



Course Syllabus

Course Code	Course Title	ECTS Credits
MATH-325	Probability and Statistics II	6
Prerequisites	Department	Semester
MATH-225	Computer Science	Fall, Spring
Type of Course	Field	Language of Instruction
Required	Mathematics	English
Level of Course	Lecturer(s)	Year of Study
1st Cycle	George Portides	3 rd
Mode of Delivery	Work Placement	Corequisites
Face to face	n/a	none

Course Objectives:

The main objectives of the course are to:

- Cover moments and use moment generating functions to find the mean and variance of random variables.
- Introduce multivariate probability distributions. Cover conditional and joint distributions, and their moment generating functions.
- Present concepts of covariance and correlation.
- Conceptualize statistical estimators and properties desired to be satisfied.
- Explain the derivation of sampling distributions of the sample mean.
- Carry out statistical inferences for the normal mean when the variance is known or unknown.

Learning Outcomes:

After completion of the course students are expected to be able to:

- Employ moment generating functions to derive moments of random variables, to distinguish probability distributions.
- Work with marginal, conditional and joint distributions for both discrete and continuous random variables.
- Calculate the covariance and correlation between of two random variables and prove properties of expectation, variance and covariance.

- Formulate the least squares estimator and maximum likelihood estimator for the mean and variance of a Normal random variable and investigate properties for unbiasedness and consistency.
- Compute confidence intervals and carry out hypotheses testing for the normal mean when the variance is known or unknown.

Course Content:

- Moments and moment generating functions.
- Multivariate distributions: the bivariate case, marginal, conditional and joint distributions.
- Conditional expectation, Joint Expectation, Covariance and Correlation.
- Least Squares Estimator, Maximum Likelihood Estimator and the properties of unbiasedness and consistency.
- The law of large numbers, the central limit theorem and sampling distributions of the sample mean.
- Statistical inferences for the mean of a normal random variable.

Learning Activities and Teaching Methods:

Lectures, Exercises and Tests

Assessment Methods:

One test and one Final Exam

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Introduction to Probability and Statistics Using R	Kerns G.	G. Jay Kerns	2010	978-0557249794
Introduction to Probability and its Applications, 3 rd edition	Scheaffer R. and Young .L.	Duxbury Press	2009	978-0534386719

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Introduction to Probability	Grinstead C. and Snell L.	AMS	2012	978-0821894149