

ECE 587 – Hardware/Software Co-Design Spring 2025

Instructor: Professor Jia Wang (jwang34@iit.edu)

Prerequisite:

CS 201 Introductory data structures, algorithms, and object-oriented programming.

ECE 441 Microprocessors, memories, I/O interfaces, and interrupt systems.

Though not required, you are recommended to take at least one course in VLSI design, software development, and computer architecture concurrently or before taking this course.

Class Time and Location: Mon./Wed. 11:25 AM – 12:40 PM, Location TBD

Class Home Page: <http://www.ece.iit.edu/~jwang/ece587-2025s/>

Textbook:

- (Recommended) “Embedded System Design: Modeling, Synthesis and Verification”
D. D. Gajski, S. Abdi, A. Gerstlauer, G. Schirner, Springer, 2009. ISBN-13: 978-1-4419-0503-1 (eBook available from <http://library.iit.edu/>)
- Plus additional research papers

Computer and Network Requirements:

- A recent Windows computer with 4 CPU cores, 16GB memory, and 512GB SSD; or access to a x64 Ubuntu server with 4 CPU cores, 8GB memory, and 100GB storage.
 - We are not able to support ARM-based computers like Apple MacBooks and Raspberry Pi’s, as well as computers that are more than 5 years old.
- Internet access to common code and package repositories like GitHub.

Course Objective: To give students a clear understanding of state-of-the-art hardware/software co-design methodology for computing systems.

Topics Covered: Hardware/software co-design of computing systems; Models of computation; Verification; High-level synthesis; Hardware and software architectures for neural networks; Trends in hardware acceleration and interconnection networks.

Grading: Homeworks: 15% / Projects: 90%. A: $\geq 90\%$ / B: $\geq 80\%$ / C: $\geq 60\%$.

Homework and Project Policy: Late homeworks and projects will not be graded. Deadlines will NOT be extended, except for extraordinary reasons. Homeworks will be graded based on general approach and completion. Discussions on homeworks/projects are encouraged, but copying will call for disciplinary action.

Lecture Schedule (tentative):

No.	Date	Topic	Chapters	HW Out/Project Due
1, 2	1/13, 1/15	Introduction	1	
3	1/20, 1/22	State-Based Models	2	
4, 5	1/27, 1/29	Process-Based Models	3.1	Homework 1
6, 7	2/3, 2/5	Concurrency in Practice	3.1	RISC-V Prototyping I
8, 9	2/10, 2/12	RISC-V and Chipyard		
10,11	2/17, 2/19	System Modeling	3.2–3.7	
12,13	2/24, 2/26	Verification	7	Homework 2
14,15	3/3, 3/5	Software Synthesis	5	RISC-V Prototyping II
16,17	3/10, 3/12	Hardware Synthesis	6	Homework 3
	3/17–3/21	Spring Break		
18,19	3/24, 3/26	Neural Networks I		System Exploration (proposal)
20,21	3/31, 4/2	Neural Networks II		Literature Survey (progress)
22,23	4/7, 4/9	Hardware Acceleration I		RISC-V Prototyping III
24,25	4/14, 4/16	Hardware Acceleration II		
26,27	4/21, 4/23	Interconnection Networks		
28,29	4/28, 4/30	Future Trends		Literature Survey (final)
	5/5–5/9	No Final Exam		System Exploration (final)

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>.