

Automata Theory -- CS4384.0U1

Summer 2016

Instructor:

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Texts:

(Primary) Introduction to the Theory of Computation, Michael Sipser. (Either the 2nd or the 3rd Edition is acceptable.)
(Supp) Introduction to Languages and the Theory of Computation, John Martin
Introduction to Automata Theory, Languages, and Computation, John Hopcroft, Jeffery Ullman

Prerequisites:

Discrete Math I and II. In particular, knowledge of the following is assumed: basic counting techniques (combinations and permutations), logic, set theory, mathematical induction and other basic proof techniques, relations, functions, and Cartesian Products.

Class Objectives and Content:

The general purpose of this course is to introduce the student to the theory of computation. Two main computational models will be discussed, namely finite automata and push-down automata, along with the corresponding classes of languages these models recognize, i.e. the regular and context-free languages respectively. If time allows, we will also discuss the Turing machine model and the issue of undecidability.

For our specific class objectives, we want to develop in the student the ability to:

- design finite state automata and regular expressions
- convert among DFA, NFA, regular expressions
- show that a language is not regular
- design Push-Down Automata and Context-Free Grammars
- convert PDAs to context free grammars and vice-versa
- show that a language is not context free.

These goals are addressed in our textbook as follows:

Chapter 0

- Introduction and review of basic concepts

Chapter 1

- Regular languages (finite automata, Kleene's Theorem, closure properties)
- Non-determinism (definition of the NFA; equivalence of NFA's and DFA's)
- Regular expressions
- Finite State Minimization (if time allows)
- Non-regular languages (Pumping Lemma for regular languages)

Chapter 2

- Context Free Languages (derivation trees and ambiguity; normal forms)
- Pushdown Automata
- Equivalence of CFG's and PDA's
- Non-context free languages (Pumping Lemma for context-free languages)

Chapter 3 (if time allows)

- Turing machines
- Undecidability (Halting Problem)

Grading Policy:

The final class grade will be based on the following percentages for both graduates and undergraduates:

Contribution	% of final grade
Ad Hoc	10%
Homeworks	30%
Mid-term exam	25%
Final exam	35%

The “Ad Hoc” portion of the final grade is reserved for the instructor’s discretion. It may consist of periodic quizzes given throughout the semester, or some other form of assessment.

A homework assignment will be given roughly every week and a half, resulting in a total of about six or seven for the semester.

Those students in the graduate section will have some extra problems on the homework assignments, and will get slightly different exams.

Grade Demarcations:

This is the current list of grade cut-offs for this semester. These numbers can be viewed as guarantees. For example, anyone who makes a 90 or above is guaranteed to get a grade that is somewhere within the “A” range.

Except for the first row, any number that appears on the right hand side in the “Percentage” column in the following chart is non-inclusive. For example, an “A” is listed as “Percentage: 93-97.” That means that anyone who makes equal to 93 or above but strictly less than 97 will get an “A”. (Anyone who makes 97 or above will get an “A+”.)

Percentage	Grade
97-100	A+
93-97	A
90-93	A-
87-90	B+
83-87	B
80-83	B-
77-80	C+
73-77	C
70-73	C-
67-70	D+
63-67	D
60-63	D-
0-60	F

Please note that the final grade calculation will be done strictly by the numbers and in a very objective manner. There will be no attempt to round a grade to the next highest level, or to fudge the grades in any way. It will be a purely mathematical calculation.

This can have profound implications that you need to be aware of. For example, as the table above shows, one needs a numeric grade that is greater than or equal 90% to get a letter grade in the “A” range. But since the final letter grades are going to be calculated purely mathematically, any numeric grade less than that will not be an “A.” This means that an 89.95% will get a “B+” in this class.

Late Policy on Homework Assignments:

There will be a late policy on homework assignments. In general, an assignment that is turned in after the due date/time but within the first 24 hours will be docked 10%, one that is turned in between 24 and 48 hours will be docked 50%, and one that is turned in after 48 hours will be docked 100%.

Note that the eLearning system is very precise in its timekeeping. Thus, an assignment that is even one second late will be marked “late” by the system.

Exam schedule:

All exams are closed book and will be held in class. The exam schedule is as follows:

Exam	Date
Mid-term exam	Tuesday, June 28, 2016; regular class time and place
Final exam	TBA (but possibly last class day)

Other Notes:

1. The final exam is not comprehensive.
2. If you decide to drop the class, please don't forget to do so officially. Past a certain point in the semester, it's impossible to drop, even with an instructor's signature. In accordance with school policy, whatever grade you have earned to that point will then be assigned to you.

The relevant drop dates are available on the academic calendar, listed on the Web at:

<http://www.utdallas.edu/academiccalendar/documents/AcademicCalendarSummer2015.pdf>

3. The TA is responsible for grading the homework assignments (and, incidentally, maintaining the database for that side of the course), while the instructor will grade the exams. Therefore, if you have any questions regarding grading on a homework, please see the TA first. (If you are not satisfied with the result for any reason, then by all means see the instructor as well.)
4. If time permits, I will do my best to answer emails in a timely fashion. However, since I have several classes this semester, it would be very helpful if you would include your class information, both the course number and the section number, in the subject line of your email. Using this pattern, the subject lines of your emails should start with "CS4384.0U1". After that, you can say whatever you want.

As an example, let us say that you wanted to ask a question about the final exam. Then the subject line should be something like: "CS4384.0U1 – Final Exam." Having an indicator like this of your class and section numbers will help tremendously in processing the various emails this semester.

5. Cheating will be handled according to the formal UTD process.
6. This is a very interesting but somewhat demanding course. Please do your best to stay up with the material, and you will find that you will both learn more and enjoy it more. You are encouraged to make full use of the resources available to you in the class.

Other University Policies:**Field Trip Policies****Off-campus Instruction and Course Activities**

Off-campus, out-of-state, and foreign instruction and activities are subject to state law and University policies and procedures regarding travel and risk-related activities. Information regarding these rules and regulations may be

found at the website address http://www.utdallas.edu/business/admin_manual/pdf/travel-and-risk-related-activities-policy-4-29-11.pdf. Additional information is available from the office of the school dean.

No off-campus activities or field trips are scheduled for this course.

Student Conduct & Discipline

The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, *A to Z Guide*, which is provided to all registered students each academic year.

The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the *Rules and Regulations, Board of Regents, The University of Texas System, Part 1, Chapter VI, Section 3*, and in Title V, Rules on Student Services and Activities of the university's *Handbook of Operating Procedures*. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391).

A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

Academic Integrity

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.

Email Use

The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.

Withdrawal from Class

The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.

Student Grievance Procedures

Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's *Handbook of Operating Procedures*.

In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the dean will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties.

Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.

Incomplete Grade Policy

As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of F.

Disability Services

The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m.

The contact information for the Office of Disability Services is:

The University of Texas at Dallas, SU 22
PO Box 830688
Richardson, Texas 75083-0688
(972) 883-2098 (voice or TTY)

Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is

hearing impaired). Classes enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance.

It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.

Religious Holy Days

The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated.

The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment.

If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.

These descriptions and timelines are subject to change at the discretion of the Professor.