Course syllabus: **Computer Programming Fundamentals and Bioinformatics in R**

This course is aimed at graduate students who have been briefly introduced to R in their coursework and want to understand the R programming language in more depth in order to use it in their research. It assumes no knowledge of computer science, and will cover introductory computer science concepts and vocabulary. Students will learn to create their own R functions, and will create small R packages as a final project. The course will also introduce analysis of DNA, RNA, and protein sequence data using BioConductor.

**Course Meeting**: M-205 Turner Hall (computer lab)

Lecture 9:00-10:50am Tuesday

Lab/Discussion 9:00-9:50am Thursday

Office hours after Thursday classes (10-11am) or by appointment.

**3 Credit Hours**

**Instructor:** Dr. Lindsay Clark

Dept. of Crop Sciences

279 Edward R. Madigan Laboratory

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**Planned course outline**

* Weeks 1-7: programming fundamentals and graphics
* Weeks 8-11: making reproducible and shareable code
* Weeks 12-15: bioinformatics

For more details, see the course schedule document.

**Grading Policy**:

The course will be graded on a 100-point scale:

Each week you will turn in answers to the lab exercises, worth three points. Labs will be worth 39 points total; the lowest lab grade or one absence will be dropped. You can turn in your answers at the end of lab period, or by 5PM Friday if you need more time.

There will be an in-class midterm on Oct. 23 worth 30 points, covering lecture and lab material through Oct. 11.

The final project, as outlined below, is worth 30 points. A short proposal for the final project is due Nov. 13 and worth 1 point.

**Final Examination**: As a final project, students will create their own R packages. Students may work alone or in groups. For group projects, the complexity of the R package is expected to be proportional to the number of people in the group. Project proposals are due Nov. 13 and should explain what the package will do, and in the case of group projects, which individuals are responsible for which components of the package. Please feel free to consult with the instructor about your project ideas as early and as often as you want. A single-person project might include one function to read in a particular data format, another function to perform an analysis, and another function to create a plot or export results, where each of these three functions is at least a couple dozen lines of code. The final project is due Dec. 18. If you would like feedback, you should send me a draft by Dec. 4 (and if some parts are incomplete, indicate which).

Final projects will be graded as follows:

Package will install in R 3.5 and performs all of the proposed tasks 50%

Documentation is sufficient for explaining how to use the package 20%

Code is well-commented and easy to read 20%

Code is efficient in terms of memory and computation time 10%

**Textbooks:** No textbook is required for this course. Below are two books, both available as online resources through the library, that might be helpful.

*Learning R* by Richard Cotton, ISBN: 978-1-4493-5710-8

*Software for Data Analysis: Programming with R* by John Chambers, ISBN: 978-0-387-75936-4

Cotton’s book is a nice straightforward introduction to the R language. Chambers is one of the creators of R, so his book delves deeper into the philosophy of R programming.

**Campus Policies**:

**Academic Integrity**: The University of Illinois at Urbana-Champaign *Student Code* should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: <http://studentcode.illinois.edu/> .

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: <http://studentcode.illinois.edu/>. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

**Students with Disabilities:** To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor as soon as possible. To insure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class should contact Disability Resources and Educational Services (DRES) and see the instructor as soon as possible. If you need accommodations for any sort of disability, please speak to me after class, or make an appointment to see me, or see me during my office hours. DRES provides students with academic accommodations, access, and support services. To contact DRES you may visit 1207 S. Oak St., Champaign, call 333-4603 (V/TDD), or e-mail a message to disability@uiuc.edu. <http://www.disability.illinois.edu/>.

**Emergency Response Recommendations:** Emergency response recommendations can be found at the following website: <http://police.illinois.edu/emergency/>. I encourage you to review this website and the campus building floor plans website within the first 10 days of class. <http://police.illinois.edu/emergency/floorplans/> .

**Family Educational Rights and Privacy Act (FERPA):** Any student who has suppressed their directory information pursuant to *Family Educational Rights and Privacy Act* (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See <http://registrar.illinois.edu/ferpa> for more information on FERPA.