



Form: Course Syllabus	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	
	Deans Council Approval Decision Number	2/3/24/2023
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	Number of Pages	08

1.	Course Title	Mathematical Statistics
2.	Course Number	0301731
3.	Credit Hours (Theory, Practical)	3
	Contact Hours (Theory, Practical)	3
4.	Prerequisites/ Corequisites	None
5.	Program Title	MSc.
6.	Program Code	
7.	School/ Center	Science
8.	Department	Mathematics
9.	Course Level	Program requirement
10.	Year of Study and Semester (s)	
11.	Other Department(s) Involved in Teaching the Course	None
12.	Main Learning Language	English
13.	Learning Types	☒ Face to face learning ☐ Blended ☐ Fully online
14.	Online Platforms(s)	☐ Moodle ☒ Microsoft Teams
15.	Issuing Date	
16.	Revision Date	20/11/2024

17. Course Coordinator:

Name: Ahmad Zghoul	Contact hours: 11:30-12:30 Su, Tue
Office number:	Phone number:
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18. Other Instructors:

Name:

Office number:

Phone number:

Email:

Contact hours:

Name:

Office number:

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Contact hours:

19. Course Description:

Univariate and multivariate distribution theory, sufficient statistics, minimal sufficient statistics, completeness, methods of point estimation and properties of point estimators, confidence, intervals, testing hypotheses, Neman-Pearson lemma, randomized tests, uniformly most powerful test, likelihood ratio tests, minimax methods.

20. Program Student Outcomes (SO's):

(To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1. Read, analyze and write logical arguments to prove mathematical and statistical concepts and theorems.
2. Communicate with mathematical and statistical ideas clearly and consistently, in writing and verbally.
3. Formulate mathematical and statistical problems by modeling real-life problems, and solve them theoretically and/or numerically using technological tools.
4. Adhere to ethical standards and good conduct in accordance with the rules and standards.
5. Apply methodologies and ethics of scientific research in preparation of scientific research in mathematics field.



21. Course Intended Learning Outcomes (CLO's):

(Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. Acquire good knowledge of main statistical distributions and their properties.
2. Understand the basic principles underlying estimation properties including data reduction, sufficiency, completeness and related theory.
3. Be able to construct estimators using different methods including MME, MLE, and to derive their properties.
4. Gain knowledge of Bayesian estimation and to recognize difference between frequency and Bayesian approaches.
5. Understand the basic principles underlying hypothesis testing including most powerful tests, Neyman-Pearson Lemma, likelihood ratio test and related theory,
6. Understand large sample theory and be able to apply it to estimators and tests.

Course CLOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
1	•	•	•	•	•	
2	•	•	•	•	•	
3	•	•	•	•	•	•
4	•	•	•	•	•	•
5	•	•	•	•	•	•
6	•	•	•	•	•	

22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Course CLO's \ Program SO's								
	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)	SO (6)	SO (7)	SO (8)
CLO (1)	•	•	•	•	•			
CLO (2)	•	•	•	•	•			
CLO (3)	•	•	•	•	•			
CLO (4)	•	•	•	•	•			
CLO (5)	•	•	•	•	•			
CLO (6)	•	•	•	•	•			



23. Topic Outline and Schedule:

Week	Lecture	Topic	CLO/s Linked to the Topic	Learning Types Face to Face (FF) Blended (BL) Fully Online (FO)	Platform Used	Synchronous (S) Asynchronous (A)	Evaluation Methods	Learning Resources
1	1.1	Review of Basic Probability Concepts Basics of Probability Theory	1	FF	Classroom & Teams		Test	Textbook
	1.2	Conditional Probability and Independence	1	FF	Classroom & Teams		Test	Textbook
	1.3	Random Variables, Distribution Functions, and Density and Mass Functions	1	FF	Classroom & Teams		Test	Textbook
2	2.1	Distributions of Functions of a Random Variable	1	FF	Classroom & Teams		Test	Textbook
	2.2	Expected Values	1	FF	Classroom & Teams		Test	Textbook
	2.3	Moments and Moment Generating Functions	1	FF	Classroom & Teams		Test	Textbook
3	3.1	Families of Distribution Exponential Families	1,2	FF	Classroom & Teams		Test	Textbook
	3.2	Exponential Families	1,2	FF	Classroom & Teams		Test	Textbook
	3.3	Location and Scale Families	1,2	FF	Classroom & Teams		Test	Textbook
4	4.1	Data Reduction Sufficient Statistics	2	FF	Classroom & Teams		Test	Textbook
	4.2	Sufficient Statistics	2	FF	Classroom & Teams		Test	Textbook
	4.3	Minimal Sufficient Statistics	2	FF	Classroom & Teams		Test	Textbook
5	5.1	Complete Statistics	2	FF	Classroom & Teams		Test	Textbook
	5.2	Ancillary Statistics	2	FF	Classroom & Teams		Test	Textbook
	5.3	Basu's Theorem	2	FF	Classroom & Teams		Test	Textbook
6	6.1	Point Estimation	3	FF	Classroom		Test	Textbook



		Methods of Finding Estimators Method of Moments			& Teams			
	6.2	Maximum Likelihood Estimators	3	FF	Classroom & Teams		Test	Textbook
	6.3	Maximum Likelihood Estimators	3	FF	Classroom & Teams		Test	Textbook
7	7.1	Bayes Estimators	4	FF	Classroom & Teams		Test	Textbook
	7.2	Bayes Estimators	4	FF	Classroom & Teams		Test	Textbook
	7.3	Methods of Evaluating Estimators unbiasedness	3, 4	FF	Classroom & Teams		Test	Textbook
8	8.1	variance bounds and information	3, 4	FF	Classroom & Teams		Test	Textbook
	8.2	variance bounds and information	3, 4	FF	Classroom & Teams		Test	Textbook
	8.3	Test 1		FF	Classroom & Teams		Test	Textbook
9	9.1	efficiency	3, 4	FF	Classroom & Teams		Test	Textbook
	9.2	consistency	3, 4	FF	Classroom & Teams		Test	Textbook
	9.3	Asymptotic Distribution of the MLE	3, 6	FF	Classroom & Teams		Test	Textbook
10	10.1	Decision theory Loss and risk functions,	4	FF	Classroom & Teams		Test	Textbook
	10.2	minimax estimator	4	FF	Classroom & Teams		Test	Textbook
	10.3	Bayes estimator	4	FF	Classroom & Teams		Test	Textbook
11	11.1	Confidence intervals Bayes C.I.	3,4	FF	Classroom & Teams		Test	Textbook
	11.2	pivotal method	3, 4	FF	Classroom & Teams		Test	Textbook
	11.3	large sample C. I.	3, 4	FF	Classroom & Teams		Test	Textbook
12	12.1	Hypotheses Testing Uniformly most powerful tests Neman-Pearson lemma.	5	FF	Classroom & Teams		Test	Textbook
	12.2	Uniformly most powerful tests Neman-Pearson lemma	5	FF	Classroom & Teams		Test	Textbook
	12.3	Midterm Exam		FF	Classroom & Teams		Test	Textbook



13	13.1	unbiased tests	5	FF	Classroom & Teams		Test	Textbook
	13.2	monotone likelihood test	5	FF	Classroom & Teams		Test	Textbook
	13.3	monotone likelihood ratio test	5	FF	Classroom & Teams		Test	Textbook
14	14.1	Generalized likelihood ratio test	5	FF	Classroom & Teams		Test	Textbook
	14.2	Generalized likelihood ratio test	5	FF	Classroom & Teams		Test	Textbook
	14.3	Generalized likelihood ratio test	5	FF	Classroom & Teams		Test	Textbook
15	15.1	Review	1-6	FF	Classroom & Teams		Test	Textbook
	15.2	Review	1-6	FF	Classroom & Teams		Test	Textbook
	15.3	Review	1-6	FF	Classroom & Teams		Test	Textbook
16		Final Exam						

24. Evaluation Methods:

Opportunities to demonstrate achievement of the CLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	CLO/s Linked to the Evaluation activity	Period (Week)	Platform
First Test	20%	Families of Distributions, Data reduction, Evaluation of Estimators	1, 2, 4	7 th week	Class Room
Midterm	30%	Methods of Estimation, Evaluation of Estimators	3,4		Class Room
Quizzes	10%	Vary	1,2,3,4	Every 3 wks	Class Room
Final	40%	All topics	1,2,3,4	16 th	Class Room



25. Course Requirements:

Students should have a computer and internet connection to be able to access the Teams platform

26. Course Policies:

A- Attendance policies:

Attendance is expected. Arrival on time is expected. Students who miss more than three class sessions with or without excuse will be dismissed from the course automatically. (See the university policies regarding absence).

B- Examination Policy:

Students unable to take a scheduled exam are expected to inform the instructor within 3 days and make arrangements for a make-up one. Make ups will be given only to students who have notified the instructor and set up an alternate time. Any missed exam will result in a grade of zero for that particular examination type.

C- Honesty policy regarding cheating, plagiarism, misbehavior:

All students in this course are expected to adhere to university standards of academic integrity. Cheating, plagiarism, and other forms of academic dishonesty will neither be accepted nor tolerated. This includes, but is not limited to, consulting with another person during an exam, turning in written work that was prepared by someone other than you, and making minor modifications to the work of someone else and turning it in as your own.

D- Available university services that support achievement in the course:

The library, computer lab, and wi-fi.

27. References:

A- Required book(s)

Casella, G., & Berger, R. L. (2002). *Statistical Inference* (2nd ed.). Duxbury.

B- Recommended books, materials, and media:

Hogg, R. V., & Craig, A. T. (1995). *Introduction to Mathematical Statistics* (5th ed.). Prentice Hall.

Bain, L. J., & Engelhardt, M. (1992). *Introduction to Probability and Statistics* (2nd ed.). Duxbury Press.



28. Additional information:

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Name of the Instructor or the Course Coordinator: Prof. Ahmad Zghoul	Signature:	Date: 20/11/2024
Name of the Head of Quality Assurance Committee/ Department: Prof. Manal Ghanem	Signature:	Date:
Name of the Head of Department: Prof. Baha Alzalg	Signature:	Date:
Name of the Head of Quality Assurance Committee/ School of Science: Prof. Emad A. Abuosba	Signature:	Date:
Name of the Dean or the Director: Prof. Mahmoud I. Jaghoub	Signature:	Date: