**UTRGV logo**

CSCI 6339: Theoretical Foundation of Computation

**Syllabus**

**Fall 2020**

# Course Information:

|  |  |  |
| --- | --- | --- |
| Meeting times: | 6:30 pm - 9:00 pm | Wednesday. |

Meeting location: online

**Course Modality:** Online Synchronous Courses (OSYNC)

# Instructor Information:

Instructor Name: Dr. Bin Fu  
Phone: (956) 665-3635  
E-Mail: bin.fu@utrgv.edu  
Office location: Interdisc Engin & Acad Bldg 3.242  
Office hours: 1:00pm ---4:00pm (Monday and Wednesday).

# Welcome & Introduction

Welcome to attend the class Theoretical Foundation of Computation. This is one of the three core courses in the Computer Science MS program. We will learn the most essential part of computation, which gives the foundation of computer science.

These courses will be delivered fully online. There will be a designated class meeting time for real-time instructor/student interaction, which will be conducted remotely via online platforms from the safety of your home. This real-time interaction may be supplemented by the digital presentation of course content.  Your instructors will provide you with feedback on assigned work, communicate with you electronically, and be available to meet with you as defined on this syllabus.

# Course Description, Prerequisites & MODE OF LEARNING

Examines classes of languages and abstract machines including finite state automata, pushdown automata, Turing machines, and the Chomsky hierarchy of formal languages, including regular sets, recursively enumerable languages, and complexity theory for NP-completeness. Prerequisite: CSCI 6301, MATH 3373 or equivalent, or consent of instructor.

COVID-19 RESOURCES**:**

Please visit the [UTRGV COVID-19 Website](https://www.utrgv.edu/coronavirus/index.htm) via the following link for the most up-to-date information and resources (<https://www.utrgv.edu/coronavirus/index.htm>). This includes information on self-screening questions, links to forms for travel and contact, etc.

Boilerplate language on self-screening and reporting is currently being developed.

Face Covering [Protocol](https://www.utrgv.edu/coronavirus/updates/2020-05-29/index.htm)**:**

As part of the university’s ongoing COVID-19 mitigation efforts to maintain a healthy environment for all members of our campus community, anyone entering a campus building must wear a face covering that covers the mouth and nose. The covering must be worn in all hallways, public spaces, research labs, teaching/computer labs, libraries, classrooms, automobiles with a passenger, stairwells, elevators and common areas, as well as office spaces. In office spaces, when social distancing of 6 feet is possible and maintained, face coverings may be removed. Face coverings also are required in outdoor settings when safe social distancing and gathering practices are not possible.

# Learning Objectives/Outcomes for the Course

After completing this course, you should be able to understand and answer the following questions:

* What is computation? This question is related to various computation models and their similarities.
* What can and cannot be computed? This question is about computability.
* What can and cannot be efficiently computed? this question is about computational complexity.
* How are language definition and computability inter-wined? This question is about the equivalence of language definition and computational capability.

Upon successful completion of this course, students will be able to

* Explain with examples the basic terminology of functions, relations, and sets.
* Perform the operations associated with sets, functions, and relations.
* Relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.
* Demonstrate basic counting principles, including uses of diagonalization and the pigeonhole principle.
* Outline the basic structure of and give examples of each proof technique described in this unit.
* Discuss which type of proof is best for a given problem.
* Relate the ideas of mathematical induction to recursion and recursively defined structures.
* Identify the difference between mathematical and strong induction and give examples of the appropriate use of each.
* Explain the use of big O, omega, and theta notation to describe the amount of work done by an algorithm.
* Use big O, omega, and theta notation to give asymptotic upper, lower, and tight bounds on time and space complexity of algorithms.
* Determine the time and space complexity of simple algorithms.
* Deduce recurrence relations that describe the time complexity of recursively defined algorithms.
* Solve elementary recurrence relations.
* Discuss the concept of finite state machines.
* Design a deterministic finite-state machine to accept a specified language.
* Explain how some problems have no algorithmic solution.
* Provide examples that illustrate the concept of un-computability.
* Determine a language's location in the Chomsky hierarchy (regular sets, context-free, context-sensitive, and recursively enumerable languages).
* Prove that a language is in a specified class and that it is not in the next lower class.
* Convert among equivalently powerful notations for a language, including among DFAs, NFAs, and regular expressions, and between PDAs and CFGs.
* Explain the Church-Turing thesis and its significance.
* Define the classes P and NP.
* Explain the significance of NP-completeness.
* Prove that a problem is NP-complete by reducing a classic known NP-complete problem to it.

# Textbook, TECHNOLOGY, and/or Resource Material

The text book is "Introduction to the Theory of Computation", Third Edition, by Michael Sipser, Thomson Course Technology.

# Grading Policies

There will be midterm for 20% of the grade, final for 25% of the grade, homeworks for 35% of the grade, and exercises in class for 20% of the grade.

# Blackboard Support

# If you need assistance with course technology at any time, please contact the [Center for Online Learning and Teaching Technology](https://www.utrgv.edu/online/) (COLTT).

| **Campus:** | **Brownsville** | **Edinburg** |
| --- | --- | --- |
| **Location:** | Casa Bella (BCASA) 613 | Education Complex (EEDUC) 2.202 |
| **Phone:** | 956-882-6792 | 956-665-5327 |

## Toll Free: 1-866-654-4555

Office Hours: Monday - Friday, 7:30 a.m. - 6:00 p.m.  
Support Tickets Submit a Support Case via our [Ask COLTT Portal](https://utrgv.edu/coltthelp)

## 24/7 Blackboard Support

Need Blackboard assistance after hours? You can call our main office numbers, 956-882-6792 or 956-665-5327, to speak with a support representative.

ATTENDANCE: Recommended on all syllabi; may be modified by the instructor as long as it is consistent with UTRGV policy.

Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGV’s attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; have been provided such an accommodation by Student Accessibility Services (SAS); for observance of religious holy days; or for military service. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

AbSENCE/SICK POLICY:Students are expected to attend all of the classes online. We will handle out quizzes at the end of each class, and students need to upload their answers to the Blackboard server. Students may give the chance to submit late quiz or homework if there is a sickness such as COVID problem after providing document.

**Makeup Work:** We plan to let all the teaching materials be available online. If you miss some course work, please contact the instruction to set up makeup option.

*The use of recordings will enable you to have access to class lectures, group discussions, etc. in the event you have to miss a synchronous or face to face class meeting due to illness or other extenuating circumstance. Our use of such technology is governed by the Federal Educational Rights and Privacy Act (FERPA), UTRGV’s acceptable-use policy, and UTRGV HOP Policy STU 02-100 Student Conduct and Discipline. A recording of class sessions will be kept and stored by UTRGV, in accordance with FERPA and UTRGV policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. You may not share recordings outside of this course. Doing so may result in disciplinary action under UTRGV HOP Policy STU 02-100 Student Conduct and Discipline.*

ACADEMIC INTEGRITY: Recommended on all syllabi.

Members of the UTRGV community uphold the [Vaquero Honor Code](https://nam01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.utrgv.edu%2Fstudentlife%2Fabout%2Fvaquero-honor-code%2Findex.htm&data=02%7C01%7Cdavid.granado%40utrgv.edu%7C2b62b139d6dd4e81de4208d83567012f%7C990436a687df491c91249afa91f88827%7C0%7C0%7C637318063815870808&sdata=u3JK2q8UqFwgzYkzXZWeIRM%2FuNsVreezdMT5ZQr8tdE%3D&reserved=0)’s  shared values of honesty, integrity and mutual respect in our interactions and relationships. In this regard, academic integrity is fundamental in our actions, as any act of dishonesty conflicts as much with academic achievement as with the values of honesty and integrity.  Violations of academic integrity include, but are not limited to: cheating, plagiarism (including self-plagiarism), and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts (Board of Regents Rules and Regulations, STU 02-100, and UTRGV Academic Integrity Guidelines).  **All violations of Academic Integrity will be reported to Student Rights and Responsibilities through** [**Vaqueros Report It**](https://nam01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.utrgv.edu%2Fen-us%2Fstudent-experience%2Freport-it%2F&data=02%7C01%7Cdavid.granado%40utrgv.edu%7C2b62b139d6dd4e81de4208d83567012f%7C990436a687df491c91249afa91f88827%7C0%7C0%7C637318063815880802&sdata=AxekhYtwdB%2Baey6EThon1hqp19tXWY7HmAdrWDFIELA%3D&reserved=0)**.**

# UTRGV Policy Statements

The UTRGV disability accommodation, mandatory course evaluation statement and sexual misconduct statement are required on all syllabi. Additional policy statements are optional, such as those covering attendance, academic integrity, and course drop policies.

## Other Course Information

In this section, please provide any other information that is pertinent to your course and your expectations for students.

STUDENTS WITH DISABILITIES:

Students with a documented disability (physical, psychological, learning, or other disability which affects academic performance) who would like to receive reasonable academic accommodations should contact **Student Accessibility Services (SAS)** for additional information.  In order for accommodation requests to be considered for approval, the student must apply using the *mySAS* portal located at [www.utrgv.edu/mySAS](https://nam01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.utrgv.edu%2FmySAS&data=02%7C01%7Cdavid.granado%40utrgv.edu%7C47dbf090677947b5e67e08d83305c9e4%7C990436a687df491c91249afa91f88827%7C0%7C0%7C637315447247309796&sdata=k%2FZq6WdNnZPfJN1x0egJQ9q0AMN%2Fd0pCtmNuRhnMy2g%3D&reserved=0) and is responsible for providing sufficient documentation of the disability to SAS. Students are required to participate in an interactive discussion, or an intake appointment, with SAS staff. Accommodations may be requested at any time but are not retroactive, meaning they are valid once approved by SAS. Please contact SAS early in the semester/module for guidance. Students who experience a broken bone, severe injury, or undergo surgery may also be eligible for temporary accommodations.

### Pregnancy, Pregnancy-related, and Parenting Accommodations

Title IX of the Education Amendments of 1972 prohibits sex discrimination, which includes discrimination based on pregnancy, marital status, or parental status. Students seeking accommodations related to pregnancy, pregnancy-related condition, or parenting (reasonably immediate postpartum period) are encouraged to apply to **Student Accessibility Services** using the following link: [Pregnancy Accommodations Request Form](https://cm.maxient.com/reportingform.php?UnivofTexasRGV&layout_id=22) [https://www.utrgv.edu/pregnancy](https://nam01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.utrgv.edu%2Fpregnancy&data=02%7C01%7Cdavid.granado%40utrgv.edu%7C47dbf090677947b5e67e08d83305c9e4%7C990436a687df491c91249afa91f88827%7C0%7C0%7C637315447247309796&sdata=W%2BBV%2Bu2W%2FFo292T1PTZEqwcRWBp0bxcCT4YD1N07Mvg%3D&reserved=0)

### Student Accessibility Services:

**Brownsville Campus**: Student Accessibility Services is located in 1.107 in the Music and Learning Center building (BMSLC) and can be contacted by phone at (956) 882-7374 or via email at [ability@utrgv.edu](mailto:ability@utrgv.edu).

**Edinburg Campus:** Student Accessibility Services is located in 108 University Center (EUCTR) and can be contacted by phone at (956) 665-7005 or via email at [ability@utrgv.edu](mailto:ability@utrgv.edu).

MANDATORY COURSE EVALUATION PERIOD**:** Required on all syllabi. Do not modify.

Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (<http://my.utrgv.edu>); you will be contacted through email with further instructions. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available on or about:

Module 1 October 7-13, 2020

Module 2 December 2-8, 2020

Full Fall Semester November 13 – December 2, 2020

SEXUAL MISCONDUCT and MANDATORY REPORTING:

In accordance with UT System regulations, your instructor is a “Responsible Employee” for reporting purposes under Title IX regulations and so must report to the Office of Institutional Equity & Diversity (OIED@utrgv.edu) any instance, occurring during a student’s time in college, of sexual misconduct, which includes sexual assault, stalking, dating violence, domestic violence, and sexual harassment, about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at [www.utrgv.edu/equity](https://nam01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.utrgv.edu%2Fequity&data=02%7C01%7Cdavid.granado%40utrgv.edu%7C3d4a82332e444b8e606d08d834d42073%7C990436a687df491c91249afa91f88827%7C0%7C0%7C637317432985425767&sdata=jCnOqfBL3vxfYuvYF3qtjVy4tmK9o9m%2FBghvXKfL%2FN4%3D&reserved=0), including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect that is free from sexual misconduct, discrimination, and all forms of violence. If students, faculty, or staff would like confidential assistance, or have questions, they can contact OVAVP (Office for Victim Advocacy & Violence Prevention) at (956) 665-8287, (956) 882-8282, or [OVAVP@utrgv.edu](mailto:OVAVP@utrgv.edu).

COURSE DROPS:

According to UTRGV policy, students may drop any class without penalty earning a grade of DR (drop) until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the “3-peat rule” and the “6-drop” rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

STUDENT SERVICES:

Students who demonstrate financial need have a variety of options when it comes to paying for college costs, such as scholarships, grants, loans and work-study. Students should visit the Student Services Center (U Central) for additional information. U Central is located in BMAIN 1.100 (Brownsville) or ESSBL 1.145 (Edinburg) or can be reached by email ([ucentral@utrgv.edu](mailto:ucentral@utrgv.edu)) or telephone: (888) 882-4026. In addition to financial aid, U Central can assist students with registration and admissions.

Students seeking academic help in their studies can use university resources in addition to an instructor’s office hours. University Resources include the Advising Center, Career Center, Counseling Center, Learning Center, and Writing Center. The centers provide services such as tutoring, writing help, counseling services, critical thinking, study skills, degree planning, and student employment. In addition, services such as the Food Pantry are also provided. Locations are listed below.

| **Center Name** | **Brownsville Campus** | **Edinburg Campus** |
| --- | --- | --- |
| **Advising Center**  [AcademicAdvising@utrgv.edu](mailto:AcademicAdvising@utrgv.edu) | BMAIN 1.400  (956) 665-7120 | ESWKH 101A  (956) 665-7120 |
| **Career Center**  [CareerCenter@utrgv.edu](mailto:CareerCenter@utrgv.edu) | BINAB 1.105  (956) 882-5627 | ESSBL 2.101  (956) 665-2243 |
| **Counseling Center**  [Counseling@utrgv.edu](mailto:Counseling@utrgv.edu)  [Counseling and Related Services List](https://www.utrgv.edu/facultysuccess/_files/documents/syllabus-statement-for-counseling-12-16-19.pdf) | BSTUN 2.10  (956) 882-3897 | EUCTR 109  (956) 665-2574 |
| **Food Pantry**  [FoodPantry@utrgv.edu](mailto:FoodPantry@utrgv.edu) | BCAVL 101 & 102  (956) 882-7126 | EUCTR 114 (956) 665-3663 |
| **Learning Center**  [LearningCenter@utrgv.edu](mailto:LearningCenter@utrgv.edu) | BMSLC 2.118  (956) 882-8208 | ELCTR 100  (956) 665-2585 |
| **Writing Center**  [WC@utrgv.edu](mailto:WC@utrgv.edu) | BUBLB 3.206  (956) 882-7065 | ESTAC 3.119  (956) 665-2538 |

# Calendar of Activities:

The UTRGV academic calendar can be found at <https://my.utrgv.edu/home> at the bottom of the screen, *prior to login*. Some important dates for Fall 2020 include:

Aug. 24 First day of classes

Aug. 27 Last day to add a class or register for Fall 2020 classes

Sept. 7 Labor Day – NO classes

Nov. 11 Last day to drop a class or withdraw

Nov. 26- 27 Thanksgiving Holiday – NO classes

Dec. 3 Study Day – NO classes

Dec. 4-10 Final Exams

Dec. 14 Grades Due at 3 p.m.