湖北工業大學
HUBEI UNIVERSITY OF TECHNOLOGY

Course Title	Probability and Mathematical Statistics
Course Code	MATH 2211
Semester	Summer 2026
Course Length	4 Weeks, 60 Contact Hours
Credits	4
Instructor	TBA
Office	TBA
Email	TBA
Prerequisite	MATH 1112 Calculus II MATH 2151 Linear Algebra I

Course Description:

This course provides a comprehensive introduction to the mathematical modeling of uncertainty and the fundamental principles of statistical inference. The first half of the semester focuses on probability theory, including discrete and continuous random variables, probability distributions, and limit theorems. The second half transitions into mathematical statistics, covering point and interval estimation, hypothesis testing, and linear regression models. The course emphasizes both the theoretical foundations and the application of these methods to real-world data in science, engineering, and economics.

Course Goals:

Students who successfully complete this course will demonstrate competency in the following general education core goals:

- **Critical thinking skills** – Students will engage in creative and/or innovative thinking, and/or inquiry, analysis, evaluation, synthesis of information, organizing concepts, and constructing solutions.
- **Communication skills** – Students will demonstrate effective written, oral, and visual communication.
- **Teamwork** – Students will demonstrate the ability to work effectively with others to support a shared purpose or goal and consider different points of view.
- **Social responsibility** – Students will demonstrate intercultural competency and civic knowledge by engaging effectively in local, regional, national, and global communities.

Student Learning Outcomes:

Upon completion of this course, students will be able to:

- Construct and analyze probability models for various random phenomena;
- Apply the Law of Large Numbers and Central Limit Theorem to approximate complex distributions;
- Perform rigorous statistical parameter estimation using Maximum Likelihood and Least Squares methods;
- Conduct and interpret formal hypothesis tests and construct confidence intervals.

Textbooks:

- *Probability and Statistics for Engineers and Scientists,* 9th Edition, by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, and Keying Ye. Pearson.
- *Student Solutions Manual for Probability and Statistics for Engineers and Scientists,* 9th Edition, by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, and Keying Ye. Pearson.
- *Mathematical Statistics with Applications,* 7th Edition, by Dennis Wackerly, John Chen, Adam Loy. Cengage Learning 2008.

Technology Requirements:

- Scientific Calculator
- Statistical Software: Introductory use of R or Python (NumPy/SciPy)

Course Requirements:

Problem Sets (20%): These are assigned regularly to bridge the gap between abstract theorems and practical calculation. They focus heavily on deriving estimators and solving combinatorial problems.

Quizzes (15%): Three short assessments are conducted during lecture hours. These ensure students are mastering the transition from probability theory to mathematical statistics.

Midterm Examination (20%): This invigilated, sit-down exam focuses exclusively on the probability half of the curriculum. It requires students to apply distribution theory to real-world scenarios, such as radioactive decay or industrial quality control.

Final Research Project (15%): A collaborative effort where students use technology (Excel, R, or Python) to analyze a provided dataset, perform Exploratory Data Analysis, verify distribution assumptions, and construct appropriate confidence intervals or regression models. The final output includes a technical report and a 5-minute in-class group presentation during the final week of the term.

Final Examination (30%): A cumulative but weighted exam held on-site during the formal examination period. While it touches on probability, the primary focus is on the latter half of the course: sampling distributions, estimation techniques, and inferential logic.

Assessments: Activity	**Percent Contribution**
Problem Sets	20%

Quizzes	15%
Midterm Examination	20%
Final Research Project	15%
Final Examination	30%

Grading:

Final grades will be based on the sum of all possible course points as noted above.

Grade	**Percentage of available points**
A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D	64-69
D-	60-63
F	0-59

Course Schedule:
The schedule of activities is subject to change at the reasonable discretion of the instructor. Minor changes will be announced in class, major ones provided in writing.

MATH 2211 Schedule

Lecture	Topic	Readings (*Walpole*)
L1	Sample Spaces, Events, and Axioms	2.1-2.2
L2	Counting Sample Points & Combinatorics	2.3
L3	Conditional Probability & Product Rule	2.6
L4	Total Probability & Bayes' Rule	2.7
L5	Random Variables & Discrete Distributions	3.1-3.2
L6	Expectation & Variance (Discrete Case)	4.1-4.2
L7	Binomial & Geometric Distributions; **Quiz 1**	5.2, 5.4
L8	Poisson Process & Distributions	5.5
L9	Continuous Variables & Density Functions	3.3
L10	Uniform & Exponential Distributions	6.1, 6.6
L11	The Normal Distribution & Applications	6.2-6.4
L12	Joint Probability Distributions	3.4
L13	Covariance & Linear Combinations	4.2-4.3
--	**Midterm Exam**	L1-13
L14	Chebyshev's Theorem & Inequalities	4.4
L15	Functions of Variables & Transformations	7.1-7.2
L16	Sampling Distributions & Random Sampling	8.1-8.3
L17	Central Limit Theorem & Approximations	8.4, 6.5
L18	Fundamental Statistics & Data Analysis; **Quiz 2**	1.1-1.6
L19	Classical Estimation: Mean & Variance	9.1-9.4
L20	Methods of Moments & MLE	9.14
L21	Confidence Intervals (One & Two Samples)	9.5, 9.8
L22	Hypothesis Testing: General Concepts	10.1-10.3

L23	Tests for Means and Proportions; **Quiz 3**	10.4-10.9
L24	Tests for Variance & Goodness-of-Fit **Brief Project Presentation**	10.10-10.11
L25	Simple Linear Regression & Least Squares **Brief Project Presentation (continued)**	11.1-11.3
--	**Final Exam**	Cumulative

Accommodation Statement:

Academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as he/she is not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow.

Academic Integrity Statement

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in coursework may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or without the University; and nondisclosure or misrepresentation in filling out applications or other University records.

Other Items:

Attendance and Expectations

All students are required to attend every class, except in cases of illness, serious family concerns, or other major problems. We expect that students will arrive on time, be prepared to listen and participate as appropriate, and stay for the duration of a meeting rather than drift in or out casually. In short, we anticipate that students will show professors and fellow students maximum consideration by minimizing the disturbances that cause interruptions in the learning process. This means that punctuality is a must, that cellular phones be turned off, and that courtesy is the guiding principle in all exchanges among students and faculty. You will be responsible for the materials and ideas presented in the lecture.

Assignment Due Dates

All written assignments must be turned in at the time specified. Late assignments will not be accepted unless prior information has been obtained from the instructor. If you believe you have extenuating circumstances, please contact the instructor as soon as possible.

Make-Up Work

The instructor will not provide students with class information or make-up assignments/quizzes/exams missed due to an unexcused absence. Absences will be excused and assignments/quizzes/exams may be made up only with written documentation of an authorized absence. Every effort should be made to avoid scheduling appointments during class. An excused student is responsible for requesting any missed information from the instructor and setting up any necessary appointments outside of class.

Access, Special Needs and Disabilities

Please notify the instructor at the start of the semester if you have any documented disabilities, a medical issue, or any special circumstances that require attention, and the school will be happy to assist.