NANYANG TECHNOLOGICAL UNIVERSITY

COURSE CONTENT

Academic Year	2021/2022	**Semester**	1
Course Coordinator	Asst Prof. Paul Liu Wen		
Course Code	CH2010		
Course Title	Engineering Statistics		
Pre-requisites	MH1810		
No of AUs	3		
Contact Hours	26 Lecture hours and 13 tutorial hours		
Proposal Date	23 Jan 2017		

Course Aims

The objective of this course is to introduce the concept of statistics and probability in engineering. It helps students to obtain correct interpretation from data collected and construct models for performance prediction.

Intended Learning Outcomes (ILO)

Student will be able to:

1. Apply concepts of probability and probability distributions.
2. Identify the different type of statistical distributions (e.g., normal, and log-normal) and describe the typical phenomena of these distributions.
3. Apply the concepts of point and interval estimation.
4. Apply the concepts of hypothesis testing.
5. Apply least squares method to estimate the parameters in a regression model.
6. Use standard software (e.g., Excel) to facilitate statistical analysis.

Course Content

Key topics taught:

1. Probability and probability distributions
2. Sampling distributions
3. Point estimation
4. Confidence intervals
5. Hypothesis testing
6. Regression

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/ Individual	Assessment rubrics
1. Final Examination (2.5hrs, Open Book)	1, 2, 3, 4, 5, 6	EAB SLO* a, b, c, d	60%	Individual	
2. Continuous Assessment	1, 2	EAB SLO* a, b, c, d	15%	Individual	

1 (CA1): Quiz					
3. CA2: Quiz	3, 4, 5	EAB SLO* a, b, c, d	15%	Individual	
4. CA3: Project	1, 2, 6	EAB SLO* a, b, c, d, e, j, i	10%	Team	See Appendix 1
Total			100%		

Formative feedback

During tutorials, the instructor will communicate expected learning outcomes in detail. After each CA, the instructor will go through the problems during tutorials. Common mistakes and misunderstanding in concepts will also be addressed.
Specific feedback to project work will be returned to students in writing. General feedback to project work will be published online.

Learning and Teaching approach

Approach	How does this approach support students in achieving the learning outcomes?
LECTURE	Course materials covering all topics
TUTORIAL	12 classroom discussion sessions on tutorial questions and related topics

Reading and References

1. Raymond Myers and Ronald Walpole, Probability & Statistics for Engineers & Scientists, 9th Edition, Prentice Hall, 2012.
2. K.F. Riley, M.P. Hobson and S.J. Bence, Mathematical Methods for Physics and Engineering, 3rd Edition, Cambridge University Press, 2008.

Course Policies and Student Responsibilities

You are responsible for meeting all course requirements, observing all deadlines, examination times, and other course procedures.

You will be awarded ZERO mark for being absence from quizzes unless it is due to the following reasons:

- Illness (valid medical certificate is required, not from Chinese doctor)
- Passing away of immediate family member (parents, siblings or grandparents)
- Participate in an activity representing NTU (support letter from participating organization)

There will be no makeup given for missed quizzes. Final grade will be determined based on the participated quiz and final examination.

You are responsible for following the university regulations for final examination as indicated here:
http://www.ntu.edu.sg/Students/Undergraduate/AcademicServices/Examination/Pages/Instructionstoexamcand.aspx

You are responsible for being on time for all lectures and tutorials. Sufficient efforts should be put into solving or attempting the tutorial problems prior to attending the respective tutorial classes.

You might be award an "F" for a component or expelled from the university if you are caught cheating.

You are responsible for seeking academic help in a timely fashion.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors

Instructor	Office Location	Phone	Email
Liu Wen Paul	N1.2-B2-23	6316 8941	wenliu@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Introduction to Statistics and Data Analysis	1, 4	
2	Probability	1	
3	Random Variables and Probability Distributions	1, 2	
4 & 5	Discrete and Continuous Probability Distributions	2	
6	Sampling Distributions and CA1	1, 2	
7	One and Two Sample Estimation Problems	3	
8	One and Two Sample Tests of Hypothesis	4	
9	Simple Linear Regression	5	

10	Multiple Linear Regression and Nonlinear Regression Models	5	
11	CA2	3, 4, 5	
12	CA3	1, 2, 3, 4, 5, 6	
13	Applications in Engineering Problems	1, 2, 4, 5, 6	

Appendix 1: Project

Criteria	Exceed Expectations	Meet Expectations	Meet Baseline Expectations	Below Expectations
LO 1, 2 and 6	Applied an appropriate concept of probability and probability distribution model for the project. Appropriate regression methodology was applied to model the data. The results were interpreted clearly and conclusion was drawn in highly articulate statistical and English language.	Applied an appropriate concept of probability and probability distribution model for the project. Appropriate regression methodology was applied to model the data. The results were interpreted correctly but the conclusion can be drawn in a more technical language supported with statistical findings.	Applied an appropriate concept of probability and probability distribution model for the project. Appropriate regression methodology was generally applied to model the data. The result interpretation was acceptable but the conclusion was not supported by appropriate statistical findings.	Unable to apply an appropriate probability and probability distribution model for the project No result and/or interpretation to showcase

Appendix 2: The EAB (Engineering Accreditation Board) Accreditation SLOs (Student Learning Outcomes)

a) **Engineering knowledge:** Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems
b) **Problem Analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c) **Design/development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
d) **Investigation:** Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e) **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
f) **The engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g) **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable development.
h) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i) **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
j) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k) **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l) **Life-long Learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change