NATIONAL COUNCIL OF HIGHER EDUCATION (NCHE)

Minimum Standards for Courses of Study in

BACHELOR OF STATISTICS
AND
BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE

July 2007

PREFACE

Section 5(i) of Universities and Other Tertiary Institutions Act 2001, requires the National Council for Higher Education "to ensure minimum standards for courses of study." In arriving at minimum standards for courses of study, Council worked with lecturers and professors from universities who recommend to Council what they thought was the minimum body of knowledge for which a degree in a particular programme can be awarded. The operative word is "minimum" and it is at this level that Council has set the standards for these courses of study.

This is done in compliance with the section of the Act quoted above but also fully aware of the objects of the Universities and Other Tertiary Institutions Act 2001, Section 3

"The objects of this Act are to establish and develop a system governing institutions of higher education in order to equate qualifications of the same or similar courses offered by different institutions of higher education while at the same time respecting the autonomy and academic freedom"

Council holds institutional autonomy and academic freedom for universities as sacrosanct. The standards prescribe the body of knowledge below which universities must not teach. The standards leave the universities with the freedom to design their courses based on the minimum standards. The universities are free to add to these minimum course contents to meet their vision, mission and individual uniqueness. When this has been done, universities can then bring their courses and programmes to Council for accreditation. Again the law requires that all courses must be accredited by Council.

Council is grateful to lecturers and professors who have helped in the process of establishing the minimum standards for courses of study.

A.B.K Kasozi
EXECUTIVE DIRECTOR

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MINIMUM STANDARDS FOR
BACHELOR OF STATISTICS PROGRAMME

2.0 NOMENCLATURE

A successful graduate will be awarded a degree of Bachelor of Statistics of the respective University.

3.0 DURATION

The Bachelor of Statistics degree is a three-year programme.

4.0 PHILOSOPHY OF BACHELOR OF STATISTICS PROGRAMME

The Statistician has to be equipped with knowledge and skills to be able to collect data, analyze, interpret, present, prepare reports, store and disseminate information through meetings, workshops, and seminars and advise management on policy matters based on information. The knowledge and skills are acquired through both theoretical and practical training, research and experience.

5.0 PURPOSE OF THE MINIMUM STANDARDS

The main reasons for setting minimum requirements of the programme include:

a. Providing a means for the academic community to describe the nurture and characteristics of programmes in Statistics;

b. Representing general expectations about the standards for the award of Bachelor of Statistics and articulating capabilities that those possessing the qualification should be able to demonstrate;

c. Serving as an important external source of reference for higher education institutions when new programmes are being designed and developed for the Bachelor of Statistics Programme;

d. Providing general guidance for articulating the learning outcomes associated with the programme;

e. Providing for variety and flexibility in the design of programmes and encouraging innovations within an agreed overall framework;

f. Enabling the learning outcomes specified for a particular programme to be reviewed and evaluated against agreed general expectations about standards;

g. Serving as one of the external source of information for academic review and for making judgment about minimum standards being met;

h. Helping the regulatory bodies like, the NCHE, the Uganda Statistical Society in monitoring the institutions training Statisticians in Uganda;

i. Assisting NCHE in ensuring that these minimum standards are maintained and continually improved on by all training institutions;

j. Guiding in the creation and weighting of specific courses which will be used in designing a credit system that should ease the transfer of students between training institutions and related programmes; and

k. Maintaining the quality of training of Statisticians in Uganda.

6.0 MINIMUM ADMISSION REQUIREMENTS

Qualification for admission to the programme is through any of the following avenues.

6.1 Direct Entry

In order to be admitted on the Programme under this scheme the candidate must meet entry requirements set by NCHE.

In addition:

- Mathematics, Pure Mathematics, Considered as essential,
- Economics, is relevant,
- General paper and subsidiary in mathematics and any one best done of Chemistry, Geography, Physics and Biology are considered as desirable.

6.2 Professional Statistics Diploma

A candidate must have obtained a good pass at Intermediate Professional level in Statistics from the Eastern Africa Statistical Training Center, Dar es Salaam or its equivalent.

Applicants with at least a credit or above in a professional Diploma in Statistics from the Eastern African Statistical Training Center may be allowed to join from the 2nd year of the Bachelor of Statistics programme. The decision to admit such an applicant into the second year shall be made on a case-by-case basis.

6.3 Other Diploma Holders

A candidate must have obtained a diploma from a recognized institution of higher learning. The Diploma programme must have involved Mathematics as a major subject. Applicants admitted under this avenue under go a 3 year training.

6.4 Mature Age

Candidates who do not have any of the above qualifications will be required to take special Mature Age entrance examinations in aptitude and specialized knowledge. Applicants admitted under this avenue under go a 3 - year training.

7.0 LEARNING OBJECTIVES/OUTCOMES OF BSTAT PROGRAMME

The students must demonstrate at graduation are:

7.1 All BSTAT Graduates

a. Conduct independent research and prepare research reports;

b. Use a number of computer applications especially statistical packages to manage and analyze data;

c. Develop and implement customized computer programmes to address different client needs;

d. Conduct monitoring and evaluation studies;

e. Identify appropriate statistical methods to solve various practical problems.

7.2 Applied Statistics Option

a. Capable of conducting studies in biostatistics,

b. Capable of collecting and preparing agricultural statistics,

c. Collect and analyse balance of payments and export statistics

d. Collect and analyse price statistics and distributive trade statistics

e. Capable of conducting studies in financial sector

7.3 Statistical Computing Option

a. Manage computer networks;

b. Set up and manage a relational database;

c. Capable of conducting Systems Analysis;

d. Develop and implement tailor made software;

e. Develop and implement statistical software.

7.4 Development Planning Option

a. Capable of formulating and estimating economic models;

b. Conducting studies of economics nature;

c. Capable of conducting studies in financial sector.

8.0 ACADEMIC COURSE CONTENT

The academic content shall be organized into two levels of training. Level one is for mainly introductory courses while level two caters for the more advanced courses. The Training Institutions will structure their curricula to meet the semester/term system load requirements.

Areas of Specialization

1.1 Bachelor of Statistics   **152 Credit Units**

Year I	Courses		
o	Descriptive statistics	30 CH	2 CU
o	Official statistics	30 CH	2 CU
o	Time Series and Index Numbers	45 CH	3 CU
o	Elementary French I	45 CH	3 CU
o	Introduction to Information & Communication Technology	45 CH	3 CU
o	Micro-economics I	45 CH	3 CU
o	Calculus I	45 CH	3 CU
o	Linear Algebra I	45 CH	3 CU
o	Statistical Organization	30 CH	2 CU
o	Probability Theory I	45 CH	3 CU
o	Statistical Inference I	45 CH	3 CU
o	Elementary French II	45 CH	3 CU
o	Macro Economics I	45 CH	3 CU
o	Principles of Development Economics	45 CH	3 CU
o	Calculus II	45 CH	3 CU
o	Non Parametric Statistics	30 CH	2 CU
o	Accounting I	45 CH	3 CU
o	Sociology I	30 CH	2 CU
o	Statistics Practical I	30 CH	2 CU

o Workshop on Data Processing	75 CH	5 CU

Year I Total Credit Units = 56

Year II   Courses

o Probability Theory II	45 CH	3 CU
o Statistical Inference II	45 CH	3 CU
o Sampling Theory	45 CH	3 CU
o Industrial Statistics	30 CH	2 CU
o Time Series Analysis	30 CH	2 CU
o Micro-Economics II	45 CH	3 CU
o Farm Management and Production Economics		
	45 CH	3 CU
o Real Analysis I	45 CH	3 CU
o Linear Algebra II	45 CH	3 CU
o Introduction to computer Programming	45 CH	3 CU
o ANOVA and Experimental Design	30 CH	2 CU
o Macro-Economics II	45 CH	3 CU
o Industry Economics	45 CH	3 CU
o Research Methods	30 CH	2 CU
o Statistics Practical II	30 CH	2 CU
o Differential Equations	45 CH	3 CU
o Linear Programming I	45 CH	3 CU
o Energy and Environmental Statistics	30 CH	2 CU
o Regression Analysis	45 CH	3 CU
o Workshop on Socioeconomic Surveys	75 CH	5 CU

Year II Total Credit Units = 56

Year III   Core Courses

o Econometric Methods	60 CH	4 CU
o Multivariate Analysis	45 CH	3 CU
o National Accounts and Income Analysis	45 CH	3 CU
o Industrial Statistical Modeling	30 CH	2 CU
o Monitoring and Evaluation	45 CH	3 CU
o Elements of Development Planning	45 CH	3 CU
o Research Project	30 CH	2 CU
o Statistics Practical III	30 CH	2 CU

Applied Statistics Option

o Agricultural Statistics	45 CH	3 CU
o Demographic and Social statistics	45 CH	3 CU
o Biostatistics	45 CH	3 CU

o External Trade and Balance of Payments 30 CH 2 CU
o Price Statistics, Distributive Trade and Services
   Statistics 30 CH 2 CU
o Financial Statistics 30 CH 2 CU

Development Planning Option
o Human Resource Planning 60 CH 4 CU
o Economic Dimensions of Development 30 CH 2 CU
o Theory and Analysis of Economic Development
   45 CH 3 CU
o Social Dimensions of Development 45 CH 3 CU
o Stabilization and Structural Adjustment 45 CH 3 CU

Statistical Computing Option
o Computer Architecture 30 CH 2 CU
o Software Engineering 30 CH 2 CU
o Operating Systems and Data Communications
   30 CH 2 CU
o Systems Analysis and Design 45 CH 3 CU
o Operations Research 30 CH 2 CU
o Computer Networking 30 CH 2 CU
o Database Management Systems 30 CH 2 CU
o Management Information Systems 30 CH 2 CU

Year III Total Credit Units

Applied Statistics = 40
Development Planning = 40
Statistical Computing = 42

BACHELOR OF STATISTICS

1. **Course Name:** **Descriptive Statistics**
2. **Course Level: 1**
3. **Credit Units: 2CU Credit Hours:** **30 hrs**

4. Brief Description

Descriptive statistics is an introductory course covering main aspects of describing and summarizing data, basic statistical concepts, Univariate frequency distributions, graphical presentations, measures of central tendency and dispersion, sample moments, Bivariate frequency distribution and introduction to regression and correlation.

5. Course Objectives

By the end of this course students should be able to:
- Understand the main aspects of describing a data set and understand basic statistical concepts.
- Understand sources of statistical data and methods of data collection.
- Summarize different types of data using appropriate methods.
- Calculate different measures of location and dispersion and be able to interpret them.

6. Detailed Course outline

1.1 Introduction **(2hrs)**
- Definitions
- Main aspects of describing a data set
- Role of statistics in scientific inquiry
- Basic statistical concepts: population, sample, parameter, statistics, sampling and non-sampling errors

1.1 Statistical Data **(5hrs)**
- Sources of statistical data
- Methods of data collection
- Classification of data
- Methods of data presentation (Tabular, Graphical, Diagrammatical)

1.1 Univariate Frequency Distribution and its Graphical Presentation
(5hrs)
- Simple frequency distribution
- Grouped frequency distribution
- Histogram, Frequency polygon, and cumulative frequency curves

6.4 Measures of Central Tendency/Location and Dispersion   **(12hrs)**
- Measures of Central Tendency
    - o   Mean
    - o   Mode
    - o   Median
- Measures of Dispersion
    - o   Measures of absolute dispersion
    - o   Measures of relative dispersion
- Recalculation of the mean and standard deviation
- Pooled mean and pooled variance

6.5 Sample Moments   **(2hrs)**
- Definition
- Skewness
- Kurtosis

6.6 Bivariate Frequency Distribution   **(2hrs)**
- Marginal distribution
- Conditional distribution

6.7 Introduction to Regression and correlation   **(2hrs)**
- Scatter diagram
- Fitting simple linear regression equation
- Spearman rank correlation and Pearson product moment correlation coefficients

7. Mode of Delivery
Lectures (30 LH)

8. Ways of Assessment
Coursework's and tests	40%
Exam	60%

9. Key Reading List

The reading list will include but not limited to the following texts

Freund, J.E, Williams, F.J. and Perles, B.M. (1993), <u>Elementary Business Statistics</u>, 6<u>th Edition, Prentice Hall, Inc.</u>
Walpole, R.E (1982). <u>Introduction to Statistics</u>, London, Collier Macmillan Ltd.
Lyman, R.O and Longnecker, M (2001). <u>An introduction to statistical methods</u>

and data analysis, 5th Edition, 511 Forest Lodge Road, Pacific Grove, CA 93950 USA, Wadsworth Group.

1. Course Name: Time Series And Index Numbers
2. Course Level: 1
3. Credit Units: 3 CU Credit Hours: 45 hrs

4. Course Description
In this course we review techniques that are useful for analyzing data collected over a period of time while Index Number analysis is useful when forecasting future events and compilation of various indices like consumer price index etc.

5. Course Objectives
The main objective of this course is to help students apply their knowledge of statistics to find solutions to real life problems. The student will be able to:

- Identifying the various components of a time series and be able to isolate them;
- Fitting different time series models;
- Forecast (predicting future values of the time series);
- Master the various methods of generating indices and apply them to solve practical problems.

6. Detailed Course Curriculum

6.1 Introduction to time series   **(6hrs)**
- Description of time series
- Movements in time series
- Objectives of studying each of the times movements
- Causes of time series Movements

2.2   Decomposition of time series   **(3hrs)**
- Multiplicative Model
- Additive Model

2.2   Adjustments to Time series data   **(6hrs)**
- Calendar Variations
- Population Changes
- Price Changes

2.2   Estimation of a trend Line   **(6hrs)**
- Semi-Average Method
- Least square Method
- Modify Trend Equations

2.2 Fit of other time series equations and curves   **(9hrs)**
- ☐ Parabolic
- ☐ Exponential
- ☐ Modified exponential
- ☐ Logistic
- ☐ Gompertz curve

2.2 Seasonal Variations   **(6hrs)**
- ☐ Simple Average Method
- ☐ Ratio-to-Trend Method
- ☐ Ratio-to-Moving Average Method

2.2 Index Numbers   **(9hrs)**
- ☐ Introduction
- ☐ Uses of Index Numbers
- ☐ Problems Encountered in the Construction of Index Numbers
- ☐ Description of Index Numbers/types of index Numbers
- ☐ Computation of Index Numbers

7. Mode of Delivery
Lectures (30 LH), and Tutorials (15 TH)

8. Ways of Assessment
Coursework's and tests   40%
Exam   60%

9. Reading List

The reading list will include but not limited to the following text:

Croxton and Cowlin, (1965). Introduction to Time Series and Index Numbers

1. Course Name: Probability Theory I
2. Course Level: 1
3. Credit Units: 3 CU Credit Hours: 45 hrs
4. Course Description:

This is an elementary introduction to the mathematical theory of probability for students who possess the prerequisite knowledge of elementary calculus. It attempts to present not only the mathematics of probability theory, but also, through numerous examples, the many diverse possible applications of the subject.

5. Course Objectives
The purpose of this course is to introduce students to a number of important Probability concepts and models in order to:
- Be able to identify and describe outcomes of certain life situations
- Acquire the skills of measuring the likelihood of outcomes of interest
- Obtain the necessary theory required for scientific decision making
- Be able to recognize the probability models in applied areas of economics, health, commerce etc
- Recognize that probability theory identifies with their daily aspirations and offers tools of inquiring into reality.

6. Detailed course curriculum
6.1 Probability and Computational Methods   **(5 Hrs)**
- The History of Probability
- The Nature of Probability Theory
- Interpretation of Probability
- Counting Methods
  - o Multiplication Rule
  - o Permutations
  - o Combinations

6.2 Sets and Probability   **(5 Hrs)**
- Basic Set Theory
  - o Basic Set Operations
  - o Set Rules
- Sample Space and Probability Axioms
  - o Sample Space, Sample Points and Events
  - o The Axioms of Probability

6.3 Conditional Probability And Independence   **(6 Hrs)**
- Conditional Probability
- Independence of Events
- Bayes' Theorem

6.4 Random Variables   **(5 Hrs)**
- Discrete Random Variable
  - o Cumulative Distribution Function
  - o Expected Value of a Random Variable
  - o Expectation of a function of a Random Variable
  - o Variance of a Random Variable
  - o Multinomial random variables

☐ Continuous Random Variable
  o Distribution Function
  o Expectation and Variance of a continuous Random Variable

6.5 Special Discrete Random Variables **(8 Hrs)**
  ☐ Bernoulli and Binomial Random Variable
  ☐ Poisson Random Variable
    o Counts in a length of time, t
    o Poisson Approximation to the Binomial Distribution
  ☐ Hypergeometric Random Variable
  ☐ Negative Binomial Random Variable
  ☐ Geometric Random Variable

6.6 Special Continuous Random Variable **(8 hrs)**
  ☐ Uniform Random Variable on an Interval
  ☐ Normal Random Variable
    o Standard Normal Variable
    o Normal Approximation to the Binomial
    o Normal Approximation to the Poisson
  ☐ Exponential Random Variable
    o Expectation and Variance
    o Cumulative Distribution
  ☐ Gamma Random Variable
    o Gamma Function
    o Expectation and Variance

6.7 Distribution Of A Function Of A Random Variable **(3 hrs)**
  ☐ Change of Variable Technique

6.8 Jointly Distributed Random Variable **(5 hrs)**
  ☐ Discrete Joint Bivariate Mass Function
  ☐ Marginal and Conditional Distributions
  ☐ Conditional Expectation

7. Mode of Delivery
Lectures (45 LH)

8. Ways of Assessment
Coursework's and tests   40%
Exam   60%

9. Reading List

The reading list will include but not limited to the following text:

Bhattacharya J and Johnston R.A. (1977) <u>Statistical Concepts and Methods</u>, John Wiley & Sons, New York.
Feller William(2001). <u>An Introduction to Probability Theory and Its Applications.</u> John Wiley & Sons, New York
Freund J.E and Walpole R.E (1987), <u>Mathematical Statistics,</u> Englewood cliffs, New Jersey: Prentice-Hall, Inc.
Hoel G. Paul (1984). <u>Introduction to Mathematical Statistics</u>, John Wiley & Sons.
Morris H. DeGroot and Mark J. Schervish (2002). <u>Probability and Statsitics</u>, Addison Wesley.
Paul G. Hoel, Sidney C. Port and Charles J. Stone (1971). <u>Introduction to Probability Theory</u>, Houghton Mifflin Company.
Sheldon Ross (1998). <u>A First Course in Probability</u>, Prentice-Hall, Inc, New Jersey.

1. **Course Name: Statistical Inference I**
2. **Course Level: 1**
3. **Credit Units: 3 CU Credit Hours: 45 hrs**
4. **Course Description**

The focus of this introductory course is estimation and hypothesis testing in which we estimate various unknown parameters of the populations. Illustrations of applications in real life are made such as inferences about the mean, measure of variation, and proportions.

5.   Course Objectives
By the end of the course, the students should be able to:

- Select a random sample and determine all possible random samples of a given size from a given population
- Demonstrate that the sample mean is a random variable and determine its sampling distribution and distinguish between the standard deviation and the standard error
- Use appropriate methods to estimate and test hypothesis of the various measures of central tendency and spread and apply the methods to solve practical problems
- Determine appropriate sample sizes for estimating various parameters and differences between parameters in practical problems

6. Detailed Course Outline

6.1   Sampling and Sampling Distributions   **(5Hrs)**
- Random Sampling
- Sampling Distributions
- The Standard Error of the Mean
- The Central Limit Theorem
- Exercises

6.2   Inferences about Population Central Values   **(8Hrs)**
- Introduction and case study-use a practical dataset
- Estimation of the Mean
- Choosing the Sample Size for estimating the Mean
- A Statistical test for the Mean
- Choosing the Sample size for the Mean
- The Level of Significance of a Statistical test
- Inferences about the Mean for a Normal Population, Standard Deviation Unknown
- Exercises

6.3   Inferences Comparing Two Population Central Values **(9Hrs)**
  ☐ Introduction and Case Study-use a practical dataset
  ☐ Inferences about difference between two means: Independent Samples
  ☐ Inferences about difference between two means: Paired Data/samples
  ☐ Choosing Sample Sizes for Inferences about differences between Means
  ☐ Exercises

6.4   Inferences about Population Variances   **(11Hrs)**
  ☐ Introduction and Case Study-use a practical dataset
  ☐ Estimation and Tests for a Population Variance
  ☐ Estimation and Tests for Comparing Two Population Variances
  ☐ Tests for Comparing two Population Variances
  ☐ Exercises

6.5   Inferences about Population Proportions-Categorical Data**(12Hrs)**
  ☐ Introduction and Case Study-use a practical dataset
  ☐ Inferences about a single Population Proportion
  ☐ Inferences about Differences between Two Population Proportions
  ☐ Inferences about Several Population Proportions: Chi-Square Goodness-of-Fit Test
  ☐ The Poisson Distribution
  ☐ Contingency Tables: Tests for Independence and Homogeneity
  ☐ Measuring the Strength of a Relationship
  ☐ Odds and Odds Ratios
  ☐ Exercises

7. Mode of Delivery
      Lectures (45 LH)

8. Ways of Assessment
      Courseworks and tests   40%
      Exam   60%

9. READING LIST
The reading list will include but not limited to the following text:

Bhattacharyya A. K. (1977), <u>Statistical Concepts and Methods</u>, New York, United States, John Wiley & Sons,
Freund J.E and Walpole R.E (1987), <u>Mathematical Statistics,</u> Englewood cliffs, New Jersey: Prentice-Hall, Inc.
Lyman R. O and Longnecker M, (2001), <u>An Introduction to Statistical Methods and Data Analysis</u> 5th Edition, 511 Forest Lodge Road, Pacific Grove, CA 93950 USA, Wadsworth Group,
Walpole R.E. (1982), <u>Introduction to Statistics,</u> New York: Macmillan.

1. **Course Name: Non-parametric Statistics**
2. **Course Level: 1**
3. **Credit Units: 2 CU Credit Hours: 30 hrs**
4. **Course Description**

Non-parametric statistics is part of inferential statistics that is divided into the following eight major topics: sign tests, signed rank tests, rank-sum tests, and Friedman analysis of variance by ranks, runs tests, rank correlation methods, Chi-square tests and Kolmogrov –Smirnov test. This estimation and hypothesis testing for non-normal populations.

5. Course Objectives

By the end of this course students should be able
- Distinguish between parametric and non-parametric methods.
- Carry out different tests of hypothesis using different non- parametric methods.
- Choose appropriate methods and tests/statistics for given problem.

6. Detailed Course outline

6.1 Introduction   **(2Hrs)**
  - Definitions
  - Steps involved in hypothesis testing
  - Advantages and disadvantages of Non-parametric methods

6.2 Sign Tests   **(4Hrs)**
  - One sample test
  - Paired sample test
  - Large sample test

6.3 Signed Rank Test (Wilcoxon)   **(4Hrs)**
  - One sample test
  - Paired sample test
  - Large sample test

6.4 Rank Sum TestsU-Test   **(7Hrs)**
  - o   Small sample test
  - o   Large sample test
  - H-Test
  - o   Small sample test
  - o   Large sample test

6.5 Friedman Analysis of Variance by Rank **(2Hrs)**

6.6 Runs Test **(2Hrs)**
- ☐ Small sample test
- ☐ Runs above and below the median
- ☐ Large sample test

6.7 Rank correlation methods **(3Hrs)**
- ☐ Small sample test
- ☐ Large sample test

6.8 Chi square tests **(4Hrs)**
- ☐ 8.1 Goodness of fit
- ☐ 8.2 Tests of association

6.9 Kolmogrov-Smirnov Test **(2Hrs)**

7. Mode of Delivery
Lectures (25 LH), and Tutorials (5 TH)

8. Ways of Assessment
Courseworks and tests	40%
Exam	60%

9. Reading List

Freund, J.E (1992). <u>Mathematical Statistics.</u> Prentice Hall, New Jersey.
Freund, J.E, Williams, F.J., and Perles, B.M. (1993). <u>Elementary Business Statistic</u> 6th Edition, Prentice Hall, Inc.
Hogg, R.V. and Craig, A.T (1978). <u>Introduction to Mathematical Statistics</u> 4th (ed), London, Collier Macmillan
Walpole, R.E., (1982). <u>Introduction to Statistics</u> 3rd (ed), London, Collier Macmillan.

1. **Course Name: Elements of Mathematics**
2. **Course Level: 1**
3. **Credit Units: 3 CU Credit Hours: 45 hrs**
4. **Course Description:**

The course is divided into the following four major topics: Sets, Mappings and Relations, Number System and Logic and Algebra of Statements

5. **Course Objectives**
   By the end of this course, students should be able to;
   - ☐ Understand concepts, processes, algorithms, and applications found in elementary mathematics and the different connections among them.
   - ☐ Engage in logical problem solving by using logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, and integers.

6. **Detailed Course Curriculum**

1.1   Sets   **(15 Hours)**
   - ☐ Types of Sets
   - ☐ Methods of Proofs in Set Theory
   - ☐ Algebra of Sets
   - ☐ Laws of Set Theory

1.1   Mapping and Rlations   **(10 Hours)**
   - ☐ Mappings & Types of Mappings
   - ☐ Relations & Properties of Binary Relations

1.1   Number System   **(10 Hours)**
   - ☐ Natural Numbers
   - ☐ Integers
   - ☐ Rational Numbers
   - ☐ Irrational Numbers
   - ☐ Real Numbers

1.1   Logic and Algebra of Statements   **(10 Hours)**
   - ☐ Conjunction, Disjunction, Negation, Conditional and Bi-conditional and Tautology
   - ☐ Validity of an Argument and Logic Laws

7. **Mode of Delivery**
      Lectures (45 LH)

8. **Ways of Assessment**

Courseworks and tests   **40%**
Exam   **60%**

9. **Reading List**

1. Course Name: Elementary French I
2. Course Level: 1
3. Credit Units: 3 CU Credit Hours: 45 hrs
4. Course Description

This is an elementary course in French that introduces students to new grammatical aspects of the French Language applicable in their daily lives and or professional milieu. The course is taught from a communication-oriented perspective and grammar is brought in intuitively. It covers greeting someone, introducing oneself and introducing others, asking for and telling time, asking for direction, expressing a wish, booking a room in a hotel, telling the date, buying an item in a shop, telling direction and making an order in a Café or restaurant.

5. Course objectives
By the end of the course students should be able to:
- ☐ Have acquired basic communication skills.
- ☐ Comprehend elementary French grammar
- ☐ Understand French documents in their professional field.
- ☐ Communicate orally and in writing in simple French.

6. Detailed Course Description

6.1 Greeting someone, introducing oneself and introducing others   **(5hrs)**
- ☐ Telling ones name and profession
- ☐ Conjugating common verbs like *s'appeler and être*
- ☐ Introducing personal pronouns

6.2 Asking for and telling time   **(5hrs)**
- ☐ Numbers 1-20
- ☐ Interrogatives phrases

6.3 Asking for Direction.   **(5hrs)**
- ☐ Cardinal points
- ☐ Conjugation of Verbs of motion

6.4 Expressing a wish.   **(5hrs)**
- ☐ The conditional tense (formal)
- ☐ The Negation

6.5 Booking a room in a hotel.   **(5hrs)**
- ☐ Numbers 1-1,000,000
- ☐ Days of the week and months of the year
- ☐ More on interrogative phrases

6.6 Telling the date **(5hrs)**
- ☐ Numbers >1,000,000
- ☐ Telling ones date of birth.

6.7 Buying an item in a shop **(5hrs)**
- ☐ Adjectives
- ☐ Forms of politeness

6.8 Telling direction. **(5hrs)**
- ☐ Cardinal points (revised)
- ☐ Ordinal numbers
- ☐ The Imperative mood.

6.9 Making an order in a Café or restaurant. **(5hrs)**
- ☐ The Imperative mood (continued)
- ☐ Hotel related vocabulary
- ☐ The conditional tense (revised)

7. Mode of Delivery
Lectures, (30 LH), Viewing Video Tapes, and Tutorials (15 TH)

8. Ways of Assessment
Coursework's and tests	40%
Exam	60%

9. Reading List

Girardet Jacky (1996). <u>Panorama 1&2</u>, Paris, CLE International.
Le Goff Claude (1994). <u>Le Nouveau French for Business</u>, Paris, Hatier.
Ma☐a Grégoire et Odile Thiévenaz (2002). <u>Grammaire Progressive du Français</u>, Paris, CLE International.
Monnerie-Goarin A. (1991). <u>Bienvenue en France (Book for Exercises)</u>, Paris, Hatier/Didier.
Monnerie-Goarin A. (1991). <u>Bienvenue en France</u>, Paris, Hatier/Didier.
Valette Jean –Paul (1981). <u>French for Mastery 1</u>, Toronto, DC Heath and Company.
Valette Jean –Paul (1981). <u>French for Mastery 2</u>, Toronto, DC Heath and Company.

1. **Course Name:** **Elementary French II**
2. **Course Level:** **1**
3. **Credit Units:** **3 CU** **Credit Hours:** **45 hrs**
4. **Course Description**

This is also an elementary course in French that builds on the grammatical aspects of the French Language already acquired in the first course unit applicable in students' day-to-day lives and or their professional contexts. The course is taught from a communication-oriented perspective and grammar is brought in intuitively. It covers being able to book a ticket for a train or a plane, making a phone call, talking about ones family, describing an individual, a country, an item, and a tourist site, describing ones daily activities in the context of reflexive verbs and describing ones activities in the past.

5. Course objectives
By the end of this course students should be able to:
- Have their communication basic skills in French enhanced
- Improve core French grammar enable them comprehend texts in French.
- Understand simple French documents in the field of statistics, economics and Demography.
- Communicate orally and in writing in simple technical French.

7. Detailed Course Description

6.1 Being able to book a ticket for a train or a plane **(4hrs)**
- Train classes and the map of major towns in France.
- The near future (aller+infinitif)
- Demonstrative adjectives.

6.2 Making a phone call **(4hrs)**
- The conditional tense of *pouvoir* and *vouloir*
- Pronouns (le, la les, me, te, se, nous…….)

6.3 Talking about ones family **(5hrs)**
- Possessive adjectives (mon, ton, son, sa …….)
- Describing items in ones office.

6.4 Describing an Individual, a country, an item, and a tourist site **(10hrs)**
- Use of statistics to describe the economy, demography etc of a country.
- Use of the comparative form in looking at the statistics of various countries.

6.5 Describing ones daily activities in the context of Reflexive verbs

(8hrs)

- ☐ Reflexive verbs
- ☐ Recounting ones activities in a professional (office) setting in present and past.

6.6 Describing ones activities in the past **(10hrs)**
- ☐ Reading and comprehension of technical documents in the field of statistics
- ☐ Reading and comprehension of texts in French.
- ☐ The Past Tense and the verbs of *avoir* and *être*
- ☐ Writing elementary compositions in the past tense.

7. Mode of Delivery
Lectures, (30 LH), Viewing Video Tapes, and Tutorials **(15 TH)**

8. Ways of Assessment
Course works and tests **40%**
Exam **60%**

9. Reading List

Girardet Jacky (1996). <u>Panorama 1&2</u>, Paris, CLE International.
Le Goff Claude (1994). <u>Le Nouveau French for Business</u>, Paris, Hatier.
Ma☐a Grégoire et Odile Thiévenaz (2002). <u>Grammaire Progressive du Français</u>, Paris, CLE International.
Monnerie-Goarin A. (1991). <u>Bienvenue en France (Book for Exercises)</u>, Paris, Hatier/Didier.
Monnerie-Goarin A. (1991). <u>Bienvenue en France</u>, Paris, Hatier/Didier.
Valette Jean –Paul (1981). <u>French for Mastery 1</u>, Toronto, DC Heath and Company.
Valette Jean –Paul (1981). <u>French for Mastery 2</u>, Toronto, DC Heath and Company.

1. **Course Name: Statistics Practical I**
2. **Course Level: 1**
3. **Credit Units: 2 CU Credit Hours:**   **30 hrs**
4. **Course Description**

This course exposes students to practical applications of the knowledge and skills acquired in four selected courses in statistics over the year. The areas include Time Series and Index Numbers, Descriptive Statistics, Introduction to ICT and Official Statistics.

5. Course objectives
By the end of this course students should be able to:
- Apply the knowledge and skills learnt in addressing practical problems
- Write simple computer application programs,
- Make forecasts of univariate time series

6. Detailed Course Description

6.1 Time Series and Index Numbers Applications   **(15hrs)**

6.2 Descriptive Statistics, Practical Applications   **(15hrs)**

6.3 Official Statistics, Practical Applications   **(15hrs)**

6.4 Introduction to ICT, Programming Applications   **(15hrs)**

7. Mode of Delivery
Demonstrations as part of the lectures and tutorials (TH 30)

8. Ways of Assessment
Exam   **100%**

9. Reading List
- Texts for the respective courses.

1. **Course Name:** **Probability Theory II**
2. **Course Level: 2**
3. **Credit Units: 3 CU Credit Hours:** **45 hrs**
4. **Course Description:**

This course is designed to cover the fundamentals of probability theory so as to be able to describe and analyze the variety of "random" phenomena that occur in the various fields. The course is divided into the following seven major topics, probability, probability Distributions and Probability Densities, mathematical expectation, special Probability Distributions, Special Probability Densities, Functions of Random variables and Sampling Distributions

Pre-requisite: Level 1 Probability Theory I, Calculus I and Linear Algebra I

5. Course Objectives
By the end of this course, students should be able to;
- Build models; develop rigorous probabilistic reasoning and analysis.
- Solve problems in econometrics, finance, quantizing, communicating, estimating, and quality control and related fields.
- Acquire solid foundation in Probability Theory that can serve as the basics for postgraduate studies in statistics, econometrics, finance, and related fields.

6. Detailed Course Curriculum

6.1 Multivariate Distributions   (10Hrs)
- Probability Distributions
- Continuous Random Variables
- Probability Density Functions
- Multivariate Distributions
- Marginal Distributions
- Conditional Distributions

6.2 Mathematical Expectation   (11Hrs)
- The Expected Value of a Random Variable
- Moments
- Markov's and Chebyshev's Inequalities
- Moment-Generating Functions
- Product Moments
- Moments of Linear Combinations of Random Variables
- Covariance & Correlation
- Conditional Expectations & Variance

6.3 Functions of Random variables   (12Hrs)
☐ Distribution Function Technique
☐ Transformation Technique using Jacobians: One variable and Several variables
　　o　Distributions of functions of random variables-Sum, difference, quotient and product. Distribution of the sample mean.
☐ The Moment Generating Function technique.

6.4 Sampling Distributions   (12Hrs)
☐ The Distribution of the Mean
☐ The chi-square Distribution
☐ The t Distribution
☐ The F Distribution
☐ Order statistics.
☐ Laws of Large Number and Central Limit Theorems;
☐ Normal and Experimental failure laws and systems reliability.
☐ Simulation

7. Mode of Delivery
Lectures (LH 30), and tutorials (TH 15)

8. Ways of Assessment
Coursework and tests	40%
Exam	60%

9. Reading List
The reading list will include but not limited to the following texts.

Freund, J.E (1992). Mathematical Statistics, 5th Edition, Prentice Hall, New Jersey.
Hogg R.V. and Craig A.T, (1978). An Introduction to Mathematical Statistics, 4th edition Prentice-Hall
Larsen J. Richard, and Marx L. Morris (1986). An Introduction to Mathematical Statistics and its Applications, 2nd Edition , Prentice Hall, New Jersey.

1. **Course Name:**   **Sample Survey Theory**
2. **Course Level:**   **2**
3. **Credit Units:**   **3 CU Credit Hours: 45 hrs**
4. **Course Description**

Sample surveys are one of the main sources of data used in socio-economic planning and development. Sample survey theory provides the theory of how representative samples from a given population should be drawn at a minimal cost and yet provides the valid estimates of population parameters. It details how challenges involved in design, implementation and data analysis can be handled, and how an efficient design can be arrived at. A large part of sample survey theory has been directly motivated by practical problems encountered in the design and analysis of sample surveys. On the other hand, sample survey theory has influenced practice, often leading to significant improvements.

5. Course Objectives
By the end of the course, the student should be able to:
- Show understanding of the principles of sample survey statistics,
- Design and analyze surveys of moderate complexity,
- Calculate sample sizes necessary to achieve predefined goals;
- Produce estimates and fit models for data obtained through surveys

6. Detailed Course Curriculum

6.1 Sample survey concepts and principles   (6hrs)
- Introduction
- Elementary concepts; definitions; properties of estimators; scope and coverage
- Designing a sample survey investigation; principles, survey organization, types of surveys
- Biases and sampling and non-sampling errors in survey results

6.2 Simple Random Sampling   (9hrs)
- Design (with and without replacement)
- Ordinary estimation of population parameters; means, totals, ratios and proportions; mathematical derivation of formulas
- Sample size calculations: means, proportions and totals; mixture of parameters
- Ratio estimators of population parameters; means and totals; bias, efficiency and approximate variance; robust estimators
- Regression estimators of population parameters; means and totals; bias, and efficiency

6.3 Stratified sampling   (9hrs)
- ☐ Forming strata
- ☐ Stratified random sampling
  - o Estimation: means, totals, and proportions
  - o Relative efficiency to SRS
  - o Ratio estimators; separate and combined; efficiency
  - o Regression estimators
- ☐ Sample size calculations

6.4 Systematic sampling   (5hrs)
- ☐ Design; linear, circular, fractional;
- ☐ Estimation; paired selection; successive difference
- ☐ Efficiency and variants of systematic design

6.5 Probability proportional to size sampling   (3hrs)
- ☐ Design
- ☐ Parameter estimation

6.6 Cluster sampling   (7hrs)
- ☐ One-stage cluster sampling
  - o Equal size clusters; estimation of parameters
  - o Unequal size clusters
  - o Design effect
- ☐ Multi-stage cluster sampling

6.7 Estimation of population size   (3hrs)
- ☐ Introduction
- ☐ Applications to wildlife abundance, etc

6.8 Multi-stage sampling   (3hrs)

7. Mode of Delivery
Lectures (LH 30), and tutorials (TH 15)

8. Ways of Assessment
Courseworks and tests   40%
Exam   60%

9. Reading List

Cochran William (1977), <u>Sample survey theory and its applications.</u> 3rd Edition, John Weley & Sons

Hansen, M.H, Hurwitz,W.N, and Madow, G.W.(1993). <u>Sample Survey Methods and Theory, Methods and Applications</u>, Volume 1, John Weley & Sons.

Kiryegera Ben (1995). <u>Monograph on Sample Surveys (With Reference to Africa).</u>

1. **Course Name: Time Series Analysis**
2. **Course Level: 2**
3. **Credit Units: 2 CU Credit Hours: 30 hrs**
4. **Course Description:**

The course is an introduction to time series concepts with emphasis on model selection, estimation, diagnostics and forecasting generally with applications in economics. The topics comprise of decomposition method and the Box Jenkins Approach to time series analysis. The students are exposed to practical examples and exercises using selected data sets.

5. Course Objectives
Students will become more familiar with the concept of time series analysis, more specifically they will be able to:
- Show understanding of basic time series concepts and terminology
- Apply appropriate time series methods to selected data sets
- Be able to interpret and summarize results of time series analysis.

6. Detailed Course Curriculum

1.1 Introduction   (3 hrs)
- Objectives of time series
- Approaches to time series analysis
- Trend
- Seasonality
- Cyclic Component
- Irregular Term

6.2 Trend   (9hrs)
- Additive versus multiplicative
- Tests for presence
- Estimation

6.3 Seasonality   (4hrs)
- Additive versus multiplicative
- Tests of Presence
- Estimation

6.4 Cyclic Component   (3hrs)
- Additive versus multiplicative
- Tests of Presence
- Estimation

6.5 Time Series Models   (3hrs)
- ☐ Stochastic process
- ☐ Stationary process
- ☐ Autocorrelation function

6.6 Box Jenkins Approach   **(3hrs)**
- ☐ Introduction
- ☐ Autoregressive (AR) models
- ☐ Moving average (MA) models
- ☐ Differencing
- ☐ Autoregressive moving average (ARMA) models

6.7 Procedure of forecasting (ARIMA)   **(6hrs)**
- ☐ Model Identification
  - o Objectives
  - o Identification techniques
    - o Autocorrelation function (ACF)
    - o Partial autocorrelation function (PACF)
  - o Identification of seasonal models
- ☐ Parameter Estimation
  - o Fitting the selected models
- ☐ Diagnostic checking
  - o Residual analysis
  - o Over fitting
- ☐ Forecasting

7. Mode of Delivery
Lectures (25), and tutorials (TH 5)

8. Ways of Assessment
Course works and tests	40%
Exam	60%

9. Reading List
Box E.P.G, Jenkins M.G, and Reinsel C.G, (1994). <u>Time Series Analysis</u>, New Jersey, Prentice Hall.
Chatfield Chris, <u>Time Series Analysis, An Introduction,</u> Fifth Edition, Chapman and Hall Cryer D. Jonathan, (1986). <u>Time Series Analysis</u>, Boston, Pws-Kent Publishing Company.
Croxton and Klein, S (1965). <u>Applied General Statistics</u>

1. **Course Name:**   **Linear Models**
2. **Course Level:**   **2**
3. **Credit Units:**   **2 CU Credit Hours:**   **30 hrs**
4. **Course Description**

This course unit is an introduction to the most commonly used linear model in data analysis. Analysis of variance (ANOVA) and covariance (ANCOVA), covariance components, and mixed linear models are covered, as well as statistical model-building strategies. Analysis of unbalanced data sets and scientific writing skills are emphasized. Methods are illustrated with data sets drawn from the health, economic and social sciences, including sample survey data. Linear regression, which is another commonly used technique, is not covered because it is beyond the scope of this course.

Prerequisite: Introductory statistics course and simple matrix theory (Linear Algebra).

5. Course Objectives:

By the end of the course, the student should be able to:
- Show understanding of the principles of linear models; ANOVA, ANCOVA and random effects linear models
- Produce estimates and fit models for data obtained and test for goodness of fit of the models
- Develop competence in identifying the appropriate model to be fitted, do relevant data transformations and be able to analyze messy (unbalanced and un-replicated) data

6. Detailed Course Curriculum

6.1 Introduction (Summation notation)   **(1hr)**
- Review of sampling theory; Cochran Theory
- Data set up for Analysis of variance and covariance; Assumptions of linear models

6.2 One-Way ANOVA (Summation notation)   **(7hr)**
- One-way ANOVA (balanced data)
- One-way ANOVA (unbalanced data)

6.3 Two-Way ANOVA (Summation notation)   **(7hrs)**

□ Two-way ANOVA with interaction (balanced data)
□ Two-way additive ANOVA (balanced data)

1.1   Nested Analysis of Variance models   **(1hrs)**

1.2   Two-way ANOVA with interaction (unbalanced data)   **(4hrs)**
    □ Analysis of covariance

6.6 Random Coefficients Models (summation notation)   **(4hrs)**
    □ Introduction to fixed and random effects
    □ One-way Random Effects model; estimation and tests of hypothesis
    □ Two-way Random Effects model; estimation and tests of hypothesis
    □ Mixed linear models; formulation, estimation and tests of hypothesis

6.7 Linear Models in (Matrix notation)   **(6hrs)**
    □ Detour of matrix algebra; traces, singular matrices, generalized inverses and projections
    □ One-way ANOVA; effects and means models

7. Mode of Delivery
Lectures (LH 25), and tutorials (TH 5)

8. Ways of Assessment
Course works and tests   40%
Exam   60%

9. **Reading List**

McCulloch E. Charles, Searle R. Shayle, (2000). <u>Generalized, Linear, and Mixed Models</u>, New York, John Wiley & Sons
Walpole, R.E., (1982). <u>Introduction to Statistics</u> 3rd (ed), London, Collier Macmillan.
Neter, Kutner, Nachtsheim, and Wasserman (1996). <u>Applied Linear Statistical Models</u>, Fourth Edition.
Software: STATA and SPSS

1. Course Name: Regression Analysis
2. Course Level: 2
3. Credit Units: 3 CU Credit Hours: 45 hrs
4. Course Description

This introduces students to analysis of Economics and Econometrics models using Regression Analysis. It covers the following major topics. Correlation Analysis of models, Significance of correlation coefficients, Regression Analysis, Building models that are realistic, Linear Regression model, Transformation of non-linear to linear models, Specification of models, Estimation of models, Verification of models and Application of models.

Prerequisite: Prior knowledge of models especially economics models (theories)

5. Course Objectives
By the end of the course, the student should be able to:
- Show understanding of the concept of Regression and Correlation analysis.
- Build realistic regression models from relationships between variables.
- Relate population models
- Show understanding of different regression analytical tools
- Show understanding of the significance of regression as a tool that ultimately can be used for planning, decision-making, predication and give forecasting of future values.

6. Course Description

6.1 Introduction to Regression   (6hrs)
- Description of relation between variables, correlation analysis as a measure of linear relationships between variables.
- Similarities and differences between correlation analysis and regression analysis
- Population models – Vis-a-Vis sample models (Regression models)
- Regression analysis concept. What it is all about?
- Linear Regression model.

6.2 Transformation methods for non linear to linear models.   **(6hrs)**
- Significance of linear models in Regression analysis.
- Specification of regression models including the classical and mathematics forms.

6.3 Estimation of the Regression Model.   **(12hrs)**
- Simple linear regression model
- Estimation techniques; Least Squares Estimation methods (OLS) and Best linear unbiased Estimation method, maximum likelihood estimation method.

☐ The importance of each of the estimation method in regression analysis.
☐ Inference to population model using regression estimators.

1.1   Multiple Regression Model.   **(12hrs)**
☐ Prediction/Forecasting future values based on the sample regression statistics.
☐ General linear Regression models.
☐ Estimation of Multiple Regression models, inference and forecasting
☐ Comparing the slops of several regression lines;
☐ Logistic Regression.
☐ Multiple regression analysis

6.6 Using matrices to analyze multiple regression   **(9hrs)**
☐ Testing for parameters using matrices

7. Mode of Delivery
Lectures (LH 30), and tutorials (TH 15)

8. Ways of Assessment
Courseworks and tests   40%
Exam   60%

9. Reading List.
The reading list is not limited to the following books.

Green H. William (2000). Econometric Analysis. 4th Edition, Prentice-Hall
Johnston J.(1997) Econometric methods, 4th Edition, McGraw-Hall, New York
Kmenta J. (1966). Elements of Econometrics, 2nd Edition, The University of Michigan Press
Koutsoyiannis. A.(1977). Theory of Econometrics, Macmillan
Layman R. Ott. (1977) An Introduction to Statistical Methods and Data analysis, Duxbury Press.
Maddala S.G. (2001).   Introduction to econometrics , 3rd Edition, Wiley College

1. **Course Name: Multivariate Analysis**
2. **Course Level: 2**
3. **Credit Units: 3 CU Credit Hours: 45 hrs**
4. **Course Description.**

The course is designed to introduce students to the main ideas of multivariate statistical analysis i.e. the analysis of sets of data where we have more than one dependent variable. The course consists of matrix algebra, descriptive multivariate statistics, multivariate distributions, inference, correlations, discriminant, principal component analysis and factor analysis.

5. Course objectives.
By the end of the course, the student should be able to:
- ☐ Show understanding of the main techniques of multivariate analysis,
- ☐ Show understanding of the techniques applicable to different sets of data and
- ☐ Apply knowledge and skills acquired in course.

6. Detailed Course outline.

6.1 Multivariate Data matrix   **(4hrs)**
- ☐ The structure of multivariate data matrix.
- ☐ Types of variables.
- ☐ Special cases of n x p matrix.

6.2 Matrix Algebra   **(4hrs)**
- ☐ Notations, the dot, inner and scalar products.
- ☐ Types of matrices and their properties.
- ☐ Inverse, determinant and partition of a matrix, and its properties.
- ☐ Quadratic forms of square/symmetric matrix

6.3 Descriptive Multivariate Statistics   **(4hrs)**
- ☐ Introduction.
- ☐ Measures of central tendency for Multivariate data.
- ☐ Measures of dispersion (variation).
- ☐ Measures of correlation for multivariate data.

6.4 Multivariate distribution theory.   **(6hrs)**
- ☐ Random vectors
- ☐ The multivariate probability distribution function.
- ☐ Marginal distributions of partitions.
- ☐ The multivariate conditional distribution.

□ Stochastic independence of variables

6.5 Multivariate Inference.   **(6hrs)**

□ Estimation and hypothesis testing (multivariate extension).
□ Estimation of mean vector and variance-covariance matrix.
□ Tests on mean vectors (for univariate and multivariate cases) for known and unknown variances using generalized T-squared test.

6.6 Principal Component Analysis.   **(5hrs)**

□ Principal Component Analysis based on dispersion matrix.
□ Determination and interpretation of principal components.
□ Computational steps of Principal Components by iterative method

6.7 Discriminant Analysis.   **(4hrs)**

□ Linear discriminant function- by Fisher
□ Classification of two multi-normal populations when parameters are known.
□ Errors of miscalculation

6.8 Canonical Correlation.   **(4hrs)**

□ Introduction and definitions with examples.
□ Sample canonical correlations and variables.
□ Tests of significance.

6.9 Cluster Analysis.   **(4hrs)**

□ Cluster data.
□ Cluster dissimilarity matrix
□ Dendrograms.

6.10 Facror Analysis.   **(4hrs)**

7. Mode of Delivery
Lectures (LH 30), and tutorials (TH 15)

8. Ways of Assessment
Course works and tests   40%
Exam   60%

9. Reading List.

Chatfield C & Collins A.J. (1980). <u>Introduction to Multivariate Analysis</u>. Chapman and Hall, London Marcoulides J.A and Hersberger S.L. (1997) <u>Multivariate Statistical Methods</u>., First CourseMardia, V. Kent and Bibbey. J.M (1979). <u>Multivariate Analysis,</u> Academic Press.
Morrison,D.F (2005). <u>Multivariate Statistical Method</u> . 4th Edition

1. Course Name: Econometrics
2. Course Level: 2
3. Credit Units: 4 CU Credit Hours: 60 hrs
4. Course Description.

This course introduces students to methodology for econometric research, simple linear regression model, econometrics estimation techniques, statistical tests of significance of the estimates, violation of classical assumptions and the consequence, multiple regression, generalized linear regression model and its application and systems of simultaneous equation.

This course assumes the knowledge of linear models, ANOVA, linear algebra and regression analysis.

5. Course objectives.
By the end of the course, the student should be able to:
☐ Show understanding of concept of econometric models
☐ Relate econometric models with real situation in the world of work.
☐ Use econometric techniques in planning, decision making and forecasting.
☐ Handle and interpret systems of equations that explain some econometric models.

6. Course Description.

6.1 Introduction (4hrs)
☐ Definition and scope of Econometrics
☐ Goals of Econometrics.
☐ Division of Econometrics.

6.2 Methodology of Econometrics: Analysis (6hrs)
☐ Specification of Econometric Models.
☐ Estimation of Econometric Models
☐ Verification of Econometric Models
☐ Application of Econometric Models

6.3 Simple Linear Models. (6hrs)
☐ The simple linear regression model
☐ Classical assumptions of linear regression model.
☐ Distribution of the dependant variable.

4.4   Estimation Methods   (6hrs)
- The Least squares Estimation Methods
- The Best Linear unbiased Estimation.
- The Maximum Likelihood estimation Methods.
- Comparison of the three estimation methods and the contribution of each method to econometric analysis.
- Further results of statistical inference.

4.4   Violation of classical Assumptions   (6hrs)
- Heteroscedasticity
- Auto regression
- Multi co linearity.

4.4   Multiple Regression   (8hrs)
- Estimation of parameters.
- Further results of statistical inference

4.4   Simultaneous Equation systems   (8hrs)
- Simultaneous equation models
- The identification problem.
- Single equation methods of estimation.
- System methods of estimation
- Analysis of dynamic econometric models.

6.8 Testing the Forecast Power of an estimated model   (8hrs)
- Forecasting unit single – equation models
- Forecasting with multiple-equation models

6.9 Three Stage Least Squares   (8hrs)
- Generalized Least Squares (GLS)
- Three Stage Least Squares (3SLS)

7. Mode of Delivery
Lectures (LH 45), and tutorials (TH 15)

8. Ways of Assessment
Course works and tests   40%
Exam   60%

9. Reading List
Green H. William (2000). <u>Econometric Analysis</u>. 4th Edition, Prentice-Hall
Johnston J.(1997) <u>Econometric methods</u>, 4th Edition, McGraw-Hall, New York
Kmenta J. (1966). <u>Elements of Econometrics,</u> 2nd Edition, The University of

Michigan Press

Koutsoyiannis. A.(1977). Theory of Econometrics, Macmillan

Layman R. Ott. (1977) An Introduction to Statistical Methods and Data analysis, Duxbury Press.

Maddala S.G. (2001).   Introduction to econometrics , 3rd Edition, Wiley College

1. **Course Name:** **Price Statistics and Distributive Trade and Services Statistics**
2. **Course Level: 2**
3. **Credit Units: 2 CU Credit Hours: 30 hrs**
4. **Course Description:**

Price statistics and distributive trade and services statistics introduces students to concepts used in price index computations, consumer price indexes, wholesale price indexes, parity rice indexes, uses of price statistics and distributive trade and services statistics.

5. Course Objectives
By the end of the course, the student should be able to:
- ☐ Show understanding of concepts of price and distributive trade statistics, importance of computation of indices and their applications in real life problems:
- ☐ Appreciate the challenges in collection, computation of price indices
- ☐ Compute price indices and interpret them

6. Detailed Course Curriculum

5.1 Introduction to Price Statistics   (3 hrs)
- ☐ Uses of price statistics
- ☐ Different types of prices
- ☐ Price collection
- ☐ Challenges

5.2 Construction of the Consumer Price Index   (6hrs)
- ☐ Sources of weights and determination of weights
- ☐ Selection of commodities and items
- ☐ How to determine item prices
- ☐ Base period

5.3 Special problems   (6hrs)
- ☐ Quality changes
- ☐ Seasonality of some commodities
- ☐ House rents

5.4 Household budget surveys/Family living surveys   (3hrs)
- ☐ Objectives
- ☐ Data collection
- ☐ Items considered for data collection

5.5 Wholesale Price Index   (3hrs)

- Computations
- System of classification
- Base period
- Selection of items

5.6 Index number of parity between prices received and prices paid by the farmers   (3hrs)

- Computation
- Index numbers of prices received
- Index number of prices paid
    - o   Index numbers of domestic expenditure
    - o   Index numbers of cost of cultivation
- Index number of parity

5.7 Wholesale and retail trade   (6hrs)

- Concepts and classifications
- Methods of collection of data
- Collection of data

7. Mode of Delivery
Lectures (LH 30)

8. Ways of Assessment
Course works and tests	40%
Exam	60%

9. Reading List

African Development Bank (2005). Product Catalogue for International Comparison Program (ICP) price surveys in African Countries. Volume I & II, African Development Bank.

Bank of Uganda (2004). Quarterly Economic Reports, Volune …

Ministry of Finance, Planning and Economic Development (2003). Background to the Budget

Uganda Bureau of Statistics (2003). Statistical Abstracts.

Uganda Bureau of Statistics, (2004). Consumer Price Index March, Monthly Releases.

1. **Course Name: Financial Statistics**
2. **Course Level: 2**
3. **Credit Units: 2 CU Credit Hours: 30 hrs**
4. **Course Description:**

Financial statistics covers concepts used in money, banking and public finance and introduces students to statistics used in assessment of performance of the financial sector. Additionally, local government statistics is studied with focus on revenue collections, revenue sharing between the central government and local governments and local government expenditure.

5. Course Objectives
By the end of the course, the student should be able to:
- Understand the concepts used in Money, Banking and Public Finance,
- Mastered the financial statistics prepared by the Central Bank, Uganda Bureau of Statistics and the Ministry of Finance, Planning and Economic development,
- Compute the statistics used to assess the performance of the financial sector.

6. Detailed Course Curriculum

1.1 Introduction   (3 hrs)
- Role of money and definitions of money
- Characteristics of money and functions of money

6.2 Central Banking   (6hrs)
- Objectives and functions
- Monetary policy
- Methods of Credit control
- Monetary survey

6.3 Commercial Banking   (4hrs)
- Functions of commercial banks
- Balance sheet of a commercial bank
- Credit creation
- Commercial banking statistics

6.4 Money supply   (6hrs)
- Definition, objectives of monetary policy
- Measures of money supply
- Financial indicators

6.5 Development Banks and Non-bank financial institutions   (3hrs)
- Role of non-bank financial intermediaries

- Statistics of non-bank financial institutions

6.6 Public Finance Statistics   (4hrs)
- Revenue

- Expenditure

6.7 Local Government finance   (4hrs)

- Revenue and expenditure
- Statistics of local government finance

7. Mode of Delivery
Lectures (LH 30)

8. Ways of Assessment
Course works and tests   40%
Exam   60%

9. Reading List

Jhingan M.L.,(1997). <u>Money, Banking, International Trade and Public Finance,</u>
6th Revised and Enlarged Edition.
Ministry of Finance, Planning and Economic Development (2000). <u>Background to the Budget</u>
Obone A.E. (1990). <u>Money,Banking and Public Finance</u> 2nd Edition,
Uganda Bureau of Statistics (2004). <u>Statistical Abstracts</u>.

1. Course Name: National Accounting and Income Analysis:
2. Course Level: 2
3. Credit Units: 3 CU Credit Hours: 45 hrs
4. Course description

The course traces the historical perspective to National Income Accounting and looks at the development of both the SNA 1968 and the revision to SNA 1993. It brings out the main elements in both vision and concentrates more on the application of SNA 1993. The course further describes the broad phenomena in National Accounting looking at accounts and accounting system drawing examples from both developed and developing countries. The course also exposes students to data collection and estimation methods and techniques in the system of national accounts.

5. Course objectives.
   By the end of the course, the student should be able to:
   ☐ Understand the circular flow of income and how national income accounts are compiled from micro to macro levels.
   ☐ Understand the macroeconomic aggregates, concepts and methods of national accounts compilation and analysis.
   ☐ Broadly review performance of economies basing on national aggregates.

6. Detailed course outline
6.1 Introduction, Definitions and Objectives
   ☐ Original and historical review of national accounting
      (15hrs)
   ☐ Uses of National accounts
   ☐ Accounting frameworks
   ☐ Estimation methods and procedures

6.2 The SNA 1993 and its concepts   (15hrs)

6.3 The main aggregates concepts   (6hrs)
   ☐ Introduction to main aggregates concepts
   ☐ Alternative formulations and applications

6.4 The inputs outputs tables, the SAM and satellite accounting   (9hrs)

7. Mode of Delivery
      Lectures (LH 45)

8. Ways of Assessment

Course works and tests	40%
Exam	60%

9. Reading List

Dornbusch and Helmers (1988). <u>National Accounting Identities</u>

Heemst Jan Van, (1994). <u>Introduction to National Accounting Concepts and extensions</u>

Ministry of Finance, Planning and Economic Development (2004). <u>Background to the Budget</u>

Uganda Bureau of Statistics (2000). <u>Statistical Abstracts</u>.

United Nations (1994). <u>1993 System of National Accounts</u>.

1. Course Name: Structural Adjustment, Stabilization and Development policy
2. Course Level: 3
3. Credit Units: 3 CU Credit Hours: 45 hrs
4. Course Description

The course introduces students to structural adjustment, stabilization and development. The objectives and approaches to structural adjustment and stabilization are studied. Examples of countries, which have adopted structural adjustment and stabilization, will be studied.

5. Course objective

By the end of the course, the student should:
- Have understood the macroeconomic challenges of developing economies and how they are addressed.
- Follow and understand the current debates concerning macroeconomic development and tackle complex policy-making issues.
- Comprehend macroeconomic issues in developing countries, such as growth theory, debt, and aid.

6. Course outline

6.1 Introduction (3hrs)
- Definition of key concepts

6.2 The History of Stabilization and Structural Adjustment Policies
(9hrs)

- The Oil Boom (1978) and Petrol-dollars (early 1980s).
- Escalation of borrowing and the subsequent default.
- The need to grow and reduce poverty in third World Countries.
- The emergence of the role of the Bretton Woods institutions.
- The Consequences and implications of default on the Third World
- Impact on Third World Countries.

6.3 Understanding the rationale for SAPs (3hrs)

6.4 Key objectives of SAPs (6hrs)
- Liberalization of markets
- Demand management including fiscal and monetary discipline
- Supply measures to boost growth

6.5 Financing Development programmes (6hrs)

6.6 Social and economic impacts of SAPs (9hrs)

6.7 Structural Adjustment to Development policy lending (9hrs)

7. Mode of Delivery
    Lectures (LH 45)

8. Ways of Assessment
    Course works and tests   40%
    Exam   60%

9. Reading List

Ahmed, I.I and Michael M. Impact of Structural Adjustment on Sustainable Rural Livelihoods, IDS Sussex UK.

Dzodzi Tsikata (2002). Effects of Structural Adjustment on Women and the Poor; TWN Africa Secretariat Based in, Ghana.

International Monetary Fund (1997). The ESAF at Ten Years: Economic Adjustment and Reform in Low Income Countries, Summary Report, Washington, D. C., IMF

Nancharaiah, G, (2003). Economic Reforms and Rural Development in India, New Delhi, Academic Foundation,

Wood Angela, (1997). The International Monetary Funds Enhanced Structural Adjustment Facility: What Role for Development? Bretton Woods Project.

1. **Course Name: Environment and energy statistics:**
2. **Course Level: 2**
3. **Credit Units: 3 CU Credit Hours: 45 hrs**
4. **Course description.**

The course is designed to prepare students to understand the broad concept of sustainable growth and development. In addition to the usual study of the circular flow income and economic processes the course examines transformation in the social and environmental spheres specifically bringing out the impact of human activities on the natural environment. The course further addresses the challenges of environmental policy/development.

5. Course objective
By the end of the course, the student should be able to:
- ☐ Compile environmental data.
- ☐ Identify and analyze environmental challenges.

6. Detailed course outline

6.1 Framework for the development of environment statistics   (9hrs)
- ☐ Nature of environment statistics
- ☐ Different approaches to environment statistics
- ☐ Framework Vs system
- ☐ Description and purpose of FDES
- ☐ Structure and contents of FDES
- ☐ Application of FDES
- ☐ Overlap and interaction in statistical system (SEEA, PRED and SAM)

6.2 Extension of FDES   (6hrs)
- ☐ Human Settlement statistics
- ☐ Statistics of the natural environment e.g. air, water and land use

6.3 Selection of environmental indicators using FDES   (12hrs)
- ☐ Statistics Vs Indicators
- ☐ Criteria for indicators selection
- ☐ List of indicators agreed by the IGWG on the advancement of environment statistics
- ☐ The OECD pressure, state Response framework for indicators
- ☐ Agenda 21 clusters and FDES

6.4 Energy statistics, Resource accounting and policy development (18hrs)
- ☐ Scope, sources and uses of energy statistics
- ☐ Energy balances and energy input-output tables

- ☐ Environment and natural resource accounting
- ☐ Valuing of natural assets
- ☐ Environmental policy

7. Mode of Delivery
Lectures (LH 45)

8. Ways of Assessment
Course works and tests   40%
Exam   60%

9. Reading List

Bartelmus, P, (1994). Towards a Framework for Indicators of Sustainable Development

OECD, (1994). Environment indicators

Prashant Vase (1996). ONS 1996 Environmental Accounts: Valuing Depletion of Natural Reserves, London.

UN-DPCSD, (1996). Indicators of Sustainable Development: Framework and Methodologies

UN-ECE, (1993). Readings in International Environment Statistics

UN-ECE, (1995). Report on the 4th meeting of the IGWG on the Advancement of Environment Statistics Stockholm

United Nations (1984). United Nations Concepts and Methods in Energy Statistics, New York

UNSD, (1984). A Framework for the Development of Environment Statistics

UNSD, (1988). Concepts and Methods of Environment Statistics: Human Settlement Statistics

UNSD, (1991). Concepts and Methods of Environment Statistics: Statistics of the Natural Environment

UNSD, (1997). Glossary of Environment Statistics

1. Course Name: Industrial Statistical Modeling
2. Course Level: 2
3. Credit Units: 2 CU Credit Hours: 30 hrs
4. Course Description:

This is commonly referred to as Statistical Quality Control or simply Quality Control (QC). It is intended to introduce students to statistical tools used in monitoring quality of manufactured products or services. It has wide applications in Pharmaceuticals, traffic control, garbage collection, management, and health service among many others.

The course is sub-divided into Concepts of Quality, Statistical Process Control, Control Charts for Variables, Control Charts for Attributes, Cumulative Sum and Weighted Average Control Charts, and Acceptance Sampling.

5. Course Objectives
By end of the course, the student should be able to:
- Describe, measure or quantify quality;
- Utilize statistical tools in the monitoring of process quality;
- Utilize statistical tools in monitoring quality of raw materials and industrial end products;
- Recognize that at the centre of quality is the true need of humans.

6. Detailed course curriculum

6.1 Concepts of Quality   (4hrs)
- Quality of Design
- Quality of Conformance

6.2 The Meaning of Quality Improvement   (6hrs)
- General Concepts of Statistical Process Control
- The seven tools of statistical process control
- Shewhart's Theory of Variability
- Choice of control limits for control charts
    - o   3 – sigma control limits
    - o   Probability Control limits
    - o   Sample size and Sampling frequency

6.3 Control Charts for Variables   (6hrs)
- X – and R - Control Charts
- Estimating Process Capability
- The Operating Characteristic (OC) Function
- X – and S – Control Charts

6.4 Control Charts for Attributes   (6hrs)

- Control Charts for Fraction non-conforming (p – Chart)
- Control Charts for number non-conforming (np – Chart)
- Control Charts for non-conformities
    - o The c – chart
    - o The u - chart

6.5 Cumulative Sum and Exponentially Weighted Moving Average Control Charts   (4hrs)
- CuSum Control Chart for monitoring process mean
    - o CuSum Status Chart
    - o The Standardized CuSum
    - o Monitoring Process Variability
    - o The V- Mask
- Exponentially Weighted Moving Average control chart

1.1 Acceptance Sampling   (4hrs)
- Lot Sentencing
- Lot-by-Lot Acceptance Sampling for Attributes
- Sampling Plans for attributes
    - o Single-Sampling Plan
    - o Double Sampling Plan
    - o Multiple Sampling Plan
    - o Sequential Sampling Plan
    - o Skip-Lot Sampling Plan

7. Mode of Delivery
Lectures (LH 30)

8. Ways of Assessment
Course works and tests	40%
Exam	60%

9. Reading List

Bradley E. Iver, and South B. John, (1981). Introductory Statistics for Business and Economics, Hinsdale.

Grant L. Eugene, and Leavenworth S. Richard, (1988). Statistical Quality Control. (6th Edition).

Montgomery C. Douglas (2001). Introduction to Statistical Quality Control, 4th Edition, John Wiley & Sons, New York

Shewhart A. Walter, (1931). Economic Control of Quality of Manufactured Product.

1. **Course Name: Statistical Decision Theory**
2. **Course Level: 2**
3. **Credit Units: 2 CU Credit Hours:**   **30 hrs**
4. **Course Description**

This is an introductory course which covers: decision flow charts, payoffs, decision theory, opportunity loss criterion, incremental analysis, distributions and sufficient statistics, bayes inference for the normal distributions and applications to linear models

5.Course Objectives
By the course, the student should:
- ☐ Have understood basic concepts, principles, procedures and applications of statistical decision theory
- ☐ Apply statistical decision theory to solve real life problems.

6. Detailed Course Outline

6.1 Decision flow charts   (3hrs)

6.2 Payoffs   (3hrs)
- ☐ Expected Monetary values and utilities
- ☐ Strategy Criteria

6.3 Decision theory   (4hrs)
- ☐ Sampling posterior
- ☐ Probability Distributions

6.4 Opportunity loss criterion   (4hrs)

6.5 Incremental Analysis   (4hrs)
- ☐ Principle of expected value

6.6 Distributions and Sufficient Statistics   (4hrs)
- ☐ Concepts of Subjective Probability

6.7 Bayes inference for the Normal distributions   (4hrs)
- ☐ Bayesian revolution in statistics and its implication to Statistical Decision theory

6.8 Applications to linear Models   (4hrs)
- ☐ Regression Analysis

7. Mode of Delivery
Lectures (LH 25), and tutorials (TH 5)

8. Ways of Assessment
Course works and tests   40%
Exam   60%

9. Reading List

Mood, H. A, Graybill, A.F, and Boes, C.D, (1963). Introduction to the Theory of Statistics McGraw Hill.
Steel G.D.R, and Torrie, H.J, (1996). Principles and Procedures of Statistics a Biometric Approach, 3rd Edition, McGraw Hill.
Walpole, R.E., (1982). Introduction to Statistics 3rd Edition, Collier Macmillan, London.

1. Course Name: Biostatistics
2. Course Level: 2
3. Credit Unit: 3   Credit Hours: 45 hrs
4. Course Description

Basic measures of mortality and morbidity. Sources of data. Comparative mortality and morbidity. Confounding Factors. Epidemiological/Observational studies. Diagnostic tests. Parametric Survival Analysis. Non-parametric Survival Analysis. Competing Risks.

5. Course Objective

To introduce the students to the specialized statistical methods for the analysis of epidemiological and survival data.

6. Detailed Course Outline

6.1 Basic measures of mortality and morbidity   (4 hours)
   ☐ Incidence rate;
   ☐ Prevalence rate.

6.2 Sources of data   (4 hours)
   ☐ Mortality and morbidity surveys;
   ☐ Administrative sources;
   ☐ Comparative studies.

6.3 Comparative mortality and morbidity   (4 hours)
   ☐ Relative Risk;
   ☐ Odds Ratio;
   ☐ Attributable Risk.

6.4 Confounding Factors   (6 hours)
   ☐ Definition of confounding factor;
   ☐ Stratification;
   ☐ Standardization.

6.5 Epidemiological/Observational studies   (8 hours)
   ☐ Cross-sectional studies;
   ☐ Case-control studies;
   ☐ Cohort Studies;
   ☐ Clinical Trials.

6.6 Diagnostic tests   (4 hours)

☐ Measures of test accuracy: sensitivity, specificity, predictive value,
☐ Prevalence estimation.

6.7 Parametric Survival Analysis   (6 hours)
☐ Survival Distributions,
☐ Maximum Likelihood estimation.

6.8 Non-parametric Survival Analysis   (5 hours)
☐ Population Life Tables,
☐ Cohort Life Tables,
☐ Kaplan-Meier estimate
☐ The Log-Rank test

6.9 Competing Risks   (4 hours)
☐ Multiple Decrement Life Tables,
☐ Cause-specific mortality,
☐ Competing risks theory.

7. Mode of Delivery
Lectures (LH 30), and tutorials (TH 15)

8. Ways of Assessment
Course works and tests   40%
Exam   60%

9. Reading List
Anderson, Auquier, Hauk et al. (1980) *Statistical Methods for Comparative Studies*. New York: Wiley.

Armitage, Berry, and Mathews (2002) *Statistical Methods in Medical Research*. Oxford: Blackwell.

Breslow and Day (1980) *Statistical Methods in Cancer Research, Vol. I: Case-Control Studies*. Lyon: IARC

Breslow and Day (1987) *Statistical Methods in Cancer Research, Vol. II: Cohort Studies*. Lyon: IARC

Cox and Oakes (1984) *Analysis of Survival Data*. London: Chapman and Hall.

Lee (1992) *Statistical Methods for Survival Data Analysis, 2nd ed*. New York: Wiley.

Lwanga and Choo-Yook Tye (1986) *Teaching Health Statistics*. Geneva: WHO

Pocock (1983) *Clinical Trials: A Practical Approach*. New York: Wiley

Selvin (1996) *Statistical Analysis of Epidemiologic Data, 2nd ed*. Oxford: OUP

1. **Course Name: Statistics Practical II**
2. **Course Level: 2**
3. **Credit Units: 2 CU Credit Hours: 30 hrs**
4. **Course Description**

This course exposes students to practical applications of the knowledge and skills acquired in four selected courses in statistics over the year. The areas include Sampling, Time Series Analysis, Computer Programming, Linear Models (or Analysis of Variance).

5. Course objectives
By the end of this course students should be able to:
- Put into practice the knowledge and skills acquired in statistics
- Write computer application programs for specific statistical tasks,
- Estimate parameters of time series models and make forecasts

6. Detailed Course Description

6.1 Time Series Analysis   (15hrs)

6.2 Sampling   (15hrs)

6.3 ANOVA or Linear Models   (15hrs)

6.4 Computer Programing   (15hrs)

7. Mode of Delivery
Demonstrations as part of the lectures and tutorials (TH 30)

8. Ways of Assessment
Exam   100%

9. Reading List
- Texts for the respective courses.

1. **Course Name: Statistics Practical III**
2. **Course Level: 2**
3. **Credit Units: 2 CU Credit Hours: 30 hrs**
4. **Course Description**

This course exposes students to practical applications of the skills acquired in selected courses in statistics over the year. The areas include Econometrics and elective courses depending on the option offered by the student.

5. Course objectives
By the end of this course students should be able to:
- Apply econometrics to given life problems
- Put into practice the knowledge and skills acquired in statistics

6. Detailed Course Description

6.1 Econometrics   (30hrs)

6.2 Demography and Social Statistics   (15hrs)

6.3 National Accounts and Income Analysis   (15hrs)

6.4 Systems Design   (15hrs)

1.1 External Trade and Balance of Payments   (15hrs)

1.2 Computer Programming   (15hrs)

1.3 ANOVA and Experimental Design   (15hrs)

1.4 Structural Adjustment   (15hrs)

7. Mode of Delivery
Demonstrations as part of the lectures and tutorials   (TH 30)

8. Ways of Assessment
Exam   100%

9. Reading List

Texts for the respective courses.

MINIMUM COURSE CONTENTS FOR
BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE PROGRAMME

1.0 PREAMBLE

This document provides minimum content requirements for training an Actuarial Scientist in Uganda. The National Council of Higher Education in conjunction with Universities in accordance with the Universities and Other Tertiary Institutions Act 2001, Section 5 and 123 has developed this document. It's intended to guide all Training Institutions in designing and implementing appropriate curricula to produce Actuarial Scientists with necessary competences, knowledge, skills, and attitudes to enable them address national and international challenges in banking, finance, insurance, pension funds and stock markets. This document offers guidelines and it contains minimum content requirements but each individual institution may add other features in order to meet its own vision, mission and objectives.

2.0 NOMENCLATURE

A successful graduate will be awarded a degree of Bachelor of Science in Actuarial Science of the respective University.

3.0 DURATION

The Bachelor of Science in Actuarial Science degree is a three-year programme.

4.0 PHILOSOPHY OF BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE PROGRAMME

Actuarial Science is about applying mathematical, statistical and economic models to study and calculate risks associated with insurance, pensions and other financial systems. The knowledge of Actuarial Science also enables one to interpret the economic environment and make informed decisions on future inflation, returns on investment, stock market behaviour, exchange rates and economic growth. The Actuarial Scientists have to be trained to meet the challenges of the profession today like globalization, the collapse of international companies, mergers etc. Actual scientists are financial analysts who should be able to make realistic assumptions and projections. The ten-week field attachment, which is part of the training programme exposes the students to the operational environment before they graduate and equips them with practical skills.

5.0 PURPOSE OF THE MINIMUM REQUIREMENTS

The main reasons for setting minimum requirements of the programme include:

b. Providing a means to academic community to describe the nurture and characteristics of programmes in Actuarial Science;

c. Representing general expectations about the standards for the award of Bachelor of Science in Actuarial Science and articulating capabilities that those possessing the qualification should be able to demonstrate;

d. Serving as an important external source of reference for higher education institutions when new programmes are being designed and developed for the Bachelor of Science in Actuarial Science Programme;

e. Providing general guidance for articulating the learning outcomes associated with the programme;

f. Providing for variety and flexibility in the design of programmes and encouraging innovations within an agreed overall framework;

g. Enabling the learning outcomes specified for a particular programme to be reviewed and evaluated against agreed general expectations about standards;

h. Serving as one of the external source of information for academic review and for making judgment about minimum standards being met;

i. Helping the regulatory bodies like, the NCHE in monitoring the institutions training Actuarial Scientists in Uganda;

j. Assisting NCHE in ensuring that these minimum standards are maintained and continually improved on by all training institutions;

k. Guiding in the creation and weighting of specific courses which will be used in designing a credit system that should ease the transfer of students between training institutions and related programmes; and

l. Maintaining the quality of training of Actuarial Scientists in the Uganda.

6.0 ADMISSION REQUIREMENTS

To be admitted as a candidate for the degree of Bachelor of Science in Actuarial Science the candidate must satisfy the following entrance requirements:

6.1   Direct Entry

The candidate shall be considered for admission if the candidate has obtained:

- The Uganda Certificate of Education (O'Level) or an equivalent qualification; and

- At least two principal passes at the Uganda Advanced Certificate of Education (U.A.C.E) including mathematics at the same sitting or its equivalent. Advanced level subjects shall be grouped with:

    o   Mathematics, Pure Mathematics, Considered as essential,

    o   Economics is relevant,

    o   General paper and subsidiary in mathematics and any one best done of Chemistry, geography, physics and biology are considered as desirable.

6.2   Mature Age Entry

A candidate must have passed the Mature Age Entry Examinations of the University in the subjects of Mathematics or Statistics.

6.3 Diploma Holders or Actuarial Science Certificate

A candidate must have obtained a Diploma from a recognized institution of higher learning or Actuarial Science certificate from a recognized body of actuaries. The Diploma or Certificate programme must have involved Mathematics as a major subject.

7.0 LEARNING OBJECTIVES/OUTCOMES OF BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE PROGRAMME

The minimum learning outcomes, which the graduate must demonstrate by graduation are ability to:

b. Collect relevant data for financial analysis

c. Analyse investments and Pension schemes, Life Assurance

d. Prepare funded project proposals and implement them;

e. Understand basic insurance, banking, stock markets, pension scheme concepts and apply them in a practical situation.

8.0 ACADEMIC COURSE CONTENT

The academic content shall be organized in two levels of training. Level one is for mainly introductory courses while level two caters for the more advanced courses. The Training Institutions will structure their curricula to meet the semester/term system load requirements.

1.1 Bachelor of Science in Actuarial Science 1 2 3
Credit Units

Year I **Courses**

o	Descriptive statistics	45 CH	3 CU
o	Time Series and Index Numbers	45 CH	3 CU
o	Introduction to Information, Communication Technology	45 CH	3 CU
o	Micro-economics I	45 CH	3 CU
o	Calculus I	45 CH	3 CU
o	Linear Algebra I	45 CH	3 CU
o	Principles of Development	45 CH	3 CU
o	Macro Economics I	45 CH	3 CU
o	Probability Theory I	45 CH	3 CU
o	Statistical Inference I	45 CH	3 CU
o	Calculus II	45 CH	3 CU
o	Linear Algebra II	45 CH	3 CU
o	Accounting I	45 CH	3 CU
o	Mathematics of Finance I	45 CH	3 CU

Year I Total Credit Units = 38

Year II **Courses**

o	Probability Theory II	45 CH	3 CU
o	Micro-Economics II	45 CH	3 CU
o	Time Series Analysis	30 CH	2 CU
o	Mathematics of Finance II	45 CH	3 CU
o	Life Contingencies I	45 CH	3 CU
o	Actuarial Data Processing	45 CH	3 CU
o	Differential Equations	45 CH	3 CU
o	Regression Analysis	45 CH	3 CU

o Macro-Economics II	45 CH	3 CU
o Linear Programming I	45 CH	3 CU
o Accounting II	45 CH	3 CU
o Life Contingencies II	45 CH	3 CU
o Statistics of Insurance	45 CH	3 CU
o Research Methods	30 CH	2 CU
o Professional Training Attachment	30 CH	2 CU

Year II Total Credit Units = 44

Year III   Core Courses

o Demographic Statistics	45 CH	3 CU
o Econometric Methods	45 CH	3 CU
o Principles and Practice of Insurance	45 CH	3 CU
o Multivariate Analysis	45 CH	3 CU
o Operations Research	45 CH	3 CU
o Investment and Asset Management	45 CH	3 CU
o Life Assurance	45 CH	3 CU
o Pension Analysis	45 CH	3 CU
o Research Project	75 CH	5 CU
o Industrial Statistical Modeling	30 CH	2 CU

Electives

o Project Appraisal	45 CH	3 CU
o Project Planning	45 CH	3 CU
o National Accounts and Income Analysis	45 CH	3 CU

Year III Total Credit Units = 41
Bachelor of Science in Actuarial Science

1. Course name: ACCOUNTING I
2. Course Level: 1
3. Credit Units: 3 CU Credit Hours: 45 hrs
4. Brief Description

Introduces students to basic principles of accounting so as to be able to logically handle several accounting aspects. Students learn the preparation of financial statements in line with the principles and according to prescribed accounting procedures. The course covers the following: purpose of accounting, accounting concepts, convention, underlying accounting reports, accounting equations, double entry booking, journals, ledger, control accounts, trail balance, final accounts and cash book and bank reconciliation statement.

5.Course objectives
By the end of the course the students should:
Have understood accounting concepts, conventions and accounting equations,
Prepare financial statements like journals, ledgers, control accounts, trial balances, income statements, balance sheets, cashbook and bank reconciliation statements.

6. Course description
6.1   Introduction to accounting,   (10hrs)
   ☐ Purpose of accounting,

   ☐ Accounting concepts,

6.2   Convention, underlying accounting reports,   (15hrs)

   ☐ Accounting equations,
   ☐ The double entry book keeping,
   ☐ Journals, ledger, control accounts,
   ☐ Trial balance.

6.3 Financial statements   (20hrs)
   ☐ Final Accounts: income statements and balance sheets.
   ☐ Cash book and bank reconciliation statement.

7. Mode of Delivery
        Lectures (LH 30), and tutorials (TH 15)
8. Ways of Assessment
        Course works and tests   40%
        Exam   60%

9. Reading List
Floyd Beams, (1998). <u>Advanced Accounting,</u> Prentice Hall
Jennings A.R, (1997). <u>Financial Accounting Manuals 1 And 2,</u> DP Publications
Meigs Johnston And Keller, (1985) <u>Advanced Accounting</u>, Mcgraw Hill Standards
Uganda Government,(CAP110). <u>The Companies Act</u>
Wood Frank (1999). <u>Business Accounting Volume 1 And 2</u>

1. Course: Name: Life Contingencies I
2. Course Level: 1
3. Credit Units: 3 CU Credit Hours: 45 hrs
4. Course Description

The course introduces students to concepts and principles of survival modeling and computations of values, benefits, bonuses, pricing reserving and looks at various life insurance contracts. The course covers: evaluation of assurances and annuities, surrender and paid-up values and annuities and assurances involving two lives.

5. Objectives of the Course
On the completion of the course the students should be able to:
- Explain the concept of survival models
- Define simple assurance and annuity contracts, and develop formula for the means and variances of present values of the payments under these contracts, assuming constant deterministic interest.
- Describe and calculate net premium policy values of simple assurance and annuity contracts.
- Compute expected present values and variances of simple benefits by table look-up or by using life tables.
- Define and use straightforward functions involving two lives

6. Course Outline

6.1 Life Contingencies Overview:

- Introduction To Concepts Of Survival Functions;
- Probability Distributions Of Lifetime Functions
6.2   Single Decrement Models:

- Probabilities Of Death And Surviving; Hazard Rates For Single
- Force Of Mortality, Probability Density Function Of Lifetimes,
- Initial Rates And Central Rates Of Mortality;
- Simple Laws Of Mortality,
- Life Table Functions, Types Of Life Tables;
- Use Of Stationary Population Model :
- Types Of Life Assurance And Annuity Contracts,
- Pricing Of Life Insurance And Annuity Contracts;
- Present Value Of Random Payments,
- The Relationship Between Annuity And Corresponding Assurance

Functions;
- ☐   The Equation Of Value Of Payments,
- ☐   Variance Of The Present Value Of Payments,

6.3 Evaluation of Assurances and Annuities

- ☐   Determination Of Liabilities Under A Simple Assurance Contract Or Annuity Contract;
- ☐ Calculation Of Surrender Values And Paid Up Sums Assured;
- ☐ Prospective And Retrospective Reserve Values;
- ☐ Relationships Between Successive Reserve Values,
- ☐ Mortality Profit Or Loss, Alterations To Policies, Extra Risk Considerations

7. Mode of Delivery
Lectures (LH 30), and tutorials (TH 15)

8. Ways of Assessment
Course works and tests   40%
Exam   60%

9. Reading List

Bowers N.L. Hans U.; Hickman J.C.; Donald A.; Nesbitt C. J. (   ) <u>Actuarial Mathematics</u>, 2nd Edition
Both P.M; Chadburn R.G; Cooper D.R; Haberman S.; James D; (   ) <u>Modern Actuarial Theory and Practice</u>
Scott W.F; (   )<u> Life Assurance Mathematics</u>
Klgman S.A; Panjer H.H; Willmot G.E; (   ) <u>Loss models: from data to decisions</u>

1. **Course Name: Mathematics of Finance I**
2. **Course Level: 1**
3. **Credit Units: 3 CU Credit Hours:**   **45 hrs**

4. **Course Description:**

Introduces the student to basic principles of actuarial science literature, and provides grounding in notations, acronyms and definitions which are of particular relevance to actuarial work in general.

5. Course Objectives

By end of the course, the students should:
Have received introductory ideas about actuarial science course and appreciated what it takes to qualify as an actuary and known actuarial symbols, notations, acronyms and general definitions commonly used in actuarial work.

6. Course Outline

6.1 Introduction   (6hrs)
   ☐ Generalized cash flows
   ☐ Consideration of interest/yield

6.2 Basic Principles of Compound Interest   (6hrs)
   ☐ Compound and Simple interest rates
   ☐ The formula $(1+i)^n$
   ☐ Equation of value
   ☐ Varying rates of interest

6.3 Development and interpretation o $\ddot{s}_{\overline{n}|} \ and \ s_{\overline{n}|}$ (8hrs)

   ❑ Consideration of Accumulation at constant rate of interest
   ❑ Consideration of accumulation at varying rates of interest
   ❑ Consideration of rates of interest other than yearly rates, convertible (nominal) rates of interest

6.4 Present values: The Function v^n (8hrs)

   ❑ Development of $\ddot{a}_{\overline{n}|} \ and \ a_{\overline{n}|}$

   ❑ Interpretation of $\ddot{a}_{\overline{n}|} \ and \ a_{\overline{n}|}$, Types of annuities and annuity certain

   ❑ Distinguish between $(1+i)^n \ and \ v^n$
   ❑ Problem involving present values
   ❑ Further consideration of the equation of value and the yield

6.5 Loans: Theoretical consideration of interest/capital schedule at fixed interest rate, varying rates of interest, and interest payable more frequently than yearly
(8hrs)

☐ Buying and selling loans: without tax considerations
☐ Consumer credit loans, mortgage loans from banks
☐ Effective annual rate of interest i
☐ Nominal annual rate of interest $i^{(m)}$
☐ Sinking Funds
☐ Analysis of annuity at two rates of interest

6.6 Discounted Cash flow Project Analysis   (9hrs)
☐ Cash flow for projects
☐ Present values of Net cash flows
☐ Internal rate of return, running yield
☐ Discounted mean term

7. Mode of Delivery
Lectures (LH 30), and tutorials (TH 15)

8. Ways of Assessment
Course works and tests   40%
Exam   60%

9. Reading List

Bowers N.L. Hans U.; Hickman J.C.; Donald A.; Nesbitt C. J. (   ) <u>Actuarial Mathematics</u>, 2nd Edition
Both P.M; Chadburn R.G; Cooper D.R; Haberman S.; James D; (   ) <u>Modern Actuarial Theory and Practice</u>
Scott W.F; (   ) <u>Life Assurance Mathematics</u>

1. **Course Name: Mathematics of Finance II**
2. **Course Level: 2**
3. **Credit Units: 3 CU Credit Hours: 45 hrs**
4. **Course Description:**

The aim is to introduce the actuarial student to what is to be expected in the course, and to provide grounding in notations and definitions, which are of particular relevance to actuarial work in general

5. **Course Objectives**

The aim is to introduce the actuarial student to what is to be expected in the course, and to provide grounding in notations and definitions, which are of particular relevance to actuarial work in general.

6. Course Outline

6.1 Fixed interest securities   (12hrs)
- Interest payment
- Redemption payment yield obtained by the investor
- Running yield, Redemption yield
- Buying and selling securities on the market
- Interest payable more frequently than yearly
- Loans payable by installments
- Taxation: Income tax and capital gains tax
- Varying coupon rates and redemption prices

6.2 Makeham Formula   (6hrs)
- Loans repayable by installments
- Varying redemption prices and coupon rates

6.3 Cumulative Sinking Funds   (9hrs)
- Term of the loan
- The capital/ interest schedule
- Investment in cumulative sinking funds
- Taxation of sinking funds

6.4 Capital redemption policies   (12hrs)
- Calculation of single premiums
- Net and office Premiums
- Reserves
- Equality of Retrospective and Prospective policy values
- Determination of profit/loss
- Alterations to policies

6.5 Simple stochastic interest rate models   (6hrs)
- Continuous increasing annuities
- Effects of variations in interest rates
- Variation in the value of securities
- Volatility and discounted mean term

7. Mode of Delivery
Lectures (LH 30), and tutorials (TH 15)

8. Ways of Assessment
Course works and tests   40%
Exam   60%

9. Reading List

Bowers N.L. Hans U.; Hickman J.C.; Donald A.; Nesbitt C. J. <u>Actuarial Mathematics</u>, 2nd Edition
Both P.M; Chadburn R.G; Cooper D.R; Haberman S.; James D; <u>Modern Actuarial Theory and Practice</u>

Scott W.F; (   ) <u>Life Assurance Mathematics</u>

1. **Course name: PROJECT APPRAISAL**
2. **Course Level: 2**
3. **Credit Units: 2 CU Credit Hours: 30 hrs**
4. **Course objectives**

Introduction to Project Appraisal, Generation and screening of project ideas, The concept of Time value of money, choice of discount rate, Investment analysis, Project Risk analysis, project appraisal, sensitivity analysis.

5. Course Objectives
The objectives of the course include;
- [ ] To equip students with skills in the framework of Project appraisal and investment analysis/decision so as to be able to logically handle facets of project analysis, levels of decision-making, phases of capital budgeting, risk analysis and sensitivity analysis.
- [ ] To provide students with an understanding of the theory and practice of project appraisal and cost-benefit analysis; and explore practical aspects of alternative approaches to economic appraisal and evaluation of projects.

6. Course Outline

6.1 Introduction to Project Appraisal   (4hrs)

- [ ] Overview of Project Appraisal
- [ ] Meaning of Project Appraisal and its process
- [ ] The Elements of Project Appraisal

6.2 Generation and screening of project ideas   (4hrs)

- [ ] Generation of ideas
- [ ] Monitoring the environment
- [ ] Corporate appraisal
- [ ] Scouting for project ideas
- [ ] Preliminary screening, project rating index etc

6.3 The concept of Time value of money   (4hrs)

- [ ] The underlying concepts of time value for money
- [ ] The present and future value of money
- [ ] Discounting cash flows
- [ ] Discounted cash flows and effects of inflation and taxation.

6.4 Investment Analysis   (6hrs)

- ☐ Over view of the Investment Analysis
- ☐ Valuation of costs and benefits, and Estimation of Project cash flows
- ☐ Cost of capital and Choice of discount rate
- ☐ Investment appraisal criteria: Pay back period, accounting rate of return, net present value, internal rate of return, profitability index etc

6.5 Risk analysis   (6hrs)

- ☐ Types and measures of project risk, Sensitivity analysis, Risk analysis in practice and selection of a project
- ☐ Risk analysis: firm risk and market risk
- ☐ Multiple projects and constraints

6.6 Elements of project appraisal   (6hrs)

- ☐ Technical analysis
- ☐ Market and demand analysis
- ☐ Environmental analysis
- ☐ Gender analysis
- ☐ Social cultural analysis
- ☐ Economic analysis
- ☐ Case studies

7. Mode of Delivery
Lectures (18 hrs) , tutorials (6 hrs) and class presentation (6 hrs)

8. Ways of Assessment
Course works and tests	40%
Exam	60%

9. Reading List

Atim, D.K, . Fundamentals of Project Planning and Management, First Edition
Bridger, A.G, and Winpenny J.T, (1988). Overseas Development Administration: A Practical Guide to the Choice and Appraisal of Public Sector Investment
Prasanna Chandra. Projects: Planning, Analysis, Selection, Implementation, and Review, 4th edition.
Pandey I.M, Financial management

1. **Course name: Investment and Assets Management**
2. **Course Level: 2**
3. **Credit Units: 3 CU Credit Hours: 45 hrs**
4. **Course description**

The course introduces students to the Investment background, Developments in investment theory. The ultimate aim is to provide the student with a standard approach to define measure and predict value of investments in a world of uncertainty. The standard notion of risk versus return is defined and analytical economic models of how risks and returns are determined and traded in financial markets are applied to solve any investment analysis problem

5. **Course objectives**

On completion of the course the student should:
- ☐ To learn the concepts of investment, investment portfolio, return and risk.
- ☐ To learn how the concepts of return and risk fit into a standard valuation model for investments - the Capital Asset Pricing Model (CAPM)
- ☐ To learn the economic concept of market efficiency and the implications of market efficiency for doing investment valuation.
- ☐ To learn the basic measures of investment value in an investment portfolio and also to learn about the selection of an investment option, some basic methods of valuing options and investment portfolio diversification.
- ☐ To learn how to conduct investment analysis in settings of statistical uncertainty by using decision tree analysis. You will learn how to apply a simple model of binomial statistical uncertainty in decision tree analysis.
- ☐ To develop a capacity to construct solutions to investment analysis problems by modeling value, risks and returns in relation to the statistical uncertainties surrounding them and general asset management.

6. **Detailed course description**

6.1 The Investment background   (3hrs)
- ☐ The Investment Setting
- ☐ Types of investments
- ☐ Fundamentals of Investment Planning

6.2 Developments in investment theory   (3hrs)
- ☐ Efficient Capital Markets
- ☐ An Introduction to Portfolio Management
- ☐ An Introduction to Asset Pricing Models
- ☐ Extensions and Testing of Asset Pricing Theories

6.3 Analysis and management of bonds (6hrs)
- ☐ Bond Fundamentals
- ☐ The Analysis and Valuation of Bonds
- ☐ Bond Portfolio Management Strategies
- ☐ Investment companies and evaluating portfolio performance
- ☐ Professional Asset Management
- ☐ Evaluation of Portfolio Performance

6.4 Investment companies and evaluating portfolio performance (4hrs)
- ☐ Professional Asset Management
- ☐ Evaluation of Portfolio Performance

6.5 Investment Vehicles (4hrs)
- ☐ Debt Investment
- ☐ Equity Investments

6.6 Important Investment Concepts (6hrs)
- ☐ Capital Markets
- ☐ Importance of capital markets
- ☐ Primary markets
- ☐ Secondary markets
- ☐ Action markets
- ☐ Negotiated markets

6.7 Insurance based investment and investment companies (6hrs)
- ☐ Annuities
- ☐ Investment Company Characteristics
- ☐ Open-end and Closed-end Investment Companies

6.8 Types of Investment Risk (4hrs)
- ☐ Systematic vs unsystematic risk
- ☐ Market and interest rate
- ☐ Regulation and business risk
- ☐ Reinvestment risk and liquidity risk

6.9 Measuring Risk (4hrs)
- ☐ Volatility
- ☐ Standard Deviation
- ☐ Beta

6.10 Valuation Methods (5hrs)
- ☐ Bond Rating Services
- ☐ Common Valuation Methods
- ☐ Fundamental versus Technical Analysis

7. Mode of Delivery

Lectures (25 hrs), tutorials (10 hrs) and class presentation (10 hrs)

8. Ways of Assessment

Course works and tests   40%
Exam   60%

9. Reading List

Black, F. (1993). Beta and Return, Journal of Portfolio Management, Fall.

Brealey, Richard A., Myers, Stewart C., Allen, Franklin, (2006). Corporate Finance, Eighth edition, 2006, McGraw-Hill.

Clifford W. Smith, Jr., Charles W. Smithson and D. Sykes Wilford. Managing Financial Risk.

Frank Reilly and Keith Brown Investment Analysis and Portfolio Management, Thomson and Southwestern, 8th edition.

Goetzmann & Edwards (1994), Short Horizon Inputs and Long Horizon Portfolio Choice

Fama, E.F. and K.R. French (1992). The Cross-Section of Expected Stock Returns, Journal of Finance,

Jones, Gilroy, Shamsuddin, Simpson (2003). Investment: Analysis and Management. Australasian edition.

Pandey, I.M (1999), Financial management, Eighth Edition

1. **Course name: Project Planning**
2. **Course Level: 2**
3. **Credit Units: 2 CU Credit Hours: 30 hrs**
4. **Brief Description**

This course is designed to teach students the basic principles of good project management. Students will learn how to identify and schedule project resources, create project flow charts, and produce critical path planning and evaluation reports and project plans.

5. Course Objectives

By the end of the course it is expected that students will:
- Be aware of the different stages of project planning and different funding sources
- Identify appropriate project planning and control techniques
- Understand what constitutes good project planning and control
- Understand how to deal with change in the project setting
- Understand how to successfully resource projects and monitor performance
- Understand how to identify dependencies and their relationship to the Critical Path
- Identify procedures that can be used for change, quality and progress control

6. Course Outline

6.1 Introduction to Project planning and management   (6hrs)

- Project defined and where do projects originate
- Project management triangle (the triple constraint)
- Project management process, defining and organizing projects
- Describe what project management is and discuss key elements of the project management framework
- Discuss how project planning relates to other types of plans
- Understand the history of project management

6.2 The project planning process   (6hrs)

- Establishing the objectives of the project
- Project outcomes, impact or effect
- Defining the project situation
- Developing action steps (activities)
- Identifying support and resource needs and Flexibility in project planning
- Case studies

6.3 Developing a Project Plan (6hrs)

- Creating an Excel project plan template
- Determining the schedule
- Including key tasks
- Determine dependencies
- Identify milestones
- List resource requirements

6.4 Project planning and scheduling (6hrs)

- Project team organizing
- Project definition
- Resource identification
- Project operations
- Managerial techniques

6.5 Project planning and control (6hrs)

- Performance specification
- Evaluation of performance
- Review and monitoring
- Problem identification
- Decision making

6.6 Planning projects (6hrs)

- Defining the work break down structure
- Project net works
- Analyzing cost – time trade offs
- Assessing risks

6.7 Project planning tools (6hrs)

- The logical framework
- Gantt chart
- Critical path method
- Program evaluation review technique
- Program review information systems for management
- Program evaluation procedures
- Integrated management planning and control techniques
- SCANS and LOB,

6.8 Project Scope Management (6hrs)

- Elements that make good project scope management important
- The scope planning process and contents of a scope statement
- Scope verification and scope change and control to avoid scope creep

6   Mode of delivery

Lectures (25 hrs), tutorials (10 hrs) and class presentation

(10 hrs)

8. Ways of Assessment

Course works and tests	40%
Exam	60%

9. Reading List

Atim, D.K, (   ). <u>Fundamentals of Project Planning and Management,</u> First Edition

Bridger, A.G, and Winpenny J.T, (1988). <u>Overseas Development Administration: A Practical Guide to the Choice and Appraisal of Public Sector Investment</u>

Burke, Roy (2003). <u>Project Management: Planning and Control Techniques,</u> John Wiley and Sons Ltd ISBN: 0470851244

Lock, Dennis (2003). <u>Project Management</u>, Gower Publishing Limited ISBN: 0566085518

Lockyer KG and Gordon J (2005). <u>Project Management and Project Network Techniques</u>, FT Pitman Publishing ISBN: 0273614541

Prasanna Chandra, (   ). <u>Projects: Planning, Analysis, Selection, Implementation, and Review,</u> 4th edition.

Pandey I.M, (   ). <u>Financial management</u>

1. **Course name:**   **Management Accounting**
2. **Course Level: 2**
3. **Credit Units: 3 CU Credit Hours:**   **45 hrs**
4. **Brief description**

Introduces the students to management accounting concepts, cost estimation, marginal and absorption costing/product costing, cost –volume-profit Analysis (CVP), accounting for management decision making, budgeting and budgetary control, recent developments in management accounting.

5. Course objectives
The general objective of the course is to enable students understand management accounting so that they can be able to provide relevant and valuable management information that is important in the execution of planning, controlling and decision making managerial functions.

On completion of this course the student should:

- ☐ Have understood the nature, scope and role of management accounting in organizational settings and;
- ☐ Be capable of preparing, analyzing and interpreting basic management accounting information relevant to planning, control decision-making and product costing.

6. Detailed course description

6.1 Introduction to Management Accounting   (6hrs)
- ☐ Definition of Management Accounting
- ☐ Management Accounting and the Management Control System
- ☐ Management Accounting and Management Information system
- ☐ Nature of managerial decisions and various managerial decisions
- ☐ The role of Management Accounting in the Managerial process.

6.2 Cost estimation   (6hrs)
- ☐ Fundamental cost accounting concepts, The classification of cost, Cost behavior patterns, Cost estimation
- ☐ Accounting for prime cost: Materials cost accounting: Labour Cost Accounting
- ☐ Accounting for Overhead Costs
    - o   Overhead cost allocation and apportionment
    - o   Cost Allocation methods

6.3 Marginal and absorption Costing/product costing   (6hrs)
- Marginal costing
- Absorption costing

6.4 Cost –volume-profit Analysis (CVP)   (6hrs)
- Break-even analysis
- Applications of CVP analysis
- Limitations of CVP analysis

6.5 Accounting for management decision making   (8hrs)
- Decision making procedures
- The concept of relevant costs and short term decisions
- The short term decisions
  - Closure /delete / abandonment decision
  - Make or buy decision
  - Acceptance of a special order
  - Decision making under influence of limiting factors
- Divisional performance evaluation
- Pricing policy/decision

6.6 Budgeting and budgetary control   (8hrs)
- Introduction to budgeting - concepts and terms
- Rationale of budgeting, preliminaries for installation of effective budgetary control system
- The Budgeting process and preparation of budgets

6.7 Recent Developments in Management Accounting   (5hrs)

7. Mode of Delivery
Lectures (30 LH), and Tutorials (15 TH)

8. Ways of Assessment
Course works and tests	40%
Exam	60%

9. Reading List

Alan P. (1989). <u>Cost and Management Accounting</u>, 3rd Ed, Paul Chapman Publishing Ltd.

Brown, L. J, and Oliver, J. W. L(1998). <u>Weldon's Cost Accounting</u>, Pitman Publishing

Drury Collin (2000). <u>Management and Cost Accounting</u>, 4th Ed,   Chapman

Publishing Ltd.

Harper, M. W, (1980). <u>Cost Accountancy</u>, Richard Clay Ltd.

Horngren, T. Charles (1991). <u>Cost Accounting, A Managerial Emphasis</u>, Prentice Hall, 7th Ed.

Lucy, T, (1992). <u>Management Accounting</u>, DP Publishing

Lucy, T, (1993). <u>First Course in Cost and Management Accounting,</u> 2nd Ed DP Publishing.

Lucy, T, (1994). <u>Costing</u>, DP Publishing

1. **Course Name: ACCOUNTING II**
2. **Course Level: 2**
3. **Credit Units: 3 CU Credit Hours: 45 hrs**
4. **Brief Description**

Introduces students to accounting for the different forms of organizations and explores further more enhanced topics in the framework of accounting so as to be able to logically handle several accounting aspects. This course covers: preparation of final accounts for, trading, profit and loss accounts for NGOs, Balance sheet, receipts and payments, manufacturing concerns, partnerships, introduction to company accounts, financial and legal framework of limited liability companies. Prerequisite of Accounting I.

5. Course Objectives
By the end of the course the students should:

- ☐ Have understood the principles of accounting for different forms of organizations

- ☐ Prepare financial statements in line with the principles and accounting procedures studied throughout the entire course.

6. Course description

6.1 Preparation of final accounts for: (6hrs)
- ☐ Trading, profit and loss accounts for NGOs,
- ☐ Balance sheet
- ☐ Receipts and payments

6.2 Manufacturing concerns,   (6hrs)
- ☐ Direct and indirect costs
- ☐ Manufacturing statements/accounts

6.3 Partnerships,   (12hrs)
- ☐ Partnership accounts
- ☐ Documents governing the partnerships
- ☐ Preparation of trading profit and loss of partnership
- ☐ Preparation of profit and loss appropriation account
- ☐ Capital and current accounts
- ☐ Balance sheet of partnerships

6.4   Introduction to company accounts,   (12hrs)
          ☐ Financial and legal framework of limited liability companies,
          ☐ Quoted and unquoted companies,
          ☐ Classes of share capital and reserves,
          ☐ Types of loan capital,

6.5 Preparation of financial statements of companies.   (9hrs)

7. Mode of Delivery
        Lectures (LH 30), and tutorials (TH 15)

8. Ways of Assessment
      Course works and tests   40%
      Exam   60%

9. Reading List

Floyd Beams, (1998). <u>Advanced Accounting,</u> Prentice Hall
Jennings A.R, (1997). <u>Financial Accounting Manuals 1 And 2,</u> DP Publications
Meigs Johnston And Keller, (1985) <u>Advanced Accounting</u>, Mcgraw Hill Standards
Uganda Government,(CAP110). <u>The Companies Act</u>
Wood Frank (1999). <u>Business Accounting Volume 1 And 2</u>

1. **Course Name: Actuarial Data Processing**
2. **Course Level: 2**
3. **Credit Units: 3 CU Credit Hours: 45 hrs**
4. **Course Description**

The course is approached theoretically and practically. Theoretical concepts of structured programming are introduced with application of C Computer Programming Language.

5. **Course Objectives**

By the end of the course the students should be able to:

☐ Comprehend theory and practical applications to data processing.
☐ Demonstrate skills in C computer programming and process financial data.

6. **Detailed Course Outline**

6.1   **Introduction to systems Analysis and design; flow charting   (15hrs)**

☐ Data processing, editing and correction; editing and imputation principles; writing of edit specification, use of an edit specification; use of an edit package; tabulation, table design, writing of a table specification; use of a tabulation package; writing programs to implement numerical algorithms; application of numerical analysis software package such as NAG

6.2   **Simulation   (30hrs)**

☐ Random and pseudo random numbers;
☐ generation of uniform variates,
☐ inverse transform method for discrete variates,
☐ acceptance-rejection method;
☐ generating normal variates;
☐ generation of a series of correlated normal random variates;
☐ naming of physical devices for uniform generators;
☐ generation of variates from specified standard distributions such as normal, exponentials etc;
☐ Number of necessary simulations for a particular purpose,
☐ reasons for use of same number of simulated numbers;
☐ Advantages and disadvantages of using simulated numbers.
☐ Common sets of random numbers vs. independent sets of random numbers

7. Mode of Delivery
Lectures (LH 30), and tutorials (TH 15)

8. Ways of Assessment
Course works and tests   40%
Exam   60%

9. Reading List

Deitel Etal (1997). <u>C How to Program</u>
Kalicharan, (1996). <u>C by Example,</u> Cambridge Press
Kernighan W. Brian, and Ritchie M. Dennis, (1977). <u>The C Programming Language,</u> Prentice-Hall, Inc.

1. Course: Name: Life Contingencies II
2. Course Level: 2
3. Credit Units: 3 CU Credit Hours: 45 hrs
4. Course Description

The course applies the concepts and principles of survival modeling and computations of values, benefits, bonuses, pricing reserving and looks at various life insurance contracts. The course covers: use of select mortality functions, life insurance contracts: expenses and bonuses and gross premiums and reserves for fixed and variable benefit contracts. Pre-requisite of life contingencies I.

5. Objectives of the Course
On completion of the course the student should be able to:
- Define, estimate and use straightforward functions involving selection.
- Describe the types of future expenses and bonus required for pricing and reserving and the influence of inflation on these.
- Describe the calculation of Gross premiums and reserves using the equation of value for fixed benefit and variable benefit contracts.
- Describe the technique of discounted emerging costs, for use in pricing, reserving, and assessing profitability, for all contract types.
- Calculate the benefits on the early termination of a contract, including transfer, and the premium or benefits after a change in terms of a contract.
- Describe the calculation of the cost of the guarantees and options under life insurance contracts.

6. Course Outline

1.1 Definition and use of selected mortality functions   (15hrs)

- The selected life tables functions and and the ultimate life table functions l_x and d_x.
- Define the following Probabilities.
- Express the following life table in terms of the function in 4.1:
- Calculate net premiums and net premium policy values using select mortality

6.2 Life insurance contracts: expenses and bonuses   (15hrs)

- Types of expenses incurred n writing a life insurance contract.
- The influence of inflation on the expenses listed in 5.1.
- The types of bonuses that may be given to a with profits contract.

6.3 Gross premiums and reserves for fixed and variable benefit contracts   (15hrs)

- ☐ The gross future loss random variable for standard contract types
- ☐ Calculation of gross premium using future loss random variable and the equivalence principle, for premiums payable annually, more frequently than annually and continuously, and for benefits payable annually or at the end of the year of death, or continuously or immediately on death.
- ☐ Calculate the gross premium using simple criteria other than the equivalence principle
- ☐ Calculate the gross premium prospective reserve using the future loss random variable.
- ☐ The gross premium retrospective reserve.
- ☐ The conditions under which, in general, the prospective reserve allowing for expenses.

7. Mode of Delivery
Lectures (30 LH), and Tutorials (15 TH)

8. Ways of Assessment
Course works and tests   40%
Exam   60%

9. Reading List

Booth P.M, Chadburn R.G, Cooper D.R, Haberman S., James D., (2006). <u>Modern Actuarial Theory and Practice</u> 2nd Edition, Faculty of Actuarial Science.
Bowers N.L, Hans U, Hickman J.C, Donald A, Nesbitt C.J, (1997) <u>Actuarial Mathematics</u>, 2nd Edition, Scocity of Actuaries.
Klgman S.A, Panjer. H.H, Willmot G.E, (   ). <u>Loss models: from data to decisions,</u> 1st Edition, John Willey & Sons.

1. Course Name: Statistics for Insurance
2. Course Level: 2
3. Credit Units: 3 CU Credit Hours: 45 hrs
4. Course Description

Statistics for Insurance course provides grounding in mathematical techniques and applications, which are of particular relevance to General (non-life) insurance and related risks.

5. Objectives:

On completion of the course, the students should be able to:
- The conditions under which, in general, the prospective reserve allowing for expenses;
- Explain the concepts of decision theory and apply them;
- Calculate probabilities and moments of loss distributions both with and without simple reinsurance arrangements
- Explain the concept of Bayesian statistics and use these concepts to calculate Bayesian estimators generating
- Describe and explain the concept of credibility theory
- Explain the concept of ruin for a risk model. Calculate the adjustment coefficient and state Lundburg's inequality
- Construct risk models appropriate to short term insurance contracts and calculate the moment generating function and the moments for the risk models both with and without simple reinsurance arrangements.

6. Course content   (45hrs)

- The conditions under which, in general, the prospective reserve allowing for expenses Explain and apply statistical techniques of fitting models to data.
- Loss distributions: lognormal, exponential, pareto, weibull, gamma, negative Binomial, Binomial Compound Poisson distributions etc;
- Parametric and empirical estimation methods
- Evaluating estimators
- Selecting and validating models
- Compound model for aggregate claims
- modelling of individual losses and losses in aggregate
- Computing the aggregate claims distribution
- Credibility theory: Bayesian estimation
- Long-term loss models for insurance processes
- The adjustment coefficient and Lundburg's inequality
- The maximum aggregate loss
- Brownian motion risk process
- Brownian motion and the probability of ruin

7. Mode of Delivery
Lectures (LH 30), and Tutorials (TH 15)

8. Ways of Assessment
Coursework and Tests   40%
Examination   60%

9. Reading List

Dobson Annette J.; Chapman & Hall; (   ) <u>An Introduction to Statistical Modeling</u>

Hossack, Ian B; Pollard John H., Zehnwirth Benjamin ( ) <u>Introductory Statistics with applications I general Insurance</u>

Daykin Chris D; Pentikainen Teivo; Pesonen Martti; ( ) <u>Practical Risk Theory for Actuaries</u>

Klugman Stuart A; Panjer Harry H; Willmot Gordon E. (   ) <u>Loss Models: from data to decisions.</u>