

INFO-I 501

Introduction to Informatics

Course Info	3 Credit Hours Online
Instructor	Bob Green, MS in HCI
Email / Phone	Use Canvas for messaging, rogreen@iupui.edu , (317) 459-9664
Canvas Section	39194
Office Hours	By appointment
Prerequisites	None
Note	This section is designed for students in the Master of Science in Applied Data Science . Students in other programs may not take this course.

COURSE DESCRIPTION

This course serves as an intensive introduction to the most central technical tools of Informatics, data structures, optimization, data visualization, simulation models, probabilistic and statistical thinking and machine learning. The course teaches statistical analysis and basics of machine learning using Python.

EXTENDED COURSE DESCRIPTION

This course introduces the most central technical tools of informatics. It will serve as an introduction to programming and computational thinking using Python 3. The purpose of the course is not to make you an expert Python programmer but to use it to better understand how to perform data analysis.

TEXTBOOK:

Title: *Introduction to Computation and Programming Using Python* (3rd. ed.)
Author: John V. Guttag
Year: 2021
Publisher: MIT Press

The text can also be rented from MIT Press

eTextbook rental | 9780262363440 | http://mitpress.mit.edu/etext_rental
4-month rental \$27.50 | 12-month rental \$38.50

COMPUTERS

Students must have access to a computer.

SOFTWARE [No cost]

Students must install Python and a development environment on their personal laptop.

Jupyter Notebook

The Anaconda distribution contains a Python interpreter and a Jupyter Notebook instance. Anaconda can be found at www.anaconda.com If Python is already installed you can find Jupyter Notebook at www.jupyter.org

PyCharm

Students may install the PyCharm Integrated Development Environment (IDE) from JetBrains. First register at <https://www.jetbrains.com/student/> After registering, JetBrains will send an email with a link. Follow their instructions to install PyCharm.

Python 3

A python interpreter can be downloaded and installed at www.python.org Install the latest version, at least version 3.6. Mac users should have python pre-installed. The Anaconda distribution will also install Python. To test whether Python is installed open the Terminal, Console or Command Prompt and enter:

```
python -version
```

TEXTBOOK AND PAPERS

It is suggested that students get their own copy of the textbook. Papers, lectures slides, and additional reading materials will be posted on Canvas.

GENERAL GUIDELINE TO THE SYLLABUS

Students are responsible for familiarizing themselves with the syllabus. The instructor is responsible for being responsive to the diverse needs of the enrolled students and for making necessary modifications to this syllabus, which is to be treated as a living document.

COURSE STRUCTURE

Each Monday video lectures will be provided through Canvas. A weekly quiz and assignment will be due Sunday night.

Principles of Graduate and Professional Learning (PGPL)

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

Program-level Learning Outcomes (PLO)

1. Statistical learning, data analytics, and deep learning models.
2. Data management, infrastructure, and data science lifecycle.
3. Client-server application development.
4. Management of large-scale data stores and closed-based computing systems.
5. Interactive data visualization and human-centered data science
6. Ethical and professional management of informatics projects.

LEARNING OUTCOMES:

Upon completion of this course students will	RBT	PLO	PGPL	Assessment
1. Design, implement, test and debug extensible and modular programs involving control structures variables, expressions assignments, I/O functions, parameter passing, data structures, regular expressions, and file handling	5, 6	1, 2	1	Quizzes 1-4 Assignments 1-4
2. Analyze complexity in algorithm development	4	1	1	Quiz 5 Assignment 5
3. Investigate research questions and design by loading, extracting, transforming, and analyzing data from various sources	5, 6	2, 4	1	Quizzes 6, 8 & 12 Assignments 6 – 15
4. Test hypotheses and evaluate reliability and validity	4	1	1	Quizzes 8, 9, 10, 13 Assignments 8, 9, 10, 13
5. Implement histograms, classifiers, decision trees, sampling, linear regression and projectiles in a scripting language	3	1, 5	1	Quizzes 6 - 7 Assignments 6 – 7
6. Decompose and simulate systems to process data using randomness	6	1	1	Quizzes 9 - 10 Assignments 9 - 10
7. Employ supervised and unsupervised machine learning for functional approximation and categorization	4	1	1	Quizzes 11 – 12 Assignments 11 – 12

RBT = Revised Bloom’s Taxonomy: 1. Remembering; 2. Understanding; 3. Applying; 4. Analyzing; 5. Executing; 6. Creating

PLO: Full Program-level Learning Objectives: <https://soic.iupui.edu/graduate/degrees/data-science/data-science-masters/> bottom of the MS in Data Science page.

PGPL: Principles of Graduate and Professional Learning (above)

WEEKLY SCHEDULE

Readings from Guttag (2021)

Week	Papers and Reading	Assessment
1	Chapter 1: Getting Started Chapter 2: Introduction to Python	Quiz 1 Assignment 1
2	Chapter 3: Some simple numerical programs Chapter 4: Functions, scoping, and abstraction	Quiz 2 Assignment 2
3	Chapter 5: Structured types, mutability, and higher-order functions Chapter 6: Recursion and Global Variables Chapter 7: Modules and Files	Quiz 3 Assignment 3
4	Chapter 8: Testing and debugging Chapter 9: Exceptions and assertions	Quiz 4 Assignment 4
5	Chapter 10: Classes and object-oriented programming	Quiz 5 Assignment 5
6	Chapter 11: A simplistic introduction to algorithmic complexity Chapter 12: Some simple algorithms and data structures	Quiz 6 Assignment 6
7	Chapter 13: Plotting and more about classes	Quiz 7 Assignment 7
8	Chapter 23: Exploring with Pandas Chapter 17: Stochastic programs, probability and distributions	Quiz 8 Assignment 8
9	Chapter 18: Monte Carlo simulation Chapter 19: Sampling and confidence intervals	Quiz 9 Assignment 9
10	Chapter 20: Understating experimental data Chapter 21: Randomized trials and hypothesis checking	Quiz 10 Assignment 10
11	Chapter 24: A quick look at machine learning Chapter 25: Clustering	Quiz 12 Assignment 12
12	Chapter 26: Classification methods	Quiz 13 Assignment 13
13	Chapter 12: Knapsack and graph optimization problems Chapter 13: Dynamic programming	Quiz 14 Assignment 14
14	Chapter 14: Random walks and more about data visualization	Quiz 15 Assignment 15
15	Chapter 22: Lies. Damned lies and statistics	Quiz 11 Assignment 11

READINGS, CLASS DISCUSSIONS, and ASSIGNMENTS

As outlined above, each week students will have assigned readings from course texts and any additional reading resources that will be shared on Canvas. Students with no (or little) programming background are encouraged to go through the supplementary materials (videos/manuals/ articles) that will be posted in the Resources section of Canvas.

COURSE GRADE BREAKDOWN

Quizzes	35%
Lab Assignments	60%
Participation	5%

Grading Scale:

A+	97 – 100	Outstanding achievement, given at the instructor's discretion
A	93 – 96.99	Excellent achievement
A–	90 – 92.99	Very good performance and quality of work
B+	87 – 89.99	Good performance and quality of work
B	83 – 86.99	Modestly acceptable performance and quality of work
B–	80 – 82.99	Marginal acceptable performance and quality of work
C+	77 – 79.99	Unacceptable work (Core course must be repeated for credit)
C	73 – 76.99	Unacceptable work (Core course must be repeated for credit)
C–	70 – 72.99	Unacceptable work (Course must be repeated for credit)
D+	67 – 69.99	Unacceptable work (Course must be repeated for credit)
D	63 – 66.99	Unacceptable work (Course must be repeated for credit)
D–	60 – 62.99	Unacceptable work (Course must be repeated for credit)
F	below 60	Unacceptable work (Course must be repeated for credit)

EXPECTATIONS, GUIDELINES, AND POLICIES

Participation:

Students must submit all assignments on time to receive full credit for participation. The Introduce Yourself assignment and completion of the Course Survey also add to the Participation grade.

It is important to notify the instructor as soon as you suspect you may not be able to complete an assignment on time due to unexpected illness or travel. Penalties for late submission are built into the Canvas grading structure. Missing assignments will receive a grade of 0, and late submissions will be penalized 10% per day late.

Attendance:

This course is being taught totally on-line. All materials, including lectures, will be provided online.

Incomplete:

The instructor may assign an Incomplete (I) grade only if at least 75% of the required coursework has been completed at passing quality and holding you to previously established time limits would result in unjust hardship to you. All unfinished work must be completed by the date set by the instructor. Left unchanged, an Incomplete automatically becomes an F after one year.

<http://registrar.iupui.edu/incomp.html>

Deliverables:

You are responsible for completing each deliverable (e.g., assignment, quiz) by its deadline and submitting it by the specified method. Deadlines are outlined in the syllabus or in supplementary documents accessible through Canvas. Should you miss a class, you are still responsible for completing the deliverable and for finding out what was covered in class, including any new or modified deliverable. In fairness to the instructor and students who completed their work on time, a grade on a deliverable shall be reduced 10%, if it is submitted late and a further 10% for each 24-hour period it is submitted after the deadline.

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 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 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 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 citations 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 acknowledgement.
 - b) A student must give credit to the originality of others and acknowledge indebtedness whenever:
 - i) Directly quoting another person's actual words, whether oral or written;
 - ii) Using another person's ideas, opinions, or theories;
 - iii) Paraphrasing the words, ideas, opinions or theories of others whether oral or written;
 - iv) Borrowing facts, statistics, or illustrative material; or
 - v) Offering materials assembled or collected by others in the form of projects or collections without acknowledgement.
- 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 evaluations of academic performance.
- 5) **Violation of Course Rules:** A student must not violate course rules established by a department, a course syllabus, verbal or written instructions, or the course materials that are rationally related to the contents of the course or 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 of the required activities within the first 25% of the course without contacting the instructor, the student may be administratively withdrawn from the 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 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 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 or generally not permitted. Laptop use may be permitted if it 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 its forms and that provides conditions necessary for all campus community members to feel welcomed, supported, included and values (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 office continues, possible disciplinary action.
- 3) **Communication:** For classroom-based courses, the instructor or teaching assistant should response 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 fact-to-face, telephone, or teleconferenced meetings, and announce periods of extended absence in advance.
- 4) **Counseling and Psychological Services:** Students seeking counseling or other psychological services should contact the CAPS office and 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/courseeval>. 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 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 if accommodations needed. Students requiring accommodations register with Adaptive Education 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 you IU email account as an official means of communication, and students should check it dialing. Although you may have your IU email forwarded to an outside email account, please email faculty and staff from you 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 as an instructional roll, 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 even, will notify students of 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.