

SPEEDCUBING: HISTORY, THEORY, AND PRACTICE
Syllabus, Fall 2009

Instructor: Lucas Garron

Email: -

Class Meeting Time: Undetermined (tentatively, late afternoon/evening, 2 hours)

Office Hours: Cube Club Meetings and by appointment

COURSE DESCRIPTION

Speedcubing is the modern sport revolving around solving the Rubik's Cube quickly. In this course, we will cover the history of the cube and what led to its current status. We will also look at the current cubing community, as well as topics like basic math theory about the cube. Students will learn to solve a cube, and will be introduced to concepts and resources that can help them improve their speedsolving skill.

GRADING

This course is only offered for one unit, Pass/No Credit. In order to receive a passing grade in the course, each student will be expected to:

- Attend and participate in class (no more than two unexcused absences).
- Complete the readings/homework, and discuss them in class.
- Complete ONE of the following and give a short presentation about it to the class:
 - A research project on a person associated with the cube.
 - A short research paper on an aspect of the Cube (approved topic).
 - Learn a significantly advanced system for the Rubik's cube (will be reviewed for effort). Examples: Blindfolded Solving, Petrus, Heise, Roux, ...
 - A multimedia/programming project for the Cube.
 - A self-proposed project that involves specific research or work.

Note: Students will learn to solve a Rubik's Cube, but solving a cube is not a requirement for passing the course. Students are also encouraged to attend cube club meetings and participate in the Stanford Fall Competition.

SCHEDULE/SYLLABUS

Each 2-hour class will involve about:

- 10-15 minutes of introductory discussion (general questions, discussion of 1st class or the readings)
- an hour of material about the cube
- 30 minutes dedicated to a lesson about the cube, which will lead into
- 15-20 minutes of cubing practice and free interaction.

CLASS 1: INTRODUCTION

Topics:

- (20) Class Introduction and Overview
- (20) A Brief History of the Cube
 - From Erno Rubik's invention through the 80's craze and its modern revival.
- (20) Demonstration: Speedcubing and the Internet
 - A view of the breadth of information available online.
- (30) Cube Lesson: How to solve the cube using a layer-by-layer beginner's method (beginning).

Homework:

- Learn to solve a Rubik's Cube.
 - Solving guides/resources will be provided.
 - Help will be provided after class and during the week's Cube Club meeting.

CLASS 2: EARLY HISTORY

Topics:

- (60) The Cube in the '80s: a closer look at its invention and rise to fame.
 - Cultural, scientific, and economic history of the cube, with some multimedia.
 - Stanford and early cubing.
- (30) Cube Lesson: How to solve the cube using a layer-by-layer beginner's method (continuation).

Homework:

- Finish learning to solve a Rubik's Cube.
- Read Hofstadter's article (Scientific American, March 1981)

CLASS 3: MODERN CUBING

Topics:

- (60) The Modern Resurgence of Cubing (2000-present)
 - The role of the internet, and interconnectivity
 - The origin of the WCA: "Tyson and Ron"
 - World Championships '09: Oct 9-11
- (30) Cube Lesson: F2L – How to solve the first two layers faster, intuitively.

Homework:

- Look through the the WCA Regulations and write down what interested you.
 - <http://www.worldcubeassociation.org/regulations/>

- Begin thinking about a research topic/person (email proposals).

CLASS 4: BEYOND THE MERE CUBE

Topics:

- (20) Discussion of cube competitions and the regulations.
- (50) From Square-1 to 7x7x7: Other Puzzles
 - Physical puzzles
 - Virtual Puzzles
 - Custom Puzzle Building
 - Theory/Math of puzzles
- (20) Cube Lesson: How to improve – tips for practicing speedcubing.

Homework:

- Look at Jaap's Puzzle Page: <http://www.geocities.com/jaapsch/puzzles/>

CLASS 5: MATH

Topics:

- (50) Mathematics of the Cube: An Introduction
- (30) Cube Lesson: How Blindfolded Solving works
 - Not a full lesson, but an intro to pique interest.
- (10) Blindfolded, One-Handed, with feet..
 - Truths and misconceptions about the variety of speedcubing

Homework:

- Finalize the project idea and begin work.
- Read <http://solvethecube.110mb.com/commutators.html>

CLASS 6: MORE MATH

Topics:

- (60) **Guest Lecture:** Professor Daniel Bump
 - Introduction to Group Theory
- (30) Cube Lesson: How “big cubes” are solved (4x4x4, etc).
 - Reduction, mention of K4 and Cage (commutators)

Homework:

- (Keep working on project)
- Browse <http://www.speedsolving.com/forum/> and <http://www.speedsolving.com/wiki/>
- Mid-Quarter Evaluations?

CLASS 7: THE COMPUTER AND THE CUBE

Topics:

- (50) Rubik's Cube and the Computer: Math, Solving Programs, software for speedcubers
 - God's Number
 - Cube Explorer
 - Kociemba, Thistlethwaite, Rokicki
 - CCT, JNetCube, cubemania, ...

- (20) Cube Lesson: An overview of the full Fridrich method.
 - Why is Fridrich so popular?
- (20) Cube Lesson: Alternative 3x3x3 Methods – Petrus & Roux

Homework:

- (Keep working on project)
- Browse <http://www.ws.binghamton.edu/fridrich/cube.html>, <http://lar5.com/cube/>, and <http://cubefreak.net/>.

CLASS 8: THE FUTURE OF CUBING

Topics:

- (15) How are people developing (speed)cubing today?
- (15) Improvement in Speedcubing – is there a limit?
- (15) The growth of the sport
- (15) What will the future think of current cubing?
- (30) Cube Lesson: Tying together the math & puzzles we've seen.

Homework:

- (Finish project & prepare for presentation.)

CLASS 9: PRESENTATIONS

Topics:

- (90) Project Presentations

Homework:

- Come up with questions and topics that have interested you, for last class (email to Lucas).

CLASS 10: OPEN FORUM

Topics:

- (?) Finish project presentations, if necessary.
- Free discussion on any cube topics, led by Lucas.
 - Elaboration on popular topics
- Concluding remarks

READING LIST

This course does not require much assigned reading. Since most cubing information is online, students will be asked to browse certain sites that interest them, and are encouraged to explore more sites independently. The following sites will be distributed as reading over the courses:

- <http://www.worldcubeassociation.org/regulations/>
 - Official competition regulations
- <http://www.geocities.com/jaapsch/puzzles/>
 - An old page by Jaap Scherphuis, about math and various puzzles.

- <http://solvethecube.110mb.com/commutators.html>
 - An introductory guide to applying commutators on a cube.
- <http://www.speedsolving.com/forum/> and <http://www.speedsolving.com/wiki/>
 - The most active online forum in the cubing community, and its wiki resources
- <http://www.ws.binghamton.edu/fridrich/cube.html>
 - The original site by Jessica Fridrich, which directed modern cubing
- <http://lar5.com/cube/>
 - Site by the Swedish champion Lars Petrus, detailing his method – a popular alternative to Fridrich.
- <http://cubefreak.net/>
 - Site of the former world-record-holder Shotaro Makisumi, a long-standing
- <http://cubewhiz.com/experiences.html>
 - Links to several pages by Bob Burton, describing his competition experiences.
- <http://www.speedcubing.com/chris/>
 - Site by the incredible Chris Hardwick, who has been a pioneer in various categories of speedcubing.

In addition, I am trying to collect historical cube literature/articles for students:

- Douglas Hofstadter's article on the cube (Scientific American, March 1981)
- Stanford Daily Article (Jan. 20, 1981)