Math 477 – Probability – Section B1
Summer 2015 – Instructor: Pat Devlin
Updated May 25, 2015

General Information

Class Meetings: Class meets every Monday, Tuesday, Wednesday, and Thursday starting May 26 and ending July 2. Class meets from 8am to 9:50am in SEC-220 (room subject to change) on Busch Campus[1]. **The final is on Thursday July 2 from 8am to 11am.**

Instructor Information: Pat Devlin (mathematics PhD student) [please, call me Pat!]
Office hours: Monday, Wednesday after class in Hill 618, also by appointment
Email: `prd41@math.rutgers.edu` (best way to reach me)
Office phone: (732)445-2390 ext. 54193
Course webpage: Use sakai to view grades, assignments, resources, and announcements
Personal webpage: `http://www.math.rutgers.edu/~prd41/` (this may not be useful)

Text: Sheldon Ross, *A First Course in Probability, 9th edition*
ISBN 978-0321794772, published by Prentice-Hall, 2012.

Academic Integrity: Do not violate the academic integrity policy (i.e., *don't cheat!*). The university takes that sort of thing very seriously, and cheating can get you in a lot of trouble. See `http://academicintegrity.rutgers.edu/policy-on-academic-integrity`

Resources: In addition to office hours, there are many resources for this subject including free tutoring through Rutgers `lrc.rutgers.edu/tutoring.shtml` and online course notes such as `math.rutgers.edu/~tmp140/courses/Fall2014/M477/F14-M477.html`

My Policies and What to Expect

Learning Goals for Students: I expect students to acquire a firm understanding of the material, particularly the concepts and ideas of the course and how they fit together in a 'big picture' sort of way. By the end of the course, I expect each of you:

(i) to know ***what*** each concept is [e.g., definitions, formulas, theorems, et cetera];

(ii) to know ***how*** to do each technique discussed [i.e., how to solve truly 'mundane' book problems (e.g., how to compute probabilities, expected values, et cetera)];

(iii) to know ***when*** each technique is applicable [e.g., to develop intuition for when one technique might be more effective than another, to know when a certain theorem applies, to know applications of techniques discussed, et cetera];

(iv) to have a feeling for ***why*** things work out [e.g., why does inclusion-exclusion make sense, why is conditioning useful, why is expectation linear, et cetera]; and

(v) to use material we discussed and ask yourself ***why not*** [i.e., to be so comfortable with the material we learned that you can use it in new (and perhaps unexpected) ways to make connections (and mathematical discoveries) all on your own].

All of the quizzes, classwork, homeworks, and exams will be geared along these lines, training you towards this end. This is what I expect you to be able to do by the end of this course, and these are the skills that the final exam will test you on.

Goals for the Instructor: My goals as your instructor are:

1. for each student to learn and master the material of this course;
2. for each student to practice creative, abstract, and mathematical thinking whenever possible;
3. for each student to earn an A (the wording is *earn* not *receive*);

[1] Any room changes will be announced.

4. to structure each class session in an effective and engaging manner;
5. to cultivate a safe environment for students to learn and make errors (both in the classroom and in office hours); and
6. to improve as an instuctor.

Pedagogy: The format of this course will be strongly influenced by the instructor's pedagogical beliefs (i.e., his views of how learning takes place). In short, the most fundamental of my views is the simple statement that *an instructor cannot possibly learn <u>at</u> you; instead, learning is an extraordinarily personal process that must occur within each student as a result of what she or he does.* If you ever have any questions or criticisms about the way this course is structured, I warmly welcome any feedback or discussion.

Classroom Expectations: While in the class, I as the instructor expect each of you:

(a) to pay attention and ask lots and lots of questions (you're all here to learn, not to text and not to pretend that you don't have any questions);
(b) to engage your mind with the material and participate in group discussions about it;
(c) to be bold enough to express an idea even if you're not positive that you're correct;
(d) to be honest with yourself about what you do and do not know (the pace is so fast that you really need to see me as soon as you fall behind on any concept whatsoever);
(e) never to hinder any fellow student's ability to learn (e.g., don't be a distraction to everyone by texting or talking in class, and don't make anyone feel 'stupid'); and
(f) to try to enjoy the learning process!

Similarly, you can expect that:

(a) the instructor will be ready and willing to address any questions you have;
(b) the instructor will challenge you to think and reason in ways that encourage your academic and intellectual growth;
(c) the instructor will always be respectful, considerate, and patient with you;
(d) the instructor will make himself available in office hours and by appointment to provide any additional help or clarification you'd like;
(e) the instructor will present the material in multiple ways so that each student might be personally engaged in a manner and at a level by which he or she learns best; and
(f) the instructor will try his best to make the learning process enjoyable!

Attendance: Students are to attend every class and to be on time. This course has a necessarily fast past, so missing even a single class can lead to substantial gaps in your understanding. In extenuating circumstances students should email me in advance, and we will try to work something out. Please note that using the Rutgers buses takes longer in the summer.

Homework: Homework is given so that a student is *forced* to practice new material, and the fast pace of this course makes doing homework absolutely vital. Your *graded* homework will be problem sets that I regularly assign; these are to be turned in. However, since the vast majority of you would greatly benefit from more practice, I strongly suggest that every day you work on additional homework problems (though these would not be graded). I will also periodically assign special homework problems, which will involve more work and creativity.

Quizzes: Short in-class quizzes will be given to ensure continual understanding. Think of these quizzes as helpful little indicators of how well you are internalizing the material. If on any quiz you get a lower grade than the one you want for the course, then you simply ***need*** to practice by doing more homework, and you should probably see me.

Exams: There will be two 'midterm' exams (Thursday June 4 and Thursday June 25) and one final exam (Thursday July 2). These exams will be cumulative (especially the final). They will be given in class at our usual class time, and you will *not* be allowed to have notes, book, or calculators. The two midterm exams will only be 80 minutes, and we will spend

the final thirty minutes of class reviewing the exams or on new material. **The final will be three hours; make sure that you are available from 8am to 11am on Thursday July 2** (and let me know immediately if that will be a problem).

Late Work and Absences: Exams simply may *not* be taken late unless there is an overwhelmingly valid and documented excuse. Quizzes and homeworks may be taken or turned in up to a week late by seeing me in office hours [or by appointment], but your grade on the assignment drops 10% for every day it is late (including a 10% drop for work turned in late on the same day).

It is extremely important to be in class on time. Homework will be collected at the start of class, and work turned in past 8:15 will be considered late. **Students each have one "free" unexcused absence or tardiness, but each subsequent incident will affect your course grade by up to five percent.**

Grades: My goal as your instructor is for literally every single student to earn an A in this course (emphasis on *earn* not *receive*). For this reason, you are always welcome to see me in office hours [or by appointment], where I can provide the opportunity for you to improve any grade you got in my class (including quizzes and exams). However, the degree to which your grade could be improved and the corresponding amount of extra learning and work that you would need to put in would of course depend heavily on the assignment in question. To clarify: *I am by no means saying it will be 'easy' to get a good grade in this course; but I am saying it will be easy to find [potentially difficult] opportunities to do so.*

Your grade will be broken into five categories. Namely:

	Portion of Total Grade
Homework	1/6
Quizzes	1/6
Midterm Exam 1	1/6
Midterm Exam 2	1/6
Final Exam	2/6

Categories of 'Homework' and 'Quizzes' will each be graded based on total points.

Schedule of Topics Covered

This is a tentative outline for the course material. Time permitting, we will cover additional topics from areas including statistics, graph theory, and computer science. Homework assignments and short quizzes will be given regularly (see previous sections). There will be two "midterm" exams and a final, each of which will be cumulative. Topics in *italics* are optional. The exact structure of the course may vary, and the presentation of some these sections will be more fluid and connected than this table may suggest.

Date	**Lect.**	**Reading**	**Topics**
Tue 5/26	1	1.1 — 2.3	Combinatorics and axioms of probability
Wed 5/27	2	2.4, 2.5	Inclusion/exclusion; equally likely outcomes
Thu 5/28	3	2.5	Combinatorial probabilities (examples)
Mon 6/01	4	3.1 — 3.3	Conditional probability; Bayes's formula
Tue 6/02	5	3.4, 3.5	Independent events; repeated independent trials
Wed 6/03	6	—	Catch up and review for midterm 1
Thu 6/04	7	**Midterm Exam 1**	
Mon 6/08	8	4.1 — 4.5	Basics of random variables
Tue 6/09	9	4.6 — 4.8	Examples of discrete random variables
Wed 6/10	10	5.1, 5.2	Continuous random variables
Thu 6/11	11	5.3, 5.4	Examples of continuous random variables
Mon 6/15	12	5.5 — 5.7	More examples of random variables
Tue 6/16	13	6.1 — 6.3	Joint distributions; independent random variables
Wed 6/17	14	6.4, 6.5	Conditional distributions
Thu 6/18	15	7.1, 7.2	Linearity of expectation
Mon 6/22	16	7.3, 7.4	Moments, covariance, correlation
Tue 6/23	17	7.5, 7.6	Conditional expectation
Wed 6/24	18	—	Catch up and review for midterm 2
Thu 6/25	19	**Midterm Exam 2**	
Mon 6/29	20	*7.7, 8.1, 8.2*	*Moment generating functions; Chebyshev's inequality*
Tue 6/30	21	8.3	Central limit theorem
Wed 7/01	22	—	Catch up and review for final
Thu 7/02	23	**Final Exam**	(From 8:00 am to 11:00 am)