



The Islamia University Bahawalpur

Rahim Yar Khan
Department of Statistics

Class: M.Sc.: Statistics

Semester: 3rd

Season Spring: Spring 2019 -21

Instructor	Muhammad Riaz	E-Mail: muhammad.riaz@iub.edu.pk		
Course Title	Statistical Inference & Application		Program	M.Sc
Course Number	STAT-21301 and STAT-21304	Credit Hours		3
Lecture Timings	Thursday (08:30 am to 11:30 am)			
Description: This course is designed to develop theoretical (mathematical) skills in the students at the master's. The course includes fundamental of statistical inference properties of estimators (unbiasedness, consistency, sufficiency, efficiency, completeness, in-variance and minimum variance unbiased estimator) and different methods of estimation (method of moments, method of least square, method of maximum likelihood estimation, minimum chi square method, Lloyds method and Bay's estimation)				
Pre-requisite: The students must be familiar with the fundamentals of probability: especially probability laws, basics operations through expectations and the transformation of random variable. They should also have a sound grip in deriving the properties of discrete and continuous distributions and order statistics.				
Course Objective: The objective of this course is to familiarize the student with a through understandings of the art of drawing statistical inference (in theoretical manner). After the end of this course, the students will be able to prove problems theoretically and will also be familiar with its practically in real life problems.				
Teaching Methodology: 1. The lectures will be delivered to the students in the class, which will be full of discussions. The use of slides multimedia projector which also help students in understandings lengthy derivations. Students will be asked in the class to explain the rationale behind the problem and its appropriate solution (theoretically) 2. The class will be conducted in a lecture, discussion environment where the class instructor will lead discussions and students will be encouraged to participate and ask question at the end of each class session. Three days will be for theory and Three days will be for application. 3. Students are expected to read the topic of the day in advance which will be told a day before by the instructor.				
Assessment: The course will be initially assessed through tests organized after mid-term and final term examination.				

Tentative Study Plan for the Semester

Week	Topics
1	Statistical inference, estimation, estimation of parameters, point estimation, point estimator, point estimate, properties of good estimator, Fisher's criteria for good estimator. Unbiasedness
2	Relevant Theorems and question of unbiasedness
3	Uniform minimum variance unbiased estimator (umvue or mvbue), Procedure, Relevant Theorems and question, definition of likelihood function
4	Consistency, Procedure, Relevant Theorems and question
5	Sufficiency, criteria for finding sufficient estimator, Relevant Theorems and question, minimal sufficient statistic, Neyman fisher factorization theorem
6	Completeness, procedure, joint completeness, complete minimal sufficient statistic, Relevant Theorems and question, Rao black well theorem and its importance
7	Lehman shaffe theorem, crammer Rao inequality and its importance,
8	In Variance, location invariance, scale invariance, Pitman estimator for location and scale, location and scale parameter, Relevant Theorems and question, efficiency, criteria of biased and unbiased estimator,
Mid Term Exam	
9	Method of estimation, Method of Moments, procedure, Relevant Theorems and question
10	Method of Maximum likelihood, procedure, properties of MLE, Relevant Theorems and question
11	Method of Maximum likelihood, Asymptotic property of MLE, MLE are consistent estimator prove
12	Method of least square, principle of least square, procedure, properties, Relevant Theorems and question
13	Method of least square, derivations, Relevant Theorems and question
14	Lloyd's method, estimation of scale and location parameter by using order observations.
15	Minimum Chi- square, Relevant Theorems and question
16	Bayes' method, risk function, lose function, properties, Relevant Theorems and question

Please Note: Each session consists of the number of lectures delivered in a weak. Any random absence by the instructor, the material to be covered during that class will be shifted to the next class meeting. In case of any necessary planned absence, information on schedule changes will be provided in advance.

Appointment with Instructor:

- 1. Instructor will be available for meeting class students immediately before & after each class for 15 minutes. However this time after the class may be extended if necessary.
- 2. Any other problem pertaining with the study, any student may contact on contact number mentioned above.

Books Recommended

- 1. Mood, A.M., Graybill, F.A. and Boss, D.C. (1997). *“Introduction to the Theory of Statistics”*. McGraw Hill, New York.
- 2. Hogg, R.V. and Craig, A.T. (1996). *“Introduction to Mathematical Statistics”*. Prentice Hall, New Jersey.
- 3. Lindgren, B.W. (1998). *“Statistical Theory”*. Chapman and Hall, New York.
- 4. Stuart, A. and Ord, J.K. (1998). *Kendall’s’ “Advanced Theory of Statistics” Vol. II*. Charles Griffin, London.
- 5. Zacks, S. (1973), *“Parametric Statistical Inference”*, John Wiley, New York.
- 6. Rao, C.R., (1973). *“Linear Statistical Inference and its Applications”*, John Wiley, New York.
- 7. Bickel, P.J., and Docksum, K.A. (2001), *Mathematical Statistics*, Vol I, Prentice Hall, N.J., 2nd ed.

Marks Distribution

Activity	Marks
Classroom participation/general behavior/group work	5%
Quiz/surprise test	5%
Assignments	5%
Presentation/Seminar	5%
Mid-term Exam	30%
Final Exam	50%
Total	100%

Student Responsibilities

- i) Students must attend class. At least 80% attendance is mandatory. Students are also responsible for doing all assigned work on time.
- ii) Students must also arrive on time and remain in class for the entire period.
- iii) Cellular Phones and Beeper must be turned off.
- iv) Test question may be taken from textbook reading, additional material discussed in the class and / or other assigned readings.