The Islamia University of Bahawalpur

**Department of Statistics, RYK Campus**

**Class: MSc Semester: 2nd Session: 2019-21**

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| **Instructor** | Syed Shakir Ali Ghazali | **E-Mail**: shakir.ghazali@iub.edu.pk | |
| **Course Title** | Probability | **Program** | MSc |
| **Course Number** | STAT-21201 | **Credit Hours** | 03 |
| **Lecture Timings** | Monday (08:30 to 11:30) | | |
| **Course Objectives:** (i) To develop the concepts regarding the applications and use of continuous probability distributions. Derivation of key properties of most commonly used continuous random variables. (ii) To enable the student to decide what kind of probability distribution to be used for a given type of data(observations/experiment) (iii) How probability distributions of various statistics are formed. (iv) Derivations of the functions of sampling distributions such as t, chi-square and F distributions, inter relationships between these random variables and their limiting forms. (v) Sampling from various distributions. | | | |

**Course Outline**

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| --- | --- |
| Week | **Topics** |
| 1,2 | **Uniform** probability distribution, its Total area, mean, variance, distribution function and r-th moment about origin and mean. |
| 3,4 | **Gamma** function, Gamma probability distribution, total area, mean and variance, r-th moment about origin, moment and cumulant generating functions, and characteristic function.  **Normal** probability distribution function, total area, mean & variance, odd and even order moments about mean, points of inflexion, moment generating function, M.D., etc.  **Beta** probability distribution of type-I, its total area, mean, variance, r-th moment about zero, harmonic mean and mode. |
| 5,6 | **Beta** probability distribution of type-II, its total area, mean, variance, r-th moment about zero, moment generating function and relationship between type-I and type-II beta probability distributions.  **Negative exponential** Probability distribution, its Total area, mean, variance, r-th moment about origin, moment and cumulant generating function, mean deviation, distribution function, percentiles, recurrence formula for moments about mean, distribution of difference and ration of two independent exponential variables. |
| 7,8 | **Maxwel**l probability distribution, its total area and r-th moment about zero.  **Laplace** probability distributions, total area, mean and variance.  **Rayleigh** probability distributions, total area, mean and variance. |
| **Mid Term Exam** | |
| 9,10 | **Bi-variate normal** probability distribution, its total area, marginal distributions of X and Y, conditional distributions of X given Y and Y given X with their means and variances, and moment generating function. Distributions of functions of random variables.  **Chi-square** distribution, its derivation, total area, mean and variance r-th moment about origin, moment and cumulant generating functions, characteristic function and recurrence formula for moments about mean. |
| 11,12 | **t**-distribution, its derivation, total area, mean and variance, even order moments about mean, asymptotic property, relationship between t-distribution and Caushy probability distribution. |
| 13,14 | **F**-distribution, its derivation, total area, mean and variance, r-th moment about origin, distribution of inverse of F variable, relationship between beta probability distribution and F-distribution, relationship between exponential probability distribution and F-distribution. Asymptotic property of F-distribution, relationship between F-distribution and t-distribution. |
| 15,16 | Central limit and Chebyshev's theorems and other inequalities. Weak and Strong Laws and their applications. Order statistics. Distributions of r-th and s-th order statistics. |

**Student Evaluation Criteria**:

|  |  |
| --- | --- |
| Attendance | 5% |
| Workshop/ Assignments/ Case study | 5% |
| Surprise Test/ Sudden Test, Quizzes | 5% |
| Class Participation | 5% |
| Mid Term Paper | 30% |
| Final Term Paper | 50% |
| **Total** | **100%** |

**Student Responsibilities:**

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

**Methods of Teaching:**

* Assigned readings
* Group activities & Discussion
* Audio visual aids lectures
* Web-assisted instruction
* Student directed teaching

**Resource Material:**

1. **Books prescribed**
2. Stuart, A., and *Kendall,* J .K. ***Advanced Theory of Statistics****,* Vol. I, Charles Griffin, London, 1998.
3. Lefebvre, M. ***Basic Probability Theory with application***, Springer, 2009.
4. Fridett, B., and Gray, L. ***A Modern Approach to Probability Theory****,*Birkhallser, Boston, 1997.
5. Hirai, A.S. ***A******Course in Mathematical Statistics****,* Ilmi KutabKhana, Lahore, 1998.
6. Johnson, N. L., et al ***Continuous Univariate distributions – Vol. 2***, Wiley, 1994.
7. Ross, S. M. ***Introduction to Probability Models***, Eighth Edition, Academic Press , 2005.
8. Ross, S. M. ***A First Course in Probability***, Prentice Hall, 2005.
9. **Reference Books**
10. Freund, J. E. ***Mathematical Statistics****,* Prentice Hall, New Jersey 6th edition, 1997.
11. Hogg, R.M., and Craig, A.T. ***Introduction to Mathematical Statistics***. Prentice Hall, Engle wood Cliffs, New Jersey, 1995.
12. Mood, A.M., Graybill, F.A., and Boss, D.C. ***Introduction to the* *Theory of Statistics****,* McGraw Hill, New York, 1997.
13. SCHAY, G. ***Introduction to Probability with Statistics Applications***, Birkhauser Boston (New York), 2007.
14. Stirzaker, D. ***Probability and Random Variables****,* Cambridge University Press, Cambridge, 1999.
15. TIGMS, H. ***Understanding Probability***, 2nd Edition, Cambridge University Press, 2007.
16. Walpole, R.E., Myers, R.H., Myers, S.L., and Ye, K. ***Probability & Statistics for Engineers & Scientists***, 8th ed. Pearson Education, 2005.

1. **Hot Research Papers**
2. Gazor, S. ***Speech probability distribution*** Signal Processing Letters, IEEE, Vol.10, (7), 2003.
3. **Research Papers**
4. Ramberga,J. S., Dudewiczb,E.J., Tadikamallac, P. R. and Mykytkad, E. F. ***A Probability Distribution and its Uses in Fitting Data****,* Technometrics Vol. 21, Issue 2, 1979.
5. Leak, W. B. ***The J-shaped Probability Distribution***, Forest Science, Volume 11, (4), 1965.
6. **Web Resources**
7. <http://dl.acm.org/citation>. (ii) [http://www.sciencedirect.com](http://www.sciencedirect.com/science/article)

**Instructor/Tutor**

**Approved by:**

**Director/ Chairman/ Subject Specialist/ Program Coordinator**

**COURSE FILE**

**Course File Folders must have twelve separators (12 tabs)**

**The detail of which is as follow:**

* **Teaching plan**
* **Syllabus**
* **Lesson plan**
* **Time Table**
* **Attendance (Copy of MIS attendance sheet Sample)**
* **Lecture notes**
* **Class tests (Best & worst test assessed sample)**
* **Class test results**
* **Assignments**
* **Sessional Results/ Sessional Marks**
* **Question paper**
* **Miscellaneous (including the term calendar rules)**

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**Departmental Calendar for 1st Semester Session 2012-13**

**Department of ………………..…….Program………..…………**

**Mid Term**

1. Commencement of Classes …………………..
2. Orientation day …………………..
3. *Enlist others departmental planned activities …………………..*
4. Teachings Ends …………………..

**Teaching & Mid Term Exam Schedule**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Sr.#* | Course (title, code) | Teacher’s name | Days, time | Room # | Mid term exam date& time |
| 01 |  |  |  |  |  |
| 02 |  |  |  |  |  |
| 03 |  |  |  |  |  |
| 04 |  |  |  |  |  |
| 05 |  |  |  |  |  |
| 06 |  |  |  |  |  |

1. Answer books of each course must be dd to dd / mm / yy

Shown to the students during lectures till

1. Last date for the submission of answer dd / mm / yy

Books to the departmental examination incharge

Final Term

1. Teaching Starts dd to dd /mm /yy
2. *Enlist others departmental planned activities*
3. Teachings Ends dd /mm / yy

**Teaching & Final Term Exam Schedule**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Sr.#* | Course (title, code) | Teacher’ name | Days, time | Room # | Final term exam date& time |
| 01 |  |  |  |  |  |
| 02 |  |  |  |  |  |
| 03 |  |  |  |  |  |
| 04 |  |  |  |  |  |
| 05 |  |  |  |  |  |
| 06 |  |  |  |  |  |

1. Answer books of each course must be dd to dd / mm / yy

Shown to the students during lectures till

1. Last date for the submission of answer dd / mm / yy

Books to the departmental examination incharge

1. Display of 1st Semester Result ………………….
2. Start of 2nd Semester Class ………………….

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**Attendance Sheet Department of Statistics**

**Class:** \_\_\_\_\_\_\_\_\_\_\_\_ **Semester:** \_\_\_\_\_\_\_\_\_\_\_ **Session:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Teacher Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Subject:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Serial No. | Roll No. | Name of student | Date | | | | | | | |
|  |  |  |  |  |  |  |  |
| Lecture No. | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 |  |  |  |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |  |
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| 14 |  |  |  |  |  |  |  |  |  |  |
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| 16 |  |  |  |  |  |  |  |  |  |  |
| 17 |  |  |  |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |  |  |  |

**Undertaking:** I hereby undertake that dates mentioned above are correct and I will be personally responsible for any misstatement or discrepancy.

**Teacher Signature:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_