**GOVERNORS STATE UNIVERSITY**

**COLLEGE OF ARTS AND SCIENCES**

**DIVISION OF SCIENCE, MATHEMATICS AND TECHNOLOGY**

**COMPUTER SCIENCE PROGRAM**

**Course Title:** Formal Language and Automata

**Course Number:** CPSC 8810

**Credit Hours**: 3

**DATE Created/Revised:** 01/2015

**INSTRUCTOR:**  Dr. Clare Tang

**OFFICE:**  F2415

**PHONE:**  (708)-534-4540

**EMAIL:** [xtang@govst.edu](mailto:xtang@govst.edu) (email is preferred for communication)

**OFFICE HOURS:** Tuesdays 10:30am-12:30pm (webex) or Email for appointments

**Term(S) Offered**: Fall

**Catalog Description**: Presents highlights of the foundations of computer science. This course will introduce the relationships between formal languages and automata; focus on the regular grammar and finite state automata, context-free grammar, and push-down stack automata; provide basic principles of compilers and compiler design, lexical analysis, parsing techniques, syntax directed translation, symbol tables, storage administration, error detection, and code generation. Thus, this course will provide both the theoretical and practical foundation of modern computer science.

**Prerequisites**: Data Structures and Algorithm CPSC 4355

**EQUIVALENT Course/Replaces Course:** None

**Restrictions**: None

### RATIONALE: Formal language study helps students to understand fundamental questions: What is computing? What does the term “computer” mean? Is there anything a computer cannot do?

**Intended Audience**: This is intended for students who pursue Master of Science degree in Computer Science or related field.

**PROGRAM OUTCOMES**:

**Graduate Program Objective**:

1. Integrate concepts, tools, and theories to find technology-based solutions to problems;
2. Apply professional skills to model, analyze, and design components or systems that meet technical specification;
3. Apply concepts of software architectures for different development projects;
4. Utilize concepts to dissect and identify system limitation in terms of threats and vulnerabilities;
5. Work and communicate effectively, either independently or in a team, to solve problems using computer science principles;
6. Demonstrate an understanding the broad social, ethical, and professional issues of contemporary computer science practice;
7. Prepare the students with the necessary research background in Computer Science.

**Expected Student LEARNING Outcomes:**

**Upon successful completion of this course, students should be able to:**

|  |  |
| --- | --- |
| Course Outcome/Objective | Graduate Program Objective |
| 1. demonstrate an understanding of theoretical foundations of formal languages, grammars, automata and compilers | * 1, 2, 5, 6 |
| 1. apply theoretical concepts as well as practical, hands-on experiences for compiler design | * 1, 3, 7 |
| 1. demonstrate knowledge required for professional activities, advanced courses and potential future research activities | * 5, 6, 7 |

**Instructional MODALITY (ies)**:

It is 100% online. However, students can always email me to schedule an online or in person meeting.

**REQUIRED Text/Learning Materials:** Linz, P and Rodger, S (2023). *An Introduction to Formal Languages and Automata*, 7*th edition*. Burlington, MA: Jones and Bartlett. Class notes posted on Blackboard.

### Online Resources: All classes notes, lecture videos, quizzes, and answers are posted on Blackboard.

## **Technology Requirements (Materials and Equipment)**

* Internet connection (DSL, LAN, or cable connection desirable)
* Access to BB/Web site/Other
* System Requirement for BB
  + This course requires minimum system (computer) requirements. Students are responsible for all software downloads, upgrades, updates, etc.
  + Blackboard Learn 9.1 Always run a “tune up” when using BlackBoard Any questions you might have regarding BlackBoard can be found in Student Helpdesk in the BlackBoard Login page (GSU)
  + Java Runtime Environment Java is required for Blackboard Learn 9.1. Download it from <http://www.java.com/en/> Always check to make sure the latest version of Java is installed on your computer. Apple’s Mac OS10.x can ensure the latest version of Java for OSX by running the *Apple Update*.
  + Acceptable Document Files The following document file types are considered acceptable for use in Blackboard and for submitting assignment work to the Blackboard system:
    - Microsoft Word: .doc, .docx, Microsoft Excel: .xls, .xlsx, Microsoft PowerPoint: .ppt, .pptx, Rich Text Format: .rtf, Adobe Acrobat: .pdf, Image form: .jpg, .jpeg, .gif, .png. (To determine the type of file you are submitting, simply right click the unopened file and select the “properties” tab)

**Activities/Assignments/Requirements:** Each student is expected to read designated chapter, watch online videos, try exercise without answer first and submit assignment online on time. Students are expected to visit blackboard frequently. It is 100% asynchronous so you can set your own pace during the week to complete the activities. However all assignments and quizzes are due the following Monday at 8am, after which time correct answer and explanation will be revealed.

**Evaluation:**

Visit the **Assignments** link in BB for details about each assignment listed below. Click on **Assessments** to access quizzes and exams. (See Part 3 for more information about accessing tools and activities).

| **Points/Percentages** | **Activities** |
| --- | --- |
| 70% | Quizzes (6 point each for total 11 of them and 4 points for the last one) |
| 30% | Final Exam |
| 100% | Total Points Possible |

### Late Work Policy

Be sure to pay close attention to deadlines—there will be no make-up assignments or quizzes, or late work accepted without a serious and compelling reason and instructor approval.

### Viewing Grades in BB (Available)

Points earned for graded activities are in the BB Grade Book. Click on the My Grades link on the left navigation to view your points.

Grades for scored activities are posted right after the due time so you can compare your answer with corrected answer and learn from it. BB is the official gradebook for the course.

Grading Scale

| **Letter Grade** | **Percentage/Points** |
| --- | --- |
| A | 90-100% |
| B | 80-89% |
| C | 70-79% |
| D | 60-69% |
| F | Less than 60% |

**Course Policies**

**Student Identify Verification:**

Per policy of The Higher Learning Commission by enrolling in this online course your identity will be verified. Verification may include one of all of the following:

1. Use of a secure login and pass code;
2. Proctored examinations where student id card will be used to verify identity;
3. Use of a monitoring technology to verify identity

(NOTE – HLC Statement on **Institutional Practices: “**In verifying the identify of students who participate in class or coursework, the institution may make use of a variety of methods at the option of the institution, including but not limited to: (1) secure login and pass code; (2) proctored examinations; and (3) new or other technologies and practices that are effective in verifying the identity of students. Such methods must have reasonable and appropriate safeguards to protect student privacy. Institutions must notify students at the time of registration or enrollment of any projected additional student charges associated with the verification of student identity such as separate fees charged by proctoring services, etc.”)

**Professionalism/Disposition (100 points)** 10 points will be deducted for each late submission or evidence of uncivil discussion with members of the course.

## **Attend Class/online Virtual Classroom**

Students are expected to finish each week’s activity and submit quiz before the following Monday 8AM, even when the Monday is a Holiday.

## **Participation**

The time you spent on reading and watch videos may be tracked. You need to read and watch at least once all materials posted on BB.

**Communication Via Email**

Use the instructor’s email. If you have not received a response within 24 hours, please resend the email with the previous email included. Begin this process by adding an automatic signature to your GSU email account. Add GUS HELPDESK link to the tutorial.

**Netiquette Guidelines**

**Retrieved from** <http://www.indiana.edu/~icy/netiquette.html>

### ***General Rules***

* Make your messages easier to read by writing paragraphs short and to the point.
* TYPING IN ALL CAPS IS CONSIDERED SHOUTING ON THE INTERNET.
* Messages in all lowercase letters can be difficult to read, instead, use normal capitalization.

### *****Group Communication*****

* Respect the fact that the class list is a closed discussion. Do not forward mail from your classmates to others without their permission.
* In an online forum or newsgroup, debate is welcome, but be tactful in responding to others. Remember that there is a person (or a whole class) at the receiving end of your post.
* Keep your questions and comments relevant to the focus of the discussion group.  Information intended for an individual or small group of individuals should be emailed to those people directly.
* If you are responding to a message from someone else, briefly summarize the post.
* When posting a question to the discussion group, request responses directed to you personally. Post a summary or answer to your question to the group.
* If you quote a previous post (by using the reply function for example), quote only enough to make your own point.
* Include your signature at the bottom of Email messages when communicating with people who may not know you personally or broadcasting to a dynamic group of subscribers.
* Resist the temptation to "flame" others on the list. Remember these discussions are "public" and meant for constructive exchanges. Treat others on the list with civility
* Use your Sycamore Email account. Do not subscribe using a shared office account or a friend's account.

### ****Individual Communication****

* If you want to get in touch with only one person in the class, send a message to that individual's e-mail address, not to the entire discussion list.
* When replying to a message posted to a discussion group, check the address to be certain it is going to the intended location (person or group). It can be very embarrassing when one replies incorrectly and posts a personal message to the entire discussion group that was intended for an individual.

## **Build Rapport**

If you find that you have any trouble keeping up with assignments or other aspects of the course, make sure you let your instructor know as early as possible. As you will find, building rapport and effective relationships are key to becoming an effective professional. Make sure that you are proactive in informing your instructor when difficulties arise during the semester so that they can help you find a solution.

## **Complete Assignments**

**All assignments for this course will be submitted electronically through Blackboard to maintain and keep track of student’s work (BB) unless otherwise instructed.** Assignments must be submitted by the given deadline or special permission must be requested from instructor *before the due date*. Extensions will not be given beyond the next assignment except under extreme circumstances.

All discussion assignments must be completed by the assignment due date and time. Late or missing discussion assignments will effect student’s grade.

## **Understand When You May Drop This Course**

It is the student’s responsibility to understand when they need to consider disenrolling from a course. Refer to the GSU Portal for dates and deadlines for registration. After this period, a serious and compelling reason is required to drop from the course.

### Incomplete Policy

Under emergency/special circumstances, students may petition for an incomplete grade. An incomplete will only be assigned per instructor’s permission. All incomplete course assignments must be completed within a timeframe given by the instructor.

**Commit to Integrity**

As a student in this course (and at this university), you are expected to maintain high degrees of professionalism, commitment to active learning and participation in this class and integrity in your behavior in and out of the classroom.

**Disability Statement:**   
**GSU is committed to providing all students equal access to University programs and facilities. You may be eligible for academic accommodations if you have a documented physical, psychiatric (anxiety, depression, bipolar disorder, AD/HD, post-traumatic stress, or others) or a neurological disability such as a learning disability, autism or TBI. You must register and provide documentation with Access Services for Students with Disabilities (ASSD) (**<https://www.govst.edu/disability-services/>) before faculty members are required to provide appropriate accommodations. For more information or to register, please contact ASSD at [assd@govst.edu](mailto:assd@govst.edu) or 708-235-3968. To aid in creating an accessible learning environment for students with disabilities contact ASSD before or during the first week of classes.

**Title IX Statement:**  
Consistent with GSU Policy 78, Title IX and Anti-Sex Discrimination, Harassment and Retaliation Policy, Title IX regulations make it clear that violence and harassment based on sex and gender is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories, such as race, national origin, etc... The University has a duty to prevent harassment, post policies against it, to investigate complaints, and to take prompt action to stop harassment when it occurs. Contact the Governors State University Title IX Coordinator to report any incidents at [titleixofficer@govst.edu](mailto:titleixofficer@govst.edu) or call 708.534-4100 and ask to speak to the Title IX Coordinator. For complete Title IX information and resources, visit: <https://www.govst.edu/TitleIX/>

**Emergency Preparedness Statement:**  
In case of emergency, the University's Alert System will be activated. Students should maintain updated contact information using the link on the homepage of the myGSU portal. In addition, students are encouraged to familiarize themselves with the Emergency Procedures posted in each classroom. Detailed information about the University's emergency management plan, information about how to update your contact information, and the Campus Safety Booklet can be found at [http://www.govst.edu/emergency.](http://www.govst.edu/emergency)

**Academic Honesty Statement:**  
 **Students are expected to fulfill academic requirements in an ethical and honest manner. This expectation pertains to the following: use and acknowledgement of the ideas and work of others, submission of work to fulfill course requirements, sharing of work with other students, and appropriate behavior during examinations. These ethical considerations are not intended to discourage people from studying together or from engaging in group projects. The University policy on academic honesty appears in the catalog appendix, which can be found on the website at** <https://catalog.govst.edu/>

**COVID-19 Statement:**

The posted campus Operating Plan is the framework which guides campus decisions regarding Covid-19 protocols. Effective Summer 2022, a layered prevention strategy that sets public health precaution levels at green-yellow-red will guide campus operations. When set at a yellow or red level masking is required in the classroom. When set to a red level, courses will move to remote instruction.

Any student who fails to follow required safety procedures including the posted procedures for COVID 19, or to comply with university employees’ instructions will be considered to be violating Student Conduct Rules (Policy 4 Student Conduct Policy) and is subject to disciplinary action that may include removal from a class or removal from campus. Updates related to COVID-19, the current Public Health Precaution Level, and the most up to date safety information are available on the COVID updates and the Campus Operating Plan at <https://www.govst.edu/COVID-19/>.

Students with disabilities who require accommodations should contact disability services at <https://www.govst.edu/disability-services/>. Students, who are impacted by COVID 19 and need adjustment to class requirements, are responsible to send a written request to the instructor as soon as possible for approval.

**Student Health & Well-Being Statement:**

As a student, you may experience situations or challenges that can interfere with your learning and personal well-being. These might include strained relationships, stress, unstable housing situations, hunger, alcohol/drug problems, feeling down, or loss of motivation. GSU has many resources to help with these or other issues you may experience. Free, confidential mental health and medical services are available on campus by contacting the Counseling & Wellness Center at 708.235.7334 or <https://www.govst.edu/wellness/>. Assistance with personal difficulties, including hunger and housing instability, is available by contacting GSU4U at <https://www.govst.edu/gsu4u>.

**Topical Outline/Course Content WITH DETAILS**

The following is a tentative schedule based on class needs. The instructor reserves the right to make any schedule changes deemed necessary.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Week** | **Expected Student Outcome** | **Topics** | **Read** | **Homework** |
| 1 | 1, 2, 3, 7 | Introductions to the Theory of Computation. | Chap 1 | Quizzes 1 |
| 2-3 | 1, 2 | Finite Automata & Regular Language. | Chap 2 | Quizzes 2, 3 |
| 4-6 | 1, 2 | Regular Language and Regular Grammars. | Chap 3 | Quizzes 4, 5, 6 |
| 7-8 | 1, 2 | Properties of Regular Language. | Chap 4 | Quizzes 7, 8 |
| 9-10 | 1, 2 | Context-Free Languages. | Chap 5 | Quizzes 9, 10 |
| 11-12 | 1, 2 | Pushdown Automata. | Chap 7 | Quiz 11, 12 |
| 13 | 7 | Part II: Applications | Chap 15 | Reading |
| 14 | 1, 2, 3, 7 | Turing Machines. | Chap 9 | Reading |
| 15 |  | **Final (Will cover chapters 1-5, 7, 15)** |  | Problem Package |