

Statistics

1. **Course number and name:** 020STAES1/020STTES1 Statistics
2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours
3. **Name of course coordinator:** Rafic Faddoul
4. **Instructional materials:** Course handouts; assignment handouts; videos

References:

- Sheldon M. Ross, (2003). *Introduction to probability models* 8th edition: Academic Press an imprint of Elsevier
- Philippe Tassi, (1992) *Méthodes statistiques*, 2nd edition : Economica
- Robert W. Keener, (2010). *Theoretical Statistics. Topics for a Core Course*: Springer
- Hogg, McKean, Graig (2005). *Introduction to Mathematical Statistics*, 6th edition: Pearson Prentice Hall
- WalPole, Meyers, Meyers, (1998). *Probability and Statistics*, 6th edition: Prentice Hall
- Donald G. Childers (1997). *Probability and Random Processes*: McGraw-Hill

5. Specific course information

a. Catalog description:

This course provides a rigorous foundation in statistical inference, equipping students with the tools to make sound decisions based on data. It begins with a review of random variables and probability distributions, before distinguishing between descriptive and inferential statistics. Students will explore key concepts of sampling distributions and learn how to construct and interpret confidence intervals for means, variances, and proportions. The course then delves into parameter estimation techniques, including the method of moments and maximum likelihood estimation. In the latter half, emphasis is placed on the theory and application of statistical hypothesis testing for different types of parameters and distributions. Students will analyze real-world problems involving tests for means, variances, proportions, independence, and goodness-of-fit. The course concludes with an introduction to linear regression and non-parametric statistical tests.

b. Prerequisites: 020PRBNI4/020PRONI3 Probability or 020AL3CI4 Algebra 3

c. Required for CCE, EE and ME students

6. Educational objectives for the course

a. Specific outcomes of instructions:

- Estimate the parameters of a population from random samples.
- Validate a hypothesis using statistical tests.
- Conduct a simple and multiple linear regression and perform the corresponding tests."

b. PI addressed by the course:

PI	1.2	1.3	6.3	6.4
Covered	x	x	x	x
Assessed		x	x	x

7. Brief list of topics to be covered

- Review on random variables and probability densities (2 lectures)
- Difference between descriptive statistics and inferential statistics (1 lecture)
- Study of the sampling distribution (1 lecture)
- Confidence intervals for the mean (2 lectures)
- Confidence intervals for the variance (1 lecture)
- Confidence intervals for a proportion (1 lecture)
- Estimation by the method of maximum likelihood (2 lectures)
- Estimation by the moment method (1 lecture)
- Introduction to the concepts of statistical hypothesis tests (2 lectures)
- Hypothesis test for the mean (2 lectures)
- Hypothesis test for the variance (2 lectures)
- Hypothesis test for proportions (2 lectures)
- Hypothesis test for independence (2 lectures)
- Hypothesis test for conformity to a law (2 lectures)
- Linear regression (2 lectures)
- Introduction to non-parametric tests (3 lectures)