CS 456/656 Automata and Formal Languages
Spring 2024

Instructor Information

Instructor: Nancy LaTourrette
Office: WPEB 419
Phone: 775.784.4014
Email: nancy@unr.edu (through WebCampus mail)
Office Hours: Wednesdays 11:00 a.m. — 2:00 p.m. (via zoom, confirmed by email)

Term Specific Information

Instruction Mode: On Campus
Class Hours: Tuesday/Thursday, 12:00pm – 1:15pm
Classroom: SLH 2
Teaching Assistant: Lee Easson - leasson@nevada.unr.edu
TA Office Hours: By appointment via Zoom
Communication Channel: WebCampus Announcement Link

Course Description

Fundamental concepts of computation. Relationship between grammars, languages and machines, emphasizing regular and context free languages, finite state acceptors and turing machines. Complexity and computability.

Course Objectives

This course is intended to be an upper level undergraduate or introductory graduate course in computer science theory. The objective is to build upon the foundations laid down in CS 365 (Discrete Mathematics). Theorems and proofs are important and will be covered. In this course you will learn the fundamental theory of finite automata and its connection to languages and grammars. The goal is to understand turing machines and their power and limitations that apply to computing.

Course Prerequisites

CS 302 (C or better), CS 365 (C or better), and Math 283.

Required Texts/Course Materials

Textbook:
- *An Introduction to Formal Languages and Automata* (6th ed.), Peter Linz, Jones and Bartlett

Online Submissions:
- Webcam
- Microphone
- Zoom app or access
- PDF creator

Class Procedures/Structures

Class Meetings Structure:
The following information is the expected format but may be subject to change:
- 10-15 minute topic overview in typical lecture format.
- 1-2 fully developed examples using a "whiteboard" though screen sharing.
- Discussions between each section and at the end of class.

WebCampus Materials:
- Textbook slides to supplement instructor lectures.
- Modules with links to textbook slides, practice problems and a solution(s), quizzes and exams, class lecture notes, if recorded.

Content Accessibility:
- This course may leverage 3rd party web/multimedia content, if you experience any issues accessing this content, notify your instructor immediately.
- Any accessibility accommodations needed for uploaded class lecture notes should be directed to your instructor as soon as possible.

Undergraduate Student Learning Outcomes (ABET)

Our graduates will have an ability to:
- Apply computer science theory and software development fundamentals to produce computing-based solutions.
- Acquire and apply new knowledge as needed, using appropriate learning strategies.

Graduate Student Learning Outcomes

Our graduates will have an ability to:
- Apply engineering and computer science research and theory to advance the art, science, and practice of the discipline.

Course Requirements

As per the University Administrative Manual (3,020), students are expected to attend classes in which they are enrolled.

Student Assessments:
- Practice problems will be assigned but not be collected. Doing the practice problems and reading the textbook will help understanding of the course material.
- There will be one **Introduction** quiz, that will test adherence to video and pdf structure and requirements (see *PDF/Video Structure and Requirement* sections below).
- There will be approximately 9+/- video take-home **Concept** quizzes on course content (see *PDF/Video Structure and Requirement* sections below).
- Quizzes will be assigned approximately every 10 days to two weeks.
- There will be 1 in-class paper **Comprehensive** final exam.
- The final exam will be held Thursday May 9th 10:15am – 12:15 pm in the course classroom during the official UNR final exam time.
- The final exam is mandatory.

Concept Quizzes and Exam:
- **Quizzes and Exam are individual efforts. All answers submitted must be each student's own work.**
- Concept quizzes and the final exam will contain both problems to be solved and/or concepts to be explained.
- Video assessments (concept quizzes) should be considered as "take-home oral" quizzes.
- Students will submit their video answers by creating a short (2-3 minutes per question or as specified in instructions) zoom recording showing and explaining (in their own words) their written work and/or concept.
- A pdf of the written solution must be submitted in addition to the video.
- Videos and solution pdfs will be submitted through the WebCampus assignment submission. No other submission methods will be accepted.
- Students will have approximately 3 days for quiz submissions.
- Unlimited submissions are allowed until the due date and time but only the last submission will be graded.
- No late submissions will be accepted.
- Allowable reference material will be specified in video quiz instructions.
- The in-class final exam will be closed book, closed notes.

PDF Structure and Requirements:
- Written solution submissions must be pdfs.
- One pdf per answer (as specified in quiz instructions).
- Label pdf with last name_first name_quiz number_question number (e.g. jones_jill_quiz2_question1).

Video Structure and Requirements:
- Quiz video submissions must be created using a Zoom recording.
- Classroom appropriate language, clothing and background is required. Students are assessed on content not aesthetics but clarity, both written and verbal, is required.
- One video per answer (as specified in quiz instructions).
- Introduction, state the following showing face and government- or university-issued ID:
  - Full Name
  - Class Number
  - Quiz Number
  - Question Number
- State the question and explain your answer.
- Showing written work (submitted pdf) while describing your answer is required, screen sharing is best.
- Conclusion, state the following showing face and government- or university-issued ID:
  - Full Name
  - Class Number
  - Quiz Number
- Label video with last name_first name_quiz number_question number (e.g. jones_jill_quiz2_question1).

- Black out any personally identifiable information on IDs e.g., birthdate, address, etc.

Grading Criteria, Scale, and Standards

The final grade will be based on:

Component	Percentage
Introduction and Concept Quizzes	65%
Final Exam	35%

Replacement Scores and Makeups:
- Up to 2 concept quiz scores may be replaced by the final exam score.
- Before final grades are calculated, the instructor will automatically replace the lowest 2 concept quiz scores (if the final exam score is higher).
- The Introduction quiz score is not eligible for replacement.
- No makeup quizzes or makeup final exam will be offered. Medical exceptions may be made after quiz replacement policy is applied.
- There is no extra credit allocated in the course.

The workload and evaluations for **CS 656** students will be different and more demanding:
- Quizzes/exams may have a different problem for graduate students that will test a broader range of course material. Examples: Subject matter covered in the text but not in lecture or material mentioned in lecture but not covered in depth.
- All answers on quizzes/exams should demonstrate a deeper understanding of course material. Example: Formal proofs with detailed explanation.
- Graduate students may be required to lead special recitation sections where solutions to practice problems will be presented and discussed.
- Graduate students may be asked to formally present practice problems and solutions to the class.

The default grading scale will not use a plus/minus scale.

Letter grade assignment:
A: 90% - 100%
B: 80% - 89%
C: 70% - 79%
D: 60% - 69%
F: 59% and below

Course Topics Outline

The course will have three parts: automata, grammars and languages, and computability. Approximately two thirds of the course will be devoted to the study of finite acceptors, regular languages, pushdown automata, and context-free languages (chapters 1-8). The rest of the course will cover turing machines and computability (chapters 9-14). The following is not necessarily intended as a sequential ordering and is subject to change.

Topics	Lectures
Proof Techniques Review	2
Introduction to Theory of Computation	3
Finite Automata	2
Regular Languages and Regular Grammars	2
Properties of Regular Languages	3
Context-Free Languages	3
Context-Free Grammars	2
Pushdown Automata	3
Properties of Context-Free Languages	3
Turing Machines	4
Algorithmic Computation	4
Final Exam – Thursday May 9th	1

COVID-19 Policies

Face Coverings
Pursuant to Nevada law, NSHE employees, students and members of the public are no longer required to wear face coverings while inside NSHE buildings irrespective of vaccination status.

Social Distancing
In alignment with State of Nevada guidelines, social distancing is no longer required.

Disinfecting Your Learning Space
Disinfecting supplies are provided for you to disinfect your learning space. You may also use your own disinfecting supplies.

Testing Positive for COVID-19 or Exhibiting COVID-19 Symptoms
Students testing positive for COVID 19 or exhibiting COVID 19 symptoms regardless of vaccination status will not be allowed to attend in-person instructional activities and must leave the venue immediately. Students should contact the Student Health Center or their health care provider to receive care and information pertaining to the quarantine and self-isolation protocols. Contact your instructor immediately to make instructional and learning arrangements.

Accommodations for COVID 19 Quarantined Students
For students who are required to quarantine or self-isolate due to (1) COVID 19 infection or (2) exposure while not vaccinated, instructors must provide opportunities to make-up missed course work, including assignments, quizzes or exams. In courses with mandatory attendance policies, instructors must not penalize students for missing classes while quarantined.

Academic Dishonesty

The University Academic Standards Policy defines academic dishonesty, and mandates specific sanctions for violations. See the University Academic Standards policy: UAM 6,502.

Student Compliance with University Policies

In accordance with section 6,502 of the University Administrative Manual, a student may receive academic and disciplinary sanctions for failure to comply with policy, including this syllabus, for failure to comply with the directions of a University Official, for disruptive behavior in the classroom, or any other prohibited action. "Disruptive behavior" is defined in part as behavior, including but not limited to failure to follow course, laboratory or safety rules, or endangering the health of others. A student may be dropped from class at any time for misconduct or disruptive behavior in the classroom upon recommendation of the instructor and with approval of the college dean. A student may also receive disciplinary sanctions through the Office of Student Conduct for misconduct or disruptive behavior, including endangering the health of others, in the classroom. The student shall not receive a refund for course fees or tuition.

Disability Services

Any student with a disability needing academic adjustments or accommodations is requested to speak with me or the Disability Resource Center (Pennington Achievement Center Suite 230) as soon as possible to arrange for appropriate accommodations.

Audio and Video Recording

Student-created Recordings

Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped, or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.

Instructor-created Recordings

Class sessions may be audio-visually recorded. Students who participate with their camera on or who use a profile image are consenting to have their video or image recorded. If you do not consent to have your profile or video image recorded, keep your camera off and do not use a profile image. Students who un-mute during class and participate orally are consenting to have their voices recorded. If you do not consent to have your voice recorded during class, keep your mute button activated and only communicate by using the "chat" feature, which allows you to type questions and comments live.

Maintaining a Safe Learning and Work Environment

The University of Nevada, Reno is committed to providing a safe learning and work environment for all. If you believe you have experienced discrimination, sexual harassment, sexual assault, domestic/dating violence, or stalking, whether on or off campus, or need information related to immigration concerns, please contact the University's Equal Opportunity & Title IX office at 775-784-1547. Resources and interim measures are available to assist you. For more information, please visit the Equal Opportunity and Title IX page.

Academic Success Services

Your student fees cover usage of the University Math Center (https://www.unr.edu/university-math-center), (775) 784-4433; University Tutoring Center (https://www.unr.edu/tutoring-center), (775) 784-6801; and University Writing & Speaking Center (https://www.unr.edu/writing-speaking-

center), (775) 784-6030. These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign of a responsible and successful student.

Syllabus Note

Syllabus material may be subject to change.