# COURSE OUTCOME OF STATISTICS
## Syllabus: CBCS

## SEMESTER-1

| PAPER CODE | COURSE TITLE | CREDITS (Theory + Practical) |
|---|---|---|
| CORE 1 : STC-1.11 & 1.12 | Descriptive Statistics and Probability Theory | 4+2=6 |

After completion of this course, Students will be able to:

- Organize, manage and present data.
- Analyse statistical data graphically.
- Learn about Measures of central tendency, dispersion and location.
- Use the basic probability rules and laws using different events.
- Translate real-world problems into probability models.
- Derive the probability density function of transformation of random variables, marginal and conditional distribution of bivariate random variables.

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Tutorial) |
|---|---|---|
| CORE 2 : STC-2.11 | Calculus | 5+1=6 |

After completion of this course, Students will be able to:

- Explain the relationship between the derivative of a function as a function and Compare and contrast the ideas of continuity and differentiability.
- Develop invaluable scientific sense, and practical engineering problem solving skills.
- Calculate limits in indeterminate forms by a repeated use of L' Hospital rule and find derivatives of composite functions.
- To find maxima and minima, critical points and inflection points of functions and to determine the concavity of curves.
- To able to evaluate integrals of rational functions by partial fractions.

## SEMESTER-II

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Practical) |
|---|---|---|
| Core-3 : STC-2.11 & 2.12 | Probability Distributions and Correlation Analysis (Theory) | 4+2=6 |

After completion of this course, Students will be able to:

- Develop problem-solving techniques needed to accurately calculate probabilities.
- Apply problem solving skills to solving real world events.
- Understand how to ascertain whether the data set fit a distribution or not
- Learn how to study relationship between two variables and several variables.

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Tutorial) |
|---|---|---|
| Core-4 : STC-2.21 | **Algebra** | 5+1=6 |

After completion of this course, Students will be able to:

- Solve systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion.
- Understand theory of equations, statement of the fundamental theorem of algebra and its consequences. Relation between roots and coefficients of any polynomial equation.
- Carry out matrix operations, including inverses and determinants.
- Understand the concepts of vector space & subspace and also understand about linear independence, span, and basis.
- Determine eigenvalues and eigenvectors and solve eigenvalue problems.
- Apply principles of matrix algebra to linear transformations.
- Demonstrate understanding of inner products and associated norms.

## SEMESTER-III

| PAPER CODE | COURSE TITLE | CREDITS (Theory + Practical ) |
|---|---|---|
| Core-5 : STC-3.11 & 3.12 | Sampling Distributions | 4+2=6 |

Upon successful completion of this course, Students will be able to:

- Understand the basic concepts of limit laws such as convergence in probabilities, WLLN, Chebychev's inequality and Central Limit Theorem and when to apply it.
- Understand the details of important sampling distributions, namely chi-square, Student -*t*, and Snedecor's *F*-distributions and use them to make conclusions about problems that arise in applied statistics.
- Understand about Hypothesis testing and p values to interpret results and come to an acceptable conclusions
- Make use of Microsoft Excel.

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Practical ) |
|---|---|---|
| CORE 6 : STC-3.21 & 3.22 | Survey Sampling and Indian Official Statistics | 4+2=6 |

After completion of this course, Students will be able to:

- Understand the concept of population and sample.
- Have a broader range of issues and to accumulate quantitative descriptions of the social world, which are unthinkable at a time when the observation techniques were limited to censuses.
- Know when to apply stratified random sampling and systematic sampling while doing a survey.
- Know how to apply ratio and regression method of estimation, variances of population mean and population total estimates.
- Understand the methods of collection of official statistics, their reliability and limitation.
- Know the role of central statistical office, National Sample Survey, National statistical commission and their publications.

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Tutorial) |
|---|---|---|
| CORE 7 : STC-3.31 | Mathematical Analysis | 5+1= 6 |

After completion of this course, Students will be able to:

- Define and recognize the series of real numbers and convergence.
- Demonstrate an understanding of limits and how that is used in sequence, series and differentiation.
- Construct rigorous mathematical proofs of basic results in real analysis.
- Demonstrate an ability to select and apply numerical analysis and numerical integration for the solution of different problems.

| PAPER CODE | COURSE TITLE | CREDITS (Practical ) |
|---|---|---|
| SEC-1 : STS 3.11(a) | Software learning | 2 |

After completion of this course, Students will be able to:

- Learn how to use Software such as M.S Excel, R, SPSS etc for statistical analysis.

## SEMESTER-IV

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Practical ) |
|---|---|---|
| CORE 8 : STC-4.11 & 4.12 | Statistical Inference | 4+2=6 |

After completion of this course, Students will be able to:

- Learn about the properties of estimation and different estimation technique such as maximum likelihood estimates, method of moments etc. to estimate the unknown parameters.
- Learn some of the testing criteria such critical region, most powerful critical region, Neyman Pearson Lemma, most powerful test.
- Learn how to use likelihood ratio tests for testing of mean and variance of one, two and several independent normal population.

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Practical) |
|---|---|---|
| CORE 9 : STC-4.21 & 4.22 | Linear Models (Theory & Practical ) | 4+2=6 |

After completion of this course, Students will be able to:

- Learn how to represent an observation by linear models and segregation of total variation into different sources of variation by analysis of variance (ANOVA) and Analysis of Co-variance (ANCOVA) techniques.
- To define regression analysis and produce simple linear regression equations and predict model with OLS.
- To evaluate the regression model through tests of linearity of regression, test for polynomial regression, test for multiple linear regression model, test for the homogeneity of a group of regression coefficient
- Construction of General Linear Model (GLM), Analysis of Multicolinearity and Autocorrelation

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Practical ) |
|---|---|---|
| CORE 10 : STC-4.31 & 4.32 | Statistical Quality Control (Theory & Practical ) | 4+2=6 |

After completion of this course, Students will be able to:

- Understand the concept of quality control, chance and assignable causes of variation, control charts for variables and attributes, setting of limits for mean chart, range chart.
- Understand the concept of acceptance sampling plan ,likelihood ratio test and sequential analysis
- Learn how to maintain and improve the quality of output of any commodity throughout the production process for successful marketing.
- Understand how to carry out inspection for acceptance purposes at many stages in the manufacturing process and thereby make the entire product marketable or acceptable to the consumer.

| PAPER CODE | COURSE TITLE | CREDITS ( Theory) |
|---|---|---|
| SEC-2 STS-4.11(a) | Statistical Techniques for Research Methods (Theory) | 2 |

After completion of this course, Students will be able to:

- Familiarize themselves with different research methodologies to carry out any research activity in a proper scientific way.

## SEMESTER-V

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Practical ) |
|---|---|---|
| CORE 11 : STC-5.11 & 5.12 | Stochastic Processes and Queuing Theory ( Theory & Practical ) | 4+2=6 |

After completion of this course, Students will be able to:

- Learn Stochastic Process, Markov Chain; find conditional probabilities, higher transitional probabilities through transition matrix.

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Practical ) |
|---|---|---|
| CORE 12 : STC-5.21 & 5.22 | Statistical Computing Using C/C++ Programming (Theory & Practical) | 4+2=6 |

After completion of this course, Students will be able to:

- Do Computer programming using C and $C^{++}$.
- To construct / write simple programs in C and $C^{++}$ on the various statistical measures and statistical tests.

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Practical ) |
|---|---|---|
| DSE-1 : STD-5.11 & 5.12 | Operations Research (Theory & Practical) | 4+2=6 |

After completion of this course, Students will be able to

- Learn the technique how to obtain maximum or optimal result with minimum costs and with limited resources in any factory/ industry or organization.

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Practical ) |
|---|---|---|
| DSE-2 : STD-5.21 & 5.22 | Time Series Analysis (Theory & Practical) | 4+2=6 |

After completion of this course, Students will be able to:

- Get familiarised with the main concepts of time series theory and methods of analysis
- know how to use them in examining economic and financial processes
- Understand specific economic problems, which occur while working with data of these types
- Get familiarised about how to compare different statistical models using in-sample and out-of-sample statistical measures of accuracy
- To define and apply the main concepts underlying the analysis of time series models. Starting with the different aspects of the concept of stationarity and exploration of real data through to fitting ARIMA models and producing forecasts.
- Compute and interpret a correlogram and a sample spectrum

## SEMESTER-VI

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Practical ) |
|---|---|---|
| CORE 13 : STC-6.11 & 6.12 | Design of Experiments (Theory & Practical) | 4+2=6 |

After completion of this course, Students will be able to:

- Designing an experiment by adopting the basic principles such as replication, randomization and local control in any comparative type of experiments like CRD, RBD, LSD, Factorial Experiments, Confounding design etc. to compare the efficacy of different treatments, viz. different types of drugs, fertilizers, ploughing method and disease control methods etc.

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Practical ) |
|---|---|---|
| CORE 14 : STC-6.21 & 6.22 | Multivariate Analysis & Index Numbers (Theory & Practical) | 4+2=6 |

After completion of this course, Students will be able to:

- Understand the relationship between many variables and making inferences of the characteristics under study.
- Interpret and use a range of index numbers commonly used in the business sector.
- Define an index number and explain its use
- Perform calculations involving simple, composite and weighted index numbers
- Understand the basic structure of the consumer price index (CPI) and perform calculations involving its use.

| PAPER CODE | COURSE TITLE | CREDITS(Theory + Practical ) |
|---|---|---|
| DSE-3 STD 6.11 | Demography (Theory & Practical) | 4+2=6 |

After completion of this course, Students will be able to:

- Identify and compare the advantages and disadvantages of the different sources of demographic data.
- Understand demographic measurements like fertility and mortality rates.
- Explain demographic changes in the world and their major determinants.
- Apply population theories to explain past and present population characteristics.
- Evaluate the use of demographic concepts and population theories to understand contemporary socio-economic issues and current affairs.
- Understand how to use life tables and calculate survival rates, and explain the difference between an ordinary life table and a multiple-decrement life table.

| PAPER CODE | COURSE TITLE | CREDITS |
|---|---|---|
| DSE-4 STD 6.21 | Project Work | 6 |

After completion of this course, Students will be able to:

- Understand how to carry out research work using primary and/or secondary data and to do compilation and data entry and to write a report on research findings.

*****