

# **I** ILLINOIS

## School of Information Sciences

**Full Course Title:** Computer Networks

**Course Number:** IS496

**Semester Year:** Spring 2024

**Classroom and Class Time:** 315 Gregory Hall, Monday 1:00 pm - 3:50 pm

**Weekly contact hours required:** Meet online 1 time per week for 2:50 minutes

This syllabus may be obtained in alternative formats upon request. Please contact the instructor.

**Course Website:** <https://www.wangdong.org/courses/spring24/index.html>

**Canvas Page:** <https://canvas.illinois.edu/courses/42018>

**Name of instructor:** [Prof. Dong Wang](#)

**Instructor's office address:** 614 E. Daniel St

**Office hours:** By Appointment

**Instructor's telephone number and email address:**

**Tel:** 217-244-6412; **Email:** [dwang24@illinois.edu](mailto:dwang24@illinois.edu) (preferred)

**Name of course assistant:** Lanyu Shang

**Assistants' office addresses:** 614 E. Daniel St, Room 5012

**Office hours:** By Appointment

**Assistants' telephone numbers and email addresses:** [lshang3@illinois.edu](mailto:lshang3@illinois.edu) (preferred)

**Name of teaching assistant:** Zhenrui Yue

**Assistants' office addresses:** 614 E. Daniel St, Room 5012

**Office hours:** 1-3 pm Friday, or By Appointment

**Assistants' telephone numbers and email addresses:** [zhenrui3@illinois.edu](mailto:zhenrui3@illinois.edu) (preferred)

### **Course Description**

The goal of this course is to introduce students to fundamental topics of principles, design, implementation, and performance of computer networks, which serve as the foundation of our largest information sharing network: the Internet. Students will explore networking techniques and protocols using hands-on experiments over different real world computer networks and information sharing applications. Topics of the course include TCP/IP architecture, Internet protocols, socket programming, congestion control, switching and routing, local area networks, internet of things (IoT), network security, the end-to-end arguments and resource allocation.

### **Pre- and Co-requisites**

The pre-requisite of this course include:

- 1) graduate or junior/senior in undergrad;
- 2) proficiency in either Python or C/C++ programming language.

# **Credit hours:** 4 credits (Graduates); 3 credits (Undergraduates)

Graduate students (4 credit hour section) are expected to complete one extra course mini-project, not required of undergraduate students (3 credit hour section). Please see details under the “Grade Distribution” section.

### **Student Learning Objectives or Outcomes**

Upon successful completion of the course, students will:

- Learn fundamental computer network principles that support the global information access, sharing and management tasks
- Learn the algorithms, protocols, etc., that drive the Internet
- Get hands dirty with implementations and experiments in real world networking and information sharing applications
- Learn to solve network programming problems in teams

### **Course Context**

This course meets a number of learning outcomes connected to program objectives for the \_\_\_ *MS/IM, MS/LIS, BS/IS* \_\_\_ program, which in turn connect to larger iSchool and University of Illinois learning goals.

### **Program Learning Outcomes**

#### **MS/IM**

Upon completion of the MS/IM program, students will be able to:

- Manage information using best practices in management and policy; knowledge representation; human-centered design and systems; and data analytics.
- Define and successfully address a tractable research question or real world problem in information management using the appropriate scientific and/or research methods.
- Accurately convey the implications of analytical results (in both oral and written modalities) to diverse stakeholders.
- Articulate and critique the range of values and of ethical standpoints within which complex sociotechnical design occurs.
- Apply best practices for providing value, leadership, and team building.
- Stay up-to-date by learning how to read, analyze, discuss, synthesize, and critique advances reported in the research literature.

#### **MS/LIS**

Upon completion of the MS/LIS program, students will be able to:

- Apply foundational concepts, theories, and principles to problems of information organization and access.
- Communicate capably with diverse stakeholders, promoting not just access to but also effective use of information services and systems in specific contexts.

- Use evidence to help address information problems, meet information needs, and create relationships in their institutions, communities, profession, and the world.
- Compare and critique contemporary information practices, structures, and standards in relation to historical and global alternatives.
- Apply core ethical principles to professional practice.

### **BS/IS**

#### **Goals of the BS/IS**

- Equip students to be leaders in a knowledge society and innovators in a knowledge economy
- Educate students for known, emerging, and currently unforeseeable careers in information sciences
- Provide an interdisciplinary education where studies in fundamentals of information sciences and in application areas are fully integrated
- Ensure that various upper-division elective pathways of the major share a common core of information sciences knowledge
- Provide a program with enough flexibility to facilitate transfers into the major at the sophomore level, transfer across colleges at the sophomore and junior level, and transfers from two-year colleges
- Since information sciences is a rapidly developing field, offer a flexible program that responds quickly to new needs and opportunities, and to new findings and approaches in the information sciences
- Prepare interested students for graduate study in information sciences and related fields

#### **Objectives of the BS/IS (based on objectives of the required courses)**

- Understand relationships among people, information, and technology
- Understand the history, theory, philosophy and methodologies of the field of information sciences
- Apply various approaches to research in the information sciences, including social science methods, data and text mining, digital humanities, historical approaches, and others
- Apply critical analytical skills to information issues
- Understand fundamental mathematical and programming tools for solving problems of information modeling, expression, and transformation

#### **iSchool Goal**

This course meets the following goal:

- Maintain global leadership in education for the information professions

#### **University of Illinois Campus-Wide Learning Goals**

This course meets the following goals:

1. Intellectual Reasoning and Knowledge
2. Creative Inquiry and Discovery
3. Effective Leadership and Community Engagement
4. Social Awareness and Cultural Understanding
5. Global Consciousness

## Course materials

- Required Textbook: Larry L. Peterson and Bruce S. Davie, "Computer Networks, A Systems Approach", Morgan Kaufmann Publishers (Elsevier), 5th Edition, ISBN-10: 0123850592 | ISBN-13: 978-0123850591.

## Bio of Instructor

Dr. Wang is an associate professor with tenure in the School of Information Sciences at the University of Illinois Urbana-Champaign (UIUC). He received his Ph.D. degree in Computer Science at UIUC. He is also affiliated with the Informatics Program, the Information Trust Institute, and the Center for Social and Behavioral Science (CSBS) at UIUC. His research interests mainly lie in the area of social (human-centric) sensing, intelligence and computing, human-centered AI, AI for social good, data quality, and big data analytics. Dr. Wang and his team's work has been applied in a wide range of real-world applications such as misinformation detection, social network analysis, crowd-based disaster response, intelligent transportation, urban planning, and environment monitoring. He has published over 150 technical papers in peer reviewed conferences and journals. His research on social sensing, intelligence and computing resulted in software tools that found applications in academia, industry, and government research labs. He authored a monograph, "Social Sensing: Building Reliable Systems on Unreliable Data", which was published by Elsevier. He is the recipient of NSF CAREER Award, Google Faculty Research Award, Young Investigator Program (YIP) Award from the US Army Research Office, Wing Kai Cheng Fellowship from the University of Illinois, the Best Paper Award of 2022 ACM/IEEE International Conference on Advances in Social Networks Analysis and Mining (ASONAM), the Best Paper Award of 16th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS) and the Best Paper Honorable Mention of 8th IEEE SmartComp.

## Assignments and Methods of Assessment

1. All assignments are required for all students. Completing all assignments is not a guarantee of a passing grade.
2. All work must be completed in order to pass this class. Late or incomplete assignments will not be given full credit unless the student has contacted the instructor prior to the due date of the assignment (or in the case of emergencies, as soon as practicable).
3. Late or incomplete assignments will not be given full credit unless the student has contacted the instructor prior to the due date of the assignment (or in the case of emergencies, as soon as practicable).
4. Criteria for grading homework assignments include (but are not limited to) creativity and the amount of original work demonstrated in the assignment. However, students are permitted to use and adapt the work of others, provided that the following guidelines are followed:
  - a. Use of other people's material must not infringe the copyright of the original author, nor violate the terms of any licensing agreement. Know and respect the principles of fair use with respect to copyrighted material.
  - b. Students must scrupulously attribute the original source and author of whatever material has been adapted for the assignment. Summarize the changes or adaptations that have been made. Make plain how much of the assignment represents original work.

**Grade Distribution:**

- Three Homework Assignments (individual): 21% (7%\*3)
- One presentation on a selected topic: 7%
- Undergraduate students (group): Three Programming Assignments: 42% (14%\*3)
- Graduate students (group): Three Programming Assignments + One Course Mini-Project and Presentation: 42% (10%\*3+12%)
- Mid-Term Exam (individual): 10%
- Final Exam (individual): 10%
- In-class Participation (individual): 10%

**Note1:** For individual based work, each student will receive the credit based on her/his own work. For the group-based work, every student in the group will receive the same credit based on the group's work. The maximum group size is two students.

**Note2:** The graduate students are expected to finish one extra course mini-project in addition to the three programming assignments that will be accomplished by both graduate and undergraduate students. This is designed to meet the expectation on different credit hours (4 for graduate students and 3 for undergraduate students) in this course.

**Incomplete grades**

An exceptional request for an incomplete grade is most often granted to students encountering a medical emergency or other extraordinary circumstances beyond their control. Students must request an incomplete grade from the instructor. The instructor and student will agree on a due date for completion of coursework. The student must submit an Incomplete Form signed by the student, the instructor, and the student's academic advisor to the front office:

<https://uofi.app.box.com/s/sx7arobhr0gfw12teaetmp1qq32ifdrd>

Please see the Student Code for full details: <http://studentcode.illinois.edu/article3/part1/3-104/>

**Grading Scale**

97-100 = A+

94-96 = A

90-93 = A-

87-89 = B+

83-86 = B

80-82 = B-

77-79 = C+

73-76 = C

70-72 = C-

67-69 = D+

63-66 = D

60-62 = D-

59 and below = F

### Attendance/ Participation Policy

The iSchool expects students to attend all classes except in cases of emergency.

Student Code on Attendance: <http://studentcode.illinois.edu/article1/part5/1-501/>

1. If you have an emergency, communicate with the instructor as early as possible to prevent negatively impacting your grade. Students missing more than one class—or who regularly arrive late or leave early—will not pass the class unless alternate arrangements are made.
2. Enrollment in this course includes expectation of regular attendance. If you find you must miss (or have missed) class, contact the instructor as soon as possible. Students may miss one class session with no penalty; thereafter, each unexcused absence will result in your grade being lowered by one step (for example, an A- will become a B+). Repeated tardiness or leaving sessions early may be considered an unexcused absence unless alternate arrangements have been made with the instructor.
3. Students share some of the responsibility for fostering an inclusive classroom. Students are expected to be respectful of others' perspectives and lived experiences during class discussion.
4. Students are expected to demonstrate respect for the ideas and opinions of all other members of the class at all times. Failure to observe this course requirement can result in a failing course participation grade, and may result in a failing grade for the course.

### Academic Integrity

The iSchool has the responsibility for maintaining academic integrity so as to protect the quality of education and research in our school and to protect those who depend on our integrity.

Consequences of academic integrity infractions may be serious, ranging from a written warning to a failing grade for the course or dismissal from the University.

1. Please review and reflect on the academic integrity policy of the University of Illinois, <http://studentcode.illinois.edu/article1/part4/1-401/> to which we subscribe. By turning in materials for review, you certify that all work presented is your own and has been done by you independently, or as a member of a designated group for group assignments.
2. If, in the course of your writing, you use the words or ideas of another writer, proper acknowledgement must be given (using `_BibTex_` or `EndNote` or `RefWorks_` style). Not to do so is to commit plagiarism, a form of academic dishonesty or plagiarism. Please be aware that the consequences for plagiarism or other forms of academic dishonesty will be severe. Students who violate university standards of academic integrity are subject to disciplinary action, including a reduced grade, failure in the course, and suspension or dismissal from the University.

*Note on the use of AI tools (e.g., ChatGPT) in course assignments.*

- **Permitted Uses:** Students are welcome to use these AI tools to aid with their written work (e.g., proofreading, grammar check) as long as they are properly cited. Please include an appendix that gives your prompts, the original output from the AI tools, and a summary of changes you made to the output.
- **Prohibited:** Directly using AI tools to complete the course assignments is strictly prohibited. This includes but is not limited to having the AI write solutions (e.g., homework, programming assignments) and essays (e.g., project proposal, midterm/final

reports). Plagiarizing content generated by AI tools is also strictly forbidden and constitutes a violation of academic integrity.

- All course assignment submissions will be subject to verification using an AI detection tool. This tool is designed to detect work that has been generated by AI, including but not limited to ChatGPT. Any assignments found to be largely or entirely generated by AI will be considered a violation of academic integrity for this course.

### **A note on teamwork:**

The programming assignments are to be completed in a team of maximum 2 people. Teamwork does not mean that one person does the work one week and the other person does the work the next week. Nor does teamwork imply that one person does most of the work on a project. If you sign your name to the solution set, it means that you have participated in solving the problems. This class follows the student code for academic integrity at UIUC. The graded work you do in this class must be your own. In the case where you collaborate with other students make sure to fairly attribute their contribution to your project.

### **Statement of Inclusion**

<https://diversity.illinois.edu/about/senate-diversity-resolution/>

As the state's premier public university, the University of Illinois at Urbana-Champaign's core mission is to serve the interests of the diverse people of the state of Illinois and beyond. The institution thus values inclusion and a pluralistic learning and research environment, one which we respect the varied perspectives and lived experiences of a diverse community and global workforce. We support diversity of worldviews, histories, and cultural knowledge across a range of social groups including race, ethnicity, gender identity, sexual orientation, abilities, economic class, religion, and their intersections.

### **Religious Observances**

In keeping with our Statement of Inclusion and Illinois law, the University is required to reasonably accommodate its students' religious beliefs, observances, and practices in regard to admissions, class attendance, and the scheduling of examinations and work requirements.

Religious Observance Accommodation Request form:

[https://cm.maxient.com/reportingform.php?UnivofIllinois&layout\\_id=19](https://cm.maxient.com/reportingform.php?UnivofIllinois&layout_id=19)

Other accommodations may be available.

### **Accessibility Statement**

To obtain accessibility-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES you may visit 1207 S. Oak St., Champaign, visiting the website: <https://disability.illinois.edu>; call 333-1970 (V/TTY), or e-mail a message to [disability@illinois.edu](mailto:disability@illinois.edu).

### **Land acknowledgement Statement**

More information: [https://chancellor.illinois.edu/land\\_acknowledgement.html](https://chancellor.illinois.edu/land_acknowledgement.html)

As a land-grant institution, the University of Illinois at Urbana-Champaign has a responsibility to acknowledge the historical context in which it exists. In order to remind ourselves and our community, we will begin this event with the following statement. We are currently on the lands of the Peoria, Kaskaskia, Peankashaw, Wea, Miami, Mascoutin, Odawa, Sauk, Mesquaki,

Kickapoo, Potawatomi, Ojibwe, and Chickasaw Nations. It is necessary for us to acknowledge these Native Nations and for us to work with them as we move forward as an institution. Over the next 150 years, we will be a vibrant community inclusive of all our differences, with Native peoples at the core of our efforts.

### **Additional Resources:**

- Center for Innovation in Teaching & Learning
  - Purposes of a Syllabi, <https://citl.illinois.edu/citl-101/teaching-learning/resources/teaching-strategies/creating-a-syllabus>
  - Guidelines to the Organization and Contents of a Syllabus, <https://citl.illinois.edu/docs/default-source/default-document-library/organization-of-syllabus.pdf?sfvrsn=2>
  - CITL resources on grading: <https://citl.illinois.edu/citl-101/measurement-evaluation/exam-scoring/assigning-course-grades>
  - Course and syllabus design: [http://cte.illinois.edu/resources/topics/course\\_plan.html](http://cte.illinois.edu/resources/topics/course_plan.html)
- Student Learning Outcomes (SLOs): <https://provost.illinois.edu/assessment/learning-outcomes-assessment/illinois-student-learning-outcomes/>.
- University of Illinois Student Learning Outcomes <https://provost.illinois.edu/assessment/learning-outcomes-assessment/assessment-at-illinois/campus-student-learning-outcomes/>
- Graduate College, requirements and recommendations for syllabi: <http://www.grad.illinois.edu/courses-syllabi>
- Inclusion by Design:
  - About: <https://www.facultyfocus.com/articles/course-design-ideas/inclusion-by-design-tool-helps-faculty-examine-teaching-practices/>
  - Tool: <https://drive.google.com/file/d/0B0ulz5eHbyjYdmY0eF9ablRRcHM/view>
- Diversity checklist: <https://racebridgesstudio.com/creating-a-classroom-diversity-checklist/>
- Graduate college guidelines for participation/discussion grades: <https://grad.illinois.edu/content/participation-grade-guidelines>