

BUILD SKILLS

In order to beat the boss, you and your team must acquire many skills and ensure that you have perfected them. When you attack and demonstrate your abilities, you are rewarded with points. If you score enough, you can easily escape. The breakdown of points is as follows:

Skill building exercises (homework)	20%
Lab experiments (labs and gameplay)	20%
Perserverance (attendance)	10%
Squad patrol (team work)	20%
The boss battle (final project)	30%



GAME OBJECTIVES

1. What is a game? What is a good strategy? These questions are related to various computation models and their similarities.
2. What can and cannot be computed? This question is about computability.
3. What can and cannot be efficiently computed? This question is about computational complexity.
4. How are language definition and computability intertwined? This question is about the equivalence of language definition and computational capability.

GAMES, PUZZLES, AND COMPUTATION

- Tim Wylie, Ph.D. -

Course Description. This course provides an overview of the complexity of games and puzzles. The topics will include hardness results and complexity classes, combinatorial game theory, surreal numbers, and standard game theory. The course will focus on hardness and combinatorial results. Additional topics related to approximations, fixed-parameter tractable, and other algorithm techniques, as well as some basic AI programming and elements of game design. Prerequisites: CSCI 3310 (any discrete Math equivalent) and CSCI/CMPE 3333.

Make-up Policy. No make-up exams will be given except for university sanctioned excused absences. If you need to miss an exam, it is your responsibility to contact me before the exam, or as soon after the exam as possible. Missing an exam without an approved (by the university or me) excuse will result in a zero.

Learning Outcomes. Upon successful completion of this course, students will be able to do the following:

1. Define and explain the significance of the major complexity classes including P, NP, EXP, PSPACE, L, NL, etc.
2. Define and use the polynomial hierarchy.
3. Be able to reduce known problems to unknown problems in order to prove their computational complexity.
4. Identify and prove that certain problems and games are in a complexity class.
5. Be able to approach an unknown game and prove its complexity or demonstrate why it is difficult.
6. Determine good heuristics and methods for playing games.
7. Basic Artificial Intelligence to effectively play certain games and when certain approaches are ineffective or infeasible.
8. Have a basic understanding of combinatorial games and surreal numbers.

Course Topics. This course provides an overview of the computational complexity of games and puzzles (one-player games). This includes, but is certainly not limited to, hardness reductions, complexity classes, dealing with hard problems, combinatorics, surreal numbers and combinatorial game theory, standard game theory, randomness, tilings, etc. We will also touch on some basic A.I. techniques and game design. When possible, groups will be utilized as well as a lot of playtesting.

Late Work Policy. Labs and exercises will be accepted late, but with penalty. Assignments must be turned in at the specified time on the given due date. Afterwards, the penalties are as follows:

- Within 24 hours late will lose 10%.
- Within 48 hours late will lose 20%.
- More than 48 hours late will lose 50%.

SIDE QUESTS!

Did you know there are several ways to get bonus points in the game and level up faster?

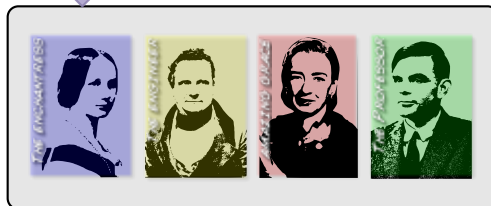
- The bonus quests include:
1. Reading research papers
 2. Reading other books
 3. Additional problems
 4. Completing things early

SCHEME

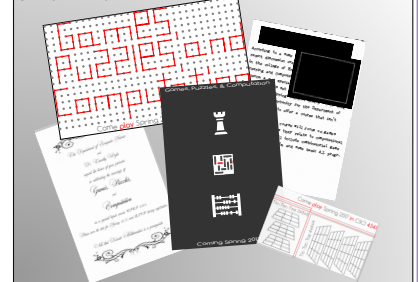
ENGR 1.274
1:40 - 2:55 p.m.

SQUAD

Your group, party, team, posse, the people who will help you survive this quest. You must pick at least 3 team members to round out your squad. Pick your role



PROPAGANDA



GAME SYNOPSIS

The evil genius and mad scientist Dr. Wylie has trapped you in a world of theory and drudgery. He desires to fail everyone, and lured you and your companions under the appearance of fun. You must arm yourself and race against time to stop him. On this epic quest you must face your fears, fight impossible odds, and accomplish amazing feats of perserverance and intelligence.

Your party of travelers will be pushed through numerous puzzles and challenges to escape the course successfully, and to test your mental agility. This requires many advanced fighting techniques that you must master.

Escape . . . if you can.



START

Winning GPC starts with a desire to learn. The first step is to get the book *Games, Puzzles, & Computation* by Hearn and Demaine from 2009. ISBN: 978-1568813226



Stay ahead of the noobs by using *The insider's guide to mastering GPC* at <http://faculty.utrgv.edu/timothy.wylie/GPC>

- Creating Documents
- L^AT_EX
- Image Editing
- Gimp, Photoshop
- Layout Editing
- Inkscape, vector-based
- Programming
- Python, Java, C++, etc.
- Mathematics
- proofs, formality, discrete structures, etc.

TOPICS

The topics you'll be exposed to will vary quite substantially. However, a rough schedule is given to feed your dread.

Weeks 1-2, Complexity classes
Weeks 3-5, Hardness reductions, groups, projects begin
Weeks 6-9, Combinatorial games, basic AI programming, puzzles/tilings
Week 9, Standard game theory
Weeks 10+, Advanced topics, project work
Every week there will also be labs where we'll discuss some of these topics as well.



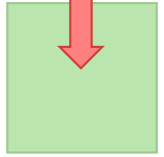
THE ESCAPE PLAN

Using your savvy skills you need to design a plan (a game) to help confuse the evil scientist. This will require some serious design and imagination in a MacGuyver-esque level of genius hackery. Your aim is to impress and confuse with something challenging, and yet fun.



THE BORING, YET IMPORTANT, RULES

- The University of Texas - Rio Grande Valley -



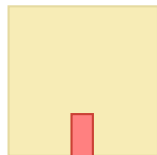
EVALS

April 12, 2017
- May 3, 2017



FINAL

May 8, 2017
1:15 - 3:00 p.m.



THE BOSS BATTLE

There's only one way to beat an evil scientist: you have to outsmart him! With your squad working together, you must research and write how to defeat the evil game he has assigned to you. This includes proving its complexity, showing how to approach it (in some useful way), and writing an A.I. to beat the evil mastermind at his own game!

TRAPPED



SPELLBOOKS



ESCAPE

By your own cleverness you escape and earn a nod of respect from the mastermind.

ABET OUTCOMES

- (a) An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline.
- (b) An ability to analyze a problem and identify and define the computing requirements appropriate to its solution.
- (c) An ability to design, implement, and evaluate a computer-based system, process, component or program to meet desired needs.
- (d) An ability to function effectively on teams to accomplish a common goal.
- (f) An ability to communicate effectively with a range of audiences.
- (i) An ability to use current techniques, skills, and tools necessary for computing practice.
- (j) An ability to apply mathematical foundations, algorithmic principles and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
- (k) An ability to apply design and development principles in the construction of software systems of varying complexity.

The boring, yet important, rules (BYIR) are necessary for the class to be successful, and to inform you of the laws. The basic idea is to B - YIR best by reading and keeping in mind the rules.

Attendance. Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGVs attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; 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.

Drop Class Policy. According to UTRGV policy, students may drop any class without penalty earning a grade of DR 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. The census date is Sept. 14th, which is the last day to drop the class without it appearing on your transcript.

Sexual Harassment, discrimination, and violence. In accordance with UT System regulations, your instructor is a "responsible employee" for reporting purposes under Title IX regulations and so must report any instance, occurring during a student's time in college, of sexual assault, stalking, dating violence, domestic violence, or 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, 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 in an environment free from sexual misconduct and discrimination.

Academic Integrity Policy. As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, 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. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

Course Evaluation. 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. Online evaluations will be available Nov. 18 - Dec. 8, 2015. Students who complete their evaluations will have priority access to their grades.

Computer Use Policy. Please read and be aware of University policies for computer use and data security, which can be found at: http://www.utrgv.edu/is/_files/documents/utrgv-aup.pdf

Note to Students with Disabilities. If you have a documented disability (physical, psychological, learning, or other disability which affects your academic performance) and would like to receive academic accommodations, please inform your instructor and contact Student Accessibility Services to schedule an appointment to initiate services. It is recommended that you schedule an appointment with Student Accessibility Services before classes start. However, accommodations can be provided at any time. Edinburg Campus: Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at accessibility@utrgv.edu.



Disclaimer. Dr. Wylie is not really an evil scientist who has lured you into a trap with the hopes that he will keep you from graduating. Or is he?



THE VILLAIN

The Evil Scientist: Dr. Tim (ruthless) Wylie
Public Lair: ENGR 3.287
Secret Lair:
Phone: 956-665-2577
Cries for help: timothy.wylie@utrgv.edu
Scheming hours: TR 9-11 A.M.