



CSCI 356-01 Data Communications

COURSE SYLLABUS: Fall 2020

INSTRUCTOR INFORMATION

Instructor: Dr. Donghwoon Kwon

Office Location: Starr 302D

Office Hours: Please make an appointment to have online office hours

Office Phone: 815-226-4056

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University Email Address: dkwon@rockford.edu

Preferred Form of Communication: Email

Communication Response Time: Within 24 hours

COURSE INFORMATION

Course Description

This course introduces the student to an environment which is undergoing rapid change through developments such as microcomputer-based workstations, digital-voice communications, local area networks, computer load sharing, decentralized transaction processing, distributed databases and other evolving technologies. Implications for systems design and development under conditions of distribution, autonomy, centralization and decentralization will be emphasized. Scheduled: Spring yearly or as needed, Meets: MNO

Course Objectives

- To identify major components and types of networks
- To define various protocols and standards used in data communications
- To identify and define the 7-layer OSI model
- To understand the roles and functions of each OSI layer
- To learn how to effectively design a network architecture using network technology
- To understand a variety of datasets for network anomaly detection

The syllabus is subject to change.

- To apply a deep learning methodology to detect network anomalies for the purpose of network security

Credit Hours: 3

Prerequisite: CSCI220 or permission of instructor

Class Type: Lecture & Lab

Class Hours: Mon, Wed, and Fri 09:00AM – 09:50AM at Starr Science Hall, Room 108C

Textbook(s) Required

- Instructor's own lecture slides and materials will be regularly and electronically provided.

Supplemental Textbook(s)

- Python TensorFlow tutorial: <https://www.tensorflow.org/tutorials>

Software / Device Required

- Python version 3 or above with TensorFlow, Keras, and other libraries for network anomaly detection. All other necessary software will be announced.

Optional Texts and/or Materials

- Flash drive recommended

Student Learning Outcomes (SLOs)

Students will be able to

- Define basic terms and fundamental concepts about data communications and networks
- Understand the basic principles of network applications and protocols
- Describe a variety of network technologies and topologies
- Design network architectures
- Obtain practical experience with server connection, the use of IP addresses, IP routing, and network security.

Topical Outline

- Topic 1: Introduction to data communications
- Topic 2: OSI 7 layers and Internet 5 layers
- Topic 3: Various protocols, Protocol Data Units (PDUs), and standards used in each layer
- Topic 4: Roles and functions of each layer
- Topic 5: Network technologies
- Topic 6: Overview of machine learning and deep learning for network anomaly detection
- Topic 8: Introduction to Python with a variety of libraries for network anomaly detection
- Topic 9: Improvement of detection accuracy

COURSE REQUIREMENTS

Instructional Methods

1. Lectures: Important materials from a variety of sources will be covered in class. Students should plan to take careful notes.
2. Labs: Based on lectures, lab exercises will be given to students. Students are required to complete lab exercises, and the discussion is highly encouraged.
3. Assignments: Programming and / or general assignments will be regularly given to students.
4. Quizzes: Occasional announced quizzes will be given to help ensure students keep up with assigned materials.
5. Exams: Two exams will be given, one midterm exam and one final exam. Midterm exam will primarily cover topics from week 1-7, and final exam will be from week 8.
6. Term Project: One group term project will be given to students. 3 Students are required to make a team, and each team has to present the final outcome in the end of the semester.

GRADING

Final grades in this course will be based on the following scale:

% of Total Points	Grade
87% - 100%	A
77% - 86.9 %	B
67% - 76.9%	C
57% - 66.9%	D
Below 57%	F

Category	Percentage
Midterm	15%
Final Exam	15%
Assignments	10%
Quizzes	5%
Attendance	5%
Presentation & Term Project	50%

COURSE SPECIFIC PROCEDURE / POLICY

1. **Assignments:** All assignments **MUST** be turned in by the assigned deadlines. All assignments are due at the time specified. Please keep in mind that no late work will be accepted without penalty. If an assignment is turned in after the due date, **20%** of the grade will be forfeited each day. No assignment will be graded if submitted **5 or more days** after it is due. An assignment must be submitted within 5 days of the due date if you want it graded. All assignments must be placed in the appropriate Dropbox on Canvas.

2. **Examination Makeup Policy:** If a student is absent from an exam during the scheduled time for that exam, the student will automatically receive a grade of 0 for the exam unless:

- a. the student notifies the instructor of the absence before 24 hrs of the exam and supplies a written doctor's excuse or any other official documents explaining the absence, or
- b. there is an extraordinary situation which the instructor allows as an acceptable excuse (instructor needs to be notified before 24 hrs of the exam). If (a) or (b) applies, arrangements for a makeup exam will be made.

It will be the responsibility of the student to show written documentation supporting the absence, from

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your team coach, physician, or other relevant authority.

COLLEGE POLICY

1. Attendance: Each student is required to be present at all class lectures and labs. If an unforeseen absence does occur, the student is responsible to get the notes and assignments from another student. If a student has more than 3 absences from class without acceptable reasons, they may be dropped from the class roster.

This 3-credit course will meet for 50 minutes per session three times a week throughout the semester. A minimum of 2-3 hours of student preparation time outside of class is expected for each credit hour. Thus, please be prepared to devote 9-12 hours per week to this course.

2. Instructor Policy: Students not regularly attending class or not turning in assignments will be given a grade of “F” at the end of semester if that student has not dropped the class or been dropped by the instructor.

3. In case of an emergency or extenuating circumstances, such as illness, family crisis, contact me or have someone on your behalf contact me immediately; emergencies will be handled on a case-by-case basis. Email is best method for contacting me.

COVID-19 Guidelines

All members of this course will adhere to the following guidelines:

- Monitor for the symptoms of COVID-19 through daily symptom and temperature checks, following-up with medical attention as necessary and contacting Lang Wellness.
- Maintain appropriate social distancing (6 feet) within the classroom and inside public spaces of buildings.
- Leave class immediately and do not congregate within classrooms or hallways.
- Stay home if ill or after exposure to someone who is ill or has tested positive for COVID-19.
- Wear appropriate mask while in class.
- Work to mitigate the spread of germs on frequently touched surfaces and objects by following instructor guidelines to keep the classroom clean.
- Keep up to date on latest COVID-19 information at <https://www.rockford.edu/portal/departments/marketing-communications/covid-19/>
- Also, for more comprehensive instructions related to COVID-19 please see the following links:
 - <https://www.rockford.edu/wp-content/uploads/2020/08/Rockford-University-Expectations-August-2020.pdf>
 - <https://www.rockford.edu/wp-content/uploads/2020/08/RU-Student-Guidance-on-COVID-19-decision-tree-3-August-2020.pdf>

HONOR CODE

In this course the policies and procedures concerning the Rockford University Academic Honor Code including definitions of cheating and plagiarism as they appear on the appropriate pages of the current

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Rockford University Handbook will be Applicable.

PLAGIARISM POLICY

1. Plagiarism: Plagiarism is to present someone else's ideas or work as your own. Credit (citation) should be given to the source in the following instances: (1) when you directly quote someone else; (2) when you use someone else's ideas or opinions (unless they are common knowledge); (3) when you use someone else's examples; (4) when you cite statistics or other facts compiled by someone else; (5) when you present evidence or testimony taken from someone else's argument (Berke, Jacqueline. *Twenty Questions for the Writer*. 4th Ed. New York: Harcourt, Brace, Jovanovich, 1985).

If a student plagiarizes, that student will receive an "F" for the assignment. A second occurrence of plagiarism will result in expulsion from the course.

2. Copy: Copying parts or whole of assignments, quizzes and exams is just as serious as any other type of plagiarism. Any indication of copying, cheating and/or plagiarism on exams/assignments/projects will be an automatic 0 (zero) for all students involved.

ADA STATEMENT

Students with Disabilities: If you believe you are eligible to receive any type of academic accommodation, through such federal laws as the ADA, please contact the Lang Center for Health, Wellness, Counseling and Disabilities Services, 815-226-4083. The Lang staff manages disability services for Rockford University.

ACADEMIC CONCERN WITH THIS COURSE

A student who questions the justice of a final grade must first seek an explanation from the course instructor. If dissatisfied with the explanation offered, the student may appeal the grade. Additional information regarding grade appeals can be found in the Academic Catalog.

ELECTRONIC DEVICES POLICY

Electronic devices may be used in the classroom as long as they are being used for academic purposes as approved by instructor and/or are an approved accommodation for a documented disability.

DISCLAIMER

- Due dates, assignments, etc. are subject to change as directed by your instructor during the course of the semester.
- If you have questions about Computer Science, computer careers, etc. please email Dr. Donghwoon Kwon at dkwon@rockford.edu

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COURSE OUTLINE / CALENDAR

Week	Lectures	Topics
1 (8/19 - 8/23)	Lecture1	Discuss the course syllabus Introduction to data communications with layers and protocols
2 (8/24 – 8/30)	Lecture2	Understanding of computer networks with terms Python TensorFlow installation
	Assignment #1: Writing assignment Due date : By 11:59PM, 09/06/2020	
3 (8/31 – 9/6)	Lecture3	Required concepts for network anomaly detection
	Lecture 4	An overview of TensorFlow and basic TensorFlow programming
	Assignment #2: 1 st TensorFlow Coding Due date: By 11:59PM, 09/13/2020	
4 (9/7 – 9/13)	Lecture 5	Machine learning for network anomaly detection (how to establish a hypothesis and cost function?)
	Assignment #3: 2 nd TensorFlow coding Due date: By 11:59PM, 09/20/2020	
5 (9/14 – 9/20)	Lecture 5	Machine learning for network anomaly detection (Cont') (gradient descent algorithm)
	Assignment #4: 3 rd TensorFlow coding Due date: By 11:59PM, 09/27/2020	
6 (9/21 – 9/27)	Lecture 6	Machine learning for network anomaly detection (Cont') (Hypothesis using a multivariable dataset)
	Assignment #5: 4 th TensorFlow coding Due date: By 11:59PM, 10/04/2020	
7 (9/28 – 10/4)	Midterm Review	
8 (10/5 – 10/11)	Lecture 7	Understanding about binary label classification (normal or abnormal) and Midterm
	Assignment #6: 5 th TensorFlow coding Due date: By 11:59PM, 10/18/2020	
9 (10/12-10/18)	Lecture 8	Understanding about multi label classification
	Assignment #7: 6 th TensorFlow coding Due date: By 11:59PM, 10/25/2020	
10 (10/19 – 10/25)	Lecture 9	Overview of deep learning for network anomaly detection and network datasets
	Assignment #8: 7 th TensorFlow coding Due date: By 11:59PM, 11/01/2020	
11 (10/26 – 11/1)	Term project is given. Students need to make a group and develop a network anomaly detection program for the next 3 weeks using the concept of deep learning and TensorFlow.	
12 (11/2 – 11/8)	Term Project	

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13 (11/9-11/15)	<i>Term Project</i>
14 (11/16-11/22)	<i>Term Project</i>
15 (11/23-11/29)	Term Project Presentation, Thanksgiving break, and the last day of the semester
	Due date for the Term Project: by 11:59PM, 11/29/2020
16 (11/30-12/6)	<i>Final Exam</i>

Date Prepared: August 10, 2020