General Information

The science of Statistics concerns the development and application of the most effective methods of collecting, analyzing and interpreting data in such a way that the fallibility of conclusions and estimates can be assessed by means of logical reasoning based on measures of probability. It deals with the designing of experiments and surveys, testing hypotheses, studying relationships among two or more variables, among other scientific methods. These methods have wide applications in such diverse fields as in industry, business, government, educational institutions, agriculture, meteorology and astronomy, engineering, medicine, social sciences and the liberal arts.

**Types of Degree Programmes**

The Department of Statistics offers the following degree programmes:

(a) B.Sc. degree in Statistics

(b) B.Sc. Combined degrees in Statistics/Mathematics, Statistics/Economics, Statistics/Computer Science and Statistics/Education in collaboration with the Departments of Mathematics, Economics, Computer Science and Education.

The normal duration for the B.Sc. degree is four years for candidates who enter by entrance examination (JAMB) and three years for direct entry candidates.

**Philosophy, Objectives and Scope of the Programme**

In accordance with the philosophy of the University of Nigeria, the programme aims at equipping the student with the basic knowledge in Probability and Stochastic Processes, Design and Analysis of Experiments, Statistical Methods and Inference, Sampling techniques, Quality Control, Operations Research and Statistical Computing. It is designed to develop the skills and the necessary intellectual orientation required by the student for subsequent career as a statistician.

**Entry and Degree Requirements**

Entrance candidates, in addition to the minimum University requirements, must have passed at the West African School Certificate Examination, Senior School Certificate Examination or in an equivalent examination with credits in Mathematics or Additional Mathematics and Physics or Chemistry or Economics. Direct Entry students in addition to the above must pass the Higher School Certificate Examination or the General Certificate of Education A/Level in two subjects, which must include Mathematics or statistics.

 **Graduation Requirements**

To graduate from the four-year Bachelor of Science (B.Sc. (Hons)) degree programme in Statistics,students must have successfully completed a minimum of 142 Credit Units as shown in Table 1.

*Table 1* – Required minimum credit units

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Level** | **100** | **200** | **300** | **400** | **TOTAL** |
| **Core-Compulsory** | 27 | 26 | 17 | 23 | 93 |
| **Electives** | 10 | 6 | 4 | 14 | 34 |
| **SIWES** | NA | NA | 15 | NA | 15 |
| **TOTAL** | 37 | 32 | 36 | 37 | 142 |
|  |  |  |  |  |  |

 NA means not applicable

**Job Opprtunities**

Successful graduates of the Bachelor of Science in Statistics programmes are well equipped for postgraduate studies and teaching in relevant subjects. Their training also makes them prepare for careers in Government Departments, Banks, International Agencies, Research Institutions, and in Commercial and Technical firms needing the services of statisticians.

**Service Courses**

The Department of Statistics offers specially designed service courses to many departments in the Faculties of Physical Sciences, Agriculture, Biological Sciences, Pharmaceutical Sciences, Veterinary Medicine, Engineering, Environmental Studies, Education and Social Sciences.

For enrollment into the service courses, students must have at least a pass in Mathematics at the G.C.E. ordinary level or in an equivalent examination.

**NUMBERING CODE FOR COURSES**

**The courses in Statistics programme are grouped into the following stress areas:**

|  |  |
| --- | --- |
| **Stress Areas** | **Code Number** |
| Basic Courses  | 0 |
| Probability/Stochastic Processes  | 1 |
| Design/Analysis/Distribution Theory  | 2 |
| Inference/Methods | 3 |
| Sampling/Quality Control | 4 |
| Demography  | 5 |
| Operations Research  | 6 |
| Statistical Computing  | 7 |
| Seminar/Industrial Training  | 8 |
| Project | 9 |

**STANDARD FOUR YEAR UNDERGRADUATE PROGRAMME FOR STATISTICS MAJOR: REVISED PROGRAMME**

|  |  |  |
| --- | --- | --- |
| **FIRST YEAR STATISTICS** |  |  |
| **FIRST SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| STA111 | Probability I | 2 |
| STA131 | Inference I | 2 |
| **Required Ancillary Courses**  |  |  |
| MTH111 | Elementary Mathematics I | 3 |
| MTH121 | Elementary Mathematics II  | 3 |
| COS101 | Introduction to Computer Science I  | 2 |
| **General Studies Courses**  |  |  |
| GSP101 | The Use of English I | 2 |
| GSP 111 | The Use of Library  | 2 |
| Any combination of at least 4 units from the electives  | 4/5 |
|  |  | 20/21 |
| **Electives**  |  |  |
| PHY123 | General Physics for Physical Sciences  | 2 |
| PHY191 | Practical Physics I  | 2 |
| CHM101 | Basic Principles of Inorganic Chemistry  | 2 |
| CHM171 | Basic Practical Chemistry  | 2 |
| ECO101 | Principles of Economics I | 2 |
| BIO151 | General Biology | 3 |
| AGR201 | Introduction to Agriculture | 2 |
| GLG103 | Basic and Applied Geology for Environmental, Physical & Social Sciences 3  |
|  |
| **SECOND SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| STA112 | Probability II | 2 |
| STA132 | Inference II | 2 |
| STA172 | Statistical Computing I  | 2 |
| **Required Ancillary Courses**  |  |  |
| MTH122 | Elementary Mathematics III | 3 |
| **General Studies Courses**  |  |  |
| GSP 102 | The Use of English II | 2 |
| Any combination of at least 6 units from the electives  | 6/7 |
|  |  | 17/18 |
| **Electives**  |  |  |
| MTH132 | Elementary Mechanics I  | 3 |
| PHY134 | General Physics for Physical Sciences II  | 2 |
| PHY154 | General physics for Physical Sciences III | 2 |
| CHM112 | Basic Principles of Physical Chemistry  | 2 |
| CHM122 | Basic Principles of Organic Chemistry | 2 |
| ECO102 | Principles of Economics II  | 2 |
| BIO152 | General Biology  | 3 |
| GLG103 | Earth History  | 3 |

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| **SECOND YEAR STATISTICS** |  |  |
| **FIRST SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| STA211 | Probability III | 2 |
| STA 231 | Inference III | 3 |
| **Required Ancillary Courses**  |  |  |
| COS201 | Computer Programming I  | 2 |
| MTH215 | Linear Algebra I | 2 |
| **General Studies Courses**  |  |  |
| GSP201 | Basic Concepts & Theory of Peace  | 2 |
| GSP207 | Logic, Philosophy and Human Existence I  | 2 |
| Any combination of at least 2 units from the electives | 2/3 |
|  |  | 15/16 |
| **Electives**  |  |  |
| ECO201 | Microeconomic Theory I  | 2 |
| MTH211 | Set, Logic and Algebra  | 3 |
| MTH221 | Real Analysis  | 3 |
| ECO281 | Structure of Nigerian Economy I  | 2 |
| PHY251 | Electromagnetism I  | 2 |
|  |  |  |
| **SECOND SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| STA 212 | Probability IV | 2 |
| STA272 | Statistical Computing II  | 2 |
| **Required Ancillary Courses**  |  |  |
| MTH216 | Elementary Differential Equation I | 3 |
| COS202 | Computer Programming II | 2 |
| **General Studies Courses**  |  |  |
| GSP202 | Issues in Peace & Conflict Resolution Studies | 2 |
| GSP208 | Nigerian Peoples and Culture | 2 |
| Any combination of at least 4 units from the electives | 4/5 |
|  |  | 17/18 |
| **Electives**  |  |  |
| ECO 203 | Microeconomic Theory I | 2 |
| MTH224 | Introduction to Numerical Analysis  | 3 |
| MTH242 | Mathematical Methods I  | 3 |
| ECO282 | Structure of Nigerian Economy II  | 2 |

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| **THIRD YEAR STATISTICS** |  |  |
| **FIRST SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| STA 311 | Probability V | 3 |
| STA 341 | Sampling Theory and Survey Methods I | 3 |
|  STA 331 | Inference IV | 3 |
| STA 321 | Distribution Theory | 2 |
| STA 361 | Algebraic Bases for Statistics | 2 |
| STA 371 | Statistical Computing III | 2 |
| **General Studies Courses** |  |
| CED 341 | Introduction to Entrepreneurship | 2 |
| Any combination of at least 4 units from the electives | 4/5 |
|  | 21/22 |
| **Electives**  |  |  |
| STA 325 | Biometrics I | 3 |
| STA 323 | Analysis of Variance | 3 |
| STA 345 | Statistical Quality Control | 3 |
| STA 351 | Demography | 3 |
| STA 357 | Actuarial Statistics I | 2 |
| STA 363 | Operations Research I | 3 |
| STA 365 | Laboratory for Operations Research I | 2 |
| STA 353 | Laboratory for Field work for Demography | 2 |
| STA 347 | Laboratory for Field work for Quality Control | 2 |
| STA 343 | Lab and Field work for Sampling Theory & Survey Methods | 2 |
| COS 334 | System Analysis and Design | 2 |
|  |  |  |
| **SECOND SEMESTER** |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| INDUSTRIAL TRAINING (SIWES) |  |
| STA 382 | Practical | 3 |
| STA 384 | Report | 12 |
|  |  | 15 |

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| **FOURTH YEAR STATISTICS** |  |  |
| **FIRST SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| STA 413  | Stochastic Processes I  | 2 |
| STA415 | Time Series Analysis I  | 2 |
| STA421 | Design and Analysis of Experiment I  | 2 |
| STA423 | Regression Analysis  | 3 |
| Any combination of at least 8 units from the electives  | 8/9 |
|  |  | 17/18 |
| **Electives**  |  |  |
| STA411 | Probability VI  | 3 |
| STA425 | Biometrics II  | 2 |
| STA431 | Bayesian inference I  | 2 |
| STA435 | Non-parametric methods I  | 2 |
| STA433 | Multivariate Analysis I  | 2 |
| STA437 | Psychometrics I  | 2 |
| STA441 | Sampling Theory and Survey Methods II | 2 |
| STA451 | Actuarial Statistics II  | 2 |
| STA461 | Operations Research II | 2 |
| STA463 | Decision Theory  | 2 |
| STA453 | Health Statistics  | 2 |
| STA455 | Environmental Statistics  | 2 |
| STA457 | Educational statistics  | 2 |
| MTH441 | Mathematical methods II  | 3 |
|  |  |  |
| **SECOND SEMESTER**  |  |
| **Course Number** | **Title**  | **Units**  |
| **Major courses**  |  |  |
| STA414 | Stochastic Processes II  | 2 |
| STA422 | Design and Analysis of Experiments II  | 2 |
| STA416 | Time Series Analysis II | 2 |
| STA492 | Project |  6 |
| CED342 | Business Development & Management |  2 |
| Any combination of at least 6 units the electives  | 6/7 |
|  |  | 20/21 |
| **Electives**  |  |  |
| STA462 | Operations Research III | 2 |
| STA436 | Non Parametric Methods II | 2 |
| STA426 | Biometrics III | 2 |
| STA432 | Bayesian Inference II | 2 |
| STA434 | Multivariate Analysis II  | 2 |
| STA438 | Psychometrics II  | 2 |
| STA466 | Laboratory for Operations Research II  | 2 |
| STA452 | Medical Statistics  | 2 |
| STA454 | Energy Statistics  | 2 |
| MTH322 | Elements of Differential Equations II  | 3 |

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| **FIRST YEAR STATISTICS/ECONOMICS** |  |  |
| **FIRST SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| STA111 | Probability I | 2 |
| STA131 | Inference I | 2 |
| ECO101 | Principles of Economics I | 2 |
| ECO171 | Introduction to Business Management I | 2 |
| **Required Ancillary Courses**  |  |  |
| MTH111 | Elementary Mathematics I | 3 |
| MTH121 | Elementary Mathematics II  | 3 |
| COS101 | Introduction to Computer Science I  | 2 |
| **General Studies Courses**  |  |  |
| GSP101 | The Use of English I | 2 |
|  GSP111 The Use of Library and Study Skills | 2 |
| Any combination of 2 units from the electives | 2 |
|  |  | 22 |
| **Electives**  |  |  |
| ECO131 | Introduction to Economics Statistics I | 2 |
| PHY123 | General Physics for Physical Sciences  | 2 |
| AGR201 | Introduction to Agriculture | 2 |
|  |  |  |
| **SECOND SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| STA112 | Probability II | 2 |
| STA132 | Inference II | 2 |
| STA172 | Statistical Computing I  | 2 |
| ECO102 | Principles of Economics II  | 2 |
| ECO172 | Introduction to Business Management II | 2 |
| **Required Ancillary Courses**  |  |  |
| MTH122 | Elementary Mathematics III | 3 |
| **General Studies Courses**  |  |  |
| GSP 102 | The Use of English II | 2 |
| Any combination of at least 2 units from the electives  | 2/3 |
|  |  | 17/18 |
| **Electives**  |  |  |
| MTH132 | Elementary Mechanics I  | 3 |
| PHY134 | General Physics for Physical Sciences II  | 2 |
| PHY154 | General physics for Physical Sciences III | 2 |
| ECO132 | Introduction to Economics Statistics II | 2 |
| ECO122 | Introduction to Business Accounting  | 2 |

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| **SECOND YEAR STATISTICS/ECONOMICS** |  |  |
| **FIRST SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| STA211 | Probability III | 2 |
| STA 231 | Inference III | 3 |
| ECO201 | Microeconomic Theory I  | 2 |
| ECO203 | Macroeconomic Theory I  | 2 |
| ECO281 | Structure of Nigerian Economy I  | 2 |
| **Required Ancillary Courses**  |  |  |
| COS201 | Computer Programming I  | 2 |
| MTH215 | Linear Algebra I | 2 |
| **General Studies Courses**  |  |  |
| GSP201  | Basic Concepts & Theory of Peace  | 2 |
| GSP207 | Logic, Philosophy and Human Existence  | 2 |
|  |  | 19 |
|  |  |  |
| **SECOND SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| STA 212 | Probability IV | 2 |
| STA272 | Statistical Computing II  | 2 |
| ECO 202 | Microeconomic Theory I | 2 |
| ECO204 | Macroeconomic Theory II | 2 |
| ECO282 | Structure of Nigerian Economy II  | 2 |
| **Required Ancillary Courses**  |  |  |
| MTH222 | Elementary Differential Equation I | 3 |
| COS202 | Computer Programming II | 2 |
| **General Studies Courses**  |  |  |
| GSP202  | Issues in Peace & Conflict Resolution Studies | 2 |
| GSP208 | Nigerian Peoples and Culture  | 2 |
|  |  | 19 |

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| **THIRD YEAR STATISTICS/ECONOMICS** |  |  |
| **FIRST SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
|  STA331 | Inference IV | 3 |
| STA341 | Sampling Theory and Survey Methods | 3 |
| STA363 | Operations Research I | 3 |
| STA371 | Statistical Computing III | 2 |
| ECO301 | Intermediate Microeconomic Theory I | 4 |
| ECO361 | Development Economics | 2 |
| ECO391 | Research Methods in Economics I | 2 |
| **Required Ancillary Courses**  |  |  |
| STA321 Distribution Theory 2**General Studies Courses**CED341 Introduction to Entrepreneurship 2  |
|  |  | 23 |
|  |  |  |
| **SECOND SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| INDUSTRIAL TRAINING (SIWES) |  |
| STA 382 | Practical | 3 |
| STA 384 | Report | 12 |
|  |  | 15 |
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| **FOURTH YEAR STATISTICS/ECONOMICS** |  |  |
| **FIRST SEMESTER** |  |  |
| **Course Number** | **Title** | **Units**  |
| **Major Courses**  |  |  |
| STA415 | Time Series Analysis I  | 2 |
| STA423 | Regression Analysis  | 3 |
| STA433 | Multivariate Analysis I | 2 |
| STA461 | Operations Research II | 2 |
| ECO401 | Advance Microeconomic Theory and Policy I | 2 |
| ECO403 | Advance Macroeconomic Theory and Policy I | 2 |
| ECO461 | Problems and Policies of Development | 2 |
| ECO465 | Economic Planning I | 2 |
| ECO475 | Project Evaluation I | 2 |
|  |  | 19 |
|  |  |  |
| **SECOND SEMESTER**  |  |  |
| **Course Number** | **Title**  | **Units**  |
| **Major courses**  |  |  |
| STA416 | Time Series Analysis II | 2 |
| STA434 | Multivariate Analysis II  | 2 |
| STA462 | Operations Research III | 2 |
| ECO402 | Advance Microeconomic Theory and Policy II | 2 |
| ECO404 | Advance Macroeconomic Theory and Policy II | 2 |
| ECO466 | Economic Planning II | 2 |
| ECO476 | Project Evaluation II | 2 |
| STA492 or ECO492 Project 6**General Studies Courses**CED342 Business Development and Management 2 |
|  |  | 22 |

THREE YEAR STANDARD PROGRAM FOR DIRECT ENTRY STUDENTS

The three year degree programme is the same as the four year standard programme excluding the first year. However, the direct entry students are required to take GSP 101 and GSP 102 (The Use of English) and either GSP201 and GSP202 or GSP207 and GSP208 during their first year.

**COURSE DESCRIPTIONS**

 **STA 111 Probability I 2 Units**

Elementary set theory. Techniques of counting, sample space and Events. Basic notions of probability; definition, axioms and laws. Simple conditional probability and independence.

**STA112 Probability II 2 Units**

One dimensional random variables, (discrete and continuous): definition, moments and their distributions. Applications to Bernoulli, Binomial, Geometric, Poisson, Normal, Exponential and Hyper-geometric distributions

**STA131 Inference I 2 Units**

Statistical Data: sources, collection, presentation and analysis. Measures of central tendency and dispersion, skewness. Moments and kurtosis. Index numbers and demographic measures.

**STA132 Inference II 2 Units**

Elementary Time Series Analysis. Sampling and Statistical Inference: standard error and sampling distributions of the mean and proportion. Tests of significance for means and proportions. Simple linear regression and correlation.

**STA 172 Statistical Computing I 2 Units**

Generation of data using table of random numbers. Presentation and analysis of data. Computations using calculator involving measures of central tendency and dispersion, time series, index numbers, simple linear regression and correlation. Test of significance (one sample only)

**STA 201 Statistics for Social Sciences II 2 Units**

Sources, collection, analysis and presentations of data. Index numbers, elementary analysis of time series, simple linear regression and correlation. Elementary non parametric tests.

**STA 202 Statistics for social sciences II 2 Units**

 Introductory probability. Binomial, Normal and Poisson distributions. Interval estimation and test of significance. Association of Attributes.

**STA 203 Statistics for Agricultural and Biological sciences I 2 Units**

Initial steps in planning of biological experiments. Methods of data collection, presentation and analysis. Measures of central tendency and dispersion. Frequency distributions. Elementary probability. Discrete and continuous distribution: Binomial, Poison, Normal and exponential distributions etc. Interval estimation.

**STA 204 Statistics for Agricultural and Biological Sciences I 2 Units**

Tests of significance. Student t test and x2 test. Two sample test and paired comparison. Regression and correlation. Analysis of variance: one way, two way (no interaction). Latin square analysis. Multiple range tests. Analysis of covariance. Simple analysis of direct assays.

**STA 205 Statistics for Physical Sciences & Engineering I 2 Units**

Frequency Distributions. Elements of Probability. Discrete probability distributions: Binomial, Poisson, Geometric and Hyper-geometric. Continuous probability distributions: Normal, Student’s t, Chi-square (x2) and F. combinational and moment generating functions.

**STA 206 Statistics for Physical Sciences & Engineering II 2 Units**

Estimation: point and interval. Test of significance. Regression and correlation. Analysis of variance: one- way and two-way (no interaction).

**STA 211 Probability III 2 Units**

Combinatorial analysis. Probability models for the study of random phenomena in finite sample spaces up to and including Bayes Theorem. Probability distribution of Discrete and Continuous two-dimensional random variables. Expectation and Univariate moment generating functions. Truncated distributions.

**STA 212 Probability IV 2 Units**

Tchebychev’s inequality. Normal approximation to Binomial distribution. Bivariate, marginal and conditional distributions and their moments, Convolution of two distributions.

**STA 231 Statistical Inference III 3 Units**

Estimation: point estimation by method of moments, maximum likelihood and least square. Properties of estimators: Unbiasedness, Efficiency, Consistency (definition only). Interval Estimation: Confidence interval for proportions, means, variance and variance ratio. Test of significance: Tests based on normal, t, chi-square and F distributions with regard to means, proportions, variance. Tests for independence of attributes and goodness-of-fit.

**STA 272 Statistical Computing II 2 Units**

Use of computer software packages (Minitab, execl) on probability and inference.

**STA 311 Probability V 3 Units**

Probability Generating function. Bivariate Normal distribution: conditional and marginal densities, bivariate moment generating functions, characteristic function and Inversion formula. Various modes of convergence. Central limit theorem. Elements of measure. Field of sets, fields, measure functions probability measure and probability space. Introduction to Markov chains: basic concepts, state and parameter space, transition probabilities.

**STA 321 Distribution Theory 2 Units**

Bivariate Normal Distribution, the gamma, chi-square, 2 types of Beta, F and t distributions. Distribution of functions of random variables - sums, products and quotients. Probability integral transformation. Order statistics and their functions.

**STA 323 Analysis of Variance 3 Units**

Analysis of one, double and multiple classifications of balanced data in crossed and nested arrangements. Analysis of two and three- way contingency tables for test of independence and interactions. Incomplete block designs. Log linear models. Analysis of covariance in one-way, two-way, three way and nested classifications.

**STA 325 ` Biometrics I 3 Units**

Direct Assays: types nature and examples. Precision of estimates, Fiellers theorem, dilution assays and design of direct assays. Indirect Assays: the dose response regression, condition of similarity and monotony. Linearizing transformations and non-linear regression. Parallel line assays: unsymmetrical designs, difference in preparations, potency estimation and fiducial limits and validity test. Approximate and exact analyses for missing entries. Symmetry design for parallel line assays. Efficiency, Reliability and Sensitivity

**STA 331 Inference IV 3 Units**

Criteria of Estimation: unbiasedness, consistency, efficiency, sufficiency and minimum variance (with proofs). Rao-cramer Inequality. Testing of hypothesis: Null and alternative hypothesis, simple, composite hypothesis. Two types of error, critical region, Power size of a test, p- value, Neyman-Pearson Theorem. Most powerful test, and likelihood ratio test.

**STA 341 Sampling Theory & Survey Methods I 3 Units**

Basic sample selection procedures. Estimation of population mean, total and proportions in simple random sampling with and without replacement. Use of auxiliary information (ratio, regression and difference estimators). Stratification: Estimation of mean total population in stratified random sampling. Sample size allocation. Cluster sampling. Two stage Cluster sampling with clusters of equal sizes. Data collection in (social investigations). Methods of social investigations. Planning of surveys. Methods of collecting information. Questionnaire design. Response errors, processing analysis and presentation of data.

**STA 343 Lab. for Sampling & Survey Methods 2 Units**

Computations involving Stratification. Ratio and regression estimates, cluster and two stage sampling, Field Work.

**STA 345 Statistical Quality Control 3 Units**

Concept of quality and meaning of control. Specifications: Control limits and specifications, process spread and specifications. Control charts: for variables and attributes: Determination of process capability and standard CuSuM charts. Acceptance sample inspection by attributes: single, double and multiple sampling plans

**STA 347 Lab & field work for quality Control I 2 Units**

Practical construction of control charts. Computations involving tolerance limits, simple, multiple and sequential sampling plans. Use of the Poisson approximation to design sampling plans for the producers and consumers risk method. Design and analysis of various rectification schemes.

**STA 351 Demography 3 Units**

Sources of demographic data: Census and vital registration. Rates and ratios. Study of mortality. Construction of Life tables Expectation of life. Measure of fertility and morbidity. Population growth and projection. Migration and the population distribution – interpretation of population parameters from defective data. Stable and quasi stable populations.

**STA 353 Laboratory & Filed Work for Demography 2 Units**

Computations involving mortality and fertility rates, life tables and population growth.

**STA 357 Actuarial Statistics I 2 Units**

Effective rate of interest- Normal rate of interest, Force of interest. Relationship between i.i(m) and Present Value. Elective and normal rate of Discount. Present value of immediate Annuity, annuity due, increasing and decreasing Annuities, Continuous Annuity. Accumulation of Annuities increasing by step and continuously. Repayment of loan by equated installments (Annuity and Sinking funds). Capital and Interest Element contained in the t-th installment. Purchase price of annuities, net of Tax- Loan Schedules.

**STA 361 Algebraic Basis for Statistics 2 Units**

Vectors: Norms, scalar and cross products. Vector spaces: Basis and dimension. Matrices: elementary operation with matrices and vectors, rank, determinants, linear equations, orthogonality. Bilinear and quadratic forms, eigensystem. Differentiation with vector and matrices.

**STA 363 Operations Research I 3 Units**

The Nature of Operations Research: History, meaning and models. Classical methods of optimization: maxima and minima, Lagrange’s Multipliers, Convex set and functions. Linear Programming: formulation and Analysis using graphs. Simplex and revised simplex methods. Duality Theory and Applications. Sensitivity Analysis in Linear Programming.

**STA 365 Laboratory for Operations Research I 2 Units**

Problem formulation involving linear programming applications. Computations involving simplex and revised simplex algorithms, graphs.

**STA 371 Statistical Computing III 2 Units**

Use of computer packages (GENSTAT, SPSS) and other current packages on topics in Inference (IV), ANOVA, Operations Research, Regression and many other applicable areas.

**STA 382 Practical on Industrial training 3 Units**

Practical work engaged in during the Industrial Training.

**STA 384 Report on Industrial Training 12 Units**

Report to be presented after the Industrial Training.

**STA 411 Probability VII 3 Units**

Probability spaces, measures and distributions. Product spaces: product of measurable spaces, product probabilities. Random variables as measurable functions. Independence and expectations of random variables. Convergence of random variables: Weak convergence, convergence almost everywhere, a convergence in p-th mean. Central Limit Theorem. Characteristics function and Laplace transforms. Inversion formula.

**STA 413 Stochastic Processes I 2 Units**

Random walk: simple and general random walk with absorbing and reflecting barriers. Markovian processes with finite chains. Branching processes Poisson process, relevant applications.

**STA 414 Stochastic Processes II 2 Units**

Birth and Death Processes. Queuing Processes: M/M 1, M/M/S, M/C and G/M/I Queues and their waiting time distributions. Diffusion Process. Relevant applications

**STA 415 Time Series I 2 Units**

Components of Time Series, measurement of trend, the seasonal index, the cyclical component and random fluctuations, serial correlation, Correlogram.

**STA 416 Time Series II 2 Units**

Stationary Time Series: Second order Stationarity, the autocorrelation function. Autoregressive process, Moving Average Processes of mixed models. Integrated Models. Estimation of the Parameters, Forecasting and Spectral density.

**STA 421 Design & Analysis of Experiment I 2 Units**

Meaning, Need, Purpose and Basic Principles of Experimental Design. Efficient design: Randomization, replication and blocking, local control. Basic designs: Completely randomized design (CRD). Randomized complete block design (RCBD), Latin square. Relative efficiency, missing values. Multiple comparisons. Departures from underlying assumptions. Examples from agriculture, biology and industry.

**STA 422 Design and Analysis of Experiment II 2 Units**

BIB designs, and factorial experiments. Split-plot design. Expected mean square (EMS)

rules, 2n factorial designs: Yates algorithm, confounding, fractional replication.

Applications with real life data. Introduction to response surface methodology.

**STA 423 Regression Analysis 3 Units**

Simple linear and multiple regression. Inference on regression parameters.

Polynomial regression. Examination of residuals, use of dummy variable.

Reparametrization of non-linear models. Partial, total and multiple correlation ratio. Generalized least squares. Prediction from regression. Multicollinearity, autocorrelation and Hereroseedasticity; Durbin-Watson test, Outliers, Selection of the best regression equation. Simple treatment of logistic regression.

**STA 425 Biometrics II 2 Units**Slope ratio assays: the power dose metameter, multiple regression equation. Analysis of variance and validity tests. Symmetrical (2K+1) point design. Comparison of assay techniques.

**STA 426 Biometrics III 2 Units**

Multiple assays: economy of multiple assays, multiple slope ratio assays and Design of multiple assays. Distribution of responses between preparations. Composite responses, the discriminant problem examples of an assay using a Discriminant function; discriminants and concomitants; the economies of Discriminant analysis.

**STA 426 Bayesian Inference I 2 Units**

Bayes’ theorem. Posterior distributions. Point estimation with the loss functions. Squared error loss, absolute error loss and zero one loss. Interval estimation, shortest, highest posterior density (HPD), equal tail and one tail interval, prediction of a future observation. Choice of prior: natural conjugate family of priors (NCP) and non-informative priors (NIP). Application to some standard one and two-parameter problems.

**STA 432 Bayesian Inference II 2 Units**

Comparison of the means and variances of two normal and two Poisson distributions.

Linear regression: joint and marginal posterior distributions of regression parameters for normally distributed regressor variables. Tests of hypothesis: Jeffrey’s methods and decision theoretic approach. Applications

**STA 433 Multivariate Analysis I 2 Units**

The multivariate normal distribution: definition, generating function, conditional distribution of the estimates. The Hotelling’s distribution, Wishart distribution. Inference about mean vectors: one sample and two sample cases. Tests of independence

**STA 434 Multivariate Analysis II 2 Units**

Classification: the linear discriminant function for two groups, errors of Misclassification and estimation of misclassification probabilities. Principal components: meaning, computation and interpretation; sampling properties. Factor analysis: model for factor structure, estimation of factor loadings, factor rotation applications.

**STA 435 Non-Parametric Method I 2 Units**

Nonparametric versus parametric inference. Distribution-free Statistics. Order Statistcs and their distributions, Kolmogorov type of test statistics. Common nonparametric tests including Runs, signs and ranks in one and two sample problems. Exact and asymptotic methods.

**STA 436 Non-Parametric Methods II 2 Units**

“Rank” estimates of location in one and two sample problems. Rank test applied to C(>2) samples: Kruskal-Wallis and Friedman tests. Rank test in simple linear regression and correlation. Sample cases. Tests of independence.

**STA 437 Psychometrics I 2 Units**

Foundations of mental measurement theory: measurements in psychology and education/construction of true scores: the classical test theory model: basic equations for test of fixed length and for homogeneous test for variable length. Composite test, Fact affecting measurement precision, estimation and predication. Estimate of parameters of the classifical model.

**STA 438 Psychometrics II 2 Units**

Other weak true-score models. Some test theory for imperfectly parallel measurements, types of reliability coefficients and their estimation. Some test theory for equivalent measurement, item sample in test theory and in research design. Applications

**STA 441 Sampling Theory & Survey Methods II 2 Units**

Unequal probability sampling; probability proportional to size with replacement and probability proportional to size-systematic selections (with cluster of unequal size)

Multistage sampling. Estimation totals, ratio. Double sampling for ratio and regression estimation. Gains in precision due to stratification, post stratification Domain estimation.

Practical examples.

**STA 451 Actuarial Statistics I 2 Units**

Investment and appraisal techniques; analysis of experiments, data and derivation of exposed to risk formulae. Graduation methods (and their application to curve fitting). Construction of mortality, sickness, multiple decrements and similar tables with application to life insurance.

National social security and pension schemes. Stochastic interest rate models. Independent annual interest rates. Mean and variance of Sn An and simple problems associated with these.

**STA 452 Medical Statistics 2 Units**

Scope and nature of medical statistics, epidemiology methods; relative risks and odds ratios adjustment of data with and without use of multivariate models, cohort studies. (life tables) competing risks survival analysis. Sequential methods in clinical trial. Stochastic models in epidemiology and other areas.

**STA 453 Health Statistics 2 Units**

Scope and types of health statistics, classification of diseases, injuries and causes of death. Sources and method of collecting health statistics; census, sample surveys, vital registration and administrative statistics. Health indicators: types, uses and problems. Health planning and financing. Health information system. Operation research in the health services.

**STA 454 Energy Statistics 2 Units**

Energy source: renewable and non-renewable. Nature, scope and uses of Energy Statistics. Concepts, definition and units of measurement in use in Energy Statistics. Energy production and consumption survey. Data requirements and the procedure for developing an energy database. Constructing an energy balance sheet with Nigeria as a case study. Modeling energy supply and demand.

**STA 455 Environmental Statistics 2 Units**

Scope, nature and sources of environmental Statistics. Assessment of environmental quality and measurement of air and water pollution. Sampling method in natural and applied sciences. Environmental impact assessment. Requirement for environmental reporting system. Characteristics and uses of the United Nations framework for the development of environmental statistics. Capacity development for environmental reporting system.

**STA 457 Educational Statistics 2 Units**

Source, nature and uses of educational Statistics. Sources and methods of collecting

educational statistics. Educational indicators. Design of educational information systems, educational models and performance of flows (flows, manpower etc.) evaluation. Multivariate methods in educational analysis, Operations research in educational management.

**STA 461 Operations Research II 2 Units**

Game theory: two persons; zero sum games, saddle point, dominance and strategies. Mathematical programming: non-linear programming, integer programming, dynamic programming. Theory of reliability: reliability function, active and passive reliability; reliability of systems in series, in parallel, and voting. Hazard rate. Mean time to failure.

**STA 462 Operation Research III 2 Units**

Optimization. Network analysis: network flows: transportation problem. Assignment problem, maximal flow problem, critical path method (CPM) and Project Evaluation and Review Technique (PERT).

**STA 463 Decision Theory I 2 Units**

Formulation of decision-theoretic problems, comparison between game theory and decision theory. Risk, utility, loss and decision function.

**STA 464 Decision Theory II 2 Units**

Admissibility and completeness. Minimax and Bayes solution, Invariant statistical problems. Applications.

**STA 466 Laboratory for Operations Research II 2 Units**

Exercises on problem formulation in applications of Operations Research. Computations in mathematical programming, dynamic programming, integer programming, non-linear programming, network analysis and game theory.

**STA 492 Project 2 Units**

Each final year student is expected to produce an acceptable first hand study of an approved topic under staff supervision. The project should be based on some of the theories and techniques covered in the courses.