CIT 57800, Advanced Topics in Data Management

Department of Computer Information and Graphics Technology
Purdue School of Engineering and Technology
Indiana University-Purdue University Indianapolis (IUPUI)
Spring 2024, **Time**: M 6:00 - 8:45 PM, **Location**: ET 329 and Remote, **Credits**: 3

Instructor:	Dr. Shu Hu	**Email:**	shu3@iu.edu
Office hours:	W 3:00 - 4:00 PM (Or by appointment to meet online)	**Office location:**	ET 309F
Personal Web:	https://web.ics.purdue.edu/~hu968/		

> **DISCLAIMER STATEMENT:** "Extenuating circumstances may result in changes to the assignments or schedule. Please check Canvas often for announcements of any changes."

1   Course

Course Description: This course will cover both the fundamentals and concepts of cloud computing and cloud-based data analytics techniques. In this course, topics to be discussed include but not limited to emerging data storage and management techniques for large-scale data sets, cloud-based data mining tools for analyzing large-scale data collections over large-scale data collections and related data security and privacy issues. The class will also introduce design data management infrastructure for real-world application domains, such as health care, online marketing, social network analysis and so on. Students will apply the learned techniques in labs. A research project report is required at the end of the course.

Course outcomes:

- Demonstrate a solid understanding of the fundamentals and concepts of data management in the Cloud

- Apply the existing advanced data management tools for effective and scalable data management in the Cloud

- Design state-of-the-art infrastructure for data management to meet an organization's need

- Design data flows to store and use data from multiple data sources in the Cloud

- Compare and assess the existing data management tools or software and recommend the appropriate ones based on the organization's resources and plan

Requirements: Graduate standing, Students are required to have previous knowledge of data structures and programming experience. Programming skill: Some labs and projects are in Linux, Java, and Python. A brief introduction to Linux will be given in class. You are expected to learn the languages on your own. Please take your laptop into the classroom because you will practice during the class.

Grading Policy & Other Course Details: The following items are designed to make your life easier and to give you some flexibility for planning your work:

- Grades are NON-NEGOTIABLE per IUPUI policy.

- If the class average is greater than 85%, we will follow absolute grading, else it will be relative grading. For example, letter grades will be based on the following grading scale:

  93 - 100% = A

  90 - 92% = A-

  87 - 89% = B+

  83 - 86% = B

  80 - 82% = B-

  75 - 79% = C+

  70 - 75% = C

  < 70% = F

  'FN', 'FNN', 'W', 'I' grades shall be granted per school policy.

  An Incomplete ("I") grade will be given in this class only under these three conditions:

  1. Unusual circumstances (such as illness) prevent the student from completing the work.
  2. The student has successfully completed 70% of the required course work.
  3. The student is clearly passing the course based on already-completed course work.

- You should go through the materials, set your questions to clarify in the class. Meetings in the class hour will be more like the Q/A sessions. Class participation is graded.

- You must submit your work in Canvas.

- There will be a small quiz (almost) every week.

- Incomplete homework assignments can be turned in for partial credit.

Textbook/Reference Books:

- *Data Analysis in the Cloud: Models, Techniques and Applications* by Domenico Talia, Paolo Trunfio, Fabrizio Marozzo. Elsevier, 2015, ISBN: 0128029145, 9780128029145.

Grade Composition:

- Semester Project: 35%

- Labs: 40% (5%×8)

- Class participation and quizzes: 10%

- Final: 15%

Important Dates:

Final Exam .... Monday 04/29/2024 from 6:00 PM to 8:45 PM in ET 329 (or Online).

Rough schedule (each topic will take up 1-2 weeks)

1. Course Overview and Introduction to Cloud Computing

2. Introduction to Amazon AWS and Google Cloud platform

3. Brief introduction of Linux OS, Virtual Machine in Cloud

4. Storage in Cloud

5. Open Data and Basic Data Processing

6. IAM in Cloud

7. Relational DB in Cloud

8. Data warehouse in Cloud

9. Project midterm presentation and Q/A

10. NoSQL in Cloud

11. Machine Learning in Cloud – AWS and GCP

12. Hadoop and Amazon Elastic MapReduce (EMR)

13. Virtual Private Cloud and Application Scenario Analysis

14. Project final presentations

15. Final Exam

Approved Resources:

1. Any material posted in the slides.

2. Material from the text-book (will copy relevant content to slides).

Working with others: Please do help each other! This material is fun, but can be challenging. Discussing it with peers can deepen your understanding. You can talk *about* the homework problems and ways of approaching them, however, every person must write up solutions separately. We will compare all submissions with each other AND non-approved sources. If you can find something online, so we can either.

Academic Integrity:
    (Short) Don't cheat! You will be caught and punished. Our department is serious about graduating ethical and upstanding computer technicians/scientists. The policy has recently been updated and will be enforced.
    (Long) The IU Code of Student Rights, Responsibilities, and Conduct states that students must uphold and maintain academic and professional honesty and integrity; the code defines academic misconduct as any activity that tends to undermine the academic integrity of the institution. Students engaging in academic misconduct may therefore receive penalties from their course instructor and disciplinary action from the university. Policies against academic misconduct apply to all course-, department-, school-, and university-related activities. Academic misconduct may involve human, hard-copy, or electronic resources and includes but is not limited to the following: cheating, fabrication, plagiarism, interference, violation of course rules, and facilitating academic dishonesty. For definitions of these activities, visit the Definitions appendix on the Student Code website For information on how faculty and students are expected to handle cases involving academic misconduct, visit Academic Misconduct on the Student Code website. Additional information about the rights and responsibilities of IU students is available in the Code of Student Rights, Responsibilities, & Conduct.

Attendance: It entails being present and attentive for the entire class period. 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. Illness or a death in the immediate family is usually the only acceptable excuse for absence from class. Absences must be explained to the instructor's satisfaction, who will decide whether omitted work may be made up. To protect your privacy, doctor's excuses should exclude the nature of the condition and focus instead on how the condition affects your coursework.

Missing class reduces your grade through the following grade reduction policy: 2% will be taken off for each unexcused absence. If you have five unexcused absences, you will lose all your 10% participation scores and be given an 'F'. Generally, a doctor's note is required for an absence.

Deliverables: You are responsible for completing each deliverable (e.g., assignment, quiz) by its deadline and submitting it by the specified method. Deadlines are given in class 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 submitted late but within a 24-hour period. No submission will be accepted after the 24 hours passed the deadline.

Accessibility Resources: If you have any disability which requires reasonable accommodations to enable you to participate in this course, please contact the Office of Accessible Educational Services, Joseph T. Taylor Hall (UC), Room 100, (317) 274-3241, and also the instructor of this course. The office will provide you with information and review appropriate arrangements for reasonable accommodations.

2   IUPUI Policy

Withdrawing from this class using eDrop: To find withdrawal deadlines for other session lengths, see the calendar at https://facultystaffcentral.iupui.edu/calendars/official-calendar.html. Then select your session of interest and the "Register, drop/add, refunds" category from the dropdown menus under "Choose your view".

If you choose to withdraw from this class, here are important dates and information:

- **Mon, Aug 28 – Sun, Oct 22**. Withdrawal with automatic grade of "W." Requires advisor approval.

- **Mon, Oct 23 - Thu, Dec 7**. Withdrawal with a grade of "W" or "F" begins on Oct 23 and extends through Dec 7. Requires advisor, instructor, and dean's approvals. **Beginning on this date (Oct 23), drops will be approved only if you have serious, extenuating circumstances. You must provide documentation (or evidence) of the serious, extenuating circumstance to the Associate Dean for Academic Affairs and Undergraduate Programs in ET 215. However, if your advisor is in the New Student Academic Advising Center in ET 101, you must see your advisor to initiate an eDrop. You must provide documentation (or evidence) of the serious, extenuating circumstances to your advisor who will forward it to the Associate Dean.**

NOTE: After you submit the electronic eDrop request, others must approve it. *You are not withdrawn until you receive confirmation your eDrop has been approved and processed*. You should attend class while you wait for the approvals and remind your instructor to approve your electronic eDrop. If all approvals are not completed in 14 days, the Office of the Registrar cancels your eDrop request; if this happens, you are still officially enrolled in the class.

Administrative Withdrawal: A basic requirement of this course is that you will participate in all class and/or lab meetings and conscientiously complete all required course activities and/or assignments. Keep in touch with me if you are unable to attend, participate, or complete an assignment on time. If you miss more than half of the required activities (including class and/or lab meetings) within the first 25% of the course without contacting me, you may be administratively withdrawn from this course. Example: Our course

meets once/twice per week; thus if you miss more than two/four classes in the first four weeks*, you may be withdrawn. Administrative withdrawal may have academic, financial, and financial aid implications. Administrative withdrawal will take place after the full refund period, and if you are administratively withdrawn from the course, you will not be eligible for a tuition refund. If you have questions about the administrative withdrawal policy at any point during the semester, please contact me.

List of school/campus resources for tutoring such as the TCM Writting Center, Math Labs, ETC: The School of Engineering & Technology supports the Technical Communication (TCM) Writing Center (ET 199D, 1st floor of the ET building diagonally across the hall from ET Student Services). You may schedule individual tutoring on campus or online through the Writing Center for writing or speaking assignments. Hours vary by semester. Walk-ins are taken (on-campus only) on a first-come/first-served basis. For more information or to schedule an appointment, go to `https://et.iupui.edu/students/tcmwriting/`. Another excellent resource for communication skills is The Purdue Online Writing Lab (OWL). `http://owl.english.purdue.edu/` The Math Assistance Center (`https://science.iupui.edu/math/academics/academic-support/mac.html`) provides support for most 100- and 200-level math courses as well as STAT 35000. The Bepko Learning Center (`https://blc.iupui.edu`) is available to help student connect with academic mentoring, tutoring, and success coaching opportunities.

Statement about civility in the classroom. Everyone deserves to be treated with dignity and respect. Within this classroom, civility requires mutual respect for all class members and instructor(s) and their knowledge and expertise. All members of this class (instructor and students) are responsible for and expected to promote respectful and courteous language, demeanor, and actions. Behavior that is offensive, disruptive, intimidating, dismissive, or condescending will not be tolerated from either the instructor or the student.

SEXUAL MISCONDUCT INFORMATION: What you should know about sexual misconduct: IUPUI does not tolerate acts of sexual misconduct, including sexual harassment and all forms of sexual violence. If you have experienced sexual misconduct, or know someone who has, the University can help. It is important to know that federal regulations and University policy require faculty to promptly report complaints of potential sexual misconduct known to them to their campus Deputy Title IX Coordinator(s) to ensure that appropriate measures are taken and resources are made available. The University will work with you to protect your privacy by sharing information with only those that need to know to ensure the University can respond and assist. If you experience or witness any act of sexual misconduct, go to `http://stopsexualviolence.iu.edu/help/iupui/index.html`. If you are seeking help and would like to speak to someone confidentially, you can make an appointment with a Mental Health Counselor on campus (contact information available at `https://stopsexualviolence.iu.edu/help/confidential_resources.html`).

IUPUI NON-DISCRIMINATION POLICY: Indiana University prohibits discrimination on the basis of age, color, disability, ethnicity, sex, gender identity, gender expression, genetic information, marital status, national origin, race, religion, sexual orientation, or veteran status. If you feel like you have been discriminated against, please contact IUPUI's Office of Equal Opportunity (OEO). OEO is located in Lockefield Village, LV 4443. You can reach the office by calling 317-274-2306.

IUPUI does not tolerate acts that are damaging to our safe, civil, and inclusive community–and neither should you. If you experience or witness an incident of bias, you should report it. For more information, see Student Incident Reporting.

INFORMATION REGARDING ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES AND CONTACT INFORMATION FOR ADAPTIVE EDUCATIONAL SERVICES (AES): Accommodations are available for students with special challenges or disabilities that may affect their performance in this class. To determine if you are eligible for accommodations, you must register with Adaptive Educational Services (AES), which can be reached at (317) 274-2050. You must provide your instructor with the documentation from AES showing you have registered with the service. For more information, visit the AES website at `https://diversity.iupui.edu/offices/aes`

STATEMENT ABOUT THE TWO-STEP LOGIN (DUO) FOR ALL CAS LOGINS: Two-Step Login (Duo) is required for all students. Be sure to bring your primary device (like a cellphone or tablet) to class so you can log in to secure IU systems. Also make sure you have a backup device like a hardware token or Google Voice. If you get stuck without a working device, the UITS Support Center can give you a bypass code, but it takes up to 20 minutes to verify your identity (not great for time-sensitive class activities). If you still need to set up Duo or need further information, get started at https://one.iu.edu/task/iu/duo

COUNSELING AND PYSCHOLOGICAL SERVICES (CAPS) INFORMATION: During the semester, if you find that life stressors are interfering with your academic or personal success, consider contacting IUPUI's Counseling and Psychological Services (CAPS). All IUPUI students are eligible for individual counseling services at minimal fees. Group counseling services are free of charge. CAPS also performs evaluations for learning disorders and ADHD; fees are charged for testing. CAPS is located in Walker Plaza, Room 220 (719 Indiana Avenue) and can be contacted by phone (317-274-2548). For more information, see the CAPS website at https://studentaffairs.iupui.edu/health/counseling-psychological/index.html. For additional information about general health services, see the Student Health and Wellness website at http://studentaffairs.iupui.edu/health-wellness/counseling-psychology/index.shtml.

TIMELYCARE: If you are looking for additional support for your mental and physical health, TimelyCare (https://www.iu.edu/mental-health/find-resources/timely-care.html) – a new IU resource for students – offers free, round-the-clock virtual health and well-being services. These include:

- TalkNow: Provides 24/7, on-demand emotional support for concerns such as anxiety, relationships, depression, or any stressors.

- Scheduled Counseling: Students can select the day, time, and mental health provider that suits their schedules and personal preferences.

- Psychiatry: Referrals are available for all students, including online-only students, across all campuses.

- Health Coaching: Guidance to develop healthy lifestyle behaviors, covering aspects like nutrition, sleep habits, time management, and mindfulness.

- Self-Care Content: Access to a library of evidence-based digital self-care content, from multi-episode self-care journeys on eating disorders and anxiety to single session yoga and meditation classes.

- Peer Community: An opportunity to connect with other students for peer-to-peer support, fostering a positive environment for discussing common challenges.

Sign up for TimelyCare to access these resources if and when they need them. The following steps will guide you through the process:

1. Download the TimelyCare app (iOS or Android) or visit timelycare.com/iu

2. Sign in using their IU credentials – IU email address and password

3. Create a profile and answer a few intake questions

A link to TimelyCare is also available in the global navigation bar of Canvas.