

and will enhance the student learning and application skills. The course aims to equip students with highly demanded health analytics skills to select, prepare, analyze, interpret, evaluate, and present data for the purposes of improving outcomes. The data will be analyzed using the statistical computing tool R.

Required Readings:

Readings and course notes are distributed via the canvas.

Reference Books: The following books are recommended for course assignments, exercises, and projects.

Ewens, W. J. & Grant, G. R. (2010). *Statistical methods in bioinformatics: An introduction* (2nd ed.). Springer. ISBN-13: 978-1441923028

Kellar, S. P. & Kelvin, E. A. (2012). *Munro’s statistical methods for health care research* (6th ed.). LWW, Kluwer. ISBN-13: 978-1451187946

Field, A. Miles, J., & Field Z. (2012). *Discovering statistics using R*. Sage. ISBN-13: 978-1446200469

Diez, D., M., Barr, C. D., & Cetinkaya-Rundel, M. (2015). *OpenIntro statistics: Introductory statistics with randomization and simulation*. OpenIntro, Inc. ISBN-13: 978-1943450039

Teaching and Learning Methods

Active Learning (AL), Project-based learning (PBL), Team-based learning, Lecture by instructor with slides and audio-video aids.

Principles of Graduate and Professional Learning (PGPL)

Learning outcomes are assessed in the following areas:

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| 1. Knowledge and skills mastery | Major emphasis |
| 2. Critical thinking and good judgment | Moderate emphasis |
| 3. Effective communication | Some emphasis |
| 4. Ethical behavior | |

Student Learning Outcomes:

Upon completion of this course, students will	PGPL	Assessment
1. Identify and interpret large size health data with missing values	1, 2	EQMFP
2. Infer and justify small size health data specific to diseases	1, 2	EQMFP
3. Correlate massive phenotypic and genotypic data	1, 2	ELQMFP
4. Decide and model population, sampling and hypothesis testing for specific diseases	1, 2	ELQMFP
5. Design and formulate sampling and hypothesis testing for hospital data and Insurance data set to evaluate the complexities	1, 2	ELQMFP
6. Select and generate regression analysis and other statistical analysis for precision medicine applications	1, 2, 3	ELQMFP
7. Outline and formulate paper presentation	1,2,3,4	L

8. Construct and rearrange project design, writing, analysis, and presentation	1, 2, 3, 4	LQMFP
9. Develop and revise programs to perform data analytics on large, complex datasets in R	1, 2	ELQMFP

Tentative WEEKLY SCHEDULE (subject to change)

Week	Contents	Specials	Assignment
Week 1	<ul style="list-style-type: none"> ▪ Class Introduction ▪ Introduction to concepts of data munging and cleaning 	Handouts	
Week 2	<ul style="list-style-type: none"> ▪ Examine the different ‘OMICS’ dataset ▪ Learn the application of the ‘OMICS’ data for precision medicine 	Book chapters Handouts	HW-1 Assigned
Week 3-4	<ul style="list-style-type: none"> ▪ Hands-on application of statistical methods on cleaning the large size ‘OMIC’ data specific to diseases ▪ Evaluate the ‘OMIC’ data with respect to the different features based on the generating platform, integrating the ‘OMIC’ data with the hospital disease data or available phenotypic data. 	Book chapters Handouts Papers	
Week 5	<ul style="list-style-type: none"> ▪ Hands on application of sampling techniques for generating different samples based on the integrated ‘OMIC’ and Phenotypic Data. ▪ Generating Different Hypothesis based on the ‘OMIC’ data analysis results. 	Handouts Papers Presentation of papers/projects	Quiz I HW-1 Due
Week 6-7	<ul style="list-style-type: none"> ▪ Project Groups Formation ▪ Compare and contrast the domain specific knowledge of the small size health data set from different Hospitals and Insurance companies. ▪ Application of statistical methods, both parametric and non-parametric, to evaluate these datasets and understanding the variability based on domain specification 	Book chapters Handouts	HW-2 Assigned
Week 8	Mid-Term Exam		Project Report I due
Week 9	<ul style="list-style-type: none"> ▪ Compare and contrast the domain specific knowledge of the Large Size Hospital Health Data. ▪ Apply different statistical packages on cleaning the large size data, evaluating different 	Handouts Papers Presentation of papers/projects	HW-2 Due

	sampling concepts, generating the hypothesis, evaluating the features, and interpret the results for different hospital scenarios		
Week 10	<ul style="list-style-type: none"> ▪ Compare and contrast the domain specific knowledge of the large size insurance data for specific diseases and hospital care payment ▪ Apply different statistical and correlation discovery packages for information extraction from the large size insurance data and interpret the results for the domain evaluation. 	Presentation of papers/projects	HW-3 Assign
Week 11	<ul style="list-style-type: none"> ▪ Apply different statistical toolkits on the different integrated samples ('OMIC' and Hospital (Phenotypic)) ▪ Apply the analytical results to Precision Medicine 	Book chapters Handouts	Quiz II
Week 12	<ul style="list-style-type: none"> ▪ Integrate the 'OMIC' data with the other heterogeneous genotypic and phenotypic data ▪ Apply different statistical methods for regression analysis over integrated genotypic and phenotypic data based on the sampling and domain specific knowledge. 	Handouts Papers Presentation of papers/projects	Project draft due
Week 13	<ul style="list-style-type: none"> ▪ Introduction to survival analysis and application of different survival analysis concepts on the integrated 'OMIC' and phenotypic data for evaluating different disease specific treatment. 		HW-3 Due
Week 14	Final Exam		
Week 15	Final Project Presentation By Groups	Final project presentations	
Week 16	Final Project Presentation By Groups	Final project presentations	All Project Reports DUE

EXPECTATIONS, GUIDELINES, AND POLICIES

ATTENDANCE

- Class attendance is required for classroom-based courses.
- Attendance shall be taken in every class. If you do not sign the attendance sheet while in class, you shall be marked absent.
- Signing the attendance sheet for another student is prohibited.
- The instructor is required to submit to the Registrar a record of student attendance, and action shall be taken if the record conveys a trend of absenteeism.
- Absences must be explained to the satisfaction of the instructor, who will decide whether omitted work may be made up.
- Missing class reduces your grade through the following grade reduction policy:
- You are allowed ONE excused or unexcused absences.

- Regardless of the reason, a 2nd absence results in a 25% reduction in your final grade
- A 3rd absence results in a 50% reduction.
- Further absences result in an F in the course.
- Missing class may also reduce your grade by eliminating opportunities for class participation.

CLASS PREPARATION

- You are expected to read the chapters and the material given in the class
- Research shows that regular attendance, preparation and active class participation have a positive impact on your final grade for a course.
- Ask whatever questions you have pertaining to the course, while we are face to face.
- When not in class, ask on the class forum and ask your questions and receive answers. In this way, the entire class can benefit from your question. There are no silly questions!!!!

LATE ASSIGNMENTS AND SUBMISSION OF ASSIGNMENTS

- All work (unless otherwise noted) should be submitted via an attachment in the Assignments area.
- Home Work will be due by 11:55 PM of the specified day. If your Home Work is late, your respective assignment will be assessed a 25% late penalty. Any assignment that is not turned in by 24 hours after the due date will not be accepted and you will receive a zero (0) for that particular assignment. Also, if I give out a solution and you have not submitted your work, you will not be able to turn in the late work and you will also receive a zero (0) for that particular assignment.

IN CLASS ASSIGNMENT AND FINAL EXAM

Each class assignment needs to be completed in the class and there will be one final exam on the last day. There are no make-up exam or assignment.

GRADE ALLOCATION

- Attendance 5%
- Quiz 15%
- In-class Assignments 15%
- Homework 15%
- Quarter Terms 15%
- Paper Presentation 15%
- Project 20%

Grading Scale:

Grading is based on the ranks of students.

Grade Category	Grade	Relative Class Rank Range
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Exceptional	A+	Top 10%
Outstanding	A	Top 25%
Good	A-	Top 45%
Satisfactory	B+	Median%
Reasonable (Pass)	B	Lower 35%
Marginal (Pass)	B-	Lower 15%
Fail	C+, C, C-	-

No credits toward major, minor, or certificate requirements are granted for a grade below B-.

CODE OF CONDUCT

All students should aspire to the highest standards of academic integrity. Using another student's work on an assignment, cheating on a test, not quoting or citing references correctly, or any other form of dishonesty or plagiarism shall result in a grade of zero on the item and possibly an F in the course. Incidences of academic misconduct shall be referred to the Department Chair and repeated violations shall result in dismissal from the program.

All students are responsible for reading, understanding, and applying the *Code of Student Rights, Responsibilities and Conduct* and in particular the section on academic misconduct. Refer to *The Code > Responsibilities > Academic Misconduct* at <http://www.indiana.edu/~code/>. All students must also successfully complete the Indiana University Department of Education "How to Recognize Plagiarism" Tutorial and Test. <https://www.indiana.edu/~istd> You must document the difference between your writing and that of others. Use quotation marks in addition to a citation, page number, and reference whenever writing someone else's words (e.g., following the *Publication Manual of the American Psychological Association*). To detect plagiarism instructors apply a range of methods, including Turnitin.com. <http://www.ulib.iupui.edu/libinfo/turnitin>

Academic Misconduct:

1. **Cheating:** Cheating is considered to be an attempt to use or provide unauthorized assistance, materials, information, or study aids in any form and in any academic exercise or environment.
 - a. A student must not use external assistance on any "in-class" or "take-home" examination, unless the instructor specifically has authorized external assistance. This prohibition includes, but is not limited to, the use of tutors, books, notes, calculators, computers, and wireless communication devices.
 - b. A student must not use another person as a substitute in the taking of an examination or quiz, nor allow other persons to conduct research or to prepare work, without advanced authorization from the instructor to whom the work is being submitted.
 - c. A student must not use materials from a commercial term paper company, files of papers prepared by other persons, or submit documents found on the Internet.
 - d. A student must not collaborate with other persons on a particular project and submit a copy of a written report that is represented explicitly or implicitly as the student's individual work.
 - e. A student must not use any unauthorized assistance in a laboratory, at a computer terminal, or on fieldwork.

- f. A student must not steal examinations or other course materials, including but not limited to, physical copies and photographic or electronic images.
 - g. A student must not submit substantial portions of the same academic work for credit or honors more than once without permission of the instructor or program to whom the work is being submitted.
 - h. A student must not, without authorization, alter a grade or score in any way, nor alter answers on a returned exam or assignment for credit.
2. **Fabrication:** A student must not falsify or invent any information or data in an academic exercise including, but not limited to, records or reports, laboratory results, and citation to the sources of information.
 3. **Plagiarism:** Plagiarism is defined as presenting someone else's work, including the work of other students, as one's own. Any ideas or materials taken from another source for either written or oral use must be fully acknowledged, unless the information is common knowledge. What is considered "common knowledge" may differ from course to course.
 - a. A student must not adopt or reproduce ideas, opinions, theories, formulas, graphics, or pictures of another person without acknowledgment.
 - b. A student must give credit to the originality of others and acknowledge indebtedness whenever:
 1. directly quoting another person's actual words, whether oral or written;
 2. using another person's ideas, opinions, or theories;
 3. paraphrasing the words, ideas, opinions, or theories of others, whether oral or written;
 4. borrowing facts, statistics, or illustrative material; or
 5. offering materials assembled or collected by others in the form of projects or collections without acknowledgment
 4. **Interference:** A student must not steal, change, destroy, or impede another student's work, nor should the student unjustly attempt, through a bribe, a promise of favors or threats, to affect any student's grade or the evaluation of academic performance. Impeding another student's work includes, but is not limited to, the theft, defacement, or mutilation of resources so as to deprive others of the information they contain.
 5. **Violation of Course Rules:** A student must not violate course rules established by a department, the course syllabus, verbal or written instructions, or the course materials that are rationally related to the content of the course or to the enhancement of the learning process in the course.
 6. **Facilitating Academic Dishonesty:** A student must not intentionally or knowingly help or attempt to help another student to commit an act of academic misconduct, nor allow another student to use his or her work or resources to commit an act of misconduct.

OTHER POLICIES

1. **Administrative withdrawal:** Students must participate in all class discussions and conscientiously complete all required course activities and/or assignments. If a student is unable to attend, participate in, or complete an assignment on time, the student must inform

the instructor. If a student misses more than half of the required activities within the first 25% of the course without contacting the instructor, the student may be administratively withdrawn from this course. Administrative withdrawal may have academic, financial, and financial aid implications. Administrative withdrawal occurs after the full refund period, and a student who has been administratively withdrawn is ineligible for a tuition refund.

2. **Civility:** To maintain an effective and inclusive learning environment, it is important to be an attentive and respectful participant in lectures, discussions, group work, and other classroom exercises. Thus, unnecessary disruptions should be avoided, such as ringing cell phones, engagement in private conversations, and other unrelated activities. Cell phones, media players, or any noisy devices should be turned off during a class. Texting, web surfing, and posting to social media are generally not permitted. Laptop use may be permitted if it is used for taking notes or conducting class activities. Students should check with the instructor about permissible devices in class. IUPUI nurtures and promotes “a campus climate that seeks, values, and cultivates diversity in all of its forms and that provides conditions necessary for all campus community members to feel welcomed, supported, included, and valued” (IUPUI Strategic Initiative 9). IUPUI prohibits “discrimination against anyone for reasons of race, color, religion, national origin, sex, sexual orientation, marital status, age, disability, or veteran status” (Office of Equal Opportunity). Profanity or derogatory comments about the instructor, fellow students, invited speakers or other classroom visitors, or any members of the campus community shall not be tolerated. A violation of this rule shall result in a warning and, if the offense continues, possible disciplinary action.
3. **Communication:** For classroom-based courses, the instructor or teaching assistant should respond to emails by the end of the next class or, for online courses, within two Indiana University working days, which excludes weekends and holidays. The instructor should provide weekly office hours or accept appointments for face-to-face, telephone, or teleconferenced meetings, and announce periods of extended absence in advance.
4. **Counseling and Psychological Services (CAPS):** Students seeking counseling or other psychological services should contact the CAPS office at 274-2548 or capsindy@iupui.edu. For more information visit <http://life.iupui.edu/caps/>.
5. **Course evaluations:** Course evaluations provide vital information for improving the quality of courses and programs. Students are urged to complete one course and instructor evaluation for each section in which they are enrolled at the School of Informatics and Computing with the following exceptions: (a) The student has withdrawn from the course; (b) fewer than five students are enrolled in the section (in which case maintaining anonymity is difficult); and (c) the section is a laboratory that must be taken with a course having a different section number. Course evaluations are completed at <https://soic.iupui.edu/app/course-eval/>. Course evaluations are typically open from the eleventh week. Course evaluations are anonymous, which means that no one can view the name of the student completing the evaluation. In addition, no one can view the evaluation itself until after the instructor has submitted the final grades. In small sections, demographic information should be left blank, if it could be used to identify the student.
6. **Disabilities policy:** All qualified students enrolled in this course are entitled to reasonable accommodations for a disability. Notify the instructor during the first week of class of accommodations needed. Students requiring accommodations register with Adaptive

Educational Services (AES) and complete the appropriate AES-issued before receiving accommodations. The AES office is located at UC 100, Taylor Hall (Email: aes@iupui.edu, Tel. 317 274-3241). For more information visit <http://aes.iupui.edu>.

7. **Email:** Indiana University uses your IU email account as an official means of communication, and students should check it daily. Although you may have your IU email forwarded to an outside email account, please email faculty and staff from your IU email account.
8. **Emergency preparedness:** Know what to do in an emergency so that you can protect yourself and others. For more information, visit the emergency management website at <http://protect.iu.edu/emergency>.
9. **IUPUI course policies:** Several campus policies governing IUPUI courses may be found at the following link: http://registrar.iupui.edu/course_policies.html
10. **No class attendance without enrollment.** Only those who are officially enrolled in this course may attend class unless enrolled as an auditor or making up an Incomplete by prior arrangement with the instructor. This policy does not apply to those assisting a student with a documented disability, serving in an instructional role, or administrative personnel. <http://registrar.iupui.edu/official-enrollment-class-attendance.html> Children may *not* attend class with their parents, guardians, or childcare providers.
11. **Religious holidays:** Students seeking accommodation for religious observances must submit a request form to the course instructor by the end of the second week of the semester. For information visit <http://registrar.iupui.edu/religious.html>.
12. **Right to revise:** The instructor reserves the right to make changes to this syllabus as necessary and, in such an event, will notify students of the changes immediately.
13. **Sexual misconduct:** IU does not tolerate sexual harassment or violence. For more information and resources, visit <http://stopsexualviolence.iu.edu/>.
14. **Student advocate:** The Student Advocate assists students with personal, financial, and academic issues. The Student Advocate is in the Campus Center, Suite 350, and may also be contacted at 317 274-4431 or studvoc@iupui.edu. For more information visit <http://studentaffairs.iupui.edu/advocate>.

MISSION STATEMENT

The Mission of IUPUI is to provide for its constituents excellence in

- Teaching and Learning;
- Research, Scholarship, and Creative Activity; and
- Civic Engagement.

With each of these core activities characterized by

- Collaboration within and across disciplines and with the community;
- A commitment to ensuring diversity; and
- Pursuit of best practices.

IUPUI's mission is derived from and aligned with the principal components—Communities of Learning, Responsibilities of Excellence, Accountability and Best Practices—of Indiana University's Strategic Directions Charter.

STATEMENT OF VALUES

IUPUI values the commitment of students to learning; of faculty to the highest standards of teaching, scholarship, and service; and of staff to the highest standards of service. IUPUI recognizes students as partners in learning. IUPUI values the opportunities afforded by its location in Indiana's capital city and is committed to serving the needs of its community. Thus, IUPUI students, faculty, and staff are involved in the community, both to provide educational programs and patient care and to apply learning to community needs through service. As a leader in fostering collaborative relationships, IUPUI values collegiality, cooperation, creativity, innovation, and entrepreneurship as well as honesty, integrity, and support for open inquiry and dissemination of findings. IUPUI is committed to the personal and professional development of its students, faculty, and staff and to continuous improvement of its programs and services.