**EDPS 845: Computer-Assisted Research**

**Summer 2016 Syllabus**

**Course Info**

Course: EDPS 845, Section 301

Term: Pre-session, 2016

Location: TEAC 112

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**Course Summary**

This course provides an overview of the open-source software and programming language R, including its applications in simulating, manipulating, analyzing, modeling, and graphing data. Functional programming and R package development will also be addressed. Prerequisites include EDPS 859: Introductory Statistics and one additional statistics course.

After completing this course, you will be able to:

* Describe the fundamentals of the R programming language
* Read and write data in various sources and formats
* Manipulate data via their shape, class, and structure
* Write efficient functional solutions to analytical and computational problems
* Utilize R’s graphing capabilities effectively to visualize data and results

**Materials**

All the software tools we will use in this course are freely available online. Electronic copies of the textbooks for the course are also free online, with printed copies available for purchase. Here's what you'll need to get started:

* R, available at [cran.r-project.org/ (Links to an external site.)](http://cran.r-project.org/)
* RStudio, IDE for R, available at [www.rstudio.com/ (Links to an external site.)](https://www.rstudio.com/)
* Git, accessed via the command line, available at [git-scm.com/ (Links to an external site.)](https://git-scm.com/)
* *An Introduction to R,* Venables, Smith and the R Core Team, PDF at [https://cran.r-project.org/doc/manuals/ (Links to an external site.)](https://cran.r-project.org/doc/manuals/)
* *Advanced R*, by Hadley Wickam, available at [adv-r.had.co.nz/ (Links to an external site.)](http://adv-r.had.co.nz/)
* *R Packages*, also by Hadley Wickam, available at [r-pkgs.had.co.nz/ (Links to an external site.)](http://adv-r.had.co.nz/)

We'll also be using a website called GitHub to share and collaborate on programming projects. Git is a popular open-source versioning software that you'll learn in week 1. You'll need to create an account at [https://github.com/ (Links to an external site.)](https://github.com/). Then, you can access and contribute to the GitHub repository for the course, at [https://github.com/talbano/edps-845 (Links to an external site.)](https://github.com/talbano/edps-845)

**Grading**

This course is offered pass/no pass. To earn a pass, you need to complete and pass the two required assignments, and two programming projects.

* Assignment 1: Demonstrate your mastery of concepts and procedures from *An Introduction to R*, chapters 1 through 10. An assignment document with instructions and exercises will be provided.
* Assignment 2: Complete all "Exercises" in *Advanced R* chapters 1 through 9, saving your R code in R syntax files as you go. Add comments to explain what each line or block of code is intended to do, and what chapter and section of the book it comes from.
* Project 1: Contribute functionality to an existing R package on GitHub, with your development tracked via Git. The functionality should encompass a stand-alone statistical or related procedure, and should be accompanied by documentation written with Roxygen2. You need to get approval for your project before you begin.
* Project 2: Develop a stand-alone R package, with documentation, using Git, posted to a GitHub repository. This is a group project, with group assignments made during week 2, and two students per group. You must again get approval for your project.

**Some Standard Policies**

Statement of academic dishonesty: Academic honesty is essential to the existence and integrity of an academic institution. The responsibility for maintaining that integrity is shared by all members of the academic community. To further serve this end, the University supports a Student Code of Conduct that addresses the issue of academic dishonesty.

Diversity statement: The University of Nebraska-Lincoln is committed to a pluralistic campus community through Affirmative Action and Equal Opportunity. We assure reasonable accommodation under the Americans with Disabilities Act. Students with disabilities are encouraged to contact me for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.

This is EDPS 845: Computer-assisted Research, section 301, scheduled for pre-session 2016.

This course is offered in a hybrid format, with in-person meetings Monday through Wednesday, 9:30 AM to 1:30 PM in TEAC 112, and online activities substituting for the remaining meeting time. For an overview of the course, with details on grading and contact info, see the [Course Syllabus](https://canvas.unl.edu/courses/383/assignments/syllabus).

Below is a tentative course outline with a rough reading schedule and due dates for assignments. Besides readings posted in the syllabus, additional readings and other resources will be posted in the [Files Index](https://canvas.unl.edu/courses/383/files).

The main readings/textbooks for this course include An Introduction to R (INTR), Advanced R (ADVR), and R packages (RPKG). See the syllabus for links. An Introduction to R is provided for free from the developers of R. You can download the PDF at the link in the syllabus. The second two "books" are written by Hadley Wickam, creator of RStudio. From what I can tell, the free electronic versions are identical to the paid printed versions.

**Preparing for Day One**

Before the start of class on May 16, you need to do three things. First, make sure you've correctly downloaded and installed all the required software, including R, RStudio, and Git. Create an account at GitHub. See the syllabus for links. On day one, we will check that you have everything installed and ready.

Second, get and skim through all the required texts for the course. Conduct a self-assessment as you go to determine where you're at, what interests you, and what you hope to get from the course. You'll describe the results of this self-assessment in class on day one.

Third, download and review chapters 1 through 10 in INTR. See the link in the syllabus. These chapters cover the basics of R and are considered prerequisite material for the course. We will review them on day one, but you should be comfortable with them thereafter.

**Tentative Course Outline**

This is subject to change, as we will tailor the content and speed to your needs. However, the due dates for assignments are pretty firm. If you can't attend for in-person meetings, you should arrange to get notes from someone, and make sure you're caught up with readings and assignments/projects by the end of a given week. Plan on lots of screen time. And email me as often as needed. A = assignment, P = project.

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| --- | --- | --- | --- | --- |
| **Week** | **Date** | **Topics** | **Reading Due** | **Assignment Due** |
| 1 | 5/16 | **Getting up to speed**   1. Introductions 2. Review assignments and project ideas 3. Check that you have downloaded all required software 4. Review INTR chapters 1 (Introduction and preliminaries) through 9 (Grouping, loops, and conditional execution) 5. Practice Git and R 6. Introduce A1 | INTR C1-C9 |  |
|  | 5/17 | **Beginning R programming**   1. Review INTR chapters 11 (Statistical models) through 14 (OS facilities) 2. Data analysis using epmr and psych packages 3. Modeling using epmr and psych packages 4. Fork and clone class repo 5. Introduce A2 | INTR C11-C14 | A1 (for feedback) |
|  | 5/18 | **Advanced R programming**   1. Discuss topics for project 1 2. Review ADVR chapters 1 through 9 3. Practice Git and R 4. Contribute to class repo | ADVR C1-C9 | A2 (for feedback) |
|  | 5/19-5/20 | **On your own**   1. Choose and get approval for topic for project 1 2. Polish up and submit final versions of A1 and A2 |  | A1 and A2 (final)  Friday at 11:59 PM |
| 2 | 5/23 | **More advanced R programming**   1. Review A1 and A2 2. Review equate and epmr 3. Write functions together 4. Practice Git and R | INTR CH9  ADVR C10-C17 |  |
|  | 5/24 | **Function development and documentation**   1. Write more functions together 2. Start P1 together |  | P1 (for feedback) |
|  | 5/25 | **Package development**   1. Review RPKG chapters 1 to 6 2. Build a package together | RPKG  C1-C6 |  |
|  | 5/26-5/27 | **On your own**   1. Choose and get approval for topic for project 2 2. Submit summary and printout of git log for project 1 |  | P1 (final)  Friday at 11:59 PM |
| 3 | 5/30 | **Memorial Day** |  |  |
|  | 5/31-6/2 | **On your own**   1. Finish P2 2. Review P2 for another group 3. I'm checking email less religiously, expect delays in feedback |  | P2 (feedback)  Thursday at 11:59 PM |
|  | 6/3 | **Presession officially ends**   1. Get feedback from me on P2 and revise |  |  |
|  | 6/6 | **Submit P2** |  | P2 (final)  Monday at 11:59 PM |