University at Buffalo
Department of Computer Science & Engineering
338 Davis Hall – (716) 645-3180

Syllabus

Please read this sheet carefully, and save it for future reference.

The syllabus is subject to change based on the needs of the course and will be communicated with you as appropriate.

Instructor

Name	Email	Office	Office Hours
Dr. Eric Mikida	epmikida@buffalo.edu	208 Capen Hall	M/T 1:00-3:00PM, W 3:00-5:00PM

Course Information

CSE 4/587 Data Intensive Computing – 3 credits

Course Description

Data-intensive computing deals with storage models, application architectures, middleware, and programming models and tools for large-scale data analytics. In particular we study approaches that address challenges in managing and utilizing ultra-scale data and the methods for transforming voluminous data sets (big data) into discoveries and intelligence for human understanding and decision making. Topics include: storage requirements of big data, organization of big data repositories such as Google File System (GFS) semantic organization of data, data-intensive programming models such as MapReduce, fault-tolerance, privacy, security and performance, services-based cloud computing middleware, intelligence discovery methods, and scalable analytics and visualization. This course has three majors goals: (i) understand data-intensive computing, (ii) study, design and develop solutions using data-intensive computing models such as MapReduce and (iii) focus on methods for scalability using the cloud computing infrastructures such as Google App Engine (GAE), Amazon Elastic Compute Cloud (EC2), and Windows Azure. On completion of this course students will be able to analyze, design, and implement effective solutions for data-intensive applications with very large scale data sets.

Course Learning Outcomes

1. On completion of this course students will be able to analyze, design, and implement effective solutions for data-intensive applications with very large scale data sets. More specifically a student will be able to:
2. Recognize a data-intensive problem.
3. Assess the scale of data and requirements.
4. Retrieve data using appropriate methods.
5. Describe the data layout and define the data repository format (Ex: store).
6. Decide the algorithms (Ex: MapReduce) and programming models (Ex: Bayesian).
7. Define application-specific algorithms and analytics (Ex: network analysis).
8. Design the data-intensive program solution and system configuration.
9. Implement the data-intensive solution and test the solution.
10. Write a report summarizing the solution and results.
11. Incorporate services from cloud computing platforms.
12. Study the foundational concepts enabling cloud computing: services-based interface, programmatic consumption of services, virtualization, PKI-based security, large-scale storage, load-balancing, machine images and on-demand services.
13. Formulate data-intensive visualization solutions for presenting the results.

Prerequisites

CSE 250 and approved Computer Science, Computer Engineering, Bioinformatics/CS Majors only. Departmental senior standing recommended. Students must complete a mandatory advisement session with their faculty advisor.

Textbooks

There are two recommended texts: Both are available for free online.

1. Doing Data Science: Straight Talk from the Frontline, 1st Edition Author(s): Cathy O'Neil and Rachel Schutt ISBN: 978-1449358655 Publisher: O'Reilly Media
2. Joel Grus. Data Science from Scratch: First Principles with Python 1st Edition, 978-1491901427, O'Reilly media. 2015.

We will be using many other references, online sources and textbooks throughout the semester. Links will be posted on the course website.

Computing Resources

You will be using various free on-line tools for this course – links will be posted on the course website. Course-related communications should be via the Piazza forum linked from the course website. Piazza posts can be either public to the class or private to instructors. Any e-mail communications must come from your UB e-mail account and include [CSE 487] or [CSE 587] in the subject line. All communications with course staff are expected to be professional.

Attendance Policy

The conceptual and theoretical course content will be delivered primarily through the in-person lectures. You are expected to attend lecture and take your own notes to prepare for later assessments. If you are out of class for an extended period of time because of sickness, notify your instructor as soon as possible. If you miss a significant portion of the semester it is recommended that you resign from the course.

Grading Policy

The following indicates the grade breakdown which will be used in assigning grades in the course. I reserve the right to make adjustments if I deem them to be necessary. Any changes will be communicated to the class in writing via e-mail to each student's UB e-mail account.

Requirement	Weight	Details
Attendance and Participation	5%	Attendance and participation in lecture is required and will be taken throughout the semester.
Course Project	45%	There will be a three part project over the duration of the semester. Students will work on teams of one or two at the most.
Midterm Exam	20%	Midterm exam given on 10/19/22 covering material from the first half of the class.
Final Exam	30%	Cumulative final exam during the final exam period covering all class material.

Overall course grade

Percentage	Letter grade	Percentage	Letter grade
95 - 100	A	70-74	C+
90 - 94	A-	65-69	C
85 - 89	B+	60-64	C-
80-84	B	55-59	D
75-79	B-	0-54	F

Regrading

Any questions about the grading of a piece of work ***must be raised within one week of the date that the graded work was returned to you.***

Incomplete (I) grades

A grade of incomplete ("I") indicates that additional course work is required to fulfill the requirements of a given course. Students may only be given an "I" grade if they have a passing average in coursework that has been completed and have well-defined parameters to complete the course requirements that could result in a grade better than the default grade. An "I" grade may not be assigned to a student who did not attend the course.

Prior to the end of the semester, students must initiate the request for an "I" grade and receive the instructor's approval. Assignment of an "I" grade is at the discretion of the instructor.

The last day to resign the course is **Friday, November 11, 2022**.

Diversity

The UB School of Engineering and Applied Sciences considers the diversity of its students, faculty, and staff to be a strength, critical to our success. We are committed to providing a safe space and a culture of mutual respect and inclusiveness for all. We believe a community of faculty, students, and staff who bring diverse life experiences and perspectives leads to a superior working environment, and we welcome differences in race, ethnicity, gender, age, religion, language, intellectual and physical ability, sexual orientation, gender identity, socioeconomic status, and veteran status.

Accessibility Resources

If you have any disability which requires reasonable accommodations to enable you to participate in this course, please contact the Office of Accessibility Resources in 60 Capen Hall, 716-645-2608 and also the instructor of this course during the first week of class. The office will provide you with information and review appropriate arrangements for reasonable accommodations, which can be found on the web at: http://www.buffalo.edu/studentlife/who-we-are/departments/accessibility.html.

Classroom Decorum

To prevent and respond to distracting behavior faculty should clarify standards for the conduct of class, either in the syllabus, or by referencing the expectations cited in the Student Conduct Regulations. Classroom "etiquette" expectations should include:

- Not coming to lab or recitation meetings late or leaving early. Do not leave a meeting unless it is an absolute necessity.
- Not talking with other classmates during lab and recitation meetings while the TA or another student is speaking.
- Showing respect and concern for others by not monopolizing class discussion. Allow others time to give their input and ask questions. Do not stray from the topic of class discussion.

Academic Integrity

Academic integrity is a fundamental university value. Through the honest completion of academic work, students sustain the integrity of the university while facilitating the university's imperative for the transmission of knowledge and culture based upon the generation of new and innovative ideas. Please refer to the university Undergraduate Academic Integrity Policy (*https://catalog.buffalo.edu/policies/academic_integrity_2019-20.html*) for additional information.

As an engineer or computer scientist, you have special ethical obligations. As per the NSPE Code of Ethics, "engineers shall avoid deceptive acts" and "shall conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession (*https://www.nspe.org/resources/ethics/code-ethics*). Similar sentiments of honesty, integrity, fairness, and responsibility are fundamental to the ACM Code of Ethics (*https://www.acm.org/code-of-ethics*).

A violation in this class generally results in an F for the entire course. The Computer Science and Engineering department's policy on academic integrity can be found here:

https://engineering.buffalo.edu/computer-science-engineering/information-for-students/policies/academic-integrity.html

Critical Campus Resources

Sexual Violence

UB is committed to providing a safe learning environment free of all forms of discrimination and sexual harassment, including sexual assault, domestic and dating violence and stalking. If you have experienced gender-based violence (intimate partner violence, attempted or completed sexual assault, harassment, coercion, stalking, etc.), UB has resources to help. This includes academic accommodations, health and counseling services, housing accommodations, helping with legal protective orders, and assistance with reporting the incident to police or other UB officials if you so choose. Please contact UB's Title IX Coordinator at 716-645-2266 for more information. For confidential assistance, you may also contact a Crisis Services Campus Advocate at 716-796-4399.

Mental Health

As a student you may experience a range of issues that can cause barriers to learning or reduce your ability to participate in daily activities. These might include strained relationships, anxiety, high levels of stress, alcohol/drug problems, feeling down, health concerns, or unwanted sexual experiences. Counseling, Health Services, and Health Promotion are here to help with these or other issues you may experience. You can learn more about these programs and services by contacting:

Counseling Services:

- 120 Richmond Quad (North Campus), 716-645-2720
- 202 Michael Hall (South Campus), 716-829-5800

Health Services:

- 4350 Maple Rd, Amherst, NY 14226, 716-829-3316

Health Promotion:

- 114 Student Union (North Campus), 716-645-2837