MATH 475 SYLLABUS, Spring Semester, 2002 Academic Year
Lec. 1, MWF 8:50 - 9:40 AM, B105 Van Vleck

Prof. Richard A. Brualdi

Office: 725 Van Vleck Hall

Text is:

Introductory Combinatorics

3rd ed., by R.A. Brualdi

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Office Hours: Tues. (11:00-11:50 AM), Wed. (1:20-2:10 PM), Fri. (9:55-10:45 AM)

WWW: http://www.math.wisc.edu/~brualdi

Through DoIT I have created an email list for this course through which I can communicate to the class over the Internet.

Please read carefully

Course Content As the title *Introduction to Combinatorics* suggests, Math 475 is a first course with emphasis on the basics of combinatorial counting techniques, number sequences, and patterns, with some graph theory thrown in (including the max-flow min-cut theorem of network flows). It is not however a course on what is traditionally called discrete mathematics. We will discuss algorithms for some of the combinatorial problems considered.

Briefly, the topics covered in the course include: pigeon-hole principle and applications; permutations and combinations; generating permutations and combinations; properties of binomial coefficients (combination numbers); partial orders, equivalence relations, and Dilworth's theorem; the inclusion-exclusion principle; recurrence relations and generating functions; difference sequences, Catalan numbers, Stirling numbers, partition numbers, and other counting sequences; graph theory (paths, cycles, trees, graph coloring, ...), network flows, and Polya counting (counting in the presence of symmetries).

Study Habits This course does require considerable work. You should be devoting **6-8 hours a week** minimum to it; reading the book, thinking about the ideas, concepts, and techniques, talking with some of your classmates about them, doing all the assigned exercises etc. If you are not prepared to make the effort, you should re-examine the reasons why you are taking this course.

There will be regular reading and homework assignments (see attached). It is expected that students will read the book - not everything you should learn and know will be discussed in class. Of course, I will write stuff on the chalkboard but I will not write the book on the board! The class and the book will reinforce each other, and neither is a replacement for the other. Questions and comments from students are encouraged. The reading assignments (sections of the book) should be done **before** the class in which they are discussed. In the class, we (you and I) will discuss the material - class participation is encouraged and expected.

Exercises There will be two kinds of exercises: some to do and check your answers (after you've done them!) with those given in the back of the book; in addition, there are exercises to be handed in (after we finish each chapter) for marking (by a graduate student grader

assigned to me). It is essential that you do both kinds of exercises with the not-to-be-handed-in exercises completed **before** you do the to-be-handed-in exercises. The assignments to be handed-in will have a **due date in class**; no late assignments will be accepted but the lowest assignment will be dropped. Your work on these exercises should be well-presented in good English, and not written carelessly. While you can discuss the exercises with classmates, **the work you hand in should be your own write-up and not copied from someone else. The assigned homework will be scaled to 70 points. I allow myself the possibility to increase someone's scaled homework score based on class participation. For this I need to know your name, so I recommend that you identify yourself when you ask a question etc.**

Exams There will be **two in-class exams** during the semester (**each worth 90 points**) and a **final exam (worth 150 points)** - see the accompanying schedule. I do not intend to give make-up exams.

Exam Schedule

- Exam 1 (Chapters 1 to 4): Wednesday, February 20.

- Exam 2 (Chapters 5 to 8): Monday, April 8.

- Final Exam: Thursday, May 16, 7:45-9:45 AM.

Approximate Chapter Schedule

- Chapter 1: 1 day

- Chapter 2: 2 days

- Chapter 3: 4 days

- Chapter 4: 4 days

- Chapter 5 (not 5.6): 3 days

- Chapter 6 (not 6.5): 3 days

- Chapter 7: 5 days

- Chapter 8: 4 days

- Chapter 11: 5 days

- Chapter 13 (only 13.1): 1 day

- Chapter 12: 3 days

- Chapter 14: 5 days

Grades These will be based on a **total of 400 points** according to the following absolute standard (and exams will be constructed with this standard in mind):

Grade	Accomplishment level	Points
A	**superior**	370 ↑
AB	**excellent**	355 ↑
B	**proficient**	330 ↑
BC	**good**	310 ↑
C	**acceptable**	275 ↑
D	**mediocre**	240 ↑
F	**unacceptable**	0 ↑

Because of this absolute standard, you are not in competition with your classmates nor does their performance influence positively or negatively your performance. You are encouraged to form study/problem groups with your classmates; things not clear to you may become obvious when you try to explain them to others or when you hear other points of view. Sometimes just verbalizing your mathematical thoughts can deepen your understanding. As already mentioned, if you discuss with others the exercises, each person should write up her/his own version of the solution.

Calculator Policy: It is acceptable to use calculators on exams to do arithmetic computations, but the computations are to be exact. So an answer which has $\sqrt{2}$ in it is to be presented as such and not as 1.414.

Attendance: It is expected that each student will be present at all of the classes. Office hours are for students who need additional help beyond that given in the class; they are not substitutes for class.

Other Information

GUTS: GUTS (Greater University Tutoring Service) is a free peer tutoring service offered either as one on one, in small groups, or in drop-in centers. The drop-in centers are located in Gordon Commons, Helen C. White Library, Kronshage Hall, and Union South. The GUTS office is 303 Union South (263-5666). They also have an exam file in their office.

Private Tutors: The receptionist office on the 2nd floor of Van Vleck has a list of private tutors.

Note to McBurney Disability Resource Center students: Students of the Center who are recommended for some accomodation (e.g., extended time on exams) should contact the instructor about this no later than January 30.

The Department of Mathematics; Van Vleck Hall (VV):

Chair: A. Adem (219 VV)

Associate Chair: D. Uhlenbrock (421 VV)

Department Administrator: G. Novara (223 VV)

Undergraduate Advisor: G. Mari-Beffa (309 VV)

TA Supervisor: R. Wilson (411 VV)

Undergraduate Secretary: P. Conklin (203 VV)

Sexual Harrassment Contact Persons: G. Benkart (817 VV), D. Rivard (B207 VV)

Access and Accomodation Coordinators: D. Uhlenbrock (421 VV)

Faculty Minority Liaison: D. Rider (821 VV) [Information available concerning diversity and multicultural issues (e.g. support services, academic internships and grants/fellowships). Prof. Rider is also available to discuss minority students' concerns about mathematics courses: 263-3603, drider@math.wisc.edu)]

MATH 475 EXERCISES

Only the exercises in **bold type** are to be handed in.

- Chapter 1: 3, 4, 26, 27, 29, 30, **31**, 32, 33. **Due on Friday, February 1**

- Chapter 2: 1, 3, 4, 5, 8, 9, 10, **11**, 14, **15**, **16**, 17, 18, **20**, **23**, 27. **Due on Friday, February 1**

- Chapter 3: 1, 2, 3, 4, 5, 6, 7, **8**, 9, 10, 11, 12, 14, 16, 17, **18**, **19**, 20, 21, 23, 25, 26, **30**, 31, 32 **33**, 34, **35**, 37, **39**. **Due on Monday, February 11**

- Chapter 4: 1, 2, 3, 4, 5, 6, 7b, **8**, 9, 10, 11, 12, 15a,b, **15 c,d**, **16 c, d**, 21, **27**, **29**, 28, 31, **33**, 34, 36, **37**, 38, 39, 41, 43, 44, 45, 46, **47**. **Due on Monday, February 18**

- Chapter 5: 4, 6, 7, 8, 9, **11**, 12, 15, 16, **17**, **18**, **23**, **30**, 31, 32, 36, 47. **Due on Monday. March 4**

- Chapter 6: 2, 3, 4, 5, **6**, 8, 9, 11, 12, **13**, 17, **24a**, **24c**, **25**. **Due on Monday, March 11**

- Chapter 7: 1 a, b, c, **d**, 6, 7, 9, 10, **11**, 15 c, e, 30, 31, **33**, 35, 37, **38**, **39**, 40. **Due on Friday. March 22**

- Chapter 8: 4, 6, **7**, 8, 11, 12, 13, **15**, 17, **19**, 21, 24, 25, 26 a, b, 27. **Due on Wednesday April 17**

- Chapter 11: 2, 3, 5, 8, 10, 11, 20, 26, 28, 29, 33, 36, 38, 41, 44, 47, 53, 54, 55, 57, 58, 59, 60, 62, 63, 65, 71, 75c, 75d, 76c, 76d, 78, 79

- Chapter 13: 4, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16

- Chapter 14: 1, 3, 4, 5, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 23, 26, 27,29, 31, 35, 37, 39, 42, 46, 49