SPECIAL TOPICS: GAME THEORY 1:00PM MWF SPRING 2009 SH 309

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Text: *Lessons in Play: An Introduction to Combinatorial Game Theory*, by Albert, Nowakowski, and Wolfe

This course will work very differently, both in terms of daily conduct and grading, than typical math courses. My hope is that we can provide an excellent learning experience to an extremely wide range of interests, and to accomplish that I propose the grading system outlined on the attached sheet. The intention is to provide sufficient flexibility for each student to customize the course to suit individual interests and abilities.

Since I hope this course will be different things for different people, it is difficult to provide a true synopsis here. What should be true for everyone is that this course will give a sort of case study in how, when you examine something closely, mathematical structures emerge on various levels; when you further study those structures, you can learn things that were completely obscure at the initial examination, and in the end you can end up learning deep lessons with applicability far beyond the original field.

Above all else, though, games are fun and this class should be too. I hope you will keep me posted on our progress toward that goal, so we can adjust as needed.

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Tentative Schedule

	Wednesday, January 14th §1.1 - §1.3 Basic Techniques	Friday, January 16th §1.4 - §1.6 Basic Techniques (cont.)
Monday, January 19th **No Class – MLK Day**	Wednesday, January 21st §2.1Game Positions and Options	Friday, January 23rd §2.2 Impartial Games
Monday, January 26th §2.3 Case Study: Partizan Endnim	Wednesday, January 28th §3.1 Sums of Games	Friday, January 30th §3.2 Comparisons
Monday, February 2nd §3.3 Equality and Identity	Wednesday, February 4th §3.4 Case Study: Domineering	Friday, February 6th §4.1 Algebra
Monday, February 9th §4.1 Algebra (cont.)	Wednesday, February 11th §4.2 Order	Friday, February 13th §4.2 Order (cont.)
Monday, February 16th §4.3 Canonical Form	Wednesday, February 18th §4.3 Canonical Form (cont.)	Friday, February 20th 4.4 Incentives
Monday, February 23rd 4.4 Incentives (cont.)	Wednesday, February 25th §5.1 Numbers	Friday, February 27th §5.1 Numbers (cont.)
Monday, March 2nd Classical Game Theory I	Wednesday, March 4th Classical Game Theory II	Friday, March 5th Classical Game Theory III
Spring Break		
Monday, March 16th §5.2 Up, Down, and Star	Wednesday, March 18th §5.3 Switches	Friday, March 20th §6.1 Games Born by Day 2
Monday, March 23rd §6.2 Games Born by Day *n*	Wednesday, March 25th §6.2 Games Born by Day *n*	Friday, March 27th §6.3 Stops
Monday, March 30th §6.3 Stops	Wednesday, April 1st §6.4 More about Numbers	Friday, March 3rd §6.4 More about Numbers (cont.)
Monday, April 6th §7.1 Stars Revisited	Wednesday, April 8th **Student Research Symposium**	Friday, April 10th §7.2 Analysis of Nim
Monday, April 13th §7.3 Adding Stars	Wednesday, April 15th §7.4 A More Succinct Notation	Friday, April 17th §7.5 Taking-and-Breaking Games
Monday, April 20th §7.6 Subtraction Games	Wednesday, April 22nd §8.1 Comparing Games and Numbers	Friday, April 24th §8.2 Coping with Confusion
Monday, April 27th §8.3 Cooling	Wednesday, April 29th Presentations	
Final Exam – 8am on Friday, May 1st		

Any students with disabilities which might affect their performance in this class should contact me as soon as possible to arrange accommodations.

Coe's faculty has adopted an academic integrity policy. It is your responsibility to understand and follow it.

Diversity, in all its forms, is valuable.

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Grading Scheme

Grades will not be point-based, but rather activity-based. Earning a certain grade in this class will require accomplishing a certain number of tasks, rather than performance on selected examinations. The following table specifies the requirements for each grade:

	A	A–	B+	B	B–	C+	C	C–
Participation	40+	40+	39+	39+	39+	38+	38+	38+
Games	60+	55+	50+	45+	40+	35+	30+	25+
Minor Projects	9+	8+	7+	6+	5+	4+	3+	2+
Major Projects	3+	3+	2+	2+	2+	1+	1+	1+
Presentations	2+	2+	1+	1+	1+	1+	1+	1+
Math Culture	12+	11+	10+	9+	8+	7+	6+	5+
Quests (Superior)	90%+	85%+	80%+	75%+	70%+	60%+	55%+	50%+
Quests (Acceptable)	100%+	100%+	95%+	95%+	95%+	90%+	90%+	90%+

The "Games" category represents games you try playing during the semester which you have never played previously. At least 50% of these must be combinatorial games. At least 15 minutes of play is required, along with brief documentation in a Game Journal where you record your impression of the game, immediate conjectures, ideas about strategies, relations to other games, and other related notes. Students should select games to represent a wide variety, without excessive representation of any one category.

"Minor Projects" are expected to constitute 2-4 hours of effort and "Major Projects" 5-9 hours. All projects should be planned in consultation with the instructor, and in many cases group efforts will be appropriate. At least two projects must include a significant written portion, with revision encouraged.

"Quests" will be evaluations somewhere between quizzes and tests, generally undertaken on an individual basis. The table lists what share must be submitted at a superior level, and what share can be at just an acceptable level, for each grade.

At least one third (rounded judiciously) of the required quota in each category must be completed by midterm (March 6th). For this purpose, "Major Projects" and "Presentations" will be considered a single category.

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Math Culture Points

A significant portion of the grade for this course will take the form of Math Culture Points. These will be earned through activities outside of class including, but not necessarily limited to, those listed below:

Activity	Points	Max #
Colloquium Attendance	1	–
Colloquium Presentation	1-3	2
Meeting Attendance Midwest Undergraduate Mathematics Symposium (April 3rd - 4th) Nebraska Conference for Undergraduate Women in Mathematics (Jan. 30th - Feb. 1st)	3	2
Mathematics Competition Participation Iowa Collegiate Mathematics Competition (Feb. 28th) Mathematical Contest in Modeling (Feb. 5th - 9th)	2	2
Math Culture Reading Some weeks specific readings will be posted on the course web page With approval, any column on MAA.org With approval, an article from *Math Horizons*, *CMJ*, etc.	1	 – 5 5
Math Club Activities (when appropriate) Winter Break Book, Movies, Pi Day celebration, Speakers, etc.	1	5
Volunteer Math Outreach Working with students at Polk Elementary, etc.	1	3
Other Appropriate Coe Activities Attending a Quantitative Research Symposium Presentation Poverty Simulation Psychology Experiment Participation Contemporary Issues Forum	1	 2 – 2 –

Generally Math Culture Points can be earned for at most two activities in any given week, so you should plan to spread your participation throughout the semester. In each case above, credit assumes both full participation and posting a brief summary/response on Moodle. These reflections should generally be between 100 and 300 words, and include both a brief summary and your personal thoughts on the event, and must be submitted within one week of the event.