Applied Mathematics

Course Code	ADU4300				
Level	04				
Course Title	Statistical Distribution Theory				
Credit value	3				
Core/Optional	Core for Applied Mathematics as major discipline				
Prerequisites	ADU3218/ADU3201(Pass / valid OCAM / CR)				
Hourly breakdown	**Theory**		**Practical hours**	**Independent Learning**	**Assessments**	**Total hrs**
	20 X 2 = 40 hrs	DS hrs = 4X3 = 12 hrs	-	▪ Sessions (20x 3) = 60 hrs ▪ Online /Audio-visual materials and other learning resources = 18 hrs ▪ Other (additional reading) = 18 hrs	▪ Continuous Assessments (CA) = 2 hrs	150
Course Aim/s.	Aim of the course is to introduce the concepts of statistical distributions and its applications.					
PLOs addressed by course	**PLO1: Knowledge:** Explain the fundamental, principles and broader knowledge pertaining to the chosen science disciplines offered for the degree. **PLO2: Practical Knowledge and Application**. Demonstrate the competency to use the knowledge and practical skills appropriately. **PLO3: Communication**: Demonstrate the competency in communicating efficiently and effectively to present information, ideas and concepts to the scientific community as well as to the wider society. **PLO4: Individual Work, Team Work and Leadership**: Demonstrate the competency in working independently and in groups in addressing issues in multi-disciplinary environments and completing the tasks on time through collaborative learning while exhibiting leadership. **PLO5: Creativity and Problem Solving:** Identify and analyze problems using quantitative and/or qualitative approaches using scientific methodology to provide valid conclusions.					
Course Learning Outcomes (CLO)	At the completion of this course student will be able to CLO1: Define a random variable, and describe, derive and apply probability density functions and probability mass functions for simple random variables. (PLO1) CLO2: Define, Calculate and interpret the mean and standard deviation of a random variable. (PLO1, PLO2) CLO3: Identify and apply (calculate the probabilities, expected values, percentiles and standard deviations) the discrete probability distributions- Binomial distribution, Hyper- geometric distribution , Geometric distribution, Negative binomial distribution and Poisson distribution. (PLO1, PLO2, PLO5, PLO4, PLO5) CLO4: Identify and apply (calculate the probabilities, expected values. percentiles and standard deviations) the continuous probability distributions- uniform distribution, normal distribution, Student's t distribution, gamma distribution, exponential distribution, chi-square distribution and F-distribution. (PLO1, PLO2, PLO3, PLO4, PLO5) CLO5: Derive cumulative distribution function and apply to calculate the probabilities and probability density function. (PLO1, PLO2, PLO3, PLO4, PLO5) CLO6: Derive the moment generating function, cumulant generating function and probability generating function, and derive moments of probabilities using a given generating function. (PLO1, PLO2, PLO3, PLO4, PLO5) CLO7: Derive distributions of functions of random variables(linear transformation of a normal random variable, square of a standard normal random variable, multiple of a gamma distribution, linear combinations of several independent normal random variables, sim of iid Bernoualli random variables, sum of independent binomial random variables with the same probability of success, sum of independent normal random variables, sum of iid exponential random variables, sum of independent Gamma random variables with the same rate parameter) and apply to solve problems. (PLO1, PLO2, PLO3, PLO4, PLO5) CLO8: Derive sampling distribution of sample mean and apply to find the probabilities related to sample mean(PLO1, PLO2, PLO3, PLO4, PLO5) CLO9: Define and derive desecrate and continuous joint probability distributions. (PLO1, PLO2, PLO3, PLO4, PLO5) CLO10:Apply joint probability distributions (calculate the probabilities, derive marginal and conditional distributions, determine whether two random variables are independent) (PLO1, PLO2, PLO3, PLO4, PLO5)					
Content (Main topics, sub topics)	**Statistical Distribution Theory** Probability mass function, Probability density function, Descriptive properties of distributions, Binomial distribution, Hyper-geometric distribution, Geometric distribution, Negative binomial distribution, Poisson distribution, Continuous symmetric distributions, Positively skewed distributions, Cumulative distribution function, Generating functions, Distributions of functions of random variables, Sampling distributions, Joint probability distributions, Descriptive properties of joint distributions					

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<tr><td>Teaching Learning methods (TL)</td><td colspan="2">Self-Learning/Independent learning of Self-study
▪ Instructional Material (IL)
▪ Online Activities (OL)
▪ Reference Work (RF)

Compulsory contact sessions
▪ Assessments (AS) and Feedback – MCQs (MCQ);Structured Essay (SEQ); Essay Questions (ES);

Non-compulsory contact sessions
▪ Day Schools (DS)</td></tr>
<tr><td rowspan="2">Assessment strategy</td><td>Overall Continuous Assessment Mark (OCAM): 40%</td><td>Final Assessment (FA): 60%</td></tr>
<tr><td>Details: Continuous Assessment1 (CAT1): -1hr
Continuous Assessment2 (CAT2): -1hr
OCAM=60%Maximum(CAT1, CAT2) +
40%Minimum(CAT1, CAT2)</td><td>Final Evaluation -Theory: 100%-2hrs</td></tr>
<tr><td>Recommended Readings:</td><td colspan="2">• Bhuyan, K.C(2010). Probability Distribution Theory and Statistical Inference, New Central Book Agency
• Forbes, C, Evans, M, Hastings, N, Peacock,(2011) B. Statistical Distributions, John Wiley and Sons</td></tr>
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