Statistics and Operations Research

Undergraduate Programmes

Modules

First year

SSTS000: Descriptive Statistics (ECP)	**Credits: 24**	**Co-requisite / Prerequisite:**
Content: • Definitions and concepts. • Sources and types of data. • Organizing and summarizing data; Descriptive statistics. • Elementary probability theory. • Counting techniques: Permutations and combinations. • Random variables and probability distributions: Bernoulli, Binomial, Poisson and Normal distributions		

SSTB000: Introduction to Statistical Inference (ECP)	**Credits: 24**	**Co-requisite / Prerequisite:**
Content: • Sampling distributions: t, F and Chi-square distributions. • Central Limit Theorem. • Estimation: point and interval; Confidence Interval for the mean, proportion and variance. • Test of hypotheses: Tests for the mean, proportion and variance. • Inferences about differences in two means and two proportions; One-way ANOVA.		

- Chi-square tests. Simple linear regression and correlation.
- Time series analysis. Index numbersInformation literacy

SSTS011: Introduction to Statistics	**Credits: 12**	**Co-requisite / Prerequisite:**

Content:

- Definitions and concepts.
- Sources and types of data.
- Organizing and summarizing data; Descriptive statistics.
- Elementary probability theory.
- Counting techniques: Permutations and combinations.
- Random variables and probability distributions: Bernoulli, Binomial, Poisson and Normal distributions

SSTA012: Introduction to Statistical Inference	**Credits: 12**	**Co-requisite / Prerequisite:**

Content:

- Sampling distributions: t, F and Chi-square distributions.
- Central Limit Theorem.
- Estimation: point and interval; Confidence Interval for the mean, proportion and variance.
- Test of hypotheses: Tests for the mean, proportion and variance.
- Inferences about differences in two means and two proportions; One-way ANOVA.
- Chi-square tests. Simple linear regression and correlation.
- Time series analysis. Index numbers.

Second year

SSTA021: Theory of Distributions	**Credits: 20**	**Co-requisite / Prerequisite:**

Content:

- Basic probability concepts.
- Theory of discrete and continuous probability distributions.
- Expected values and MGF.
- Special discrete and continuous probability distributions: Bernoulli, Binomial, Hypergeometric, Geometric, Poisson and Negative Binomial, Uniform, Gamma, Exponential, Weibull, Pareto and Normal distributions.
- Theory of multivariate discrete and continuous distributions, marginal and conditional distributions.
- Covariance and correlation.
- Theory of conditional expectation and conditional variance.

Distributions of random functions: distribution function, transformation and MGF techniques

SSTA022: Statistical Inference	**Credits: 20**	**Co-requisite / Prerequisite:**

Content:

- Convergence and limiting distribution, Law of large numbers and Central limit theorem with applications.
- Sampling distributions
- Estimations: Point and Interval estimation
- Methods of finding point estimators.

- Criteria for evaluating estimators. Confidence intervals: pivotal quantity method.
- Theory of hypothesis testing: MP and UMP tests, Generalized likelihood ratio tests.
- Application to normal populations.

SSOA021: Introduction to Linear Programming	**Credits: 20**	**Co-requisite / Prerequisite:**

Content:

- Linear Programming Models: Graphical approach; the Simplex Method; the Big-M-method; the two-phase method.
- Concept of duality and duality theorem.
- Transportation model.
- Assignment problems.
- Network problems.

SSOA022: Game and Decision Theory	**Credits: 20**	**Co-requisite / Prerequisite:**

Content:

- Game Theory: Rectangular games; Graphical solution procedure; Algebraic technique; Solution by LP method.
- Decision Theory: Decision rules; Decision making without probabilities; Decision making with Probabilities; Decision Analysis with additional information; Utility; Decision Trees.

Third year

SSTA031: Time Series Analysis	**Credits: 16**	**Co-requisite / Prerequisite:**

Content:

- The classical approach to time series analysis: Decomposition of time series.
- Smoothing methods.
- Forecasting.
- Properties of stochastic time series models
- Stationary series.
- Autocorrelation and partial autocorrelation functions.
- Purely random, moving average and autoregressive processes.
- The Box-Jenkins approach: ARMA and ARIMA models.
- Case studies.

SSTB031: Applied Linear Regression	**Credits: 16**	**Co-requisite / Prerequisite:**

Content:

- Simple Linear Regression.
- Review of Matrix Algebra.
- Multiple Linear Regression.
- Model Adequacy Checking.
- Variable Selection and Model Building.

SSTA032: Design and Analysis of Experiments	**Credits: 16**	**Co-requisite / Prerequisite:**

Content:

- Definitions of basic terminologies; Design of experiments.
- Design and analysis of: Completely randomized, Randomized block, Latin square and Factorial designs.
- Multiple comparisons of treatment means.
- Analysis of covariance.

SSTB032: Multivariate Statistical Methods	Credits: 16	Co-requisite / Prerequisite:
Content: • Review of matrix theory. • Multivariate distributions: Multivariate normal distribution and its properties; Inference about multivariate means; Hotelling's T2. • Multivariate analysis of variance and regression. • Introduction to data reduction.		

SSTC032: Sampling Theory	Credits: 16	Co-requisite / Prerequisite:
Content: • Elements of Sampling, • Questionnaire Design, • Simple Random Sampling, • Stratified Random Sampling, • Ratio Estimation, • Difference and Regression Estimators, • Systematic Sampling.		

SSOA031: Statistical Quality Control	Credits: 16	Co-requisite / Prerequisite:
Content: • Quality improvement in the modern era; • Statistical methods useful in quality control; • Inferences about process quality;		

- Basic methods of statistical process control;
- control charts for variables and attributes;
- univariate and multivariate process monitoring and control.

SSOB031: Advanced Linear Programming	**Credits: 16**	**Co-requisite / Prerequisite:**
Content: • Review of Linear Programming Model; • Algebra of the Simplex Method; • Geometry of the Simplex Method; • The two-phase method; • Duality and sensitivity analysis; • The Revised Simplex method; • Case studies		

SSOA032: Integer Programming	**Credits: 16**	**Co-requisite / Prerequisite:**
Content: • Pure and Mixed Integer Programming models; • Problem formulation; • Graphical Solutions / Lattice Points; • Cutting Plane Algorithms; • Branch-and-Bound Algorithms; • Case Studies		

SSOB032: Dynamic Programming	**Credits: 16**	**Co-requisite / Prerequisite:**

Content:

- The Stagecoach problem;
- Characteristics of a Dynamic Programming Problem;
- Deterministic and Probabilistic Dynamic Programming Problems;
- Case studies.

SSOC032: Queuing Models	**Credits: 16**	**Co-requisite / Prerequisite:**

Content:

- Basic Structure of Queuing Models;
- Examples of Real Queuing Systems;
- The Role of Exponential Distribution;
- The Birth and Death Process;
- The M/M/S Model and its Variations;
- Queuing Models Involving Non-Exponential Distributions.