The University of Jordan

Accreditation & Quality Assurance Center

Course Syllabus

Course Name: Linear Statistical Models

1	**Course title**	Linear Statistical Models
2	**Course number**	0301734
3	**Credit hours (theory, practical)**	3
	Contact hours (theory, practical)	3
4	**Prerequisites/corequisites**	None
5	**Program title**	M.Sc.
6	**Program code**	
7	**Awarding institution**	The University of Jordan
8	**School**	School of Science
9	**Department**	Department of Mathematics
10	**Level of course**	Elective
11	**Year of study and semester (s)**	First or Second year
12	**Final Qualification**	M.Sc. degree
13	**Other department (s) involved in teaching the course**	None
14	**Language of Instruction**	English
15	**Date of production/revision**	October 28 2020

16. Course Coordinator:

Office numbers, office hours, phone numbers, and email addresses should be listed.

Dr. Hisham Hilow
Department of Mathematics
Email: hilow@ju.edu.jo

17. Other instructors:

Office numbers, office hours, phone numbers, and email addresses should be listed.

Prof. Mohammad Z. Al-Raqab
Department of Mathematics
Email: mraqab@ju.edu.jo

18. Course Description:

As stated in the approved study plan.

Linear models are central to the theory and practice of modern statistics. They are used to model the relationship between a random response (i.e. outcome) and a set of factors associated with or affecting it linearly. Such linear models include regression models (called also full rank models) for

modelling data from undersigned experiments and Analysis of Variance models (called also less than full rank models) for modelling data from designed experiments besides the Analysis of Covariance models and mixed models. Course topics include: the Unconditional and Conditional Multivariate Normal Distribution and the Non-Central Chi-square and F Distributions; the distributional properties of linear and quadratic forms, which are sums of squares; least squares parameter estimation under full and less than full rank setting; Linear model fitting , model selection and diagnostics and tests of linear hypothesis.

19. Course aims and outcomes:

A- The aim of the course is to give students a firm grounding in the statistical theory and methodology underlying linear models so that they become able to apply their methods effectively to analyzing statistical data for characterize and quantifying sources of variation in the data then ranking the significance of these sources, paying proper attention to meeting and checking assumptions underlying these models **.**

B- **Intended Learning Outcomes (ILOs): Based on the materials learnt in this course and u**pon successful completion of this course students will be able to

1. understand the underlying statistical theory of linear models (full rank and less than full rank) and recognizing the limitations of these models.
2. fit linear models to statistical data explainable by sources of variation using statistical computing packages and interpret results effectively.

20. Topic Outline and Schedule:

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
Review of Matrix Algebra and projection matrices	1		1		
Solving linear systems of equations by the generalized matrix inverse	2		1		
Linear least squares estimation under full rank and less than full rank models	3		1		

Random vectors and random matrices and their mean ,variance and distribution	4		1 &2		
The Multivariate Normal distribution and the non-central chi-square and F distributions	5-6		1 &2		
Linear and quadratic forms and their mean variance and distributions	7		1		
Linear Regression models (simple / Multiple) and model selection and model diagnostics	8-9		1 &2		
Gauss Markov Theorem, model re-parameterization and estimability	10-11		1		
Analysis of Variance linear models	12-13		1 &2		
Variance components and mixed models	14		1 &2		

21. Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

In order to succeed in this course, each student needs to be an active participant in learning – both in class and out of class, attending and participating in .

- Lectures and discussions during class time.
- team work by discussion real life data with colleagues.
- Various sets of homework which are assigned on different period of times.
- Solution of homework sets and exams, which will be solved to allow students to learn and figure out their mistakes.

22. Evaluation Methods and Course Requirements:

ILO/s	Learning Methods	Evaluation Methods	Related ILO/s to the program
	Lectures	Exams	
	Home works	Assignments	
	Discussions		

23. Course Policies:

A- Attendance policies:

. Attendance is absolutely essential to succeed in this course. You are expected to attend every class; please notify your instructor if you know you are going to be absent. All exams must be taken at the scheduled time. Exceptions will be made only in extreme circumstances, by prior arrangement with the instructor.

2. If a student is absent for more than 10% of lectures without an excuse of sickness or due to other insurmountable difficulty, then he/she shall be barred from the final examination also he/she will get a failing grade in this course.

3. Medical certificates shall be given to the University Physician to be authorized by him. They should be presented to the Dean of the Faculty within two weeks of the student's ceasing to attend classes.

4.Test papers shall be returned to students after correction. His/her mark is considered final after a lapse of one week following their return.

5. Solutions for the exams questions and marks will be announced to the students.

6. Cheating is prohibited. The University of Jordan regulations on cheating will be applied to any student who cheats in exams or on home-works

24. Required equipment:

25. References:

A- Required book (s), assigned reading and audio-visuals:

Linear Models in Statistrics,2nd edition by Rencher, AC and Schaalje, GB 2008 John Wiley and Sons

B- Recommended books, materials, and media:

Linear Statistical Models,2nd edition, Stapleton ,JH 2009 John Wiley and Sons

26. Additional information:

Name of Course Coordinator: --Hisham Hilow----------Signature: ---------- Date: -Oct 28, 2020

---------- Head of curriculum committee/Department: ---------- Signature: ----------

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Head of Department: ---------- Signature: ----------

Head of curriculum committee/Faculty: ---------- Signature: ----------

Dean: ---------- -Signature: ----------

Copy to:
Head of Department
Assistant Dean for Quality Assurance
Course File