NATIONAL BOARD FOR TECHNICAL EDUCATION

HIGHER NATIONAL DIPLOMA (HND)

IN

STATSITCS

CURRICULUM AND COURSE SPECIFICATIONS

November 2004

Produced by the National Board for Technical Education (NBTE)
Plot B, Bida Road, P.M.B. 2239, Kaduna Nigeria.

GENERAL INFORMATION

1.0 CERTIFICATION AND TITLE OF THE PROGRAMME:
The certificate to be awarded and the programme title shall read:

"HIGHER NATIONAL DIPLOMA IN STATISTICS"
A transcript showing all the courses taken and grades obtained shall be issued on demand.

STRUCTURE OF PROGRAMME

The Higher National Diploma programme is structured to last for two years (four semesters).

EVALUATION OR AWARD

All terminal Higher National Diploma programmes must be externally moderated after every five years. In grading the awards the Board's unified grading system should be applied.

ACCREDITATION

All programmes leading to the award of Higher National Diploma in statistics must be accredited by the National Board for Technical Education. Details of accreditation of programmes are available from the Executive Secretary Programmes Department, National Board for Technical Education, Plot 'B' Bida Road, P.M.B. 2239, Kaduna,

2.0 GOALS AND OBJECTIVES

2.1 HIGHER NATIONAL DIPLOMA PROGRAMME:

Retained (after every five years). The Higher National Diploma Programme in Statistics is designed to produce Statisticians capable of collecting data, analyzing and making inference.

The Higher National Diploma Programme in Statistics is a post National Diploma, two-year programme aimed at producing professional statisticians. The programme is designed to give the students:

(i) A thorough knowledge of statistics and statistical method;

(ii) A deep understanding of statistics and its application within the commercial, industrial and scientific environment;
(iii) Practical skills in research methodology, analysis and design of experiments leading to decision making and /or prediction.
(iv) Ability to use a computer when the need arises;
(v) Development of their ability to think logically, organize their thought well, and communicate such thoughts clearly, so that diplomates of the programme will be able to work in research centers; government establishments; industries and commercial houses as statisticians.
(vi) Set up a statistical project without supervision

3.0 ENTRY REQUIREMENTS:

3.1 HIGHER NATIONAL DIPLOMA

The entry requirement into Higher National Diploma Programme in Statistics is at least a Lower Credit grade in National Diploma in Statistics obtained from an accredited statistics programme with one year supervised Industrial Experience. In exceptional cases, at least two years Industrial Experience for candidates with Pass grade or any other equivalent certificate.

4.0 CURRICULUM

4.1 The curriculum of the HND programme consists of three main components. These are:
(a) General studies/education
(b) Foundation courses
(c) Professional courses

4.2 **The General Studies/Education** component shall include courses in:

Language and Communication - English language and communication. This is compulsory.
and
Social Studies- Citizenship (the Nigeria constitution) is compulsory.

The General Education component shall account for not more than 10% of total contact hours for the programme.

Foundation Courses - Courses in mathematics and computer studies. The number of hours will vary with the programme and may account for about 10-15% of the total contact hours.

Professional Courses - Courses which give the student the theory and practical skills he needs to practice his field of calling at the technician / technologist level. These may account for between 60-70% of the contact hours depending on programme.

5.0 CURRICULUM STRUCTURE

5.1 HND Programme:

The structure of the HND Programme consists of four semesters of classroom, laboratory and workshop activities in the college. Each semester shall be of 17 weeks duration made up as follows:
15 contact weeks of teaching, i.e. lecture and practical exercises, etc. and 2 weeks for tests, quizzes, examinations and registration.

6.0 CONDITONS FOR THE AWARD OF THE ND

Institutions offer accredited programmes for the award of the Higher National Diploma to candidates who successfully complete the programme after passing prescribed course work, examinations and project. Such candidates should have completed a minimum of between 90% and 100% of credit units depending on the programme. Higher Diplomas shall be awarded based on the following classifications:

Distinction	-	CGPA 3.50-4.0
Upper credit	-	CGPA 3.00-3.49
Lower Credit	-	CGPA 2.50- 2.99
Pass	-	CGPA 2.00-2.49

7.0 GUIDANCE NOTES FOR TEACHERS TECHING THE PROGRAMME

7.1 The new curriculum is drawn in unit courses. This is in keeping with the provisions of the National policy on Education, which stress the need to introduce the semester credit units which will enable a student who so wish to transfer the units already complete in an institution of similar standard from which he is transferring.

7.2 In designing the units, the principle of the modular system has been adopted; thus making each of the professional modules, when completed self-sufficient and providing the student with technician operative skills, which can be used for employment purposes.

7.3 As the success of the credit unit system depends on the articulation of programmes between the institutions and industry, the curriculum content has been written in terms of behavioural objectives, so that it is clear to all, the expected performance of the student who successfully completed some of the courses or the diplomates of programme is clearly defined. There is a slight departure in the presentation of the performance based curriculum which required the conditions under which the performance are expected to be carried out and the criteria for the acceptable levels of performance. It is a deliberate attempt to further involve the performance that can take place and to follow that with the criteria for determining an acceptable level of performance. Departmental submission on the final curriculum may be vetted by the academic board of the institution. Our aim is to continue to see to it that a solid internal evaluation system exists in each institution for ensuring minimum standard and quality of education in the programmes offered throughout the polytechnic system.

7.4 The teaching of the theory and practical work should, always where possible, be integrated. Practical exercise, especially those in professional courses and laboratory work should not be taught in isolation from the theory. For each course, there should be a balance of theory to practice depending on the course objectives and content. Life data, case studies, mini-projects and visits to and from available organizations should be incorporated wherever and whenever possible.

STATISITICS (HIGHER NATIONAL DIPLOMA)
Year one
Semester one: Curriculum Table

S/No	Course code	Course title	L	P	Total	Prerequisite
1	STA 311	Statistical Theory III	2	3	5	
2	STA 312	Applied General Statistics II	2	3	5	
3	STA 313	Statistical Inference and Scientific Methods	2	3	5	
4	STA 314	Operations Research I	2	3	5	
5	MTH 314	Mathematical Methods II	2	3	5	
6	COM 312	Database Design I	2	3	5	
7	STA 315	Technical English II	1	1	2	
8	GNS 111	Citizenship education III	1	1	2	
		Total	14	20	34	

L- Lecture
P-Practical
TH-Total Hours.

STATISTICS (HIGHER NATIONAL DIPLOMA)

Year one

Semester two: Curriculum Table

S/No	Course code	Course title	L	P	Total	Prerequisite
1	STA 321	Statistical Theory IV	2	3	5	STA 311
2	STA 322	Sampling Techniques II	2	3	5	
3	STA 323	Design and Analysis of Experiments II	2	3	5	
4	STA 324	Statistical Management and Operations	2	3	5	
5	STA 325	Biometrics	2	3	5	
6	MTH 322	Mathematical Methods III	2	3	5	MTH 314
7	COM 322	Database Design II	2	3	5	COM 312
		Total	14	21	35	

STATISTICS (HIGHER NATIONAL DIPLOMA)

Year two

Semester three: Curriculum Table

S/No	Course code	Course title	L	P	Total	Prerequisite
1	STA 411	Operations Research II	2	3	5	STA 314
2	STA 412	Sampling Techniques III	2	3	5	STA 322
3	STA 413	Econometrics	2	2	4	
4	STA 414	Economic and Social Statistics II	2	3	5	
5	STA 415	Industrial Statistics II	2	3	5	
6	STA 416	Medical Statistics	2	2	4	
7	STA 417	Design and Analysis of Experiments III	2	3	5	STA 323
8	STA 418	Small Business Management II	1	1	2	
		Total	15	20	35	

STATISTICS (HIGHER NATIONAL DIPLOMA)

Year two

Semester four: Curriculum Table

S/No	Course code	Course title	L	P	Total	Prerequisite
1	STA 421	Operations Research III	2	3	5	STA 411
2	STA 422	Demography II	2	3	5	
3	STA 423	Non-parametric Statistics	2	3	5	
4	STA 424	Statistical Computing	2 2	3	5	
5	STA 425	Time Series Analysis	2	3	5	
6	STA 426	Multivariate Methods and Stochastic Processes		3	5	
7	STA 427	Project		5	5	
		Total	12	23	35	

Programme: Statistics (Higher National Diploma)	**Course Code: STA 311**	**Total Hours: 5**
Course: Statistical Theory III		**Theoretical: 2 hours /week**
Year: 1 Semester: 1	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to introduce students to distributing continuous types and to elementary estimation theory

General Objectives: On completion of this course, the diplomates should be able to:

1. Understand distributions of the continuous type.
2. Understand the concept of the use of conditional distributions.
3. Understand the distribution of functions of random variables
4. Understand further uses of the central limit theorem.
5. Understand the bivariate normal distribution
6. Understand the concept of the Chebyshev inequality and its uses
7. Understand the method of least squares estimation

	Theoretical Content	**Practical Content**
	General Objective 1 (STA 311): Understand distributions of the continuous type	

Week	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
1	1.1 Define continuous random variables. 1.2 Define the probability distribution function of a continuous variable. 1.3 Evaluate the probability distribution function of a continuous variable. 1.4 Define the distribution function of a continuous random variable. 1.5 Determine the distribution function of a continuous random variable using the probability distribution function.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.6 Evaluate the expected value of a continuous random variable. 1.7 Evaluate the moment generating function of a variable. 1.8 Evaluate the characteristic function of a variable	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 2 (STA 311): Understand the concept of the use of conditional distributions					

3	2.1 Define conditional probability density function of X given Y. 2.2 Compute conditional probability such as P(X/Y)=y.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
4	2.3 Define conditional mean of X and the conditional variance of X given Y.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 311): Understand the distributions of functions of random variables					
5	3.1 Define the distribution of functions of random variables. 3.2 Determine the mean, the variance and moment generating fFunction of a function such as $Y=(X_1, X_2)$. 3.3 Identify functions that are linear combinations of random variables.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
6	3.4 Calculate the expected values and variances of the function in 3.3 above. 3.5 Find the moment generating functions and the distributions of the sum of independent random variables.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 4 (STA 311): Understand further uses of the central limit theorem.					

7	4.1 Review the central limit theorem. 4.2 State the importance of the central limit theorem.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
8	4.3 Approximate probabilities when n is "sufficiently large" using the central limit theorem.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 5 (STA 311): Understand the bivariate normal distribution					
9	5.1 Define the bivariate normal distribution. 5.2 Derive the moment generating function of the bivariate normal distribution.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
10	5.3 Obtain the marginal and the conditional densities of the bivariate normal distribution	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 6 (STA 311): Understand the concept of the Chebyshev inequality and its uses					

11	6.1 State the Chebyshev Inequality.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
12	6.2 Prove the law of large numbers applying the Chebyshev Inequality. 6.3 Solve some problems using the inequality	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 7 (STA 311): Understand the method of least squares estimation					
13	7.1 Distinguish between point and estimate intervals. 7.2 Define the least squares estimator.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
14	7.3 Define the best linear unbiased estimator (BLUE). 7.4 State the Gauss-Markov theorem.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
15	7.5 Obtain the least squares estimates of β_o and β_1 in	Explain and discuss the	Textbooks	Demonstrate	Explain and	Textbooks

	the model $y=\beta_0 + \beta_1 X + E$ 7.6 State and explain the desirable properties of a good estimator unbiasedness, efficiency, sufficiency and consistency	concepts covered	Lecture Notes	understanding of the concepts covered by solving examples	supervise student exercises and assess student work	Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 311)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 homeworks to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Statistical Techniques, R. D. Mason

Programme: Statistics (Higher National Diploma)	**Course Code: STA 312**	**Total Hours: 5**
Course: Applied General Statistics I		**Theoretical: 2 hours /week**
Year: 1 Semester: 1	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to provide the student with a better knowledge of regression and correlation analysis.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand the linear relationship between two variables.
2. Understand the correlation between two variables.
3. Understand multiple regression between two independent variables.
4. Understand polynomial models of various orders.
5. Understand multiple correlation analysis of two independent variable X_1 and X_2.
6. Understand the analysis of contingency tables.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 312): Understand the linear relationship between two variables					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 State the simple linear regression model. 1.2 Fit a straight line by the least squares methods to a set of bivariate data. 1.3 Construct confidence intervals for the regression coefficients.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.4 Carry out test of hypothesis about the regression coefficients. 1.5 Explain and use the F-test in regression analysis for the two variable cases. 1.6 Check for deviation from assumptions on the regression model.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 2 (STA 312): Understand the correlation between two variables					
3	2.1 Define the correlation between two variables. 2.2 Calculate and interpret the product-moment coefficient of correlation.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

4	2.3 Construct confidence intervals for correlation coefficients. 2.4 Carry out test of hypothesis about the product moment coefficient of correlation.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 312): Understand multiple regression between two independent variables					
5	3.1 State the multiple linear regression model. 3.2 Compute linear regression coefficients.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
6	3.3 Construct confidence intervals for regression coefficients. 3.4 Carry out test of hypothesis for the regression coefficients.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
7	3.5 Apply analysis of variance (ANOVA) in multiple linear regression analysis. 3.6 Select the best regression equation stepwise.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 4 (STA 312): Understand polynomial models of various orders					
8	4.1 Obtain the first order, second order and third order polynomial models. 4.2 Explain and use of "dummy" variables in multiple regressions.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
9	4.3 Define orthogonal polynomials and orthogonal regression. 4.4 Obtain various order fitted regression equations using orthogonal polynomials	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 5 (STA 312): Understand multiple correlation analysis of two independent variable X_1 and X_2					
10	5.1 Define and interpret multiple and partial correlation coefficients. 5.2 Compute multiple and partial correlation coefficients.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
11	5.3 Test hypotheses about correlation coefficients.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 6 (STA 312): Understand the analysis of contingency tables					
12	6.1 Define attributes, factors and factor levels. 6.2 Explain the dichotomous classification of attributes. 6.3 Explain the manifold classification of attributes.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
13	6.4 Define contingency tables. 6.5 Apply the χ^2 test of independence of dichotomous classification. 6.6 Describe Yates contingency correction for a 2*2 contingency table.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
14	6.7 Assess the validity of Yates continuity correction. 6.8 Describe Fisher's exact test. 6.9 Derive the formulae for Fisher's exact test. 6.10 Assess the validity for Fishers exact test.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

15	6.11 Describe Neamos test for matched samples. 6.12 Apply χ^2 test of independence to the manifold classification. 6.13 Compute and interpret Yates coefficient of association. 6.14 Compute and interpret partial association of attributes.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 312)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

An Introduction to Contemporary Statistics, M. Hurburg

Statistical Analysis for Decision Making, M. Hurburg

Programme: Statistics (Higher National Diploma)	**Course Code: STA 313**	**Total Hours: 5**
Course: Statistical Inference and Scientific Methods		**Theoretical: 2 hours /week**
Year: 1 Semester: 1	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to enable students draw inference by statistics.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand scientific and natural laws.
2. Understand aims and principles of statistical inference.
3. Understand decision theory.
4. Understand Bayer's decision theory.
5. Understand other decision concepts.
6. Understand the logic of theories of inference.
7. Understand classical standard significance tests**.**

	Theoretical Content			Practical Content		
	General Objective 1 (STA 313): Understand scientific and natural laws					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Explain scientific laws. 1.2 Explain natural laws. 1.3 Distinguish between 1.1 and 1.2 above	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 2 (STA 313): Understand aims and principles of statistical inference					
2	2.1 Explain statistical inference. 2.2 State the basic aims of statistical inference. 2.3 State the principles of statistical inference.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 313): Understand Decision Theory					
3	3.1 Explain decision theory. 3.2 State the essential components in decision making.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

4	3.3 Define loss, consequence, space and utility. 3.4 Define utility function. 3.5 State different types of utility function.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
5	3.6 Explain the properties of a utility function. 3.7 Explain the utility of money.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 4 (STA 313): Understand Bayer's decision theory					
6	4.1 Define loss function, risk function and decision function. 4.2 Explain dominance and admissibility assignments.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
7	4.3 Apply 4.1 above in solving practical problems. 4.4 Compute Bayer's strategies.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

8	4.5 Define a prior distribution. 4.6 Define posterior distribution. 4.7 Distinguish between prior and posterior distributions.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 5 (STA 313): Understand other decision concepts					
9	5.1 Explain minimum and maximum principles. 5.2 Construct decision tree.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
10	5.3 Apply set of above to solve practical problems.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 6 (STA 313): Understand the logic of the theories of inference					
11	5.3 State the principal theories of inference. 5.4 Explain the logic of 6.1 above.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 7 (STA 313): Understand classical standard significance tests.					
12	7.1 Define significance tests. 7.2 Explain the Neyman-Pearsen test	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
13	7.3 Determine the Neyman-Pearson tests.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
14	7.4 Distinguish between simple and composite hypotheses. 7.5 Explain Bayesian tests.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
15	7.6 Compute the maximum likelihood estimate of the means and variances of distributions. 7.7 Explain the likelihood ratio test.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 313)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 homeworks to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: STA 314**	**Total Hours: 5**
Course: Operations Research I		**Theoretical: 2 hours /week**
Year: 1 Semester: 1	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to provide the students with the knowledge of the techniques of operations research and their applications.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand the nature of operations research.
2. Understand the definition and scope of linear programming.
3. Understand the graphical method of solving linear programming problems (involving only two variables).
4. Understand the simplex method of solving linear programming problems.
5. Understand sensitivity analysis.
6. Understand the principle of duality and its application.
7. Understand transportation and assignment problems
8. Understand network analysis.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 314): Understand the nature of operations research					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Define operations research. 1.2 Outline the history of operations research. 1.3 Explain the concept of model building in operations research. 1.4 State the principles of modelling. 1.5 State the advantages and disadvantages of models in operations research.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 2 (STA 314): Understand the definition and scope of linear programming					
2	2.1 Define linear programming. 2.2 Define a linear programme. 2.3 State the scope of linear programming. 2.4 Explain linear megnalities, their graphs and solutions. 2.5 State the two methods of solving linear programming problems e.g. graphical and simplex.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 3 (STA 314): Understand the graphical method of solving linear programming problems (Involving only two Variables)					
3	3.1 Draw graphs for the constraints of a linear programming problem 3.2 Identify the feasibility region in 3.1 above. 3.3 Identify the vertex of the feasibility region in 3.2 above.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
4	3.4 Identify feasibility solution area (convex region). 3.5 Locate the vertices for the solution using the objective function. 3.6 Solve problems in two variables	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 4 (STA 314): Understand the simplex methods of solving linear programming problems					
5	4.1 Develop the simplex algorithm.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
6	4.2 Identify basic variables, non-basic variables shadow prices (cost, evaluations etc). 4.3 Develop the simplex method with equalities as constraints.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

7	4.4 Apply the simplex method to problems involving few variables. 4.5 Make use of a computer package for the simplex method	Explain and discuss the concepts covered	Textbooks Software Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Software Lecture Notes
	General Objective 5 (STA 314): Understand sensitivity analysis					
8	5.1 Explain sensitivity analysis techniques. 5.2 Apply the techniques of sensitivity analysis to some practical problems.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 6 (STA 314): Understand the principle of duality and its application					
9	6.1 Derive dual linear program from primal program. 6.2 Solve optimization problems graphically using dual linear program.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
10	6.3 Solve optimization problems by the dual simplex method. 6.4 Obtain the solution of the dual program from the primal program	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 7 (STA 314): Understand transportation and assignment problems					
11	7.1 Define transportation problems. 7.2 Explain northwest corner methods for starting a transportation problem. 7.3 Solve simple transportation problems using the simplex method. 7.4 Explain least-last rule as an alternative method of solving transportation problems. 7.5 Use a computer package to solve a transportation problem	Explain and discuss the concepts covered	Textbooks Software Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Software Lecture Notes
12	7.6 Solve an assignment problem as a special transportation problem. 7.7 Explain the row/column methods for solving assignments problems. 7.8 Use a computer package to solve an assignment problem	Explain and discuss the concepts covered	Textbooks Software Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Software Lecture Notes
	General Objective 8 (STA 314): Understand network analysis					
13	8.1 Define network analysis. 8.2 List some examples of network flow problems. 8.3 State and explain the origin of PERT and CPM techniques as aids to efficient project management. 8.4 List some applications of PERT and CPM in project managements.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	8.5 Explain and evaluate the earliest and latest event times, float times and project completion time.					
14	8.6 Estimate optimistic, pessimistic, most likely times. 8.7 Construct dependency tables and PERT networks	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
15	8.8 Explain a critical path and methods of identifying. 8.9 Evaluate project completion times; least cost 8.10 Use a computer package to solve a PERT network	Explain and discuss the concepts covered	Textbooks Software Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Software Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 314)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

An Introduction to Management Science, D. R. Anderson, D. J. Sweeney, T. A. Williams

Operations Research, H. A. Taha

Programme: Statistics (Higher National Diploma)	**Course Code: STA 315**	**Total Hours: 2**
Course: Technical English II		**Theoretical: 1 hour /week**
Year: 1 Semester: 1	**Pre-requisite:**	**Practical: 1 hour /week**

Goal: This course is designed to provide the student with the skills required to write statistical reports and communicate professionally in good English.

General Objectives: On completion of this course, the diplomate will be able to:

1. Write reports, including statistical input, by using good English and appropriate layouts (formats)
2. Engage in professional correspondence
3. Write a full report on a statistical investigation in an accepted format
4. Write a questionnaire in good English.
5. Deliver a short lecture on a statistical topic

	Theoretical Content			Practical Content		
	General Objective 1 (STA 315): Write reports, including statistical input, by using good English and appropriate layouts (formats)					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Students understand how to write in good English	Give examples of good and bad English.	Classroom resources	Students write a 2 page article, including statistical input at HND level, in the style of a newspaper article for a general audience.	Provide suitable data and oversee writing	Workshop resources (writing and library resources)
2	1.2 Students understand that reports conform to specific formats	Give examples of good reports including statistical input	Classroom resources	Students write a short technical report, with statistical input at HND level	Provide suitable data and oversee writing	Workshop resources (writing and library resources)
3	1.3 Students know how to vary the formats for the different topics and needs	Give examples of good reports including statistical input	Classroom resources	Students write a short technical report, with contrasting statistical input at HND level	Provide suitable data and oversee writing	Workshop resources (writing and library resources)

	General Objective 2 (STA 315): Engage in professional correspondence					
4	2.1 Students understand how to write to sources to request information of a more technical nature.	Explain rules of letter writing and professional letter writing and Give examples	Classroom resources	Students are able to write to sources to request information and to engage in professional correspondence	Provide suitable assignments and pair up students for letter writing	Workshop resources (writing and library resources)
5	2.2 Students know the rules and etiquette for engaging in a short exchange of letters with another statistician discussing a statistical topic of a more technical nature.	Explain rules of letter writing and professional letter writing and Give examples	Classroom resources	Students are able to write to sources to request information and to engage in professional correspondence	Provide suitable assignments and pair up students for letter writing	Workshop resources (writing and library resources)
	General Objective 3 (STA 315): Write a full report on a statistical investigation in an accepted format					
6	3.1 Students understand the rules for writing a full statistical report.	Explain accepted format(s) for statistical reports. Explain free standing abstract, introduction, methods, results, discussion, and references	Classroom resources	Students can write a full report on a statistical topic at HND level	Provide data and sets individual assignments	Workshop resources

7	3.1 (continued) Students understand the rules for writing a full statistical report.	Explain accepted format(s) for statistical reports. Explain free standing abstract, introduction, methods, results, discussion, and references	Classroom resources	Students can write a full report on a statistical topic at HND level	Provide data and sets individual assignments	Workshop resources
	General Objective 4 (STA 315): Write a questionnaire in good English.					
8	4.1 Understand the language issues of a questionnaire	Explain principles and give examples	Classroom resources	Students research the background requirements for a survey	Help students choose topics and oversee research	Classroom resources Internet
9	4.2 Understand how to construct a questionnaire	Oversee construction of questionnaire	Classroom resources	Students construct a questionnaire to support their survey	Help students choose topics and supervise construction	Classroom resources Internet
	General Objective 5 (STA 315): Deliver a short lecture on a statistical topic					
10	5.1 Understand how to prepare a lecture and speak in public	Provide advice	Workshop resources, overhead projector powerpoint	Students prepare for giving a fifteen minute lecture on a statistical topic at HND level	Help students select topics and support preparation of lectures	Workshop resources, overhead projector powerpoint

11	5.1 (continued) Understand how to prepare a lecture and speak in public	Provide advice	Workshop resources, overhead projector powerpoint	Students prepare for giving a fifteen minute lecture on a statistical topic at HND level	Help students select topics and support preparation of lectures	Workshop resources, overhead projector powerpoint
12	5.1 (continued) Understand how to prepare a lecture and speak in public	Provide advice	Workshop resources, overhead projector powerpoint	Students prepare for giving a fifteen minute lecture on a statistical topic at HND level	Help students select topics and support preparation of lectures	Workshop resources, overhead projector powerpoint
13	5.1 (continued) Understand how to prepare a lecture and speak in public	Provide advice	Workshop resources, overhead projector powerpoint	Students prepare for giving a fifteen minute lecture on a statistical topic at HND level	Help students select topics and support preparation of lectures	Workshop resources, overhead projector powerpoint
14	5.1 (continued) Understand how to prepare a lecture and speak in public	Provide advice	Workshop resources, overhead projector powerpoint	Students prepare for giving a fifteen minute lecture on a statistical topic at HND level	Help students select topics and support preparation of lectures	Workshop resources, overhead projector powerpoint

15	5.1 (continued) Understand how to prepare a lecture and speak in public	Provide advice and feedback on presentation	Workshop resources, overhead projector powerpoint	Students give a fifteen minute lecture on a scientific topic at HND level	Evaluate presentation	Workshop resources, overhead projector powerpoint

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Project %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 315)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	0
Test	0 progress test	0
Practical / Project	Article Short reports (2) Letters (2) Full report Questionnaire Lecture all to be assessed by the teacher	10 10 10 20 10 40
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: STA 321**	**Total Hours: 5**
Course: Statistical Theory IV		**Theoretical: 2 hours /week**
Year: 1 Semester: 2	**Pre-requisite: STA 311**	**Practical: 3 hours /week**

Goal: This course is designed to provide the student with an enhanced knowledge of theories of statistics

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand distributions of independent random variables.
2. Understand various distributions related to the normal
3. Understand Cochran's theorem
4. Understand the Neyman/Pearson lemma for testing of hypothesis
5. Understand the methods of maximum likelihood estimation
6. Understand the method of minimum variance unbiased estimation

	Theoretical Content			Practical Content		
	General Objective 1 (STA 321): Understand distributions of independent random variables					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Define a necessary and sufficient condition for the independent of two discrete variables. 1.2 Derive the characteristic function of the sum of independent variables	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.3 Derive the distribution function of the sum of two independent random variables	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 2 (STA 321): Understand various distributions related to the normal					
3	2.1 Define the gamma function 2.2 Define and derive the probability density function of the χ^2 distribution 2.3 Derive the characteristic function of the χ^2 distribution	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

4	2.4 Explain the concept of degrees of freedom 2.5 Compute the first and the second moments of the χ^2 distribution 2.6 Define and derive the students t distribution	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
5	2.7 Compute the first and the second moments of the t distribution 2.8 Define and derive the Fisher's F distribution 2.9 Compute the first and the second moments of the r distribution.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 321): Understand Cochran's theorem					
6	3.1 State Cochran's theorem for K samples	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
7	3.2 Apply Cochran's theorem to samples from normal populations	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 4 (STA 321): Understand the Neyman/Pearson lemma for testing of hypothesis					
8	8.1 Define the test of a simple hypothesis against a simple alternative hypothesis. 8.2 Distinguish between randomized and non-randomized tests	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
9	8.3 Define the power of a test and the UMP tests 8.4 Derive and represent OCcurves	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
10	8.5 State and prove Neyman /Pearson lemma to find the most powerful test	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 5 (STA 321): Understand the method of maximum likelihood estimation					
11	5.1 Define and compute the likelihood function of random variables	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

12	5.2 Define and compute the maximum likelihood estimators of parameters of the normal, poisson and the binomial distributions.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 6 (STA 321): Understand the method of minimum variance unbiased estimation					
13	6.1 Define and compute Crammer-Rao bounds 6.2 Define and compute Bhattacharya bounds for estimators of parameters of the normal, poisson and binomial distribution	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
14	6.3 Define and compute unbiased estimators and the MVUE parameters of the distribution in 6.2 6.4 Define and illustrate sufficient statistics and complete statistics	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
15	6.5 State and prove the Rao-Blackwell theorem 6.6 Apply the Rao-Blackwell theorem to solve problems.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 321)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 homeworks to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Statistical Techniques**,** R. D. Mason

Statistics: A tool for social sciences, Ott, Larson

Programme: Statistics (Higher National Diploma)	**Course Code: STA 322**	**Total Hours: 5**
Course: Sampling Techniques II		**Theoretical: 2 hours /week**
Year: 1 Semester: 2	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to enable students acquire a better knowledge of techniques of statistical sampling.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand systematic sampling
2. Understand single stage cluster sampling
3. Understand stratified random sampling**.**

	Theoretical Content			Practical Content		
	General Objective 1 (STA 322): Understand systematic sampling					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Define systematic sampling 1.2 Explain linear and circular systematic sampling	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.3 Estimate mean and variance under systematic sampling	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
3	1.4 Construct confidence interval for population means	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
4	1.5 Estimate relative precision in systematic sampling	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 2 (STA 322): Understand single stage cluster sampling					
5	2.1 Define cluster sampling 2.2 State the reasons for cluster sampling 2.3 Determining optimum unit	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
6	2.4 Describe single-stage cluster sampling of equal and unequal sizes 2.5 Estimate population parameters under sampling of equal sizes	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
7	2.6 Construct confidence intervals under sampling of equal size 2.7 Estimate population parameters under sampling of unequal size under unequal probabilities	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
8	2.8 Estimate population parameters under sampling using ratio-to-size 2.9 Describe sampling with probability proportional to size (PPS)	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
9	2.10 Estimate parameter sampling of unequal sizes under sampling with probability proportional to size	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

10	2.11 Estimate relative precision sampling equal and unequal size 2.12 Explain variance function and cost function in determining optimum unit.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 322): Understand stratified random sampling					
11	3.1 Define stratified random sampling 3.2 State reasons for stratification	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
12	3.3 Explain the principles of stratification 3.4 Estimate mean, total, proportion and variance under stratified sampling using the allocations in 3.3 above.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
13	3.5 Construct confidence interval for population parameters	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
14	3.6 Estimate relative precision in stratified sampling 3.7 Determine the size of sample in stratified sampling	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

15	3.8 Explain equal allocation, proportional allocation, optimum allocation, and Neyman allocation	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 322)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

Statistical Techniques, R. D. Mason

Programme: Statistics (Higher National Diploma)	**Course Code: STA 323**	**Total Hours: 5**
Course: Design and Analysis of Experiments II		**Theoretical: 2 hours /week**
Year: 1 Semester: 2	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to enable the student to design experiments and analyse results.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand methods of increasing the accuracy of experiments.
2. Understand classification of designs and analysis of variance.
3. Understand the randomized block design with one observation per cell.
4. Understand the RBD with more than one observation per cell.
5. Understand Latin square design

	Theoretical Content			Practical Content		
	General Objective 1 (STA 323): Understand methods of increasing the accuracy of experiments					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Review the iterative nature of experimentation 1.2 Explain the need for sequential experimentation 1.3 Explain the uses and advantages of randomization	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples from real life situations	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
	General Objective 2 (STA 323): Understand classification of designs and analysis of variance					
2	2.1 Describe the completely randomized experiment 2.2 Identify the one-way classification of data 2.3 Distinguish between fixed and random effects model	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples from real life situations	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
3	2.4 Partition the sum of squares for the one way classification 2.5 Carry out analysis of variance for the one way classification	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples from real life situations	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data

4	2.6 Estimate the parameters of the model 2.7 Test for the adequacy of the model	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples from real life situations	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
	General Objective 3 (STA 323): Understand the randomized block design with one observation per cell					
5	3.1 Describe randomized block design (RBD) 3.2 State the advantages of the randomized block design 3.3 Partition the sum of squares in randomized block design	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples from real life situations	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
6	3.4 Carry out analysis of variance for randomised block design 3.5 Estimate the parameters of the model	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples from real life situations	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
7	3.6 Estimate standard error for differences between two means 3.7 Estimate missing values in randomized block design 3.8 Carry out ANOVA and RBD with missing values.	Explain and discuss the concepts covered	Textbooks Lecture Notes ANOVA table Life data	Demonstrate understanding of the concepts covered by solving examples from real life situations	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes ANOVA table Life data

8	3.9 Estimate efficiency of randomized block design 3.10 Estimate the relative efficiency of RBD 3.11 Test for the adequacy of the model	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples from real life situations	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
	General Objective 4 (STA 323): Understand the RBD with more than one observation per cell					
9	4.1 Explain the two way classification model with an equal number of observations per cell 4.2 Define the term interaction	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
10	4.3 Explain interaction by means of diagram 4.4 Partition the sum of square for the model in 4.1	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
11	4.5 Carry out ANOVA for the model in 4.1 above 4.6 Test for the adequacy of the model in 4.5 above	Explain and discuss the concepts covered	Textbooks Lecture Notes ANOVA table	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes ANOVA table

	General Objective 5 (STA 323): Understand Latin square design					
12	5.1 Describe Latin square design 5.2 Explain randomization in Latin square design 5.3 Partition the sum of square in Latin square design	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
13	5.4 Carry out analysis of variance in Latin square design 5.5 Estimate the parameters of the model 5.6 Estimate standard error for differences between two means 5.7 Test for adequacy of the model in 5.5 above	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
14	5.8 Estimate missing values in Latin square design 5.9 Carry out ANOVA for the missing value model	Explain and discuss the concepts covered	Textbooks Lecture Notes ANOVA table	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes ANOVA table
15	5.10 Estimate efficiency of Latin square model 5.11 Estimate the relative efficiency of the design	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 323)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: STA 324**	**Total Hours: 5**
Course: Statistical Management and Operations		**Theoretical: 2 hours /week**
Year: 1 Semester: 2	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This Course is designed to enable students to manage statistical information.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand the principles of management.
2. Understand the practice and organization of management.
3. Understand the principles and practice of a feasibility study

	Theoretical Content			Practical Content		
	General Objective 1 (STA 324): Understand the principles of management					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Define management. 1.2 Explain the various statistical services.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.3 Plan the setting up of a statistical services centre. 1.4 Formulate and implement necessary statistical service policies.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
3	1.5 Define a statistician's leadership role in the centre. 1.6 Explain various management roles such as span of control, decision-making, and the delegation of authority etc.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
4	1.7 Explain the needs for setting up efficient communication system.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 2 (STA 324): Understand the practice and organization of management					
5	2.1 Identify the techniques and skills of management. 2.2 Construct organizational charts.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
6	2.3 Review critical path analysis and its use in management. 2.4 Explain discounted cash flow and apply to practical examples. 2.5 Define decision theory using expected values and tree diagram.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
7	2.6 Apply 2.5 above some practical examples. 2.7 Describe techniques of employment (interview), staff training and staff utilization.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
8	2.8 Identify the relationship between statistical service and other components of the organization. 2.9 Identify the interdependence of management service, other organisation and the general public.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

9	2.10 Carry out a case study of typical statistical service and organisation either in government industry, commerce or research.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 324): Understand the principles and practice of a feasibility study					
10	3.1 Identify a business proposal. 3.2 Define a feasibility study /project analysis. 3.3 Distinguish between small and medium scale business.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
11	3.4 Organize a feasibility study. 3.5 Identify types of organisation.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
12	3.6 Identify types of business. 3.7 Define sources of capital. 3.8 Carry out a financial plan.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

13	3.9 Identify sources of raising capital. 3.10 State the advantages and disadvantages of each source.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
14	3.11 Identify the issues of managing a business. 3.12 Know the type of staff to employ.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
15	3.13 Discuss keeping accurate records about the business 3.14 Explain project profit and loss accounts of the business	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 324)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 homeworks to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: STA 325**	**Total Hours: 5**
Course: Biometrics		**Theoretical: 2 hours /week**
Year: 1 Semester: 2	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to introduce the student to application of statistics in the design and analysis of studies in biology, agriculture and medicine.

General Objectives: On completion of the course, the diplomate should be able to:

1. Understand basic concepts of cells in biology.
2. Understand the basis for the inheritance theory.
3. Understand population genetics.
4. Understand basic distributions in biological models.
5. Understand the basic assay methods.
6. Understand the transformation needed in bio-medical responses.
7. Understand the estimations and uses of potency of substances.
8. Understand other biometric distributions and their uses.

	General Objective 1 (STA 325): Understand basic concepts of cells in biology					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Classify micro organisms 1.2 Describe the living cell 1.3 Describe cell division 1.4 Explain cellular basics for reproduction, mitosis and meiosis	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 2 (STA325): Understand the basis for the inheritance theory					
2	2.1 State the mendelian theory and ratios 2.2 Explain and interpret the mendelian theory	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
3	2.3 Explain the dominance theory 2.4 Explain linkage	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 325): Understand population genetics					
4	3.1 Explain gene frequency 3.2 Explain population changes in terms of gene frequency	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess	Textbooks Lecture Notes

	3.3 Estimate population theory in terms of gene frequency				student work	
5	3.4 Define genotypes and phenotypes 3.6 Distinguish between genotypes and phenotypes	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 4 (STA 325): Understand basic distribution in biological models					
6	4.1 Explain the need for the binomial distribution in biological problems 4.2 Explain the need for the poisson distribution in biological problems	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
7	4.3 Apply the distribution in 4.1 and 4.2 above to solving problems	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 5 (STA 325): Understand the basic assay methods					
8	5.1 Define bio-assay 5.2 Define quantal responses 5.3 Explain the uses of bio-assay and quantal responses 5.4 Define parallel line assays	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
9	5.5 Define slope ratio assays	Explain and discuss the	Textbooks	Demonstrate	Explain and	Textbooks

	5.6 Explain the uses and the method of assays in 5.4 above in solving problems 5.7 Apply the assay methods to solve problems	concepts covered	Lecture Notes	understanding of the concepts covered by solving examples	supervise student exercises and assess student work	Lecture Notes
	General Objective 6 (STA 325): Understand the transformation needed in bio-medical responses					
10	6.1 Define probit transformation 6.2 Define logit transformation 6.3 Define angular transformation	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
11	6.4 Explain the needs and uses of the transformations in 6.1, 6.2 and 6.3 above 6.5 Apply the transformation to solve problems	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 7 (STA 325): Understand the estimations and uses of potency of substances					
12	7.1 Describe the methods of estimation of ED50 7.2 Describe the methods of estimation of LD50 7.3 Compare ED50 and LD50	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
13	7.4 Explain the uses of LD50 and ED50 in solving problems 7.5 Explain the fiducial limits for ratios	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 8 (STA 325): Understand other biometric distribution and their uses					
14	8.1 Define and explain the uses of the distributions: logarithmic, log-normal, poisson, negative binomial, exponential and χ^2	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
15	8.2 Explain the uses of poisson processes and growth curves in biometrics	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 325)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

Statistics Methods in Medical Research (2nd Edition)**,** P. Armitage, G. Berry

Programme: Statistics (Higher National Diploma)	**Course Code: STA 411**	**Total Hours: 5**
Course: Operations Research II		**Theoretical: 2 hours /week**
Year: 2 Semester: 3	**Pre-requisite: STA 314**	**Practical: 3 hours /week**

Goal: This course is designed to enable students to understand advanced techniques in operations research.

General Objectives: On completion of this course, the diplomates should be able to:

1. Understand the basic concepts of queuing.
2. Understand basic simulation techniques.
3. Understand inventory theory (deterministic models only).

	Theoretical Content			Practical Content		
	General Objective 1 (STA 411): Understand the basic concepts of queueing.					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Explain queueing theory. 1.2 Define basic queueing terminologies (arrival/service times, traffic intensity etc.)	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.3 State the distributions of arrival and service times as poisson and exponential processes	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
3	1.4 Define and state the assumptions of a simple (M/M/1) queue	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
4	1.5 State and apply the formulae for M/M/1 to practical problems.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess	Textbooks Lecture Notes

					student work	
5	1.6 Define and state the assumptions of a double channel, (M/M/2) queue 1.7 State and apply the formulae for M/M/2 to practical problems.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 2 (STA 411): Understand basic simulation techniques.					
6	2.1 Define simulation 2.2 State the various simulation techniques	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
7	2.3 Explain Monte-Carlo methods	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
8	2.4 Apply Monte-Carlo methods to simulation	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

9	2.5 Apply computer packages on simulation techniques	Explain and discuss the concepts covered	Textbooks Lecture Notes Software	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Software
	General Objective 3 (STA 411): Understand inventory theory (deterministic models only					
10	3.1 Explain inventory theory	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
11	3.2 Define the classical economic order quantity model (EOQ) 3.3 Explain the components of the EOQ and QST models	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
12	3.4 Obtain the optional order quantity and, optional time between replenishment by minimizing the cost function and applying partial derivatives. 3.5 Solve simple inventory problems.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
13	3.6 Carry out sensitivity analysis of the classical EOQ model. 3.7 State the cost functions of EOQ with shortages allowed.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess	Textbooks Lecture Notes

					student work	
14	3.8 Explain the components in the model stated in 2.7 3.9 Determine the optional order quantity, minimum cost and the inventory level just after replenishment from the model in 2.7.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
15	3.10 Explain the model in 2.7 by the use of a graph. 3.11 Solve some simple problems to illustrate the use of the models in 2.7.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 411)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

An Introduction to Management Science, D. R. Anderson, D. J. Sweeney, T. A. Williams
Operations Research, H. A. Taha
Simul8, Good Decision Partnership (simulation software)

Programme: Statistics (Higher National Diploma)	**Course Code: STA 412**	**Total Hours: 5**
Course: Sampling Techniques III		**Theoretical: 2 hours /week**
Year: 2 Semester: 3	**Pre-requisite: STA 322**	**Practical: 3 hours /week**

Goal: This course is designed to enable the student carry out more advanced sampling for analysis.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand two stage sampling.
2. Understand stratified two stage sampling
3. Understand ratio estimate under stratified sampling.
4. Understand the principles of regression estimation.
5. Understand the treatment of non-sampling error.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 412): Understand two stage sampling					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Describe the structure and uses of sampling 1.2 Estimate population parameters under sub sampling with units of equal and unequal sizes	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Statistics kit	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Statistics kit
2	1.3 Construct confidence interval for population parameters under sub sampling with units of equal and unequal sizes 1.4 Determine sample size and allocation to the two stages	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Statistics kit	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Statistics kit
3	1.5 Describe self-weighting design 1.6 Estimate relative precision	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Statistics kit	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Statistics kit
	General Objective 2 (STA 412): Understand stratified two-stage sampling					
4	2.1 Describe stratified sampling 2.2 Estimate population two-stage parameters in two-stage sampling	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by	Explain and supervise student exercises	Textbooks Lecture Notes

				solving examples	and assess student work	
5	2.3 Determine size of sample in stratified two-stage sampling 2.4 Determine the allocation of sample sizes to different strata and stages	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
6	2.5 Estimate relative precision under stratified two-stage sampling	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 412): Understand ratio estimation under stratified sampling.					
7	3.1 Explain ratio estimation 3.2 Estimate population ratio by combined ratio method	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
8	3.3 Compare separate and combined estimates 3.4 Estimate the bias of ratio estimator	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

9	3.5 Describe optimum allocation in ratio estimator	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 4 (STA 412): Understand principles of regression estimation					
10	4.1 State the principle of regression estimation 4.2 Compare regression coefficients	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
11	4.3 Estimate the mean and total of the population 4.4 Derive the variance of the regression estimator	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
12	4.5 Compute the variance of the regression estimator 4.6 Compute relative efficiency of regression estimator given the ratio estimator under stratified sampling 4.7 Estimate the bias of the regression estimator of the population mean under stratified sampling	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 5 (STA 412): Understand the treatment of non-sampling error					
14	5.1 Identify and explain non-sampling error 5.2 Construct models for non-sampling error	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess	Explain and discuss the concepts covered using life

					student work	data
15	5.3 State the assumptions underlying non-sampling error 5.4 Compute the estimate of the population mean under assumptions in 5.3 above. 5.5 Compute the variance of the estimate in 5.4 above	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Explain and discuss the concepts covered using life data

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 412)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

Sampling Techniques, W G Cochram (John Wiley)

Programme: Statistics (Higher National Diploma)	**Course Code: STA 413**	**Total Hours: 4**
Course: Econometrics		**Theoretical: 2 hours /week**
Year: 2 Semester: 3	**Pre-requisite:**	**Practical: 2 hours /week**

Goal: This course is designed to enable students understand the application of mathematics and statistics to economics.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand the nature and quality of economic data, measurement and functions.
2. Understand the application of regression and correlation to economic data.
3. Understand the use of analysis of variance, homoscedaticity and heteroscedaticity in economics.
4. Understand the concepts of multicolinearity.
5. Understand serial and auto-correlation.
6. Understand errors in variable and simultaneous equation models.
7. Understand lagged variables.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 413): Understand the nature and quality of economic data measurement and functions					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Define econometrics 1.2 Explain end quality of economic data. 1.3 Define the following functions: production, consumption and investment. 1.4 Construct economic models for the functions in 1.3 above.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.5 Define price elasticity for sale and demand 1.6 Apply the maximum likelihood estimation (MLE) method to the function of economic model in 1.4 above. 1.7 Apply the models in 1.4 above to solve problems.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 2 (STA 413): Understand the application of regression and correlation to economic data					
3	2.1 Fit appropriate regression models correlation to economics variables. 2.2 Test hypotheses about the parameters of the model in 2.1 above and interpret the results. 2.3 Compute and interpret correlation coefficients using economic variables.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

4	2.4 Compute and interpret partial correlation coefficients using economic variables 2.3 Compute and interpret multiple correlation coefficients using economic variables 2.4 Test hypotheses about the coefficients in 2.3 to 2.5 above.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 413): Understand the use of analysis of variance, homoscedasticity in economics					
5	3.1 Apply analysis of variance in solving economic problems 3.2 Define homoscedasticity 3.3 State the assumptions of homoscedasticity	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
6	3.4 Test for homoscedasticity and interpret the results 3.5 Define heteroscedasticity 3.6 State the assumptions of heteroscedasticity.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 4 (STA 413): Understand the concepts of multicollmearity					
7	4.1 Define and illustrate multicollinearity 4.2 State the assumptions and consequences of multicollineartiy	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by	Explain and supervise student exercises	Textbooks Lecture Notes

				solving examples	and assess student work	
8	4.3 Test for multicollinearity with any appropriate methods and interpret the results.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 5 (STA413): Understand serial and auto-correlation					
9	5.1 Define and illustrate auto-correlation 5.2 State the sources and consequences of auto-correlation 5.3 Test for first-order auto-correlation	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
10	5.4 Calculate residuals and estimate parameters of auto-correlation 5.5 Define and illustrate serial auto-correlation	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 6 (STA 413): Understand errors in variable and simultaneous equation models.					

11	6.1 Explain errors in measurement of variables 6.2 Determine the solutions for errors in measurement of variables 6.3 Define dummy variables.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
12	6.4 State the uses of dummy variables in economic functions 6.5 Explain simultaneous dependence of economic variables 6.6 State the consequences of simultaneous relations and the appropriate solution.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
13	6.7 Explain the two-stage least squares (2SLS) method. 6.8 Calculate the 2SLS estimates.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objectives 7 (STA 413): Understand lagged variables					
14	7.1 Define lagged variables 7.2 Explain exogenous and endogenous lagged variables	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

15	7.3 Construct a distributed – lag model for demand and estimate the parameters.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 413)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: STA 414**	**Total Hours: 5**
Course: Economic and Social Statistics II		**Theoretical: 2 hours /week**
Year: 2 Semester: 3	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to enable the student to further understand the application of statistics in rectifying and solving social and economic problems.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand sources of data for economic and social investigation.
2. Understand the concepts of social accounting.
3. Understand the concepts and use of national accounting.
4. Understand the application of index numbers to economic and social statistics.
5. Understand the principles of statistical management.
6. Understand the application of regression and correlation in economic and social statistics.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 414): Understand sources of data for economic and social investigation					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	3.3 Identify sources of social and economic information 3.3 Identify various sources of information e.g. government statistics, libraries, etc	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics
2	3.3 Explain the problems of collecting economic and social statistics in Nigeria	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics
	General Objective 2 (STA 414): Understand the concepts of social accounting					
3	2.1 Explain social accounting 2.2 Describe the nature of social accounting with examples	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics
4	2.3 State the uses of social accounting 2.4 Estimate the items in social accounting using statistical procedures	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by	Explain and supervise student exercises	Textbooks Lecture Notes

			Official statistics	solving examples	and assess student work	Official statistics
	General Objective 3 (STA 414): Understand the concepts and use of national accounting					
5	3.1 Identify various sectors of a national economy 3.2 Define national accounting 3.3 Identify components of national accounts 3.4 Explain with examples the T-entry systems of an account 3.5 Construct the input and output table of a national economy	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics
6	3.6 Define national output 3.7 Define national income 3.8 Differentiate between net product and gross national product 3.9 State and explain allied aggregates of national income 3.10 Describe the measurement of national income with examples	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics

7	3.11 Define real national income 3.12 Define the methods of measuring real national income 3.13 Explain the term international trade 3.14 Explain the importance of international trade to accounting 3.15 Differentiate between visible and invisible trade 3.16 Explain methods of payment in international trade 3.17 Compute the financial account of nation	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics
	General Objective 4 (STA 414) : Understand the application of index numbers to economic and social statistics					
8	4.1 Explain in general terms, the meaning of an index number 9.2 Calculate a weighted index number	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics

9	4.3 Calculate indices of production 4.4 Identify the problems in index number construction	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics
10	4.5 Compute an index of industrial production by the method of deflation and the method of indicators 4.6 Explain the index of retail prices	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics
11	4.7 Relate the index in 4.6 above to a cost-of-living index 4.8 State the uses of index numbers	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics
	General Objective 5 (STA 414): Understand the principles of statistical management					
12	5.1 Define industrial relations 5.2 Explain the various type of employment 5.3 Explain decrement life table	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics

13	5.4 Apply decrement life table to forecasting of labour turn–over 5.5 Apply statistical procedure to the estimation of labour productivity	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics
	General Objective 6 (STA 414): Understand the application of regression and correlation in economic and social statistics					
14	6.1 Fit appropriate regression models 6.2 Test hypotheses about the parameters of the model and interpret the results	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics
15	6.3 Compare and interpret correlation coefficient using both economic and social data	Explain and discuss the concepts covered using life data	Textbooks Lecture Notes Official statistics	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Official statistics

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 414)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: STA 415**	**Total Hours: 5**
Course: Industrial Statistics II		**Theoretical: 2 hours /week**
Year: 2 Semester: 3	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to enable students to apply statistical methods in achieving quality control in industry.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand the concepts of statistical quality control.
2. Understand process control by inspection of variables.
3. Understand process control by inspection of attributes.
4. Understand the principles of an acceptance sampling plan.
5. Understand the use of statistical tests of significance in quality control.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 415): Understand the concepts of statistical quality control					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Define statistical quality control 1.2 Define and illustrate factors which determine the quality of a product	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.3 Explain the purpose of quality control 1.4 Distinguish between statistical process control and production control	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
3	1.5 State human factors in quality control	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 2 (STA 415): Understand process control by inspection of variables					
4	2.1 Define the term inspection of variables 2.2 Explain when a process is under control	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by	Explain and supervise student exercises	Textbooks Lecture Notes

	2.3 Explain the notion of control limit (warning and action)			solving examples	and assess student work	
5	2.4 Explain and construct an X-chart 2.5 Explain and construct an R-chart	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
6	2.6 Identify the merit and demerit of using either X-chart and R-chart 2.7 Identify and illustrate danger signals observable in control charts	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 415): Understand process control by inspection of attributes					
7	3.1 Define the term inspection of attribute. 3.2 Explain and construct a P-chart	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by undertaking a mini project	Explain and supervise student mini project and assess student work	Textbooks Lecture Notes Life data
8	3.3 Explain and construct a C-chart	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by undertaking a mini project	Explain and supervise student mini project and assess student work	Textbooks Lecture Notes Life data

9	3.4 Describe the merits and demerits of using a process control chart by attributes	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by undertaking a mini project	Explain and supervise student mini project and assess student work	Textbooks Lecture Notes Life data
	General Objective 4 (STA 415): Understand the principles of an acceptance sampling plan					
10	4.1 Define acceptance sampling plan by attribute 4.2 State and explain the purpose of an acceptance sampling plan 4.3 Define and explain the concepts of consumer's risk, producer's risk, AQL, LTPD, AOQ, AOQL and expected number of defects in a sample.	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by undertaking a mini project	Explain and supervise student mini project and assess student work	Textbooks Lecture Notes Life data
11	4.4 Construct an operating characteristic (OC) curve 4.5 Explain the type of acceptance sampling plans: single, double, multiple, sequential 4.6 Construct a single sampling plan for attributes using poisson chart	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by undertaking a mini project	Explain and supervise student mini project and assess student work	Textbooks Lecture Notes Life data
12	4.7 Define and explain average amount of inspection 4.8 Design a double sampling plan including evolutionary process	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by undertaking a mini project	Explain and supervise student mini project and assess student work	Textbooks Lecture Notes Life data
	General Objective 5 (STA 415): Understand the use of tests of significance in quality control					

13	5.1 State the null hypothesis and alternative hypothesis in quality control.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
14	5.2 Carry out tests of hypothesis for the following cases (a) Difference between two sample means (b) Difference between two sample variance (c) Difference between two sample proportion	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
15	5.2(continued) Carry out tests of hypothesis for the following cases (a) Difference between two sample means (b) Difference between two sample variance (c) Difference between two sample proportion	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 415)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Programme: Statistics (Higher National Diploma)	**Course Code: STA 413**	**Total Hours: 4**
Course: Medical Statistics		**Theoretical: 2 hours /week**
Year: 2 Semester: 3	**Pre-requisite:**	**Practical: 2 hours /week**

Goal: This course is designed to provide the student with the knowledge of the application of statistics in the studying and analysis of studies in medicine.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand the usual sources and the uses of medical data.
2. Understand various data collection schedules and their historical development.
3. Understand health indices.
4. Understand planned studies in medical research.
5. Understand the basic theory of epidemiology.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 416): Understand the usual sources and the uses of medical data					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Identify the normal sources of medical statistics 1.2 Explain health statistics 1.3 Explain vital statistics	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
2	1.4 Explain the uses of the statistics in 1.2 and 1.3 above 1.5 Compare the sources, forms and nature of medical statistics	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
	General Objective 2 (STA 416): Understand various data collection schedules and their historical development					
3	2.1 Describe the registration processes for births and deaths 2.2 Describe the registration certificates of births and deaths	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
4	2.3 Describe the registration certificate of births and deaths of some other nations 2.4 Describe the C.I.D, it's principles and historical	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by	Explain and supervise student exercises	Textbooks Lecture Notes

	developments		Secondary life data	solving examples	and assess student work	Secondary life data
5	2.5 Compare the certificates and forms in 2.1 and 2.2 above.	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
	General Objective 3 (STA 416): Understand health indices					
6	3.1 Define the vital statistical indices 3.2 Define the health statistical indices	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
7	3.3 Eplain the method of indirect standardization of rates 3.4 Explain the method of direct standardization of rates	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
8	3.5 Solve problem involving standardization rates	Explain and discuss the concepts covered	Textbooks Lecture	Demonstrate understanding of the concepts	Explain and supervise student	Textbooks Lecture

			Notes Secondary life data	covered by solving examples	exercises and assess student work	Notes Secondary life data
	General Objective 4 (STA 416): Understand planned studies in medical research					
9	4.1 Define clinical trials 4.2 Identify ethical problems involved in clinical trials 4.3 Explain the term placebo treatment	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
10	4.4 Design a clinical trail using the placebo treatment 4.5 Describe the application of cross-over designs to medical problems. 4.6 Explain morbidity surveys	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
11	4.7 Distinguish between retrospective and prospective studies 4.8 Identify situation for the use of study methods met in 4.7 above 4.9 Describe cohort study	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
12	4.10 Describe case-control study	Explain and discuss the	Textbooks	Demonstrate	Explain and	Textbooks

	4.11 Describe double blind studies 4.12 Describe follow-up studies	concepts covered	Lecture Notes Secondary life data	understanding of the concepts covered by solving examples	supervise student exercises and assess student work	Lecture Notes Secondary life data
13	4.13 Describe sequential clinical trials 4.14 Explain the use of the various study methods in 4.9 to 4.12 above 4.15 Define non-parametric sequential clinical trials and explain their uses. 4.16 Identify common mistakes (fallacies) involve in clinical trials.	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
	General Objective 5 (STA 416): Understand the basic theory of epidemiology					
14	5.1 Define epidemiology of disease	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
15	5.2 Apply the methods of clinical trials to epidemiological problem	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess	Textbooks Lecture Notes

			Secondary life data		student work	Secondary life data

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 416)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 homeworks to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Statistics Method in Medical Research (2nd Edition), P. Armitage, G. Berry

Programme: Statistics (Higher National Diploma)	**Course Code: STA 417**	**Total Hours: 5**
Course: Design and Analysis of Experiments III		**Theoretical: 2 hours /week**
Year: 2 Semester: 3	**Pre-requisite: STA 323**	**Practical: 3 hours /week**

Goal: This course is designed to enable the student to further develop knowledge of the principles of design and analysis of experiments.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand Graeco-Latin square design.
2. Understand cross-over designs.
3. Understand factorial experiments.
4. Understand split-plot design.
5. Understand incomplete block designs.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 417): Understand Graeco-Latin square design					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Describe and illustrate Graeco-Latin square design 1.2 Partition the sum of square in Graeco-Latin square design	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
2	1.3 Carry out analysis of variance for Graeco-Latin square design	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
3	1.4 Estimate standard errors in the Graeco-Latin square design 1.5 Apply 1.2 to 1.4 above in solving problems	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
	General Objective 2 (STA 417): Understand cross- over designs					
4	2.1 Describe and illustrate cross-over design 2.2 Partition the sum of squares in cross-over design	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by	Explain and supervise student exercises	Textbooks Lecture Notes

			Secondary life data	solving examples	and assess student work	Secondary life data
5	2.3 Carry out analysis of variance for cross-over designs 2.4 Estimate the standard error for difference between two means	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
6	2.5 Estimate missing values in cross-over designs 2.6 Apply 2.2 to 2.5 above in solving problems	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
	General Objective 3 (STA 417): Understand factorial experiments					
7	3.1 Describe and illustrate factorial experiments 3.2 Distinguish between main effects and interactions 3.3 Interpret the term interaction 3.4 State the advantages of factorial experiments	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
8	3.5 Carry out tests of hypothesis on main effects and interactions 3.6 Explain confounding in 2n factorial experiments	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess	Textbooks Lecture Notes

	3.7 Explain confounding and factorial replication in factorial experiments 3.8 State the advantages of confounding		Secondary life data		student work	Secondary life data
9	3.9 State the advantage of factorial replication 3.10 Estimate missing values in factorial experiments 3.11 Describe Yates's algorithm 3.12 Apply 3.5 to 3.11 above in solving problems	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
	General Objective 4 (STA 417): Understand spilt-plot design					
10	4.1 Describe and illustrate simple split-plot design 4.2 State the advantage of split-plot design 4.3 Partition sum of squares in split plot design	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
11	4.4 Carry out analysis of variance (ANOVA) for split-plot design 4.5 Estimate standard errors in split-plot design 4.6 Estimate missing values in split-plot design	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data

12	4.7 Estimate efficiency of split-plot design 4.8 Apply 4.3 to 4.7 above in solving problems	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
	General Objective 5 (STA 417): Understand incomplete block designs					
13	5.1 Describe and illustrate incomplete block designs and state their advantages 5.2 Distinguish between balanced and partially balanced design 5.3 Carry out analysis of variance (ANOVA) for partially balanced incomplete block design	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
14	5.4 Estimate standard errors in complete block designs 5.5 Estimate missing values in incomplete block designs	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary life data
15	5.6 Estimate efficiency of incomplete block design 5.7 Apply 5.3 to 5.6 above in solving problems.	Explain and discuss the concepts covered	Textbooks Lecture Notes Secondary	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Secondary

			life data			life data

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 417)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 homeworks to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: STA 418**	**Total Hours: 2**
Course: Small Business Management II		**Theoretical: 1 hour /week**
Year: 2 Semester: 1	**Pre-requisite:**	**Practical: 1 hour /week**

Goal: This course is designed to provide the student with further basic knowledge on the various tools used in the management of small-scale businesses.

General Objectives: On completion of this course, the diplomate will be able to:

1. Understand the financing of small business enterprises
2. Understand financial management in a small business enterprise
3. Understand credit control in small business enterprises.
4. Understand the organization, and its structure for a small-scale enterprise.
5. Understand a small-scale enterprise information system.
6. Understand marketing management for a small-scale enterprise.
7. Produce a business plan for a small-scale enterprise.
8. Be able to give a presentation on a business plan for a small-scale enterprise.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 418): Understand the financing of small business enterprises.					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Estimate the capital needs of a selected small business. 1.2 State sources of finance for small business. 1.3 Explain the roles of specialized institutions in financing small businesses. 1.4 Explain how to source short-term and long-term credits	Explain sources of capital and how to estimate needed capital for a small business. Explain short-term and long term credits and their sources. Explain the roles of specialized institutions in financing small businesses in the areas of: a) Provision of SME equity. b) Provision of term loan opportunities for SMEs investment schemes. c) Provision of working capital facility for SMEs d) Financing SMEs through leasing. e) Financing SMEs for non-oil export. f) Financing SMEs through the capital market. g) General	Text Books Journals Publications	Apply all the theoretical contexts to come from the rest of the course to the assigned business. Prepare a financing plan. Identify various sources of funds and their costs. The group will meet together in all practical sessions and each group will have to submit a project about their assigned business at the end of the course.	From one the beneficiaries of the institutions handling SME, describe the learning outcomes. The teacher to set up student groups of (3-4) students each and assign a type of business for each group.	Internet and relevant websites

		requirements/conditi ons for market financial assistance to SMEs				
2	1.5 Explain the various reasons for borrowing. 1.6 Describe costs of borrowing with some examples. 1.7 Explain how to approach lenders. 1.8 Explain reasons for financial plans.	Explain various reasons for borrowing. With some examples, explain cost of borrowing. Explain reasons for financial plan and how to approach a lender	Text Books Journals Publications	Prepare a financing plan for their assigned business. Identify various sources of funds and their costs. Describe how to approach lenders.	From one the beneficiaries of the institutions handling SME, describe the learning outcomes.	Internet and relevant websites
	General Objective 2 (STA 418): Understand financial management in a small business enterprise					
3	2.1 Explain the need for sound financial management in small business. 2.2 Prepare the basic financial records required for small business enterprises and their operation. 2.3 Explain preparation of key financial statements – cash flow, profit and loss account and balance sheet. 2.4 Explain preparation of depreciation schedule.	Explain the need for sound financial management in small businesses Explain basic financial records Explain key financial statements. Explain depreciation.	Text Books Journals Publications Formats of prime books of accounts.	Describe the various records require to operate their assigned SME Describe key financial statements and how to prepare a depreciation schedule.	Guide students to prepare the records, extract key financial statements to determine BEP, loss or gain.	Internet and relevant websites
4	2.5 Explain how to determine gross margin and net profit. 2.6 Explain preparation of loan repayment schedule	Explain gross margin and net profit and Break-even-point (BEP).	Text Books Journals	Describe key financial statements and how to prepare a	Guide students to prepare the records,	Internet and relevant websites

	(AMORTIZATION) 2.7 Explain how to determine break-even-point (BEP). 2.8 Explain problem of financial management in small enterprises.	Explain the various types of loan repayment and their application. Guide students to prepare a depreciation schedule for a selected business, extract its cash flow, profit and loss and balance sheet to determine its break – even- point, gross margin and net profit. Explain problems of financial management in small enterprises.	Publications Formats of prime books of accounts.	depreciation schedule. Use appropriate application packages to do amortization.	extract key financial statements to determine BEP, loss or gain.	
	General Objective 3 (STA 418): Understand credit control in small business enterprises.					
5	3.1 Explain credit control 3.2 Explain the various steps in extending credits to customers. 3.3 Identify sources of information on credits.	Explain credit control Explain the 3c's of credit (character, capacity and condition). Explain where and how to get information on credits.	Text Books Journals Publications	Identify how credits can be extended to their assigned small business, sources and costs of the credits	Identify the CS of credit. Use internet to get information on credits	Internet and relevant websites
6	3.4 Explain consumer credit and credit cards. 3.5 Explain reasons for credits to small business enterprises. 3.6 Identify cost of credit	Explain consumer credit and credit card. Explain reasons for credit to small business enterprises and their costs.	Text Books Journals Publications	Identify credit cards and reasons for credit	Identify the CS of credit. Use internet to get information on credits	Internet and relevant websites
	General Objective 4 (STA 418): Understand the organization, and its structure for a small-scale enterprise.					

7	4.1 Understand organization charts for small-scale enterprises. 4.2 Understand span of supervision.	Explain Demonstrate.	Textbook Handouts Charts	Know how to set staffing requirements for their assigned small business. Know how to develop job description of jobs required.	Guide students to develop organization charts, job description and job specification and to identify different functions of their assigned business.	Sample forms Charts
8	4.3 Understand formal communication structure for a small business. 4.4 Developing job-know how to set specifications for the operation of small business.	Explain Demonstrate.	Textbook Handouts Charts	Know how to develop job description of jobs required for their assigned business. Know how to develop job specification	Guide students to develop organization charts, job description and job specification and to identify different functions of their assigned business.	Sample forms Charts
	General Objective 5 (STA 418): Understand a small-scale enterprise information system.					
9	5.1 Understand management information system. 5.2 Understand accounting information system. 5.3 Understand production information system.	Explain & demonstrate sample systems. Demonstrate the need of each system for the small business.	Textbook Handouts	Know the important information required for each system within the context of their assigned business.	Guide students with their assigned study Guide on use of appropriate software	Appropriate computer software

10	5.4 Understand financial information system. 5.5 Understand marketing information system. 5.6 Understand inventory information system.	Explain & demonstrate sample systems. Demonstrate the need of each system for the small business.	Textbook Handouts	Know the important information required for each system within the context of their assigned business.	Guide students with their assigned study Guide on use of appropriate software	Appropriate computer software
	General Objective 6 (STA 418): Understand marketing management for a small-scale enterprise.					
11	6.1 Know how to identify markets for different products. 6.2 Know the steps in conducting a market survey to determine demand and supply for a particular product. 6.3 Appreciate the need for product development for satisfying consumer needs.	Explain and give examples of certain products. Demonstrate steps. Explain why product development is important and is an on going process. Explain different pricing strategies and conditions and circumstances for choosing a particular strategy	Textbook Handouts	Identify markets and conduct survey applied to their assigned business. Explain channels of distribution for sample products. Explain different pricing methods and determinants of methods.	Guide students with their assigned study	Textbook Handouts
12	6.4 Understand channels of distribution for products and services. 6.5 Understand pricing strategies.	Explain and give examples of certain products. Demonstrate steps. Explain why product development is important and is an on going	Textbook Handouts	Identify markets and conducts survey within the context of their assigned business. Explain channels	Guide students with their assigned study	Textbook Handouts

		process. Explain different pricing strategies and conditions and circumstances for choosing a particular strategy		of distribution for sample products. Explain different pricing methods and determinants of methods.		
13	6.6 Understand promotion and sales activities for small-scale enterprises. 6.7 Ability to analyse consumer behaviour and anticipation of demand. 6.8 Ability to analyse competitors and developing market SWOT analysis.	Explain elements of promotion. Identify advantages & disadvantages and usage of promotion elements at different stages of product life cycle. Explain SWOT analysis and how to identify and assess strengths, weaknesses, opportunities and threats.	Textbook Handouts	Appreciate the importance of promotional activities for a small business. Understand the process of SWOT analysis.	Guide students with the application of promotion and sales activities on the assigned businesses Guide students to develop SWOT for the assigned businesses given present trends and marketing environment	Samples of Promotional materials SWOT analysis form
	General Objective 7 (STA 418): Produce a business plan for a small-scale enterprise.					
14	7.1 Assimilate the previous aspects of the course to produce a complete business plan for the assigned small business.	Oversee and support the production of the business plan	Textbook Handouts	Be able to contribute to the preparation of a business plan as a member of a group	Oversee and support the production of the business plan	Textbook Handouts
	General Objective 8 (STA 418): Be able to give a presentation on a business plan for a small-scale enterprise					

15	8.1 Prepare a presentation on a business plan for the assigned small-scale enterprise. 8.2 Give a presentation on a business plan for the assigned small-scale enterprise.	Evaluate presentations and give feedback	Presentation materials	Be able to be part of a group presentation and have responsibility for part of that presentation.	Evaluate presentations and give feedback	Presentation materials

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 418)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	0
Test	At least 1 progress test for feed back.	25
Practical / Project	Project with group (25%) and individual (50%) components to be assessed by the teacher	75
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: STA 421**	**Total Hours: 5**
Course: Operations Research III		**Theoretical: 2 hours /week**
Year: 2 Semester: 4	**Pre-requisite: STA 411**	**Practical: 3 hours /week**

Goal: This course is designed to further develop students' knowledge of techniques and application of operations research.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand the revised simplex method.
2. Understand the definition, scope and solution of integer programming problems.
3. Understand further inventory theory (non-deterministic models).

	Theoretical Content			Practical Content		
	General Objective 1 (STA 421): Understand the revised simplex method.					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Explain the revised simplex method	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.2 Apply the revised simplex method to simple problems	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
3	1.3 State the advantages of the revised simplex method over the standard simplex method from problems solved in 1.2	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 2 (STA 421): Understand the definition, scope and solution of integer programming problems.					
4	2.1 Define the nature of an integer programming problem. 2.2 Outline the popular methods of solving integer programming problems.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess	Textbooks Lecture Notes

					student work	
5	2.3 Solve problems by the branch and bound algorithm.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
6	2.4 Solve problems by the Gomory cutting planes method	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
7	2.5 Discuss mixed-integer programming 2.6 Discuss uses of integer programming to the introduction of logical variables.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
8	2.7 Solve assignment problems using integer programming	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 421): Understand further inventory theory (non-deterministic models).					

9	3.1 Explain simple inventory decisions using the newsboy problem (single period) 3.2 Carry out marginal analysis of the newsboy problem	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
10	3.3 Determine the optimal solution of the newsboy problem using marginal analysis 3.4 Explain simple mulit-period inventory policies	Explain and discuss the concepts covered	Textbooks Lecture Notes Software	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Software
11	3.5 Compare continuous review and periodic review procedures for analysing multi-period inventory systems	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
12	3.6 Explain the EOQ model for uncertain demand under simple continuous review	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
13	3.7 Solve simple inventory problems using the model met in 3.6	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

14	3.8 Explain the EOQ model for normally distributed demand	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
15	3.9 Solve simple inventory problems using the model met in 3.8	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 421)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

An Introduction to Management Science, D. R. Anderson, D. J. Sweeney, T. A. Williams

Operations Research, H. A. Taha

Programme: Statistics (Higher National Diploma)	**Course Code: STA 422**	**Total Hours: 5**
Course: Demography II		**Theoretical: 2 hours /week**
Year: 2 Semester: 4	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to give the student a better understanding of population statistics.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand the methods of evaluating demographic data.
2. Understand the methods of adjusting demographic data.
3. Understand the basic measures of fertility.
4. Understand the basic measures of mortality.
5. Understand life tables and their construction.
6. Understand reproductivity.
7. Understand the basic measures of migration.
8. Understand population estimates and projections.
9. Understand methods of estimating demographic measures from incomplete data.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 422): Understand the methods of evaluating demographic data					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Compute and interpret Whipple's index of digit preference 1.2 Compute and interpret Meyer's blended index of digit preference 1.3 Evaluate demographic data using the age-ratio method 1.4 Evaluate demographic data using the sex-ratio method 1.5 Compute and interpret the age-sex accuracy index.	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
	General Objective 2 (STA 422): Understand the methods of adjusting demographic data					
2	2.1 Adjust age data using the Carrier-Farraq ratio method 2.2 Adjust age-sex data using Newton's quadratic method	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data

	General Objective 3 (STA 422): Understand the basic method of fertility					
3	3.1 Compute and interpret crude birth rate, general fertility rate and child-woman ratio 3.2 State the advantages and disadvantages of measures in 3.1 above	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
4	3.3 Compute and interpret age-specific fertility rate and mean age at birth 3.4 Relate the measures in 3.3 above to the age pattern of fertility 3.5 Explain fertility trends and differentials	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
	General Objective 4 (STA 422): Understand the basic measures of mortality					
5	4.1 Explain cause-of-death surveys 4.2 Compute and interpret crude death rate and rate by age and sex 4.3 Compute and interpret infant mortality rate, neo-natal mortality rate, post neo-natal mortality rate and maternal mortality rate	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
6	4.4 State the advantages and disadvantages of rates met in 4.2 and 4.3 4.5 Explain mortality differentials, trends and concept of demographic transition	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data

	General Objective 5 (STA 422): Understand life tables and their construction					
7	5.1 Construct life tables using Reed-Merrel and Coale-Dmeny methods 5.2 Interpret the various life table functions	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
8	5.3 Compute and interpret life table survival ratios 5.4 Explain the use of model life tables for demographic estimation and projection	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
	General Objective 6 (STA 422): Understand reproductivity					
9	6.1 Compute and interpret gross reproduction rate and net reproduction rate 6.2 Compute and interpret a replacement index	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
	General Objective 7 (STA 422): Understand the basic measures of migration					
10	7.1 Define the concepts of immigration and emigration 7.2 Distinguish between immigration and emigration 7.3 Compute and interpret immigration rate, emigration rate, gross migration rate and net gross migration	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data

11	7.4 Estimate net migration using the intercensal component method 7.5 Estimate net migration using the intercensal cohort-component method	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
	General Objectives 8 (STA 422): Understand population estimates and projections					
12	8.1 Compute and interpret arithmetic, geometric and exponentral growth rates 8.2 Project total population using the rates in 8.1	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
13	8.3 Explain population growth models such as quadratic, exponential, modified exponential, Gompertz, logistic etc 8.4 Fit the models in 8.3 to population figures and make estimates 8.5 Explain population growth estimation surveys	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data
	General Objectives 9 (STA 422): Understand methods of estimating demographic measures from incomplete data					
14	9.1 Estimate crude birth rate using the reverse survival method 9.2 Estimate crude death rate using the forward survival method	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data

15	9.3 Estimate fertility by the Brass P_1/P_2 method 9.4 Estimate child mortality by the Brass P_1/P_2 method 9.5 Explain the use of prospective and retrospective surveys in demographic estimation	Explain and discuss the concepts covered	Textbooks Lecture Notes Life data	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes Life data

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 422)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: STA 423**	**Total Hours: 5**
Course: Non-parametric Statistics		**Theoretical: 2 hours /week**
Year: 2 Semester: 4	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to enable the student to understand non-parametric statistics.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand non-parametric testing.
2. Understand a one sample of test of goodness of fit
3. Understand a two sample test for related samples.
4. Understand a two sample test for independent samples.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 423): Understand non-parametric testing					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Explain distribution-free methods of statistics	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.2 State advantages of non-parametric statistical methods	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
3	1.3 State disadvantages of non-parametric statistical methods	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 2 (STA 423): Understand a one sample of test of goodness of fit					
4	2.1 Explain the binomial test 2.2 Explain the χ^2 one sample test	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

5	2.3 Explain the one-sample runs test 2.4 Explain Kolmogorov-Smirnov goodness of fit	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
6	2.5 Evaluate examples using the tests met in 2.2 -2.4	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 423): Understand a two sample test for related samples					
7	3.1 Explain the use of the sign test and the condition underlying the test	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
8	3.2 Explain the method of the sign test including ties	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

9	3.3 Apply the sign test to solve problems	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
10	3.4 State the rationale and method of the Wilcoxon matched pairs signed rank test 3.5 Apply the Wilcoxon tests for independent samples	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 4 (STA 423): Understand a two sample test for independent samples					
11	4.1 Define the median test 4.2 Explain the rationale and method of the median test	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
12	4.3 Define the Mann-Whitney V-test 4.4 Demonstrate the media test with examples	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

13	4.5 Explain the rationale and methods of V-test 4.6 Define the Kologorov-Smirnov two samples test 4.7 Explain the rationale of the Kolmogorov-Smirnov two samples test	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
14	4.8 Apply the test in 4.6 above to small and large samples 4.9 Define the runs test function and method	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
15	4.10 Apply the runs test to small and large samples 4.11 Explain the rationale and methods of the test	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 423)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 homeworks to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: STA 424**	**Total Hours: 5**
Course: Statistical Computing		**Theoretical: 2 hours /week**
Year: 2 Semester: 4	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to enable the student to understand the application of computers in statistics.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand random numbers and methods of generating them.
2. Understand numerical methods of solving equations.
3. Understand how to solve matrix equations by numerical methods.
4. Understand the basic concepts of kernel-based probability density estimation.
5. Understand forming statistical algorithms.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 424): Understand random numbers and methods of generating them					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Define a random number 1.2 Define a pseudo-random number 1.3 State the properties of random numbers 1.4 State the uses of random numbers 1.5 Identify various methods of generating random numbers	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.6 Explain the higher congruental methods of generating random numbers 1.7 Define a random number generator 1.8 Identify various random number generators	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
3	1.9 Generate random numbers from various distributions using the generators in 1.8 1.10 Perform statistical test for random numbers eg. goodness of fit and independence tests	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 2 (STA 424): Understand numerical methods of solving equations					
4	2.1 Explain the need for numerical solutions of equations 2.2 Evaluate by graphical methods the roots of equations 2.3 Evaluate by direct iteration processes, the roots of equations	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
5	2.4 Evaluate by bisection methods, the roots of an equation 2.5 State and explain the regular Falsi formula for finding the roots of equations 2.6 State and explain Aitkin's formula for finding the roots of equations	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
6	2.7 State and derive the Newton- Raphson formula 2.8 Apply 2.2 to 2.7 to solve problems 2.9 Compare the efficiency and accuracy of 2.3 to 2.7	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 3 (STA 424): Understand how to solve matrix equations by numerical methods					
7	3.1 Define an orthogomal matrix 3.2 Apply matrix methods for orthogonalisation 3.3 Decompose a matrix into triangular and diagonal forms 3.4 Apply Jacobi's method to the solution of matrices in the form 3.3	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
8	3.5 Review eigen values and eigen vectors methods 3.6 Apply numerical methods to determine eigen vectors and eigen values 3.7 Evaluate the inverse of a matrix	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 4 (STA 424): Understand the basic concepts of kernel-based probability density estimation					
9	4.1 Explain the need for probability density estimation 4.2 State the various type of kernel functions 4.3 State the properties of kernel functions	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
10	4.4 Explain the use of a smoothing parameter 4.5 Define a kernel-based probability density estimation	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

11	4.6 Check the assumption of independence in the given sample 4.7 Estimate the unknown probability density function from a given sample	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 5 (STA 424): Understand forming statistical algorithms					
12	5.1 Introduce the writing of flow charts	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
13	5.2 Define statistical algorithms 5.3 Write flow charts for statistical algorithms for sums, squares and products 5.4 Write flow charts for statistical algorithms to generate random samples from: exponential, poisson, chi-square, weibull and normal distributions	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
14	5.5 Write flow charts for statistical algorithms for serial correlation coefficient and log 5.6 Write flow charts for a statistical algorithm for Kolmogorov-Smirnov one sample test	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

15	5.7 Write flow charts for statistical algorithms to test for randomness 5.8 Apply algorithms to multiway tables	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 424)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	50
Test	At least 2 progress tests for feed back.	20
Practical	At least 7 homeworks to be assessed by the teacher	30
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: STA 425**	**Total Hours: 5**
Course: Time Series Analysis		**Theoretical: 2 hours /week**
Year: 2 Semester: 4	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to develop the student's ability to analyse time series data and use its techniques for forecasting.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand the meaning and importance of time series analysis.
2. Understand autoregressive models.
3. Understand serial correlation.
4. Understand the application of Fourier analysis to spectral theory.
5. Understand periodogram analysis.
6. Understand a correlogram.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 425): Understand the meaning and importance of time series analysis					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Define a time series 1.2 Illustrate time series data with examples 1.3 Plot time series data graphically	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.4 Explain the components of time series 1.5 Explain moving averages	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
3	1.6 State the importance of moving averages in time series analysis 1.7 Evaluate the trend using moving average and least squares methods	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 2 (STA 425): Understand autoregressive models					
4	2.1 Define autoregressive models 2.2 Derive the first and second order of autoregressive models	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
5	2.3 Compute the estimates of the parameters of the models in 2.2 2.4 Carry out the residual analysis of autoregressive models	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (STA 425): Understand serial correlation					
6	3.1 Define serial correlation 3.2 Identify the sources and consequences of autocorrelation	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
7	3.3 Define peaks, troughs and periods	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

8	3.4 Determine the period in time series	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 4 (STA 425): Understand the application of Fourier analysis to spectral theory					
9	4.1 Explain Fourier analysis 4.2 Define spectral density	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
10	4.3 Identify spectral density in moving average and autoregressive series	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
11	4.4 Plot spectral density for moving averages and autoregressive series	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 5 (STA 425): Understand periodogram analysis					
12	5.1 Define a periodogram 5.2 Construct a periodogram for autoregressive analysis	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
13		Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 6 (STA 425): Understand a correlogram					
14	6.1 Describe a correlogram 6.2 Define a correlogram	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
15	6.3 State the importance of correlograms and spectral analysis	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 425)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 homeworks to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Statistical Foresasting, W. G. Gilchrist

Programme: Statistics (Higher National Diploma)	**Course Code: STA 426**	**Total Hours: 5**
Course: Multivariate Methods and Stochastic Processes		**Theoretical: 2 hours /week**
Year: 2 Semester: 4	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to enable the student to understand multivariate methods and stochastic processes.

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand distributions of two or more random variables.
2. Understand the multivariate normal distribution.
3. Understand the construction and use of discriminant analysis.
4. Understand principal component analysis.
5. Understand factor analysis.
6. Understand the use of Hotelling's T^2 distribution.
7. Understand the basic concepts of stochastic processes.
8. Understand a Markov process.
9. Understand the basic concepts of a poisson process.
10. Understand the basic concepts of birth and death processes.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 426): Understand distributions of two or more random variables					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Define the joint function of two or more variables 1.2 Obtain marginal and conditional distributions of multivariate distributions 1.3 Define the cumulative distribution function of distribution of two or more variables.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 2 (STA 426): Understand the multivariate normal distribution					
2	2.1 Define the multivariate normal distribution 2.2 Evaluate the expected value of the distribution met in 2.1	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
3	2.3 Obtain the marginal distributions of the multivariate normal distribution 2.4 Evaluate the distribution of linear combinations of normally distributed variables 2.5 Obtain conditional distributions of normally distributed random variables	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 3 (STA 426): Understand the construction and use of discriminant analysis					
4	3.1 Explain discriminant analysis 3.2 Define Fisher's linear discriminant function (FLDF)	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
5	3.3 Apply the function in 3.2 to solve problems	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 4 (STA 426): Understand principal component analysis					
6	4.1 Define the population principal components 4.2 Define sample principal components	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
7	4.3 Apply the principal components to solve problems	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 5 (STA 426): Understand factor analysis					
8	5.1 Explain factor analysis 5.2 Explain factor loading	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
9	5.3 Apply factor analysis to solve problems	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 6 (STA 426): Understand the use of Hotelling's T^2 distribution					
10	6.1 Define Hotelling's T^2 Distribution	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
11	6.2 Apply T^2 statistics to solve problems e.g. testing the hypothesis about, and obtaining confidence region of, the mean vector	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 7 (STA 426): Understand the basic concepts of stochastic processes					
12	7.1 Define a stochastic processes 7.2 Give examples of stochastic processes	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 8 (STA 426): Understand a Markov process					
13	8.1 Explain a Markov process 8.2 Define Markov chains 8.3 Give examples of Markov chains	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 9 (STA 426): Understand the basic concepts of a poisson process					
14	9.1 Define a poisson process 9.2 Give examples of poisson processes	Understand basic concept of birth and death process	Understand basic concept of birth and death process	Understand basic concept of birth and death process	Understand basic concept of birth and death process	Understand basic concept of birth and death process
	General Objective 10 (STA 426): Understand the basic concepts of birth and death processes					
15	10.1 Define a simple birth and death process 10.2 State examples of simple birth and death process 10.3 Define the mean and variance for birth and death processes	Understand basic concept of birth and death process	Understand basic concept of birth and death process	Understand basic concept of birth and death process	Understand basic concept of birth and death process	Understand basic concept of birth and death process

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 426)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 homeworks to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: STA 427**	**Total Hours: 5**
Course: Project		**Theoretical: 0 hours /week**
Year: 2 Semester: 4	**Pre-requisite:**	**Practical: 5 hours /week**

Goal: This course is designed to enable the student to undertake an individual project and write a report on it.

General Objectives: On completion of this course, the diplomate should be able to:

1. Research a chosen topic at HND level from available sources.
2. Collect data on the chosen topic.
3. Produce a report on the chosen topic.

	Theoretical Content			Practical Content		
	General Objective 1 (STA 427): Research a chosen topic at HND level from available sources.					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Choose, under guidance, an appropriate topic of interest.	Provide guidance in finding suitable topics.	Textbooks Lecture Notes Internet	Selection of a topic of interest.	Provide guidance in finding suitable topics.	Textbooks Lecture Notes Internet
2	1.2 Research a chosen topic from available sources.	Provide guidance in finding suitable sources.	Textbooks Lecture Notes Internet	Demonstrate research ability	Provide guidance in finding suitable sources.	Textbooks Lecture Notes Internet
3	1.2 (continued) Research a chosen topic from available sources.	Provide guidance in finding suitable sources.	Textbooks Lecture Notes Internet	Demonstrate research ability	Provide guidance in finding suitable sources.	Textbooks Lecture Notes Internet
4	1.2 (continued) Research a chosen topic from available sources.	Provide guidance in finding suitable sources.	Textbooks Lecture Notes Internet	Demonstrate research ability	Provide guidance in finding suitable sources.	Textbooks Lecture Notes Internet

	General Objective 2 (STA 427): Collect data on the chosen topic.					
5	2.1 Collect data on the chosen topic from available sources .	Provide guidance in collecting data	Textbooks Lecture Notes Internet	Demonstrate ability to collect data	Provide guidance in collecting data.	Textbooks Lecture Notes Internet
6	2.1 (continued) Collect data on the chosen topic from available sources .	Provide guidance in collecting data	Textbooks Lecture Notes Internet	Demonstrate ability to collect data	Provide guidance in collecting data.	Textbooks Lecture Notes Internet
7	2.1 (continued) Collect data on the chosen topic from available sources .	Provide guidance in collecting data	Textbooks Lecture Notes Internet	Demonstrate ability to collect data	Provide guidance in collecting data.	Textbooks Lecture Notes Internet
8	2.1 (continued) Collect data on the chosen topic from available sources.	Provide guidance in collecting data	Textbooks Lecture Notes Internet	Demonstrate ability to collect data	Provide guidance in collecting data.	Textbooks Lecture Notes Internet
9	2.1 (continued) Collect data on the chosen topic from available sources .	Provide guidance in collecting data	Textbooks Lecture	Demonstrate ability to collect data	Provide guidance in collecting	Textbooks Lecture

			Notes Internet		data.	Notes Internet
	General Objective 3 (STA 427): Produce a report on the chosen topic.					
10	3.1 Produce a report on the chosen topic.	Provide guidance in report writing	Textbooks Lecture Notes Internet	Demonstrate ability in report writing	Provide guidance in report writing	Textbooks Lecture Notes Internet
11	3.1 (continued) Produce a report on the chosen topic.	Provide guidance in report writing	Textbooks Lecture Notes Internet	Demonstrate ability in report writing	Provide guidance in report writing	Textbooks Lecture Notes Internet
12	3.1 (continued) Produce a report on the chosen topic.	Provide guidance in report writing	Textbooks Lecture Notes Internet	Demonstrate ability in report writing	Provide guidance in report writing	Textbooks Lecture Notes Internet
13	3.1 (continued) Produce a report on the chosen topic.	Provide guidance in report writing	Textbooks Lecture Notes Internet	Demonstrate ability in report writing	Provide guidance in report writing	Textbooks Lecture Notes Internet

14	3.1 (continued) Produce a report on the chosen topic.	Provide guidance in report writing	Textbooks Lecture Notes Internet	Demonstrate ability in report writing	Provide guidance in report writing	Textbooks Lecture Notes Internet
15	3.1 (continued) Produce a report on the chosen topic.	Provide guidance in report writing	Textbooks Lecture Notes Internet	Demonstrate ability in report writing	Provide guidance in report writing	Textbooks Lecture Notes Internet

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(STA 427)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	0
Test	0 progress tests	0
Practical	Report of 20 - 30 pages length	100
Total		100

Recommended Textbooks & References:

Programme: Statistics (Higher National Diploma)	**Course Code: COM 312**	**Total Hours: 5**
Course: Database Design I		**Theoretical: 2 hours /week**
Year: 1 Semester: 1	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to introduce student to computer database

General Objectives: On completion of this course, the diplomates should be able to:

1. Understand the organization's information need and database concepts.
2. Understand and differentiate the various types of data models
3. Understand how to model data
4. Understand the design of relational databases design
5. Know the structured query language (SQL)
6. Understand database systems architecture

	Theoretical Content			Practical Content		
	General Objective 1 (COM 312): Understand the organization's information need and database concepts.					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Understand the types of information need. 1.2 Understand the purpose of data base systems	State types of information which organizations use. Define database and database system. State different purposes for database systems.	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able Implement the design of various types of data base models.	To assist student accomplish the design of various types of data base models.	Networked PC in a lab loaded with database packages and flip chart.
2	1.3 Understand data view and data model 1.4 Understand database administrators, users and languages.	Explain data view and models. State different types of model. Discuss different types of database languages. Explain database administrator and users	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able Implement the design of various types of data base models.	To assist student accomplish the design of various types of data base models.	Networked PC in a lab loaded with database packages and flip chart.

	General Objective 2 (COM 312): Understand and differentiate the various types of data models					
3	2.1 Different types of data model: hierarchical, network and relational models	Explain the basic concepts of: hierarchical, network and relational models	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able Implement the design various types of data base models.	To assist student accomplish the design of various types of data base models	Networked PC in a lab loaded with database packages and flip chart.
4	2.1 (continued) Different types of data model: hierarchical, network and relational models	Explain structure data diagrams .	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able Implement the design various types of data base models.	To assist student accomplish the design of various types of data base models	Networked PC in a lab loaded with database packages and flip chart.
	General Objective 3 (COM 312): Understand how to model data					
5	3.1 Understand the concept of E-R, entity sets ,entity relationship, weak entity sets.	Describe the basic concepts of E-R Explain entity set and entity relationship diagram	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To able to implement the design of E-R database schema and reduction of E-R schema into table.	To assist student accomplish the design of E-R database schema and reduction of E-R schema into table	Networked PC in a lab loaded with database packages and flip chart.

6	3.2 Be able to design E-R database schema 3.3 Understand reduction of E-R schema into tables.	Explain weak entity sets Discuss the design of E-R data base schema Demonstrate the reduction at E-R schema into tables.	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To able to implement the design of E-R database schema and reduction of E-R schema into table.	To assist student accomplish the design of E-R database schema and reduction of E-R schema into table	Networked PC in a lab loaded with database packages and flip chart.
	General Objective 4 (COM 312): Understand the design of relational databases design					
7	4.1 Understand pitfalls in relational-database design 4.2 Understand decomposition and normalization	State the pitfalls in relational database design Explain decomposition and normalization	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able to implement the design of relational database and normalize it.	To assist student accomplish the design of relational database and normalize it.	Networked PC in a lab loaded with database packages and flip chart.
8	4.3 Understand domain-key normal form 4.4 Review alternative approaches to database design.	Explain domain-key normal form. Discuss the alternative approaches to database design	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able to implement the design of relational database and normalize it.	To assist student accomplish the design of relational database and normalize it.	Networked PC in a lab loaded with database packages and flip chart.

	General Objective 5 (COM 312): Know the structured query language (SQL)					
9	5.1 Understand the background of SQL 5.2 Understand the basic structure of SQL	Discuss the background of SQL Discuss the basic structures	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able to implement the structure of SQL	To assist student accomplish the implement'n of the structure of SQL	Networked PC in a lab loaded with database packages and flip chart.
10	5.3 Understand nested sub-queries 5.4 Understand derived relations and views	Explain rested sub queries Describe derived relations	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able to implement the structure of SQL	To assist student accomplish the implement'n of the structure of SQL	Networked PC in a lab loaded with database packages and flip chart.
11	5.5 Understand views	Explain views Discuss how databases can be modified.	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able to implement the structure of SQL	To assist student accomplish the implement'n of the structure of SQL	Networked PC in a lab loaded with database packages and flip chart.

12	5.6 Understand joined relations 5.7 Understand data definition language and embedded SQL.	Discuss joined relations Demonstrate the implementation of data definition language and embedded SQL.	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able to implement the structure of SQL	To assist student accomplish the implement'n of the structure of SQL	Networked PC in a lab loaded with database packages and flip chart.
	General Objective 6 (COM 312): Understand database systems architecture					
13	6.1 Understand centralized systems 6.2 Understand client- server systems	Explain centralized systems Explain client server systems	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able to understand database systems architecture	To assist student able to understand database systems architecture	Networked PC in a lab loaded with database packages and flip chart.
14	6.3 Understand parallel systems	Explain parallel systems	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able to understand database systems architecture	To assist student able to understand database systems architecture	Networked PC in a lab loaded with database packages and flip chart.

15	6.4 Understand distributed systems and network types	Differentiate between distributed systems and networked systems.	White board. A PC loaded with data base software and connected to an OHP and flip chart.	To be able to understand database systems architecture	To assist student able to understand database systems architecture	Networked PC in a lab loaded with database packages and flip chart.

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(COM 312)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 homeworks to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Oracle package (latest version by Henry F. Korth & Abraham stiller Schmaltz, Mcgraw hill 1977

Programme: Statistics (Higher National Diploma)	**Course Code: COM 322**	**Total Hours: 5**
Course: Database Design II		**Theoretical: 2 hours /week**
Year: 1 Semester: 2	**Pre-requisite: COM 312**	**Practical: 3 hours /week**

Goal: This course is designed to provide the student with further knowledge of computer databases

General Objectives: On completion of this course, the diplomate should be able to:

1. Know object oriented data mode and object oriented languages.
2. Understand the design of object-oriented databases.
3. Understand file structure and physical storage
4. Understand the concept of indexing and hashing.
5. Understand query processing
6. Understand the concept of transactions and concurrency control
7. Understand recovery systems
8. Understand DBMS applications

	Theoretical Content			Practical Content		
	General Objective 1 (COM 322): Know object oriented data mode and object oriented languages					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Understand object oriented data models and the concept of object oriented languages.	Discusses the different types of data models. Explain the concept of object oriented languages List object oriented data models. Mention different types of object oriented languages e.g. O.O.pascal, visual C++ etc.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to implement the design of various types of object oriented data base models.	Assist the student in the design of various types of object oriented data base models.	Networked PC in a lab loaded with database packages and flip chart and connected to internet.
	General Objective 2 (COM 322): Understand the design of object-oriented databases					
2	2.1 Design forms, reports and triggers.	Explain and demonstrate how to design forms reports and triggers in object oriented databases.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to implement the design of various types of forms, reports and triggers	Assist student in being able to implement the design of various types of forms, report and triggers	Networked PC in a lab loaded with database packages and flip chart and connected to internet.

3	2.1 (continued) Design forms, reports and triggers.	Explain and demonstrate how to design forms reports and triggers in object oriented databases.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to implement the design of various types of forms, reports and triggers	Assist student in being able to implement the design of various types of forms, report and triggers	Networked PC in a lab loaded with database packages and flip chart and connected to internet.
	General Objective 3 (COM 322): Understand file structure and physical storage					
4	3.1 Understand physical storage media and tertiary storage devices 3.2 Understand access and organization of records, and data –dictionary. 3.3 Understand storage structure of object oriented databases	Revise the physical storage media. Discuss the various types of tertiary storage devices eg CD-rom, tape Explain access mode and record organization and data-dictionary storage concept. Explain the storage structure of object-oriented databases.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to implement the design of record structure and data dictionary.	Assist student to design record structure and data dictionary.	Networked PC in a lab loaded with database packages and flip chart and connected to internet.

	General Objective 4 (COM 322): Understand the concept of indexing and hashing					
5	4.1 Understand the basic concepts of indexing and hashing. 4.2 Understand ordered indices 4.3 Understand B+ and B– tree index files 4.4 Understand the concept of static and dynamic hasting 4.5 Understand multiple-key access.	Explain the concepts of indexing and hashing. Discuss ordered indices Explain B+,B- tree and the concept of static and dynamic hasting. Explain multiple-key access concept.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to implement the design of record indexing and hashing and to design record with multiple keys.	Assist student to design record indexing and hashing and to design record with multiple keys.	Networked PC in a lab loaded with database packages and flip chart and connected to internet.
	General Objective 5 (COM 322): Understand query processing					
6	5.1 Understand the concept of catalogue information. 5.2 Understand the selection operation 5.3 Understand sorting and join operations 5.4 Understand the evaluation of expressions 5.5 Understand the transformation of relational expressions.	Explain the concept of catalogue information. Discuss the selection, sorting and join operations Evaluate expressions and transform relational expressions.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to implement selection, sorting and joining operation	Assist student to implement the selection, of sorting and joining operations	Networked PC in a lab loaded with database packages and flip chart and connected to internet.

	General Objective 6 (COM 322): Understand the concept of transactions and concurrency control					
7	6.1 Understand transaction, transaction state, atomicity and durability 6.2 Understand concurrent executions, serializability, recoverability and isolation. 6.3 Understand transaction in SQL and texts for serializability. 6.4 Understand the concept of lock based protocols, time-stamp-based and validation-based protocols.	Explain transaction state, atomicity and durability. Discuss concurrent executions, serialization recoverability and isolation. Explain transaction in SQL and how to test for serializability. Discuss lock-based protocols time-strip based protocols and	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to Implement the some transaction in SQL which include insert and delete operations.	Assist student to achieve some transactions in SQL which include insert and delete operations.	Networked PC in a lab loaded with database packages and flip chart and connected to internet.
8	6.5 Understand multiple granularity, multiversion schemes and deadlock handling. 6.6 Understand the insert and delete operations 6.7 Understand concurrency in index structures.	Explain multiple granularity, multiversion schemes and deadlock handling Explain the insert and delete operations, and concurrency in index structures.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to Implement the some transaction in SQL which include insert and delete operations.	Assist student to achieve some transactions in SQL which include insert and delete operations.	Networked PC in a lab loaded with database packages and flip chart and connected to internet.

	General Objective 7 (COM 322): Understand recovery systems					
9	7.1 Understand failure classification and storage structures. 7.2 Understand recovery . 7.3 Understand log based recovery and shadow paging.	Discuss failure classification and storage structure. Explain recovery and shadow paging.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to implement various operations in SQL	Assist student to achieve various operations in SQL	Networked PC in a lab loaded with database packages and flip chart and connected to internet.
10	7.4 Understand recovery with concurrent transaction. 7.5 Understand buffer management.	Explain recovery with concurrent transaction. Discuss buffer management.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to implement various operations in SQL	Assist student to achieve various operations in SQL	Networked PC in a lab loaded with database packages and flip chart and connected to internet.
	General Objective 8 (COM 322): Understand DBMS applications					
11	8.1 Understand decision support system (DSS). 8.2 Understand data analysis and data mining	Discuss DSS and data analysis. Discuss data mining	White board. A PC loaded with data base software and connected to an OHP	To be able to implement various operations in SQL	Assist student to achieve various operations in SQL	Networked PC in a lab loaded with database packages and flip chart and connected to

			and flip chart			internet.
12	8.3 Understand warehousing.	Discuss warehousing.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to implement various operations in SQL	Assist student to achieve various operations in SQL	Networked PC in a lab loaded with database packages and flip chart and connected to internet.
13	8.4 Understand spatial and geographical databases.	Explain spatial and geographical data bases.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to implement various operations in SQL	Assist student to achieve various operations in SQL	Networked PC in a lab loaded with database packages and flip chart and connected to internet.
14	8.5 Understand multi-media databases.	Discuss multimedia databases.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to implement various operations in SQL	Assist student to achieve various operations in SQL	Networked PC in a lab loaded with database packages and flip chart and connected to internet.

15	8.6 Understand mobility and personal data bases.	Discuss personal databases.	White board. A PC loaded with data base software and connected to an OHP and flip chart	To be able to implement various operations in SQL	Assist student to achieve various operations in SQL	Networked PC in a lab loaded with database packages and flip chart and connected to internet.

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(COM 322)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 homeworks to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Henry F. Furth and Abraham Silbersihat, Mcgraw Hill, 1997

Computer studies for Tertiary Instituttion concept publications.
A.O. Itegboje et all 2001.

Programme: Statistics (Higher National Diploma)	**Course Code: MTH 314**	**Total Hours: 5**
Course: Mathematical Methods II		**Theoretical: 2 hours /week**
Year: 1 Semester: 1	**Pre-requisite:**	**Practical: 3 hours /week**

Goal: This course is designed to enable student acquire an enhanced understanding of mathematical methods.

General Objective: On completion of this course, the diplomate should be able to:

1. Understand basic concepts of series.
2. Understand basic partial differentiation and its application.
3. Understand basic double integration and its application.
4. Understand first and second order differential equations with constant coefficients

	Theoretical Content			Practical Content		
	General Objective 1 (MTH 314): Understand basic concepts of series					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Define a Sequence of numbers and list examples. 1.2 Define a series of numbers e.g. geometric and arithmetic and give examples. 1.3 Define the limiting value of a series. 1.4 Explain with examples the process of finding limiting values. 1.5 Define and explain convergent and divergent series.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.6 Differentiate between convergence and divergence of series. 1.7 Illustrate the application of the tests in 1.5 above with examples. 1.8 Define absolute convergence and conditional convergence and give examples. 1.9 Explain tests for absolute convergence, conditional convergence and give examples.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 2 (MTH 314): Understand basic partial differentiation and its applications					
3	2.1 Define partial derivative of the function of two variables. 2.2 Explain the use of partial derivatives in the evaluation of percentage changes and small errors.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
4	2.3 Explain with examples total derivatives of implicit functions. 2.4 Explain higher derivatives of a function of two variables.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
5	2.5 Determine the maximum and minimum of function of two variables, applying higher derivatives.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 3 (MTH 314): Understand basic double integration and it application					
6	3.1 Explain repeated integration of a function of two variables.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

7	3.2 Define, with examples, double integrals in cartesian and polar coordinates. 3.3 Determine and sketch the region of integration of a double integral.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
8	3.4 Explain with examples the change of a variable technique in double integration and the evaluation of the Jacobian of a function of two variables.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
9	3.5 Apply double integration to determine volumes, moments and centres of gravity	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
	General Objective 4 (MTH 314): Understand first and second order differential equations with constant coefficient					
10	4.1 Explain with examples the formation of ordinary differential equation. 4.2 Define order, degree, general solution, boundary or linear conditional and particular solution of differential equations. 4.3 Define the first and second order ordinary differential equation with constant coefficients.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

11	4.4 List examples of various types of equation in 4.3 above. 4.5 Solve a first order linear differential equation using integrating factors by substitution.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
12	4.6 Solve problems such as compound interest problems and problems of growth and decay using linear ordinary differential equations. 4.7 Define linear homogenous/non-homogenous equations of second order with constant coefficients.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
13	4.8 Define a homogenous linear ordinary differential equation and its method of solution. 4.9 Find the solution of non-homogenous linear ordinary differential equations using the D-operator of order two techniques.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
14	4.10 Explain with examples the methods of undetermined coefficients for the solution of non-homogenous equations.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

15	4.11 Explain with examples the methods of variation of parameters and Laplace transforms in solving ordinary differential equations with initial values	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

Type of Assessment	Purpose and Nature of Assessment **(MTH 314)**	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	60
Test	At least 2 progress tests for feed back.	20
Practical	At least 5 homeworks to be assessed by the teacher	20
Total		100

Recommended Textbooks & References:

Engineering Mathematics, K. A. Stroud

Programme: Statistics (Higher National Diploma)	**Course Code: MTH 322**	**Total Hours: 5**
Course: Mathematical Methods III		**Theoretical: 2 hours /week**
Year: 1 Semester: 2	**Pre-requisite: MTH 314**	**Practical: 3 hours /week**

Goal: This course is designed to introduce the student to the concepts of rank of matrix and solutions of systems of linear partial differential equations in one variable**.**

General Objectives: On completion of this course, the diplomate should be able to:

1. Understand the definition of a vector space and the concept of linear dependence and independence.
2. Understand systems of simultaneous linear equations.
3. Understand quadratic forms and their methods of reduction.
4. Understand eigen values and eigen vectors and their computations.
5. Understand first order and first degree partial differential equations and the methods of their solutions.

	Theoretical Content			Practical Content		
	General Objective 1 (MTH 322): Understand the definition of vector space and the concept of linear dependence and independence					
Week	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**	**Specific Learning Outcomes**	**Teacher's activities**	**Resources**
1	1.1 Define a vector space and subspace and give examples 1.2 Explain with examples the basis and dimension 1.3 Explain with examples linear dependence and linear independence of vectors	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
2	1.4 Determine the dimension of the row space of a Matrix A 1.5 Construct a basis for a finite dimensional vector space using a set of vectors that span the space. 1.6 Define an inner product	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
3	1.7 Define a euclidean vector space 1.8Construct an orthogorial basis for a euclidean vector space using the Gram-Schmidt process	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 2 (MTH 322): Understand systems of simultaneous linear equations					
4	2.1 Explain the fundamental theorem for the existence and consistency of solutions of the linear equation AX=B, while A is an m x n matrix, X is n x 1 matrix and B is m x 1 matrix 2.2 Explain the types of inconsistencies viz when {A} = 0 2.3 Define homogeneous and non homogenous system of linear equations and describe their method of solutions	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
5	2.4 Explain with examples numerical solutions of systems of equations 2.5 Explain with examples of row and column operations 2.6 Define determinants of second, third and fourth order.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
6	2.7 Apply the results of 2.6 above in solving a system of linear equation by Crammer's rule 2.8 Explain methods of solutions of linear systems (e.g. Jacobin's methods, Gauss- Seidel and successive over relaxation methods)	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 3 (MTH 322): Understand quadratic forms and their method of reduction					
7	3.1 Define a symmetric matrix and give examples 3.2 Define the quadratic form: $Q=X^TAX$ 3.3 Explain with examples the transformation of quadratic forms to matrix forms.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
8	3.4 Define the rank of singular and non- singular quadratic forms 3.5 Define a quadratic form of rank form $h_1y_1^2 + h_2y_2^2 + \ldots\ldots\ldots + h_ry_r^2$ (with hi = 0) 3.6 Define the canonical form of a matrix	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
9	3.7 Define real quadratic forms and prove that every real quadratic form is reducible by a non-singular transformation to canonical form: $W_1^2 + W_2^2 + \ldots\ldots\ldots\ldots + W_p^2 = W_{P+1}^2 \ldots\ldots\ldots W_r^2$ with p = index of the quadratic form and r =rank of the quadratic form and give examples 3.8 Define positive – definite and positive – semi definite quadratic forms and give examples	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 4 (MTH 322): Understand eigen values and eigen vectors and their computation					
10	4.1 Define a linear transformation of the form Y = AX, where A is a matrix 4.2 Define the characteristic polynomial of a matrix and give examples 4.3 Determine the solutions of the characteristic equations	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
11	4.4 Determine the eigen values and their corresponding eigen vectors 4.5 Transform matrices to diagonal form using the matrix of the eigen vector 4.6 Determine the number of eigen values in an n x n matrix	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
12	4.7 Determine the eigen values of different types of matrices 4.8 Explain numerical methods for the determination of lowest and largest eigen values 4.9 Define and explain with examples the Cayley - Hamilton theorem	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

	General Objective 5 (MTH 322): Understand first order and first degree partial differential equation and the methods of their solution					
13	5.1 Define a partial differential equation and give examples 5.2 Explain with examples general solution, particular solution, singular solutions and boundary value problems	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
14	5.3 Define homogenous and non- homogenous first order first degree partial differential equations 5.4 Find solutions of first order and first degree partial differential equations with boundary values by methods of separation of variables	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes
15	5.5 Find solutions of first order and first degree partial differential equation with boundary values using change of variable technique.	Explain and discuss the concepts covered	Textbooks Lecture Notes	Demonstrate understanding of the concepts covered by solving examples	Explain and supervise student exercises and assess student work	Textbooks Lecture Notes

Assessment: Give details of assignments to be used:
Coursework/ Assignments %; Course test %; Practical %; Projects %; Examination %

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Total		100

Recommended Textbooks & References:

LIST OF PHYSICAL FACILITIES FOR HIGHER NATIONAL DIPLOMA STATISTICS

ITEM	NO.	REMARKS
Statistical kit Programmable Calculators Micro Computer Statistical softwares and packages	2 30 15 5	

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