F78PA Probability and Statistics A

COURSE DETAILS
Course Code: F78PA
Full Course Title: Probability and Statistics A
SCQF Level: 8
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL
Undergraduate: Yes
Postgraduate Taught: Yes
Postgraduate Research: No

COURSE AIMS
- To reinforce basic ideas related to probability models and their applications to statistical problems
- To provide an introduction to computer simulation and its applications to probability and statistics

LEARNING OUTCOMES – SUBJECT MASTERY
After studying this module, students should be able to:
- Use the axioms of probability to derive the key properties of probability models, random variables, distributions.
- Identify and construct the appropriate probability models for use in statistical and other applications.
- Correctly carry out probability calculations.
- Correctly apply appropriate mathematical techniques from calculus in probability calculations.
- Carry out calculations involving joint random variables including conditional and marginal properties.
- Construct and express logical mathematical derivations with clarity.

LEARNING OUTCOMES – PERSONAL ABILITIES
At the end of the module, students should be able to:
- Demonstrate the ability to learn independently
- Manage time, work to deadlines and prioritise workloads
- Use an appropriate computer package to simulate data from various probability distributions and to use the computer as an experimental tool in probability and statistics
- Apply technical knowledge of probability and statistics to problems in various areas of professional application.
- Provide coherent justification for various standard calculations in probability and statistics

SYLLABUS
- Probability models – sample spaces, events, random variables, probability measures, axioms and properties
- Conditional probability and independence including chain rule, partition rule, Bayes’ Theorem and applications, uses of independence
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- Random variables and their distributions – distribution, probability and density functions, transformations
- Expectation, variance, and standard deviation of random variables, alternative calculations
- Important special distributions and their main properties: Bernoulli, Binomial, Geometric, Hypergeometric, Poisson, Uniform, Normal, Exponential, Gamma, Beta.
- Distributions of data, relation to and comparison with theoretical distributions, graphical techniques
- Joint probability, density and distribution functions
- Marginal and conditional distributions
- Independent random variables and sum of independent random variables
- Generating functions
- Markov and Chebychev inequalities, the weak law of large numbers, and the Central Limit Theorem with applications to statistics
- Expectation of a function of random variables, covariance, correlation
- Conditional expectation and its uses
- Computer simulation and its applications in probability and statistics

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