website is at www.wcupa.edu/ussss/ossd.

REPORTING INCIDENTS OF SEXUAL VIOLENCE

West Chester University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment and to comply with Title IX of the Education Amendments of 1972 and guidance from the Office for Civil Rights, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator, Ms. Lynn Klingensmith. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred to the person designated in the University protection of minors policy. Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at the webpage for the Office of Social Equity at <http://www.wcupa.edu/admin/social.equity/>.

EXCUSED ABSENCES POLICY

Students are advised to carefully read and comply with the excused absences policy, including absences for university-sanctioned events, contained in the WCU Graduate Catalog. In particular, please note that the "responsibility for meeting academic requirements rests with the student," that this policy does not excuse students from completing required academic work, and that professors can require a "fair alternative" to attendance on those days that students must be absent from class in order to participate in a University-Sanctioned Event.

EMERGENCY PREPAREDNESS

All students are encouraged to sign up for the University's free WCU ALERT service, which delivers official WCU emergency text messages directly to your cell phone. For more information, visit www.wcupa.edu/wcualert. To report an emergency, call the Department of Public Safety at 610-436-3311.

ELECTRONIC MAIL POLICY

It is expected that faculty, staff, and students activate and maintain regular access to University provided e-mail accounts. Official university communications, including those from your instructor, will be sent through your university e-mail account. You are responsible for accessing that mail to be sure to obtain official University communications. Failure to access will not exempt individuals from the responsibilities associated with this course.