



Xi'an Jiaotong-Liverpool University

西交利物浦大學

Department of Mathematical Sciences

MODULE HANDBOOK

MTH113TC

**Introduction to Probability and
Statistics**

Dr. Yinna Ye & Dr. Jionglong Su

Semester 1

2020/2021

SECTION A: Basic Information

□ Brief Introduction to the Module

This module is designed and developed particularly for 2nd Year undergraduates at XJTLU. It is intended as an elementary introduction to the theory of probability and statistics for students in Data Science and Big Data Technology.

□ Key Module Information

Module name: Introduction to Probability and Statistics

Module code: MTH113TC

Credit value: 5 credits

Semester in which the module is taught: Semester 1

Pre-requisites needed for the module:

Programmes on which the module is shared: BEng Data Science and Big Data Technology

□ Delivery Schedule (subject to changes of timetable setting from Registry)

Lectures	
Time (Week 1 – Week 5)	Teaching mode
Mon. 9 - 11 am.	Online
Tue. 2 – 4 pm.	
Wed. 2 – 4 pm.	
Thu. 5 – 7 pm.	

Tutorials			
	Time (Week 1 – Week 6)	Venue	Teaching Mode
Group 1	Thu. 2 – 3 pm.	MA418	Onsite
Group 2	Fri. 11 – 12 am.	MA405	
Group 3	Fri. 4 – 5 pm.	MA418	
Group 4 (International)	Fri. 5 – 6 pm.	MA418	Online

Seminar			
	Time (Week 6)	Venue	Teaching Mode
Group 1	Tue. 9-11 am	SD214	Onsite
Group 2	Tue. 2-4 pm	SD220	
Group 3	Tue. 4-6 pm	SB220	
Group 4 (International)	TBA	N/A	Online

❑ **Module Leader and Contact Details**

Name: Dr. Yinna Ye

Email address: yinna.ye@xjtlu.edu.cn

Room number and office hours: MB324, TBA

Preferred means of contact: email

❑ **Additional Teaching Staff and Contact Details**

Co-lecturer: Dr. Jionglong Su

Email: jionglong.su@xjtlu.edu.cn

Room number and office hours: SC527, TBA

SECTION B: What you can expect from the module

❑ **Educational Aims of the Module**

The aim of this module is to

- To provide a rigorous introduction to probability and mathematical statistics particularly for math majored students;
- To discuss the potential scope of the applications and illustrate typical ways of analysis;
- To provide an appropriate technical background for related higher level MTH modules.

❑ **Learning Outcomes**

Students completing the module successfully should be able to:

- A. describe statistical data;
- B. apply basic probability theory to solve related problems;
- C. provide good knowledge on typical distributions such as Bernoulli, Binomial, Geometric, Uniform, Poisson, Exponential and Normal distributions and their applications.

□ Assessment Details

Initial Assessment

Sequence	Method	Assessment Type (EXAM or CW) ²	Learning outcomes assessed (use codes under Learning Outcomes)	Duration	Week	% of Final Mark	Resit (Y/N/S) ³
001	CW	CW	A,B	1.0 hours		15	N
002	Final Exam	EXAM	A,B,C	2.5 hours		85	Y

Resit Assessment

Sequence	Assessment Type (EXAM or CW)	Learning outcomes assessed (use codes under Learning Outcomes)	Duration	Week	% of Final Mark
R002	EXAM	A,B,C	2.5 hours		85

Marks for components where no resit opportunities are offered will be carried forward, whether or not they are passed or failed, and will be calculated, with the same weighting, in the final module mark.

□ Syllabus & Teaching Plan

The syllabus of this module is as follows:

- A. Elementary probability: a) Sample space, Set operations, b) Axioms of probability, Fundamental formula for probability, c) Rule of complement, Rule of total probability, Monotonicity, Rule of addition
- B. Conditional probability & independence: a) Conditional probability, b) The multiplication principle, c) The law of total probability, d) Bayes' formula, e) Independent events

- C. Random variables & their distributions: a) Discrete random variables, probability mass function, cumulative distribution function, Expectation, Variance, Standard deviation, b) Bernoulli, Binomial, Geometric, Poisson distributions, c) Continuous random variables, probability density function, cumulative distribution function, Expectation, Variance, Standard deviation, d) Uniform, Exponential, Normal distributions.
- D. Sampling distributions, Confidence interval estimation, Hypothesis Testing

The teaching plan is the following, which might be slightly flexible due to the students learning process.

Week number and/or date	Lecture/Seminar/Field trip/other	Topic/Theme/Title	Pre-reading
Week 1	Lecture 1 - Elementary Probability, Conditional Probability & Independence	Chap1: Elementary Probability. Sample space & events, Axioms of probability, Fundamental formula for probability, Some useful results on probability: Rule of complement, rule of total probability, Rule of addition.	Chapter 1 in Lecture Note & Slides
		Chap 2: Conditional Probability & Independent events. Conditional probability, Multiplication principle, Law of total probability, Bayes' formula, Independent events	Chapter 2 in Lecture Note & Slides
Week 2	Lecture 2 - Random Variables	Chap 3 - Part 1: Discrete Random Variables. Cumulative Distribution Functions, Expectation, Variance, Standard Deviation; Common discrete random variables: Bernoulli, Binomial, Geometric, Poisson random variables	Chapter 3 in Lecture Note & Slides
		Chap 3 - Part 2: Continuous Random Variables. Expectation, Variance, Standard deviation; Common continuous random variables: Uniform, Exponential, Normal random variables	
Week 3	Lecture 3 - Descriptive Statistics	Random & Systematic Sampling: population, sample, Simple Random Sampling, Systematic Sampling, Parameter, Statistic	Slides - Week 3
		Classification of variables: Qualitative and quantitative variables, type of data.	

		Graphs to Describe Variables: Frequency distribution, relative frequency distribution, Bar chart, Pie chart, cross table, Histogram, Ogives, Stem-and-leaf Displays, Scatter Plot.	
Week 4	Statistical Measures	Measures of central tendency and location: Mean, Median, Mode, Shape of Distribution, Quantiles, 5-number summary	Slides - Week 4
		Measures of variability: Range, IQR, Box-and-Whisker Plot, Variance, Standard Deviation, Coefficient of Variation, Chebyshev's Thm, Empirical Rule, Central Limit Thm, z-score	
		Measures of relationships between variables: Covariance, Correlation Coefficient	
Week 5	Lecture 4 - Sampling Distributions	Sampling Distributions: distributions of the sample mean, sample proportions and sample variance, Chi-square distribution. Confident interval & Hypothesis testing (If time permits)	Slides - Week 5

❑ Reading Materials

Optional Textbooks

Title	Author	ISBN/Publisher
PROBABILITY AND STATISTICS, 4TH EDITION	MORRIS H. DEGROOT, MARK J. SCHERVISH	9781292025049 /PEARSON
INTRO STATS (5TH EDITION)	RICHARD D. DE VEAUX, PAUL F. VELLEMAN, DAVID E. BOCK	9780134210223 /PEARSON

Reference Textbooks

Title	Author	ISBN/Publisher
INTRODUCTION TO STATISTICS AND DATA ANALYSIS	ROXY PECK, CHRIS OLSEN, JAY L. DEVORE	9780840068392 /BROOKSCOLE
INTRODUCTION TO PROBABILITY AND STATISTICS 14TH EDITION	WILLIAM MENDENHALL, ROBERT J. BEAVER, BARBARA M. BEAVER	9781133103752/CENGAGE LEARNING

SECTION C: Further Information

❑ Student Feedback

The University is keen to require student feedback to make improvements for each module in every session. It is University policy that the preferred way of achieving this is by means of an Online Module Evaluation Questionnaire Survey. Students will be invited to complete the questionnaire survey for this module at the end of the semester.

You are strongly suggested to read policies mentioned below very carefully, which will help you better perform in your academic studies. All the policies and regulations related to your academic study can be found in Student Academic Services section under the heading “Policies and Regulations” on [E-bridge](#).

❑ Plagiarism, Cheating, and Fabrication of Data.

Offences of this type can result in attendance at a University-level committee and penalties being imposed. You need to be familiar with the rules. Please see the “Policy for Dealing with Plagiarism, Collusion and Data Fabrication” document available on e-Bridge in the Student Academic Services section under the heading ‘Policies and Regulations’.

❑ Rules of submission for assessed coursework

The University has detailed rules and procedures governing the submission of assessed coursework. You need to be familiar with them. Details can be found in the “Code of Practice for Assessment” document available on e-Bridge in the Student Academic Services section under the heading ‘Policies and Regulations’.

❑ Late Submission of Assessed Coursework

The University attaches penalties to the late submission of assessed coursework. You need to be familiar with the University’s rules. Details can be found in the

“Code of Practice for Assessment” document available on e-Bridge in the Student Academic Services section under the heading ‘Policies and Regulations’.

❑ **Mitigating Circumstances**

The University is able to take into account mitigating circumstances such as illness or personal circumstances which may have adversely affected student performance on a module. It is the student’s responsibility to keep their Academic Adviser, Programme Director or Head of Department informed of illness and other factors affecting their progress during the year and especially during the examination period. Students who believe that their performance on an examination or assessed coursework may have been impaired by illness, or other exceptional circumstances should follow the procedures set out in the Mitigating Circumstances Policy, which can be found on e-Bridge in the Student Academic Services section under the heading ‘Policies and Regulations’.

❑ **ICE**

Copies of lecture notes and other materials are available electronically through ICE, the University’s virtual learning environment at: [ICE @ XJTLU](#).