

Certificate in Applied Statistics and Computer (CASC)

Paper No.	Course Code	Title of the Course / पाठ्यक्रम का शीर्षक	Credits
1639	CASC-01	Statistical Methods	4
1640	CASC-02	Probability and Probability Distribution	4
1641	CASC-03	Correlation, Regression and Statistical Inference	4
1642	CASC-04	Applied Statistics	4
1643	CASC-05	Fundamental of Computer and IT	8
Total Credits			24

CASC-01 Statistical Methods

BLOCK – I. Data Collection and Its Representation

Unit-I- Data Collection and Tabulation :

Meanings, Definitions and Applications of Statistics, Measurements and Scale, Measurements of qualitative data, Methods of data collection, Types of data.

Unit-II- Representation of Data- I (Diagrammatical representation):

Frequency distribution, Tabulation of data, Diagrammatical Representation of data, Bar diagram, Multiple bar diagram, Divided bar diagram, Percentage bar diagram, Pie chart, Pictogram, leaf chart,

Unit-II- Representation of Data- I (Graphical representation):

Graphical representation of frequency distribution, Histogram, Frequency polygon, Frequency curve, Ogive.

BLOCK – II. Measures of Central Tendency and Dispersion

Unit-I- Measures of Central Tendency :

Types of measures of central tendency, Arithmetic mean, Fundamental Theorems on Arithmetic mean, Geometric mean, Harmonic mean, Median, Mode, Percentiles, Deciles, and Quartiles.

Unit-II- Measures of Dispersion :

Types of measures of Dispersion, Range, Mean Deviation, Variance and Standard deviation, Effect of change of origin and scale, Relationship between measures of central tendency and measures of dispersion, Coefficient of variation.

BLOCK – II. Moments, Skewness and Kurtosis

Unit-I- Moments, Raw Moments and Central Moments :

Definition of moments, raw moments for ungrouped data, raw moments for grouped data, Central moments, Factorial moments, Interrelationship between various moments, effect of change of origin and scale on moments, Charlier's checks, Sheppard's correction for moments.

Unit-II- Skewness and Kurtosis :

Definition of skewness, Measures of skewness, Pearson's coefficient, Bowley's coefficients, Kurtosis, Measures of Kurtosis, effect of change of origin and scale.

CASC-02

Probability and Distribution

BLOCK – I. Probability Theory

Unit-I- Random experiments and Probability:

Deterministic and random experiments, Sample space, Events, Algebra of Events, Axiomatic definition of Probability, Classical definition of Probability, Statistical definition of probability, Addition Theorem of Probability .

Unit-II- Conditional Probability:

Conditional probability, Multiplicative theorem of Probability, Independent events, Partition of sample space, Baye's Theorem.

BLOCK – II. Probability Distributions and Expectations

Unit-I- Random Variables and Probability Distributions:

Definition and types of random variable, Cumulative distribution function and its properties, Probability Mass Function, Probability Density Function..

Unit-II- Expectation:

Definition and types of Mathematical Expectation, Moments in terms of expectation, Mathematical and Multiplication theorems of Expectation, other theorems on expectation.

Unit-III- Inequalities for Moments:

Cauchy-Schwartz Inequality, Markov's inequality, Chebyshev's inequality.

BLOCK – III. Concept of Probability Distributions

Unit-I- Univariate Distributions:

Bernoulli Distribution, Binomial Distribution, mean and variance of binomial distribution, Moments, Moments Generating Function, Additive and Multiplicative property, Recurrence relation for moments, Fitting of Binomial Distribution, Poisson Distribution, Poisson Distribution as a limiting case of Binomial Distribution, mean and variance of Poisson distribution, Moments, Moment Generating Function, Additive and Reproductive property, Recurrence relation for moments, fitting of Poisson Distribution.

Unit-II- Discrete Distribution:

Geometric Distribution, mean and variance, moment generating function of geometric distribution, Negative Binomial Distribution, Moment Generating Function, Mean and Variance, Recurrence formulae for negative Binomial Distribution, Poisson Distribution as a limiting case of Negative Binomial Distribution, Hyper Geometric Distribution, Mean and Variance, Recurrence relation for Hyper Geometric distribution..

Unit-III- Normal Distribution:

Normal Distribution and its parameters, Standard Normal Distribution, Moments, Moments Generating Function, Area Property, properties of normal curve, Standard Scores, Advantages and Characteristics of Z Scores.

Unit-IV- Continuous Distribution:

Uniform Distribution, Moment Generating Function, Distribution Function, Moments of Uniform Distribution, Exponential Distribution, Moments, Moment Generating Function, Lack of Memory Property.

CASC-03

Correlation, Regression and Statistical Inference

BLOCK – I. Correlation and Regression

Unit-I- Bivariate Data and Correlation:

Scatter Diagram, Karl Pearson's coefficient of correlation, Properties of correlation coefficient, limits of correlation coefficient, Effect of change of origin and scale on correlation coefficient.

Unit-II- Regression:

Regressions, linear regression model, principal of least square, Regression lines, Regression coefficient, Properties of Regression coefficients.

Unit-III- Correlation and Intra Class Correlation:

Rank correlation coefficient, Spearman's rank correlation coefficients, rank correlation coefficient for tied ranks, Intra-class correlation, some remarks on Intra-class correlation.

Unit-IV- Theory of Attributes:

Combinations, Classes and Class frequencies of Attributes, Dichotomous Classification, Consistency of data, joint distribution of attributes, Contingency tables, Independence and Association of Attributes, Measures of Association, Yates Correction.

BLOCK – II . Basic Principles of Statistical Inference

Unit-I- Estimation :

Point Estimation, properties of a good estimators, Consistency, Unbiased ness, Efficiency, Sufficiency, Confidence Interval Estimation .

Unit-II- Method of Estimation:

Procedures of Estimation, Method of Moments, method of Maximum Likelihood, Method of Scoring, Properties of Estimators.

Unit-III- Testing of Hypothesis :

Statistical Hypothesis, Simple and Composite Hypothesis, Critical Region, Two kinds of Error, One-tailed and Two-tailed tests, Test of Significance, Most Powerful Test, Uniformly Most Powerful Test .

BLOCK – III . Test of Significance

Unit-I- Exact Tests and Fisher's transformations :

Tests of Significance based on Chi-Square Distribution, Tests of Significance based on t – Distribution, Tests of Significance based on F – Distribution, Tests of Significance based on Fisher's Z - Distribution.

Unit-II- Large Sample Tests :

Testing Significance of Mean, Testing Equality of Means, Testing Significance of Proportion, Testing Equality of Proportions, Testing Significance of Standard Deviation, Testing Equality of Standard Deviation.

Unit-III- Non-Parametric Tests :

Non Parametric Tests, Sign Test, Wilcoxon Signed- Rank Test, Mann- Whitney U-Test, Run Test.

CASC-04
Applied Statistics

BLOCK – I. Index Numbers:

Unit-I- Index Number: General Theory:

Definition & Construction of an Index number, Price Relatives, Quantity or Volume Relatives, Value Relatives, Link & Chain Relatives, Problem involved in computation of an Index Number .

Unit-II- Index Numbers: Important Formulae:

Introduction, Calculation of Index Number, Laspeyre's, Paasche's, Marshall- Edgeworth's, fisher's formulae, other indices, Quantity Index, Criteria of good Index Number

Unit-III- Consumer Price Index Number:

Introduction, Construction & Computation of Consumer Price Index Number (CPI), Steps in construction of CPI, Use & Limitations of CPI, Base Shifting of Index Numbers, Splicing of Index Number Series, Deflating the Index Number, Index of Industrial Production.

BLOCK – II. Time Series Analysis:

Unit-I- Time Series:

Introduction, Utility of Time Series Analysis, Component of Time Series, Mathematical Models For Time Series Analysis.

Unit-II- Determination of Trends:

Introduction, Graphic Method, Method of Semi Averages, Method of Curve Fitting by the Principle of Least Squares, Method of Moving Averages (when Period is Even & Odd).

Unit-III- Determination of Seasonal Indices:

Introduction, Measurement of Seasonal Indices, Method of Simple Averages, Ratio to Trend Method, Ratio to Moving Average Method, Method of Link Relatives.

BLOCK – III . Demography:

Unit-I- Sources of Demographic Data :

Introduction, Demography & Vital Statistics, Sources of Demographic Data, Errors in Data Collection, Evaluation & its Adjustments, Rates & Ratios.

Unit-II- Measures of Mortality:

Introduction, Measures of Mortality, CDR, SDR, StDR, MMR, IMR.

Unit-III- Measures of Fertility :

Introduction, Measures of Fertility, CBR, GFR, ASFR, TFR.

Unit-IV- Life Tables:

Introduction, Description & Construction of Complete Life Table, Uses of a Life Table.

Unit-IV- Measures of Reproductivity:

Introduction, GRR, NRR.

BLOCK – III . Statistical Quality Control:

Unit-I- Introduction of Statistical Quality Control :

Introduction, Advantages of Quality Control, Quality Characteristics, Basic Principles & Operating Characteristics of Control Charts, Choice of Control Limits, Sample Size & Sample Frequency, Rational Subgroups, Analysis of Pattern on Control Charts, Rate of Detection of Change in Average Level.

Unit-II- Control Charts for Variables:

Introduction, Control Charts for Mean, Control Charts for Range, Control Charts for Standard Deviation.

Unit-III- Control Charts for Attributes :

Introduction, Control Charts for Fraction Defectives, Control Charts for Number of Defectives, Control Charts for Number of Defects .

Unit-IV- Principles of Acceptance Sampling:

Introduction, AQL, LTPD, Producer's Risk, Consumer's Risk, OC Function, AOQ, Average Total Inspection, Average Sample Number, Single Sampling Plan, Double Sampling Plan, Sampling Inspection by Variables.

CASC-05

Fundamental of Computer & IT

Introduction to Computer:

Computer Basics: Characteristics of Computer, Application of Computer.

Basic Components of Computer: Components of Computer, CPU, Memory, Keyboard, Mouse, VDU, Printers, RAM, ROM, CD-ROM, Hardware and Software.

Classification of Computer: Analog, Digital Hybrid Computer, General purpose, Special Computer, Micro, Mini, Mainframe Computer, Super Computers, Desktop, Laptop, Palmtop. Representation of Data/information: Information Technology, Data, information, Data processing, Characteristics of information, Scope of information, Basic data types.

Basics of Digital Electronics:

Digital Number System : Number System, Decimal System, Binary System, Octal System, Hexadecimal System, Code Conversion, Binary Codes, 8421 Code/BCD Code,

2421 Code, 5211 Code, Reflective Code, Sequential Codes, Non weighted codes, Gray Code, Error Detecting and Correction Codes, ASCII Code, EBCDIC Code, Floating point Numbers.

Digital Logic Gates: Gate. AND, OR, NOT, BUF, NAND, NOR, XOR, XNOR, Universal Gates. Simplification of Boolean Functions: Karnaugh Maps, Minimization Technique upto 5- variable K-map, Inverse function. Digital Combinational Circuit: Decoders, Encoders, Priority Encoder, Multiplexer, De- Multiplexer, Boolean Function, Implementation, Mux-Demux Application Example. Sequential Circuits: Concept of Sequential logic, Asynchronous sequential circuit, Synchronous sequential circuits, Latches and Flip- Flops, RS, JK Latch, JK Master Slave Flip-Flop, Sequential circuits Design.

Memory System:

Introduction of Memories System: Memory Cell, Block diagram of Memory Cell, Memory locations and address, Memory operations, Memory hierarchy.

Main Memories: Semi-conductor RAM Memories, Static Memories, Dynamic RAM, Performance Measure, SDRAM, ROM, Flash Memory, Speed, size and cost of memory.

Secondary Storage Memories: Magnetic Disk Memory, Floppy Disk Memory, RAID Disk Arrays Optical Disk.

High Speed and Virtual Memories: Cache Memories, Performance Consideration, Virtual Memories, Demand Paging.

Microprocessor:

Introduction to Microprocessor: Evolution, Introduction and Characteristics of Microprocessor Systems, Microprocessors Register Structure, ALU, Timing and Control Unit, CPU, Memory, Input/Output, Hardware, Software and firmware, Machine Language, Assembly language, High level language.

Microprocessor : Architecture, Software Model, Functions and operations, Instruction and Data format, Opcode format, Data transfer Instructions, Arithmetic instructions, Addressing Mode of 8085. 16-Bit Microprocessor: Architecture, Bus interface unit, Execution Unit, Register Organisation, Memory Segmentation, Software Model of 8086, 8088 Microprocessor.

Advanced Microprocessors and Micro Controllers: Introduction to 32 bit and 64 bit Microprocessors, The 80386. Microprocessor, The 80486 Microprocessor, Pentium Processor, Motorola 68XXX Processors, Microcontrollers.