

ISAT 252: Programming and Problem Solving (Sec 1)

Fall 2014

COURSE AND INSTRUCTOR INFORMATION

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| Meeting Times: | Guided Session: TR 11:00am-12:15pm in ISAT/CS 343 Open Lab: M 8pm-Midnight in ISAT/CS 343, 337, 336 (Hacking Session) |
| Instructor: | Nicole Radziwill, Ph.D., MBA |
| Office: | ISAT/CS 325 |
| Phone/SMS: | 703.835.6336 (SMS or Email 24/7) |
| Email: | nicole.radziwill@gmail.com |
| Office hours: | During Open Lab times, by Appointment, or Skype/gChat anytime |
| Teaching Assistant: | Paul Rose |
| TA Phone/SMS: | 703.473.8365 (SMS or Email 24/7) |

NATURE OF COURSE CONTENT

COURSE DESCRIPTION

“Computational Thinking” (<http://www.cs.cmu.edu/~CompThink/>) is a term coined by Jeanette Wing, Chair of the Computer Science Department at Carnegie-Mellon University. According to Wing, Computational Thinking:

- is a way of solving problems, designing systems, and understanding human behavior that draws on concepts fundamental to computer science. To flourish in today’s world, computational thinking has to be a fundamental part of the way people think and understand the world.
- means creating and making use of different levels of abstraction, to understand and solve problems more effectively.
- means thinking algorithmically and with the ability to apply mathematical concepts such as induction to develop more efficient, fair, and secure solutions.
- means understanding the consequences of scale, not only for reasons of efficiency but also for economic and social reasons.
- Computational thinking is NOT just for programmers, but represents a general approach to problem solving useful in most all disciplines. That is why the ISAT 252 course is a required part of our curriculum. You should begin to find the skills you learn here to be useful in a broad array of the problem-solving activities you’ll encounter in life.

The most important thing you will learn in this class is NOT how to program, but rather how to approach a problem, analyze a problem, design a solution to a problem, and implement a solution to a problem using strategies and techniques developed and honed in the programming community. You will also learn how to write real, practical, working programs **that directly contribute to your capabilities as an analyst.**

COURSE STYLE & DELIVERY

This course implements the **10 Principles of the Burning Mind Project** as its core value system. (<http://www.burningmindproject.org/the-ten-principles/>) As a result, the course is somewhat self-directed, blended (integrating online and in-class components) and gift-oriented.

- **Self-Directed:** After the first few weeks, you will prepare a work plan for the semester and work towards successfully achieving many of the activities you attempt. You are not required to complete all activities you attempt. You can work individually or in teams.
- **Blended:** Some of the work can be done online, at your leisure. There will be ample open lab time, with instructor guidance, provided for you to complete lab exercises and extend those lab exercises to create new explorations and new recipes.
- **Gift-Oriented:** In many classes, you may ask "what can I *get* out of taking this class?" However, in this course, we want you to ask the question "what can I *give* to others as a result of my participation in this class?" *Individual gifts* are an important component. As you explore the programming and analysis topics, we request that you identify things you are good at and could contribute to a larger, team project. You will have the opportunity to share interesting techniques each week during "Show and Tell". Then, your classmates can find you if they need your skills to build out a particular solution.

SCHEDULE

We will do the following modules together in August/September:

- Week 1: Introduction to R (Hello World!) and Introduction to GitHub
- Week 2: Data Structures (rforcats.net)
- Week 3: Data Acquisition & APIs
- Week 4: Provenance, Curation, and Data Management Plans
- Week 5: Creating Images and Working with Hyperspectral Data

The rest of the semester, you will have the option to work with our class on weekly exercises that will expand your awareness of various topics in computational thinking.

You will finalize or complete a project and presentation to share during finals week in December.

GOALS OF THE COURSE

By the end of this course, you will be comfortable with reading code, and writing code to help you analyze your data. You will have constructed a portfolio of code snippets to help you with basic data analysis tasks, which you will be able to use for future courses or for your job. You will understand the difference between data management and data curation, and know how to craft a data management plan for funding or for industry needs.

METHODS OF EVALUATION

GRADING

The goal of this course is to *produce artifacts* that demonstrate your understanding of the topics that we cover, and that *provide value* to real clients and/or real people (including your future self, your future colleagues, your instructors, the students within your learning community, and students who will participate in future learning communities by enrolling in ISAT 252).

Grading is based on *accrued points* for completing various tutorials and projects, to the satisfaction of the instructor and/or instructor-designated proxies. You get as many chances as you like within one development cycle to continually improve the quality of your work, but points can only be accrued for successful completion of a particular activity or artifact. There are 90+ available points outlined below. Items in italics are the 11 points we will complete together during the first three weeks of the course.

| 1 Point Each | 2 Points Each | 3 Points Each | 4 Points Each |
|---|--|--|---|
| <ul style="list-style-type: none">• Hello World exercise• Set up your personal Github repository• Demonstrating a cool thing you learned and sharing it with other students on our Facebook group and during in-class "Show and Tell" | <ul style="list-style-type: none">• Weekly exercises• Bonus points if your weekly exercise is exemplary and I ask you to share it with the class during a "Show and Tell" session | <ul style="list-style-type: none">• Creating a new lab or tutorial that we can use in future 252 classes• Completing a Data Management Plan (DMP) for your semester project using the provided checklist or DMPTool app• Presenting a semester-long team project during the final exam session | <ul style="list-style-type: none">• Completing a semester-long team project• Completing a nicely organized GitHub portfolio containing working code and relevant data sets |

(*) = REQUIRED

Grading rubrics for assessment of the team projects will be issued later in the semester.

Your work plan should take into consideration:

- That all exercises, labs, and new labs **must be checked off (and points received) by the middle of November**. It is important that everyone is able to relax and focus on their semester projects throughout the month of December.
- **The exercises provided to you are just "starting places"**. I would love to see you develop new labs this semester, or conduct real research projects that you can submit to arXiv.org and the new JMU Research Journal! Also, there are opportunities to help me with some more advanced research projects, and developing labs that I'd love to see (but that don't exist yet). These would be worth a variable number of points each depending upon how much I want to get them done. Inquire within!

Grading Guidelines: 25+ accrued points is an A, 18-25 is a B, 12-17 is a C, 8-11 is a D, below 8 is F. To receive a passing grade in this course, you should successfully conduct and complete at least one data analysis programming project of your own.

REQUIREMENTS & POLICIES

REQUIRED TEXTS and SOFTWARE

Matloff, N. (2011). The Art of R Programming. No Starch Press. 400 pages.
http://www.amazon.com/gp/product/1593273843/ref=as_li_tl?ie=UTF8&camp=1789&creative=390957&creativeASIN=1593273843&linkCode=as2&tag=qualandinnowe-20&linkId=YODI26KEJ7VW2TFR

You should also download and install the R Statistical Software from <http://www.r-project.org> - this is a great, FREE, open source package! It is also installed on the machines in the ISAT computer labs, but it is tremendously useful to have your own installation.

ADD/DROP DEADLINES

All of the dates related to adding, dropping, and withdrawing from this course are in the JMU catalog and are posted on the University Registrar's web site (<http://www.jmu.edu/registrar>). **YOU ARE RESPONSIBLE FOR KNOWING THESE DATES.** Professors are not required to grant grades of "WP" or "WF" after that date and I typically do not. I do not allow incompletes.

COURSE POLICIES AND PROCEDURES

Any accommodations (e.g. for sickness) must be made ahead of time with me. As long as there is a justifiable reason that I agree with, I will be as flexible as I can to help you complete the requirements for this course. The most important part is *setting my expectations effectively*.

Attendance and Participation

Attendance is, in general, required because we aim to be part of a vibrant learning community. I don't take attendance formally *but I do notice when people are missing, and your peers who need your expertise will also notice when you are missing*. The amount of understanding and flexibility you will get from me will be inversely proportional to the amount of class you miss.

Exams

Several exams will be given throughout the semester. Credit for completing the exam can be achieved in one of two ways: 1) by getting at least an 85 on the first attempt of the written exam, OR 2) by meeting with the instructor for an oral exam to remedy the deficiencies from the first attempt of the written exam.

Missed Exams

Make-up exams will not be given. There are a multitude of opportunities within this course to achieve the learning objectives so if a student is unable or unprepared to sit for an exam, he or she can choose from a suite of alternatives to demonstrate the course competencies.

Final Exam Session

Everyone is **required** to attend the scheduled exam session during finals week **for its full duration**. There will be no exceptions to this policy except in the case of dire emergency (e.g. you unexpectedly had to get your appendix out the day before and just can't show up. "My girlfriend's ride to the airport fell through and I had to take her" isn't dire. I'm sure she has more friends than just you. If not, you should encourage her to develop more friendships.)

Special Needs

If you are a student who is registered with the Office of Disabilities, I need to be given written documentation to support your situation in order to provide you with any accommodations (this is required by law). YOU are responsible for pre-arranging with me to provide accommodations (e.g., additional time for an exam). I suggest an email a few days ahead of time so that arrangements can be made. In your email, you need only say that you are contacting me to arrange for your accommodation; you do not need to elaborate in your email. It is ALWAYS necessary to work things like this out in advance.

Honor Code

You are expected to abide by the JMU Honor Code at all times. Examples of academic dishonesty that are violations of the Honor Code include, but are not limited to, the following: turning in work under only your own name that you did not actually do completely yourself (for collaborative work, *always* list the names of your collaborators), plagiarizing other people's words or computer code (and that includes text off the Internet), receiving unauthorized help on an exam, providing unauthorized help on an exam (and that includes talking about an exam before all students have taken it), and misuse of materials that are permitted for an exam. Violations of the JMU Honor Code will be dealt with in accordance with the policy that permits professors, at their own discretion, to assess and penalize students for cheating. All incidents of academic dishonesty will be reported to the Honor Committee, according to the requirements of the university. Regarding **Working in Groups**: Be a good citizen and follow the JMU Honor Code. If you aren't sure if some type of collaboration is appropriate, please ask. You are responsible to make sure your actions are appropriate and exhibit the highest levels of integrity.

Weather

Please check the JMU cancellation policy for information about the impact of inclement weather on our class (<http://www.jmu.edu/JMUpolicy/1309.shtml>). Your instructor drives in from Charlottesville. If there are any issues with her commute the class will be notified by email.

Contacting the Instructor

You can contact the instructor any time (24/7) via email or SMS to 703.835.6336.

Also, you can contact your friendly neighborhood TA Paul Rose any time as well via email or SMS to 703.473.8365.