# MAFE316IU- STATISTICS-FALL 2021

**Welcome to "Statistics" in Fall 2021! This is a core course in Applied Mathematics (Financial Engineering and Risk management).**

**Lecturer:** Dr. Nguyen Minh Quan. Office: A2.610
Office Hours: Thursday 9:00-11:00 AM and/or appointment. Please send me an email before a meeting. The meeting will be organized via Zoom.
Email: quannm@hcmiu.edu.vn
Homepage: http://math.hcmiu.edu.vn/user/nmquan/

**Teaching Assistant:**
Miss Vũ Mỹ Linh. Email: vmlinh@hcmiu.edu.vn

**Lectures: Monday, 1:15 PM-4:40 PM in Zoom (Offline: L108)**
From September 6, 2021, lectures will be organized virtually via **Zoom**. Please join in Zoom by using the following information for ALL meetings (the link has been updated on Sept 4, 2021):

https://us06web.zoom.us/j/2158118519?pwd=cUNqUG1GaXppM0Z1ZUx3aG05czV4QT09
**Meeting ID:** 215 811 8519
**Passcode:** 879771

**Textbook (main):** Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, Elsevier (6th edition), 2020.
The course will cover **chapters 1 through 10** of the textbook. Some sections may be omitted.
**References (optional):**
[1] Probability & Statistics for Engineers & Scientists, 9th Edition by Ronald Walpole, Raymond Myers, Sharon Myers, Prentice Hall, 2012.

[2] Python for Probability, Statistics, and Machine Learning by Jose Unpingco, 2nd Edition, Springer, 2019

[3] D. Ruppert, D. Matteson, Statistics and Data Analysis for Financial Engineering: With R Examples, Springer, 2015.

**Link for materials:**

https://drive.google.com/drive/u/1/folders/1q-idt8YCqmw7i_Kgx1sXVceTXTINcU3d

**Prerequisites:** MAFE206IU (Probability).
**Number of Credits:** 4

**Main Contents/Objectives**: Statistics is the art of learning from data and forecast future outcomes. This course provides the students following contents at the undergraduate level**:** Introduction to Statistics, Descriptive statistics, Distributions of Sampling Statistics, the Central Limit Theorem, Parameter Estimation, Hypothesis Testing, Compare two normal populations, Regression**,** Analysis of Variance (ANOVA), Introduction to Python and R: Practice Statistics in Excel, Python, and R.

**Learning outcomes:**

Upon the successful completion of this course students will be able to:

1. Master the basic concepts and techniques of Statistics, including common distributions: normal distribution, chi-square distribution, T-distribution, F-distribution, the central limit theorem
2. Estimate the statistical parameters: population mean and sample mean
3. Develop and conduct statistical experiments or test hypotheses, analyze and interpret data and draw conclusions
4. Apply regression models to predict and forecast future outcomes
5. Apply statistical background to any basic kinds of statistical modeling problems: solve the problem, analyze the results, and draw conclusions

**Assessments:** Your final grade will be determined by averaging your grades for exams and assignments with the following weightings:

- ***Assignments/Quizzes/Project (4HW, 1 project, 10 quizzes, and bonus): 30%,***
- ***Midterm Test: 30%,***
- ***Final Exam: 40%.***

- There are tentatively **4 Homework Assignments, 1 project, and about 10 quizzes.** Your grade on "**HW Assignments/Quizzes/Project"** is the average score of 10 quizzes (with any bonus for class participants), 1 team project, and 4 homework assignments. Composing the solutions in Latex is recommended with a bonus. The quizzes will be given in-class (noticed) and after class.
- **Assignments:** Collaborations and discussions between students are strongly encouraged, but you **must** write your own solutions. Show all your work; **how you arrive at your answer is more important than the finally numeric answer**. Duplication of homework solutions prepared in whole or in part by someone else is **NOT** permitted. **Late submissions** for HW Assignments will be penalty a deduction of 10% for each day of lateness.
- HW, lectures, and announcements will be posted on IU Blackboard.
- **Bonus credits in class:** Bonus points will be given for active class participation, for example, for students who make good questions, answer the questions from the lecturers/students or solve the proposed problems/questions. There will be some "in-class bonus problems".
- **Project:** There will be one project assignment with R (or Excel/Python). **A team of 2-3 students is allowed.** The following links might be helpful for your R-project:
  1. A free course introduction to R (basic) on DataCamp:
  https://www.datacamp.com/courses/free-introduction-to-r
  2. Install R and the Rstudio desktop on your computer:
  http://www.rstudio.com/products/rstudio/download/
  http://cran.rstudio.com/

**Workload:** You are expected to spend about 5 hours of work per week outside of class. Some of you will do well with less time than this, and some of you will need more.

**Tips for success:** Active in learning and class participation, self-motivation, self-study, read/review the material before the class, do in-class quizzes and homework assignments seriously, teamwork (allowed to discuss on assignments and quizzes), meet instructor in his office hours, speak up and raise questions, improve your problem-solving skills: **firstly, make appropriate questions** and secondly, find the answers to these questions.

## Tentative Schedule

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| Sept 6 | Introduction to Statistics. Descriptive statistics. |
| Sept 13 | Descriptive statistics (continue). **Practicing on PC with Excel.** |
| Sept 20 | Normal distribution (quick review). Exponential distribution. |

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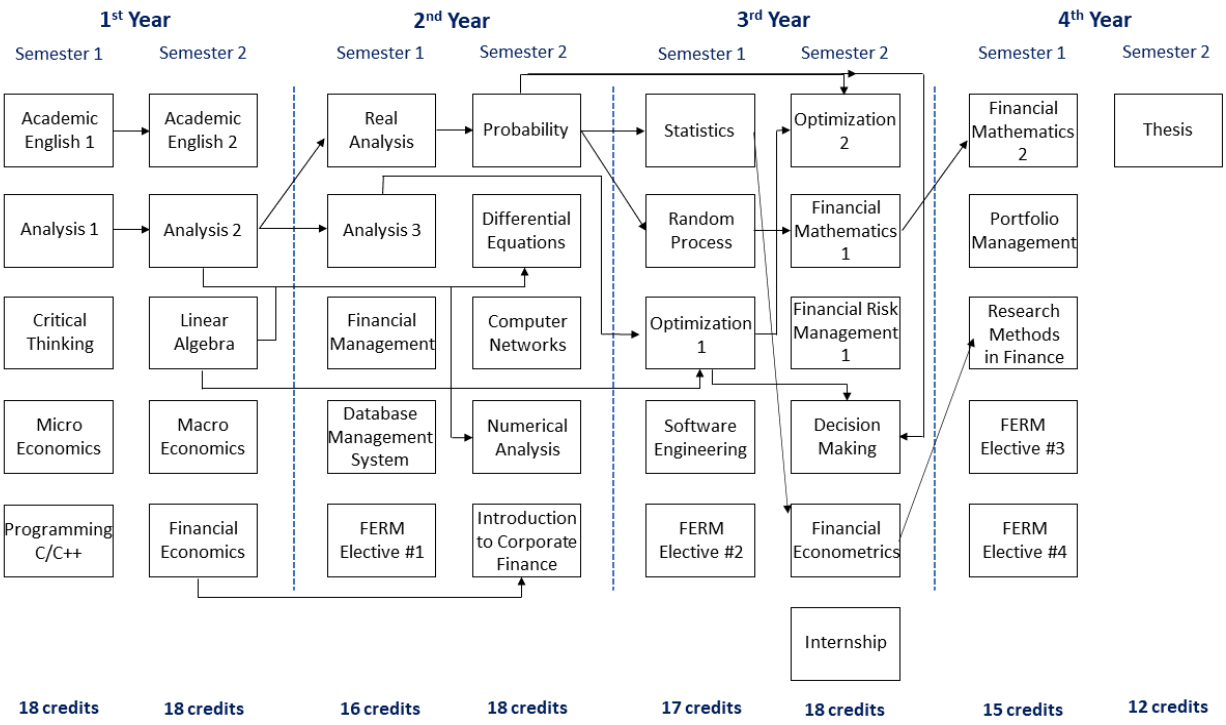
| | Gamma distribution. |
| Sept 27 | Chi-square distribution. Student's t-distribution. F-distribution. Exercises. **Practicing with R** |
| Oct 4 | Distributions of Sampling Statistics. The Central Limit Theorem. **Practicing with R. HW1 due.** |
| Oct 11 | Distributions of Sampling Statistics (cont.). |
| Oct 18 | Parameter estimation. **Practicing with R/Python.** |
| Oct 25 | Parameter estimation (cont.). Exercises. **HW2 due** |
| **Nov 1-Nov 13** | **Midterm Examination.** |
| Nov 15 | Parameter estimation (cont.). **Practicing with Python.** |
| Nov 22 | Hypothesis Testing |
| Nov 29 | Hypothesis Testing (cont.). **Practicing with Python. Project released.** |
| Dec 6 | Compare Two Normal Populations. **HW3 due** |
| Dec 13 | Regression. |
| Dec 20 | Regression and Python/R. Analysis of Variance (ANOVA). |
| Dec 27 | Analysis of Variance (ANOVA). Exercises **(last day of class).** |
| Jan 3-8, 2022 | Reservation week |
| **Jan 10-22, 2022** | **Final Examination weeks (scheduled by OAA). HW4 and Project due by the exam date.** |

Below is the curriculum map (corresponding to the highest English entrance level) which shows the position of Statistics in the curriculum:




---HAVE FUN! 😊 ---