MA4631/MA540
Probability and Mathematical Statistics I
Fall 2014

Professor: Dr. Zheyang Wu; Office: SH101, Phone 831-5031, E-mail: zheyangwu@wpi.edu, Office Hours: Tuesday 1-2pm, Thursday 12-1pm, or by appointment.

Lecture: MA540-191 and MA4631-101: T, 5:30-8:20pm, SH203.

Online blackboard: http://my.wpi.edu.

Textbook: "Statistical Inference (2nd Edition)" by Casella and Berger. The course will cover most content of Chapters 1-5, with potentially additional materials added.

Theme: This course gives the foundation (at an intermediate level) of statistics: the theory behind modern statistical data analysis. We emphasize the mathematical aspects of probability and statistics: concepts and theorems. We gain knowledge and skills in mathematical thinking, deduction, and proving. Not much statistical computation will be involved, which will be taught in separate statistical courses.

Expectation of course work: You are expected to develop skills of problem solving and mathematical arguments in probabilistic and statistical settings. You will be developing the abilities of reasoning and applying the theory, and you will be assessed accordingly.

Topics and temporary schedule:

1. Probability Theory : (a) Axiomatic Foundations and Calculus of Probability; (b) Random Variables, Distribution and Density Functions.

2. Transformations and Expectations : (a) The Expectation Operator; (b) Moment Generating Functions; (c) Transformations, Jacobians.

3. Common Families of Distributions : (a) Discrete Distributions; (b) Continuous Distributions; (c) Exponential Families and Location-Scale Families.

4. Multiple Random Variables : (a) Marginalization, Conditioning and Independence, Correlation; (b) Mixture Distributions, Hierarchical Models; (c) Multivariate Distributions; (d) Inequalities.

5. Properties of a Random Sample : (a) Distributions of Sums of Random Variables and Order Statistics; (b) Convergence in Probability, Almost Sure Convergence, Laws of Large Numbers, Central Limit Theorems; (c) Normal Sampling; (d) Generating a Random Sample.

Homework: Homework assignments are to be posted on myWPI with specified due dates. Homework is individual effort; everyone works on his/her own answers. Evidence of getting the answers from anywhere or anyone else is forbidden (see academic honesty policies below). Note that bad writing likely causes misunderstanding and hurts credit. No late HW accepted, unless approved in advance.

Exams: The midterm exam (Oct. 14, Tuesday before the break week) and the comprehensive/cumulative final exam (Dec. 16, Tuesday in the final week) are both in-class and closed-book. Calculator is allowed, but not essential.

Grade: The distribution of works contributing towards the final grade:

$$\begin{array}{rl} Homework & 35\% \\ Midterm(Oct.14, Tue) & 30\% \\ Final(Dec.16, Tue) & 35\% \end{array}$$

Note: Students of MA4631 are required to do the same work as those of MA540. Meanwhile, certain adjustments could be made for the final letter grades at the instructor's discretion.

Academic Honesty: Study groups are welcome for learning books and notes, digesting lectures, and preparing exams. **However, no discussions are allowed to address homework assignments. You have the obligation to not ask, and to refuse answering questions from any other students regarding to homework problems. You also have the duty to report such a behavior if happened (confidentiality will be protected and creditability will be rewarded). For any questions regarding to homework problems, please ask the instructor.**

Each student is expected to familiarize him/herself with WPI's academic honesty policies which can be found at http://www.wpi.edu/offices/policies/honesty. All acts of fabrication, plagiarism, cheating, and facilitation will be prosecuted according to the university's policy. If you are ever unsure as to whether or not your intended actions are considered academically honest, please see me.

Academic Accommodations Statement: If you need course adaptations or accommodations because of a disability, or if you have medical information to share with me that may impact your performance or participation in this course, please make an appointment with me as soon as possible.

If you have approved accommodations, please go to the Exam Proctoring Center (EPC) in Morgan Hall to pick up Letters of Accommodation.

If you have not already done so, students with disabilities who need to utilize accommodations in this class are encouraged to contact the Office of Disability Services (ODS) as soon as possible to ensure that such accommodations are implemented in a timely fashion. This office can be contacted via email: DisabilityServices@wpi.edu, via phone: (508) 831-4908, or in person: 137 Daniels Hall.