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|  | R Shiny for Operations |
| **Tue/Thu - 4:30-5:50 pm, Location:** HBH 1004 |
| **Semester:** Mini 1**, Year:** 2018 |
| **Units:** 6**, Section(s):** 1 |

**Instructor information**

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| **Name** | Geoffrey Arnold |
| **Contact Info** | Email: [gla@andrew.cmu.edu](http://gla@andrew.cmu.edu) |
| **Office location** | TBD |
| **Office hours** | Thursdays 6:15-7:15 |

# **Course Description**

This course will teach students to generate interactive websites including GIS maps and other data visualizations and reports using the R programming language. The course will focus on RStudio’s Shiny web application framework for creating interactive web applications, and the Leaflet library package for mobile-friendly interactive maps. This course builds directly from its prerequisite course, Programming R for Analytics course, and offers students a chance to build skills that will be marketable in both the public and the private sectors. Students will learn to load data from a variety of sources and formats for use in interactive web interfaces that can provide real-time information, including Rest APIs.

# **Learning Objectives**

* Use R to generate interactive charts, maps, tables and graphs.
* Create, develop and deploy R Shiny web applications.
* Customize the appearance of Shiny applications using Shiny and CSS.
* Use Web API’s and DB Connectors to get data into Shiny applications.
* Use Human Centered Design principles.
* Use git and versioning to save, revert and troubleshoot code.

# **Learning Resources**

* Students will require a laptop capable of running R and R Studio for this course, and bring it to every class in order to follow along with lecture.
* Free user accounts for [GitHub](https://github.com/) and [shinyapps.io](http://www.shinyapps.io/).
* We will not be using Canvas in this class, instead all Course Documents, Assignments and Lectures can be found here: <https://github.com/RforOperations2018>
* There is no required text for this course, but supplemental websites and materials will be provided in addition to course lectures.
  + <http://www.wprdc.org/>
  + <https://data.world/>
  + <https://www.data.gov/>
  + <https://www.census.gov/data.html>
  + <https://datasf.org/opendata/>
  + <https://data.cityofchicago.org/>

# **Assessments**

The final course grade will be calculated using the following categories:

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| **Assessment** | **Percentage of Final Grade** |
| HW 1: Building a basic UI | 10% |
| HW 2: Filtering a Plot | 10% |
| Project 1: Create a Dashboard | 30% |
| HW 3: API Calls | 10% |
| HW 4: Leaflet Map | 10% |
| Project 2: Interactive Map | 30% |

All assignments will be turned in by providing a link to the student’s GitHub repository of their work. This will allow the instructor to view how the student’s code evolved over time, for some Homework Assignments only a few commits may be necessary, but it is anticipated that the projects students complete will require numerous commits. The number of commits will not impact a student’s overall grade. Once you are done you should email the url of your github repo to [gla@andrew.cmu.edu](http://gla@andrew.cmu.edu).

Assignments and projects are expected to follow [Google’s R Style Guide](https://google.github.io/styleguide/Rguide.xml).

Students will be assigned the following final letter grades, based on calculations coming from the course assessment section.

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| **Grade** | **Percentage Interval** |
| A+ | 97-100% |
| A | 93-96% |
| A- | 90-92% |
| B+ | 87-89% |
| B | 83-86% |
| B- | 80-82% |
| C+ | 77-79% |
| C | 73-76% |
| C- | 70-72% |
| D | 60-69% |
| R (F) | < 69% |

# **Grading Policies**

* **Late-work policy**: Because of the iterative nature of this course students expecting to get the most out of the course should stay up to date with assignments. Therefore, students without a valid excuse will not be eligible for a grade higher than 80% on any late assignment.
* **Make-up work policy**: Emergencies and unforeseeable events can and do occur. If a student has an emergency of some kind they must notify the Professor within 24 hours of end of the emergency. Students are expected to provide some kind of basic documentation of the event.
* **Attendance and/or participation policy**: Attendance is an important factor in learning the course material and seeking guidance from the professor, however no attendance will be taken. For students who may be sick or otherwise unable to attend class, lectures slides will be available online in advance on the course Github page.

# **Course Policies**

* **Academic Integrity & Collaboration**: While in many instances you may find yourself working on teams while programming and performing analysis Shiny apps are contained and it is required that you understand how all portions work. To this end, Students may work together on assignments, but each student is required to submit their own code/application. To ease the grading process Students should regularly commit their code milestones to Github, including things that did not work. Students who do not follow these guidelines will receive a C- or lower grade on the assignment in question.
* **Late-work/Make-up work policy**: If a student has an emergency of some kind they must notify the Professor within 24 hours of end of the emergency. Students are expected to provide some kind of basic documentation of the occurrence.
* **Accommodations for students with disabilities**: If you have a disability and require accommodations, please contact Catherine Getchell, Director of Disability Resources, 412-268-6121, getchell@cmu.edu. If you have an accommodations letter from the Disability Resources office, I encourage you to discuss your accommodations and needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate.
* **Statement on student wellness**: As a student, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. CMU services are available, and treatment does work. You can learn more about confidential mental health services available on campus at: <http://www.cmu.edu/counseling/>. Support is always available (24/7) from Counseling and Psychological Services: 412-268-2922.
* **Mobile Devices**: Using electronic devices not only detract from your learning experience but also that of your peers. Students are asked to keep their cell phones on vibrate and to keep them out of sight during lecture. If you have to take a call or respond to a message please leave the classroom. Students are permitted to use their cellphone during any in-class work time.

# **Course Schedule**

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| **Date** | **Class** | **Theme/Topic** | **Learning Outcomes Addressed** | **Assignment Due** |
| August 28th | Class 1 | Course Intro - GitHub | Use git and versioning to save, revert and troubleshoot code. |  |
| August 30th | Class 2 | Basic concepts of R Shiny apps | How to create, develop and deploy R Shiny web applications. |  |
| September 4th | Class 3 | ggplot2, plotly, Outputs | How to create, develop and deploy R Shiny web applications. |  |
| September 6th | Class 4 | Input Widgets, Filtering & Reactive Functions | Use R to generate interactive charts, maps, tables and graphs. | HW 1 |
| September 11th | Class 5 | Updates, Notifications, Values Lists, Events and Downloads | Use R to generate interactive charts, maps, tables and graphs. |  |
| September 13th | Class 6 | Shiny Dashboard, Flexdashboard | Use R to generate interactive charts, maps, tables and graphs. | HW 2 |
| September 18th | Class 7 | CSS Tricks and App Design and deploying apps to shinyapps.io | Customize the appearance of their Shiny applications using Shiny and CSS. |  |
| September 20th | Class 8 | Project Work Class |  | Project 1 |
| September 25th | Class 9 | Leaflet for R | Use R to generate interactive charts, maps, tables and graphs. |  |
| September 27th | Class 10 | Leaflet wrap-up & in-class work | Use R to generate interactive charts, maps, tables and graphs. | HW 3 |
| October 2nd | Class 11 | Using API’s and Databases | Use Web API’s and DB Connectors to get data into Shiny applications. |  |
| October 4th | Class 12 | Deploy on your own – Shiny Server Community & Pro, ShinyProxy | How to create, develop and deploy R Shiny web applications in other ways. | HW 4 |
| October 9th | Class 13 | Putting Users First: Human-Centered Approaches to Digital Product Design  & Course Evaluations | Use Human Centered Design principles. | Guest Lecturer: Robert Burack |
| October 11th | Class 14 | Project Work Class |  |  |
| October 16th | Reading Day | No class |  |  |
| October 18th | Exam Day | Final Project Due, No Class |  | Project 2 |