Program Mathematics Unit

Syllabus of Course 90911

Introduction To Probability

Academic Year	**2025**
No. of course hours	**4.00 Semestrial hours [Lecture 3.00 + tutorial -1.00]**
Academic credits	**3.50**
Prerequisites	**Pre: 90901 Differential And Integral Calculus1**
Please note that **The prerequisites are for all programs, you are required to be updated on the prerequisites you need according to your personal program.**	
Class Attendance	**Not mandatory**
Objectives	**Probability Theory as a mathematical model to analyze problem of uncertainty.**
Abstract	**Basic concepts in probability theory: sample space, elementary theorems, combinatorial calculations, conditional probability and independence, random discrete variables, expected value and variance, special random variables,** **multivariate variables, central limit theorem. Basic concepts in statistics: statistical estimation and testing, confidence intervals.**

Academic learning outcomes

Learning outcomes related to the content of the course	**The ability to define and solve problems in probability and statistics**

Learning outcomes - Skills

Integrative learning: linking to practical experience. The ability to identify connections between experience and similarly perceived ideas.
Problem solving: defining problems and identifying strategies. The ability to identify one or more approaches to problem solving without application in a specific context.
Critical thinking: explaining the issues, foundation, contexts, and taking a position. Presenting the subject based on information sources without interpretation, evaluation or taking a position.

Further points of emphasis	

Lecture topics by weeks

The order of the topics can be changed at the lecturer's discretion.

1	**Introduction, definitions of probability, sample space, operation on events.**
2	**Axioms of probability, sample and space events, symmetric sample spaces, basic principles of combinatorial computations of probabilities.**
3	**Conditional probability: Probability trees, Bayes' formula.**
4	**Independent event , the sequence of independent trials, Binomial and Geometric probabilities.**
5	**Discrete random variables: Distribution func tion, expected value, variance.**
6	**Special random variables: Uniform distribution, Bernoulli and Binomial random variables, Geometric distribution, Hyper geometric distribution, Poisson distribution.**
7	**Continuous random variables: Distribution and density func tions, Expectation and Variance, Uniform distribution, Exponential distribution, Normal distribution.**
8	**Multivariate discrete random variables: joint distribution table, independent random variables, conditional distribution. Expectation of a sum of random variables, Covariance, Variance of sums, Pearson correlation coefficient.**
9	**Sequence of independent and identically distributed random variables. Sample Mean, The Central Limit Theorem. Normal approximation of Binomial distribution.**

10	**Topics in statistics: Estimation, unbiased estimator, Mean squared error (MSE), confidence interval for mean, confidence interval for variance,**
11	**Statistical hypothesis testing, error types, p-value, power,**
12	**Hypothesis Test for One Population Mean when variance known, Hypothesis Test for One Population Mean when variance unknown - t test.**
13	**Review**

Tutorials / Labs topics by weeks

The order of the topics can be changed at the lab instructor's / tutor's discretion.

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Language of instruction	**Hebrew**
Subjects for self-tutoring	
Textbooks and Recommended Bibliography	**Sheldon M. Ross, A First Course in Probability, Prentice Hall, 1998.** **A. Raviv and T. Leviatan, Introduction to Probability and Statistics: Statistical Inference. (In Hebrew), Amihai** **(1994), 299p.**

Course Requirements and Calculation of Final Grade

Task Type	Percentage of Final Grade
Final Exam Grade	90
Midterm Exam Grade	0
Homework Assignments	10
A project in a course where there is no Final Exam	0
A project in a course where there is a Final Exam	0
Final Grade	0

Clarification to pass the course:

In order to pass the course, students must fulfill the following conditions [excluding the English Beginners Course, Labs and Workshops]:

1. Final course grade of at least 60 [taking into consideration all the above course requirements].
2. Attendance according to the attendance requirement [see section regarding attendance].

Exam and Midterm Exam

Type of Midterm Exam	
Duration of Midterm Exam	
Location of Midterm exam	
Duration of Final Exam	**180 minutes**
Location of Final exam	**Regular class (no computers)**
Permitted Material/Tools for Exams	**Standard calculator**
Details of permitted materials for exam	
Formula Sheets	**Formula sheets written by the lecturer**
No. of Pages	