Instructor: Dr. Pete E. Pascuzzi  
Office: WALC 3053A  
Phone: 765-494-3620  
email: ppascuzz@purdue.edu  
Hours: Monday and Thursday 9:00 – 10:00, on Piazza or by appointment.  

Teaching Assistant: TBD  
Office: TBD  
Phone: TBD  
email: TBD  
Hours: TBD  

COURSE OBJECTIVES  
Students will acquire, assess, clean, visualize and analyze biological data sets with R. Students will be able to describe the link between complex biological phenomena and the data captured through human observation or scientific instrumentation. Students will learn how to organize data sets to optimize clarity and analytic possibilities while minimizing errors with examples drawn from the literature or biological databases. R will be taught starting with small-scale data such as drug sensitivity assays moving to genome-scale datasets such as gene expression and pathway analysis later in the course. These skills will be taught in the light of increasing data literacy and enabling reproducible research through clear documentation of data and communication of results. Relevant concepts from biology and statistics will be reviewed.  

LEARNING OUTCOMES  
• Understand how complex biological phenomena are captured as data.  
• Learn how to manage data science projects using tools such as R, Linux and remote computing.  
• Use R to acquire, assess, clean, organize, visualize and analyze biological data.  
• Use R to document and communicate analysis of biological data.  

TEXTBOOKS  
We will use textbooks that are available for free online. You may also use online forums such as StackOverflow to search for solutions. However, read the forum rules carefully before you post questions! R is very popular, so a well-crafted Google search will often reveal multiple solutions for your problems.
TIME AND PLACE

The class is scheduled as separate lecture and lab sections. In practice, both sessions will be the same with 30 – 50 minutes of lecture with the remaining time for hands on assignments.

<table>
<thead>
<tr>
<th>Session</th>
<th>Day</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture-Lab</td>
<td>WF</td>
<td>1:30 – 3:20</td>
<td>SC G046</td>
</tr>
</tbody>
</table>

PIAZZA COURSE FORUM

I have created a Piazza Forum for this class. Many course materials will be distributed through this site. In addition, you can post questions for the instructor, teaching assistants and fellow students on this forum. All posts can be made anonymous to your fellow students, so there is no reason to be shy. However, you cannot post anonymously to the instructors or TA. I strongly encourage students to seek help here, and I strongly encourage students to answer questions. If a post was helpful, please take a moment to post a follow-up that indicates that the post was helpful. You can also click good note to provide feedback metrics.

IMPORTANT! Throughout the semester I will require you to make posts to Piazza. These will not be graded, but we will track them as part of Class participation and attendance. You must make these post to earn the bonus points!

ASSESSMENT

This is the schedule of assessments for the class. The schedule may be adjusted slightly during the semester.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Grading</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes &amp; Exercises</td>
<td>20%</td>
<td>~weekly</td>
</tr>
<tr>
<td>Class Notebook</td>
<td>0 or 10%</td>
<td>April 29</td>
</tr>
<tr>
<td>Midterm written exam</td>
<td>20%</td>
<td>Feb 28</td>
</tr>
<tr>
<td>Group programming project</td>
<td>20%</td>
<td>Mar 13</td>
</tr>
<tr>
<td>Final written exam</td>
<td>20%</td>
<td>Apr 24</td>
</tr>
<tr>
<td>Final programming project</td>
<td>20%</td>
<td>May 1</td>
</tr>
<tr>
<td>Class participation and attendance</td>
<td>1% or 2% bonus points</td>
<td>NA</td>
</tr>
</tbody>
</table>
• There will be at least 12 quizzes/exercises during the semester. Point values may vary but these will be scaled so that each has equal weight. You will be graded on your top best quizzes/exercises. If you miss a quiz/exercise because of an unexcused absence, you will receive a zero.

• The Midterm and Final written exams are multiple choice and TRUE/FALSE. You will be permitted to use your Class Notebook and RStudio on these exams.

• The Group Programming Project will be graded with a rubric that will be distributed with the assignment. An important aspect of this project is the ability to work in a team!

• The Final Programming Project is a solo effort that must be completed during class. You will be given a preview and rubric for this project so that you know what to expect.

• Students that have done poorly on the Midterm or Final written exam may opt to have their course Notebook graded. If students select this option, the low exam will be weighted 10% and the Notebook will be weighted 10% when your final grade is determined. **You must turn in your Notebook on April 29 if you select this option!**

• Perfect attendance is required for 2% bonus points, but one absence is allowed for 1% point. This might seem like a minor reward, but perfect attendance can easily change your letter grade, e.g. 88% (B+) + 2% = 90% (A-). Prearranged, excused absences may be allowed at the discretion of the instructor. Requests must be emailed to, and confirmed by, the instructor. **Periodically, you will be asked to make posts to Piazza. These posts are a required component of participation. Missed post will count as missed classes!**

• I will share my grade book R code with you after the Midterm. This will allow you to track your own grade as the semester progresses. In addition, you can ask me for your current grade at any time. However, you must come to my office.

### GRADING SCALE

<table>
<thead>
<tr>
<th>Score</th>
<th>Grade</th>
<th>Score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>98.00 and above</td>
<td>A+</td>
<td>78.00 to 79.99</td>
<td>C+</td>
</tr>
<tr>
<td>92.00 to 97.99</td>
<td>A</td>
<td>72.00 to 77.99</td>
<td>C</td>
</tr>
<tr>
<td>90.00 to 91.99</td>
<td>A-</td>
<td>70.00 to 71.99</td>
<td>C-</td>
</tr>
<tr>
<td>88.00 to 89.99</td>
<td>B+</td>
<td>68.00 to 69.99</td>
<td>D+</td>
</tr>
<tr>
<td>82.00 to 87.99</td>
<td>B</td>
<td>62.00 to 67.99</td>
<td>D</td>
</tr>
<tr>
<td>80.00 to 81.99</td>
<td>B-</td>
<td>60.00 to 61.99</td>
<td>D-</td>
</tr>
<tr>
<td>59.99 and Below</td>
<td></td>
<td></td>
<td>F</td>
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</table>
EXTRA CREDIT

Class attendance and participation is the only way to achieve extra credit. No exceptions will be made.

COURSE MANAGEMENT SYSTEM

We will not use Blackboard for this course. I will distribute course materials through Piazza, or in some cases, Data Depot.

OBTAINING EXTRA HELP

Professor Pascuzzi will be available to answer your questions immediately after class, on Piazza, or by appointment (arranged by e-mail). The teaching assistant will be available via Piazza or by appointment. If you are struggling, get help!

ACADEMIC INTEGRITY

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.

The Purdue Honor Pledge:

“As a boilemaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue”

Academic misconduct of any kind will not be tolerated in any course offered by the Department of Biochemistry. For specifics, please refer to Purdue’s Regulations Governing Student Conduct

Any incidence of academic misconduct will be reported to the Office of the Dean of Students. Academic misconduct may result in disciplinary sanctions including expulsion, suspension, probated suspension, disciplinary probation, and/or educational sanctions. In addition, such misconduct will result in punitive grading such as:

- receiving a lower or failing grade on the assignment, or
- assessing a lower or failing grade for the course

Punitive grading decisions will be made after consultation with the Office of the Dean of Students. Please note reported incidences of academic misconduct go on record for reference by other instructors. Further, a record of academic misconduct is likely to influence how current/future situations are handled.

To provide you with an unambiguous definition of academic misconduct, the following text has been excerpted from “Academic Integrity: A Guide for Students”, written by Stephen Akers, Ph.D., Executive Associate Dean of Students (1995, Revised 1999, 2003), and published by the Office of the Dean of Students in cooperation with Purdue Student
Government, Schleman Hall of Student Services, Room 207, 475 Stadium Mall Drive West Lafayette, IN 47907-2050.

Purdue prohibits “dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty.” [Part 5, Section III-B-2-a, Student Regulations] Furthermore, the University Senate has stipulated that “the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest.” [University Senate Document 72-18, December 15, 1972]

More specifically, the following are a few examples of academic dishonesty which have been discovered at Purdue University.

- substituting on an exam for another student
- substituting in a course for another student
- paying someone else to write a paper and submitting it as one’s own work
- giving or receiving answers by use of signals during an exam
- copying with or without the other person’s knowledge during an exam
- doing class assignments for someone else
- plagiarizing published material, class assignments, or lab reports
- turning in a paper that has been purchased from a commercial research firm or obtained from the internet
- padding items of a bibliography
- obtaining an unauthorized copy of a test in advance of its scheduled administration
- using unauthorized notes during an exam
- collaborating with other students on assignments when it is not allowed
- obtaining a test from the exam site, completing and submitting it later
- altering answers on a scored test and submitting it for a regrade
- accessing and altering grade records
- stealing class assignments from other students and submitting them as one’s own
- fabricating data
- destroying or stealing the work of other students

Plagiarism is a special kind of academic dishonesty in which one person steals another person’s ideas or words and falsely presents them as the plagiarist’s own product. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one’s own words, without giving appropriate acknowledgment
submitting a document written by someone else but representing it as one’s own

CLASS ATTENDANCE

In accordance with University policy, you are expected to attend every scheduled class. If you have a valid reason for missing class such as a University-sponsored activity, religious observances, illness, or family emergency, the instructor or TA will assist you in obtaining information and materials you may have missed. Students who skip class without a valid excuse should not expect the instructor or TA to supply class notes or provide special help. For more information see the Purdue Regulations Governing Classes and the Class Absence page from the Office of the Dean of Students.

EMERGENCY PREPAREDNESS

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances.

MENTAL HEALTH STATEMENT

• If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try WellTrack: https://purdue.welltrack.com/. Sign in and find information and tools at your fingertips, available to you at any time.
• If you need support and information about options and resources, please see the Office of the Dean of Students, http://www.purdue.edu/odos, for drop-in hours (M-F, 8 am-5 pm).
• If you’re struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services: https://www.purdue.edu/caps (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

ON-LINE COURSE EVALUATIONS

During the last two weeks of the semester, you will be provided an opportunity to evaluate this course and your instructor(s). To this end, Purdue has transitioned to online course evaluations. On Monday of the fifteenth week of classes, you will receive an official email from evaluation administrators with a link to the online evaluation site. You will have two weeks to complete this evaluation. Your participation in this evaluation is an integral part of this course. Your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

NON-DISCRIMINATION POLICY STATEMENT

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to
strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. Purdue’s nondiscrimination policy can be found at http://www.purdue.edu/purdue/ea_eou_statement.html.

MENTAL HEALTH

Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)494-6995 or http://www.purdue.edu/caps/ after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

STUDENTS WITH DISABILITIES

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.

CLASS SCHEDULE (fluid and subject to change)

Week 01 (Jan 15 & 16)
- Course overview and logistics.
- RStudio, Rmarkdown and R packages.
- LearnR Tutorials 1 and 2.
- Assignment.

Week 2 (Jan 22 & 24)
- Rectangular and tidy data.
- Data types and structures.
- R data manipulation.
- LearnR Tutorials 3 and 4.
- Assignment.

Week 3 (Jan 29 & 31)
- Data visualization as scientific communication.
- R data visualization.
- LearnR tutorials 5 and 6.
- Assignment.
Week 4 (Feb 5 & 7)
- Data file formats and repositories.
- R data import.
- Assignment.

Week 5 (Feb 12 & 14)
- Programming with R functions.
- Learn R tutorial 7.
- Assignment.

Week 6 (Feb 19 & 21)
- Programming with R using loops or apply functions.
- Assignment.

Week 7 (Feb 26 & 28)
- Genomic annotation data.
- First exam.
- Assignment.

Week 8 (Mar 4 & 6)
- Genome scale biological data.
- Unsupervised clustering.
- Assignment.

Week 9 (Mar 11 & 13)
- Open
- Midterm Exam.

Week 10 (Mar 18 & 20)
- Spring Break.

Week 11 (Mar 25 & 27)
- Biological sequence data.
- Tools: R and Bioconductor
- Assignment.

Week 12 (Apr 1 & 3)
- Biological annotation data.
- Gene set/pathway enrichment analysis.
- Assignment.

Week 12 (Apr 8 & 10)
- Gene expression data (RNA-seq).
Week 13 (Apr 15 & 17)
• TBD.

Week 14 (Apr 22 & 24)
• TBD
• Second written exam.

Week 15 (Apr 29 & May 1)
• Final Programming Project.

DISCLAIMER
This syllabus is subject to change.