

<b>Course Information*</b>	<p>Course Title: <b>94-842 Programming R for Analytics</b></p> <p>Instructor: Zbigniew Zdziarski (zzdziarski@australia.cmu.edu)</p> <p>Office Hours: by appointment</p>
<b>Prerequisites (if applicable)</b>	<p>Some prior computer programming training or experience.</p>
<b>Description*</b>	<p>R is a powerful cross-platform programming language and environment designed for statistical computing. From the website of the R Project:</p> <p style="padding-left: 40px;">R provides a wide variety of statistical (linear and nonlinear modelling, classical statistical tests, time-series analysis, classification, clustering, ...) and graphical techniques, and is highly extensible.</p> <p>In Programming R for Analytics, students will learn to use the R programming language, along with the associated RStudio development tools. This course will introduce students to standard programming practices and basic data analytics using R. Through hands-on assignments and projects, students will develop proficiency with data exploration, analysis and visualization using R.</p>
<b>Course Materials (if applicable)</b>	<p>There are no required textbooks for this course, but the following list of recommended books will give you valuable references for R programming:</p> <ul style="list-style-type: none"> <li>• Phil Spector, <a href="#">Data Manipulation with R</a></li> <li>• Paul Teetor, <a href="#">The R Cookbook</a></li> <li>• Winston Chang, <a href="#">The R Graphics Cookbook</a></li> <li>• Norman Matloff, <a href="#">The Art of R Programming: A Tour of Statistical Software Design</a></li> </ul> <p>Additionally, like any programming language, R has a wide variety of comprehensive online resources available. A few that are particularly relevant to this course are listed below:</p> <ul style="list-style-type: none"> <li>• <a href="#">R Style guide</a></li> <li>• <a href="#">An Introduction to Factors in R</a></li> <li>• <a href="#">A brief introduction to apply in R</a></li> <li>• <a href="#">ggplot2 cheatsheet</a></li> <li>• <a href="#">The odds ratio: calculation, usage, and interpretation</a></li> <li>• <a href="#">Fisher's exact test</a></li> <li>• <a href="#">Pearson's Chi-squared test</a></li> </ul>

<b>Evaluation Method</b>	Grade Distribution 5 Weekly Homework Assignments 25%  Lab Participation 10%  Quizzes 30%  Final Project 35%
<b>Learning/Course Objectives*</b>	By the end of this course, students will achieve: <ul style="list-style-type: none"> <li>• Familiarity with the R programming language and the RStudio development environment</li> <li>• Hands-on experience using various basic data formats and file types in R</li> <li>• Comfort importing, manipulating, and exporting complex data sets using R</li> <li>• Experience using basic statistical analysis tools in R to analyze data sets</li> <li>• Experience visualizing data sets and present analysis findings graphically using a variety of methods</li> <li>• A working understanding of when to use R, as opposed to other programming tools, to meet data analytics needs</li> </ul>
<b>Grading Scale*</b>	A+ 97.00 – 100.00% A 93.00 – 96.99% A- 90.00 – 92.99% B+ 87.00 – 89.99% B 83.00 – 86.99% B- 80.00 – 82.99% C+ 77.00 – 79.99% C 73.00 – 76.99% C- 70.00 – 72.99%  * No A+ grades will be given for homework assignments: A is the maximum for these (and more-or-less expected)
<b>Course/Topical Outline:*</b>	<ul style="list-style-type: none"> <li>• Week 1 – Introduction and Basics (Basics of R, RStudio, R Markdown; basic data types and operations; vectors, creating sequences, common functions; R Style basics)</li> <li>• Week 2 – Data Frames and Lists (Importing tabular data; data frames; simple summaries of categorical and continuous data; lists)</li> </ul>

	<ul style="list-style-type: none"> <li>• Week 3 – Data Cleaning Tasks (Common data cleaning tasks; writing functions in R; if/else statements; for/while loops; using apply() to iterate over data; using with() to specify environment)</li> <li>• Week 4 – Data Summaries and Graphics (Introduction to plyr; multivariate statistical summaries; ggplot2 graphics)</li> <li>• Week 5 – Statistical Tests and Models (Testing for differences in means between two groups; QQ plots; plotting confidence intervals; ANOVA)</li> <li>• Week 6 – Linear and Logistic Regression (linear and logistic regression and their interpretation; introduction to dplyr)</li> <li>• Week 7 – Shiny App Building (Shiny; interactive visualisations; course summary)</li> </ul> <p>* Subject to change</p>
<b>Schedule</b>	<p>Lectures, labs, and quizzes will be administered in-class. Labs and quizzes are mandatory and are due at the end of the class period with no exceptions granted. If you are traveling or otherwise cannot make a class, you must schedule a time before the beginning of class to complete the quiz/lab.</p> <ul style="list-style-type: none"> <li>• Week 1 – lecture and lab</li> <li>• Week 2 – homework 1 due/lecture/lab</li> <li>• Week 3 – homework 2 due/lecture/lab/quiz 1</li> <li>• Week 4 – homework 3 due/lecture/lab</li> <li>• Week 5 – homework 4 due/lecture/lab/quiz 2</li> <li>• Week 6 – homework 5 due/lecture/lab</li> <li>• Week 7 – group project due/lecture/lab/quiz 3</li> </ul> <p>Note: The schedule is subject to change.</p>

<b>Course Policies &amp; Expectations</b>	<p><b>Assignment Submission:</b></p> <p>Everything must be submitted in Canvas by the due date/time. There may be special occasions in which I ask for a printout version of your work in addition to the online submission – which must be handed in at the beginning of the class due date.</p> <p>If you experience upload problems with Canvas, email me your work for grading IMMEDIATELY, AND PRIOR TO, THE DUE DATE/TIME, along with a screenshot of the upload error. When emailing me your work, I also need you to email technical information to validate the issue (type out what the error message is that you are receiving, computer information, network information, file information, date/time of attempted upload, and screenshot of error) prior to the due date/time via email to me or you will receive a 0% on the corresponding assignment. I need the error information so I can validate your excuse with Canvas administration – it must be validated by error logging. If you contact me about Canvas submission issues after the due/date time, I cannot help you.</p> <p><b>Late Policy:</b></p> <p>Unless otherwise stated, no assignments will be accepted late. On the rare occasion that an assignment is announced that it can be submitted late, the assignment will be accepted with a penalty of 10% of the total worth of the assignment per day late, up to and including the late deadline announced. Do <i>*not*</i> ask me to make special exceptions for you and you alone – that is NOT fair to the rest of the class. NO assignments may ever be delivered by email. Please do not ask to have a Canvas assignment re-opened online for late submission. Budget for upload time to Canvas. All assignments are due by the start time of the class which it is due (unless otherwise noted).</p> <p><b>Students with Disabilities:</b></p> <p>Our community values diversity and seeks to promote meaningful access to educational opportunities for all students. CMU and your instructors are committed to your success and to supporting Section 504 of the Rehabilitation Act of 1973 as amended and the Americans with Disabilities Act (1990). This means that in general no individual who is otherwise qualified shall be excluded from participation in, be denied benefits of, or be subjected to discrimination under any program or activity, solely by reason of having a disability.</p>
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If you believe that you need accommodations for a disability, please contact us ASAP, and we will work together to ensure that you have the correct access to resources on campus to assist you through your coursework and time at CMU.

**Academic Integrity:**

Carnegie Mellon University sets high standards for academic integrity. Those standards are supported and enforced by students, including those who serve as academic integrity hearing panel members and hearing officers. The presumptive sanction for a first offense is course failure, accompanied by the transcript notation "Violation of the Academic Integrity Policy." The standard sanction for a first offense by graduate students may be suspension or expulsion. Please see <http://www.cmu.edu/academic-integrity/> for any questions.

**Cell Phones, Smartphones and other handheld wireless devices:**

Other than during class breaks, please silence ring tones and refrain from engaging in calls, messaging or other use during class time. All devices must not be visible during quizzes.

**Policy Regarding Students Using English as a Foreign Language:**

Assignments in this course are graded with reference to evidence of the acquisition of concepts, presentation format, and accuracy of information. Having done business in countries that use languages other than English, we understand that the use of an unfamiliar language can result in unusual word choices or grammatical errors that are not critical to the overall understanding of the information. Therefore, we will take into account your need to

function in a language that may be unfamiliar to you. We will provide feedback as appropriate if we feel that language or grammar you have used in assignments would be best if it were configured in a different way.

**Use of SU Canvas System for this course:**

The Heinz School uses Carnegie Mellon University's Canvas system to facilitate distance learning as well as to enhance main campus courses. In this course, we will use the Canvas system

generally to post lecture notes and related documents and to receive assignments electronically from students.

**Take care of yourself:**

Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.

All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful. If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services (CaPS) is here to help: visit their website at <http://www.cmu.edu/counseling/>. Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.

If you or someone you know is feeling suicidal or in danger of self-harm, call someone immediately, day or night:

- Emergency, police & ambulance 000 (24 hours)
- Lifeline Australia 13 11 14 (24 hours)
- Suicidal Call back Service 1300 659 467 (24 hours)

SANE helpline 1800 187 263 (Weekdays 10am-10pm AEST)

If you have questions about this or your coursework, please let me know.