# ECE 473 – Introduction to Cloud Computing and Cloud Native Systems
# ECE 573 – Cloud Computing and Cloud Native Systems
# Fall 2023

**Instructor:** Professor Jia Wang
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**Prerequisites:** ECE 242 Digital Computers and Computing

**Class Time and Location:** Mon./Wed. 3:15 PM – 4:30 PM, Hermann Hall 005

**Class Home Page:** `http://www.ece.iit.edu/~jwang/ece473-2023f/`

**Required Textbook:**
- "Cloud Native Go: Building Reliable Services in Unreliable Environments"
  Matthew Titmus, O'Reilly Media, 2021, ISBN-13 978-1492076339
- Plus additional research papers

**Computer Requirement:** A computer desktop or laptop with at least 4 cores and 16GB memory and that is able to run VirtualBox is required. Internet access to common code and package repositories like GitHub and Docker Hub is required.

**Course Descriptions:** This course introduces students to cloud native systems that build on top of the cloud computing architecture to provide scalable services in dynamic environments. Key topics covered include virtualization and containerization, distributed database systems, communication mechanisms, batch and stream processing, resource management, consensus, security, and system design techniques for scalability, resilience, manageability, and observability. Course projects will provide hand-on experiences on state-of-the-art languages, libraries, and tools. Students registering for ECE 573 are required to complete additional project sections in advanced areas.

**Grading:**
- Homeworks: 2 points each for a total of 10 points.
- Projects: 20 points each for a total of 120 points.
- ECE 473: A $\geq$ 90 / B $\geq$ 80 / C $\geq$ 60 / D (undergraduate only) $\geq$ 55.
- ECE 573: A $\geq$ 110 / B $\geq$ 90 / C $\geq$ 75.

**Homework and Project Policy:** Late homeworks and project reports will not be graded. Discussions on homeworks and projects are encouraged, but copying will call for disciplinary action.

**Lecture Schedule (tentative):**

| No. | Date | Topic | Chapters | HW Out | Project Due |
|---|---|---|---|---|---|
| 1, 2 | 8/21, 8/23 | Introduction | 1,6 | HW #1 | |
| 3, 4 | 8/28, 8/30 | Go Introduction | 2,3 | | |
| 5 | ~~9/4~~, 9/6 | Cloud Native Patterns | 4 | HW #2 | |
| 6, 7 | 9/11, 9/13 | RESTful Services | 5 | | PRJ #1 |
| 8, 9 | 9/18, 9/20 | Virtualization and Containerization | | | |
| 10,11 | 9/25, 9/27 | Resource Management | | HW #3 | PRJ #2 |
| 12,13 | 10/2, 10/4 | SQL Database and CAP Theorem | | | |
| 14 | ~~10/9~~, 10/11 | Distributed Database Systems | | | |
| 15,16 | 10/16,10/18 | Scalability and Resilience | 7,9 | HW #4 | PRJ #3 |
| 17,18 | 10/23,10/25 | Communication Mechanisms | 8 | | |
| 19,20 | 10/30, 11/1 | Batch Processing | | | |
| 21,22 | 11/6, 11/8 | Stream Processing | | HW #5 | PRJ #4 |
| 23,24 | 11/13,11/15 | Manageability and Observability | 10,11 | | |
| 25 | 11/20,~~11/22~~ | Consensus Algorithms | | | |
| 26,27 | 11/27,11/29 | Security in Cloud | | | PRJ #5 |
| | 12/4–12/8 | **No Final Exam** | | | PRJ #6 |

**ECE 473 Course Objectives (ABET)**
After completing this course, you should be able to:

1. Identify scenarios where cloud computing applies.
2. Understand virtualization and containerization techniques.
3. Explain common storage, communication, and computing patterns in cloud.
4. Describe cloud native system design techniques for security, scalability, resilience, manageability, and observability.
5. Utilize open-source software to build cloud native systems.

**ADA Statement:** Reasonable accommodations will be made for students with documented disabilities. In order to receive accommodations, students must obtain a letter of accommodation from the Center for Disability Resources and make an appointment to speak with me as soon as possible. The Center for Disability Resources is located in the Life Sciences Building, room 218, 312-567-5744 or `disabilities@iit.edu`.

**Sexual Harassment and Discrimination Information:** Illinois Tech prohibits all sexual harassment, sexual misconduct, and gender discrimination by any member of our community. This includes harassment among students, staff, or faculty. Sexual harassment of a student by a faculty member or sexual harassment of an employee by a supervisor is particularly serious. Such conduct may easily create an intimidating, hostile, or offensive environment. Illinois Tech encourages anyone experiencing sexual harassment or sexual misconduct to speak with the Office of Title IX Compliance for information on support options and the resolution process. You can report sexual harassment electronically at iit.edu/incidentreport, which may be completed anonymously. You may additionally report by contacting the Title IX Coordinator, Virginia Foster at `foster@iit.edu` or the Deputy Title IX Coordinator

at eespeland@iit.edu. For confidential support, you may reach Illinois Tech's Confidential Advisor at (773) 907-1062. You can also contact a licensed practitioner in Illinois Tech's Student Health and Wellness Center at student.health@iit.edu or (312)567-7550 For a comprehensive list of resources regarding counseling services, medical assistance, legal assistance and visa and immigration services, you can visit the Office of Title IX Compliance website at https://www.iit.edu/title-ix/resources.