SYLLABUS

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Private study*	*Pre-requisites*	*Course Level*	*Teaching Language*
STA	**211**	**Mathematical Statistics**	**4**	**3**	**0**	**2**	**7**	**STA 111 MAT 203**	**4[1]**	**English**

A. Course Description

This course describes the most important ideas, theoretical results, and examples of bivariate probability distributions, sampling distributions and the CLT, functions of random variables, parameter estimations and hypothesis testing. The course includes the essential fundamentals of these topics. The emphasis is on calculations, and some applications are mentioned.

B. Course Outcomes

At the end of this course the student will be able to

- Use joint probability mass functions and joint probability density functions to calculate probabilities.
- Determine the distribution of a general function of a random variable.
- Calculate moment generating functions and use the functions to determine moments and distributions.
- Understand the central limit theorem.
- Know how to compute and explain the precision with which a parameter is estimated.
- Construct confidence intervals on the mean, variance, standard deviation and population proportion.
- Test hypotheses on the mean, variance or standard deviation and population proportion.

C. References:

Required Textbook

Probability & Statistics for Engineers & Scientists, R. Walpole, R. Myers, S. Myers, K. Ye, Pearson Education International, 9th Edition, 2012.

Other references

1. *Mathematical Statistics with Applications,* D. Wackerly, W. Mendenhall, R.L. Scheaffer, Brooks/Cole-Cengage Learning, 7th Edition, 2008.
2. *Probability and Statistics in Engineering*, William W. Hines, Douglas C. Montgomery, David M. Goldsman, Connie M. Borror, John Wiley & Sons Inc, 4th Edition, 2003.
3. *Introduction to Mathematical Statistics,* R. Hogg et al, Prentice Hall, 2004.

[1] *B.Sc. in Applied Mathematics.*

Course Website: Google Classroom Webpage: http://www.imamm.org/

D. Topics Outline

1. **Bivariate Probability Distribution:** Two Discrete Random Variables, Two Continuous Random Variables, Covariance and Correlation, Bivariate Normal Distribution, Linear Combinations of Random Variables.
2. **Sampling Distributions and the Central Limit Theorem:** Sampling Distributions, Sampling Distributions of the Means, The Chi-Square Distribution, The T Distribution, The F Distribution.
3. **Functions of Random Variables:** Finding the Probability Distribution of a Function of Random Variable, The Method of Distribution Function, The Method of Transformations, Using The Moment-Generating Functions.
4. **Parameter Estimations:** Point Estimation: Properties of Estimators, The Method Maximum Likelihood Estimators, The Method of Moments, Precision of Estimation: The Standard Error, Single –Sample Confidence Interval Estimation: Confidence Interval on the Mean of Normal Distribution, Variance Known and Variance Unknown, Confidence Interval on the Variance of a Normal Distribution, Confidence Interval on a Proportion, Two Sample Confidence Interval Estimation: Confidence on the Difference Between Means of two Normal Distribution, Variance Known and Variance Unknown.
5. **Hypothesis Testing:** Statistical Hypotheses: General Concepts, The Use of P-Values for Decision Making in Testing Hypotheses, Single Sample: Tests Concerning a Single Mean (Variance Known/Unknown), Two Samples: Tests on Two Means, Choice of Sample Size for Testing Means, One Sample: Test on a Single Proportion, Two Samples: Tests on Two Proportions, One- and Two-Sample Tests Concerning Variances.

E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6th or 7th week.
- **Midterm 2:** 11th or 12th week.
- **Quizzes & Homework:** During the semester.
- **Final Exam:** 16th week.

Your course grade will be based on your semester work as follows:

Midterm 1: 20 %	**Midterm 2:** 20 %	**Final Exam:** 40 %
4 Quizzes, 4 Homeworks, Attendance & Participation: 20 %		

The grading distribution:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

G. Student Workload:

#	Teaching/learning activities	Contact Hours	Frequency	Total Contact hours	Self-study hours	Total self-study hours	Student Learning Time
1	Lecture	3	15	45	1	15	60
2	Tutorial	2	15	30	3	45	75
3	Lab\Practical	0	0	0	0	0	0
4	Homework	0	4	0	1	15	15
5	Quiz	0.25	4	1	1	4	5
6	Test (Midterm)	1.5	2	3	6	12	15
7	Final Exam	2	1	2	12	12	14
Total				**81**		**103**	**184**

Independent self-study = 103/15 ≅ 7 hrs per week

H. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

- **Executive Rules for Study Regulations and Exams**
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