No. 131

11 February 2009



SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Statistics

registered by Organising Field 10 - Physical, Mathematical, Computer and Life Sciences, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at <u>www.saqa.org.za</u>. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and *no later than 11 March 2009.* All correspondence should be marked **Standards Setting** – SGB for Statistics and addressed to

The Director: Standards Setting and Development SAQA *Attention: Mr. E. Brown* Postnet Suite 248 Private Bag X06 Waterkloof 0145 or faxed to 012 – 431-5144 e-mail: ebrown@saqa.org.za

D. MPHUTHING ACTING DIRECTOR: STANDARDS SETTING AND DEVELOPMENT



QUALIFICATION: National Certificate: Official Statistics

SAQA QUAL ID	QUALIFICATION TITLE				
65649	National Certificate: Official Statistics				
ORIGINATOR	PROVIDER				
SGB Statistics	GB Statistics				
QUALIFICATION TYPE	FIELD	SUBFIELD			
National Certificate	10 - Physical, Mathematical, Computer and Life Sciences	Mathematical Sciences			
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS		
Undefined	120	Level 5	Regular-Unit Stds Based		

This qualification does not replace any other qualification and is not replaced by another qualification.

PURPOSE AND RATIONALE OF THE QUALIFICATION Purpose:

The overall competency framework for the discipline of statistics does make provision for lower level operational and technical skills. This qualification is intended to serve as an entry point into the discipline of statistics that covers technical and conceptual skills. Qualifying learners could navigate this learning pathway in providing competent support to statisticians and other applied research professionals by focussing on the early stages of the statistical process.

Qualifying learners will be able to:

- > Collect meaningful data.
- > Capture the data.
- > Manage data.
- > Calculate routine statistical summaries and economic indicators.

> Describe the role, governance and legislation related to statistics in the broader economic and social context.

Rationale:

There is a critical skills shortage of qualified statisticians (National Research Foundation (NRF) defined scarce skill) especially at this time when decision making is increasingly becoming evidence-based. This entry-level qualification provide learners access to the statistics discipline that provides a service to government, municipalities, non-governmental organisations and specific uses for the private sector. Qualifying learners will be able to be employed in specific occupations that involve data collection, supervising data collection, data editing, data capturing, elementary analysis of data and research. Industries and structures that use statistics have projected an increase in the need for qualified individuals that are able to competently manage information of which statistics is a critical component. This qualification helps to develop statisticians that contribute to a quality hierarchy of skills required to provide quality services in statistics.

The qualification contributes to the holistic development of the learner by providing a learning pathway and further development opportunities within statistics and related fields. The competencies gained through completion of this qualification also add value to economic development in an information-driven society where monitoring and evaluation is a critical component.

RECOGNIZE PREVIOUS LEARNING?

LEARNING ASSUMED IN PLACE

> Communication at NQF Level 4.

> Mathematics at NQF Level 4.

Range:

> The term data quality is used in the context of official statistics that are measured against the criteria reflected in the South African Statistical Quality Assurance Framework (SASQAF).

Recognition of Prior Learning:

The structure of this unit standards-based qualification makes the Recognition of Prior Learning possible through challenging the associate Exit Level Outcomes and unit standards. This qualification may therefore be achieved in part through the recognition of prior learning, which includes formal, informal and non-formal learning and work experience. The learner should be thoroughly briefed on the mechanism to be used and RPL assessors should provide support and guidance. Care should be taken that the mechanism used provides the learner with an opportunity to demonstrate competence and is not so onerous as to prevent learners from taking up the RPL option towards gaining a qualification.

If the learner is able to demonstrate competence in the knowledge, skills, values and attitudes implicit in this qualification and/or unit standards, the appropriate credits should be assigned to the learner. Recognition of Prior Learning will be done by means of Integrated Assessment as mentioned above.

This Recognition of Prior Learning may allow:

- > Accelerated access to further learning at this or higher levels on the NQF.
- > Obtaining of this Qualification in part.

Access to the Qualification:

> Open to learners with a Senior Certificate or FETC or equivalent qualification.

QUALIFICATION RULES

Fundamental Component:

The Fundamental Component consists of a total of 33 credits comprising of unit standards in:

- > Statistical concepts.
- > Relationships between indicators.
- > The National Statistics System.

All Unit Standards to the value of 33 credits in the Fundamental Component are compulsory.

Core Component:

Source: National Learners' Records Database

The Core Component consists of Unit Standards to the value of 64 credits, all of which are compulsory.

Elective Component:

The Elective Component consists of a list of unit standards that could be chosen by learners in various disciplines and contexts e.g. Mathematics, Environment, Economics. Learners should choose Elective Unit Standards to the value of 23 credits from this list so as to attain a minimum of 120 credits for this qualification.

EXIT LEVEL OUTCOMES

1. Collect meaningful data.

2. Capture the data.

3. Manage data.

> Range: Manage include but are not limited to editing, identifying outlying observations, modify, verify.

4. Calculate routine statistical summaries and socio-economic indicators.

5. Describe the role, governance and legislation related to statistics in the broader economic and social context.

Critical Cross-Field Outcomes:

This qualification promotes, in particular, the following critical cross-field outcomes:

Identifying and solving problems in which responses show that integrative thinking and critical analysis has been made when:

> Applying knowledge and comprehension of the United Nations ten fundamental principles of official statistics.

> Isolating unusual data points and establishing whether these unusual points are outliers or not.

> Contrasting/relating the variables with their unit of measurement and their ranges.

> Assessing whether the computed statistics are consistent with other similar statistics from other sources.

> Assessing whether the use/interpretation of statistics is correct.

Working effectively with others as a member of a inter-disciplinary team when:

> Identifying and explaining factors that enhance the quality of official statistics.

> Explaining reasons why keeping personal information gathered by statistical agencies confidential, using strictly professional methods of data collection and dissemination, and avoidance of unnecessary burden on respondents, reduce total error in surveys.

Organising and managing oneself and one's activities responsibly and effectively when:

> Judging the factors in statistical production, that improve the image of a Statistical Agency to the public.

> Comparing and identifying activities that undermine the ethics in statistical production.

> Consulting the literature and practitioners to ensure that the most effective professional methods are used in the interests of quality official statistics.

Communicating effectively with stakeholders and authorities using:

> Explaining statistical concepts and methods in everyday language so that they are understood by the general public.

> Illustrating the effectiveness of graphical presentation of official statistics.

Collecting, analysing, organising and critically evaluating information from various sources when:

> Using international concepts, classification and methods to enhance the comparability of official statistics.

> Identifying and mitigating the factors that affect people's confidence in official statistics.

> Elaborating on the strengths and weaknesses of statistical processes and procedures used to produce official statistics.

> Explaining the need to keep to schedules in dissemination official statistics.

Using science and technology effectively and showing responsibility towards the environment and health of others when:

> Expending some effort to educate the general public about environmental degradation and its consequence using well-researched official statistics.

> Contributing to the building of a database on environmental, health, political, social, technological, legal issues etc.

> Distributing official statistics on the environment to schools.

Demonstrating an understanding of the world as a set of related systems by recognising the complex and dynamic nature of these systems as well as the inter-relationships and linkages that exist between systems when:

> Integrating statistical, demographic, economical and mathematical concepts in solving social problems.

> Building on the knowledge base of other disciplines to design integrative studies and questionnaires.

Contribute to the full personal development of each learner and the social and economic development of the society at large by:

> Explaining the legal framework for producing official statistics and the part played by each learner in fulfilling the objectives of producing credible, accurate and timely official statistics. Contributing to the production of economic and social indicators that feed into the decision making processes of government and other stakeholders to monitor and regulate the economy and create environments for poverty alleviation and enhanced service delivery.

> Elaborating on the need to have an independent National Statistics Office that is seen and believed to be producing official statistics without government interference.

> Providing the opportunities to learners to learn by "doing".

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit-Level-Outcome 1:

1.1 The purpose of data collection is explained and definitions of target population and samples are given to identify important stakeholders.

1.2 Different methods of collecting data are compared against costs, convenience, relevance and error.

1.3 The appropriate method of data collection is selected for a given problem in accordance with the purpose.

1.4 The potential sources of error in data collection are identified and highlighted in accordance with the specific scenario and purpose.

1.5 Survey questions are critically evaluated and modified in order to produce responses with minimal errors.

1.6 Techniques of asking questions correctly are applied in interviews to create an environment that allows the respondent to give truthful answers.

1.7 A structured field report is prepared in accordance with specific project information requirements for continuous monitoring purposes.

1.8 A variety of sources are utilised in collecting meaningful information and report on findings in accordance with relevant project needs.

Associated Assessment Criteria for Exit-Level-Outcome 2:

2.1 A dataset is structured using spreadsheets in a format which is suitable for statistical processing.

2.2 Manual coding, sorting and filtering of data are executed in preparation for capturing activities.

2.3 Different errors in data capturing template are identified to facilitate the accuracy of data capturing.

2.4 Double data entry techniques are used to prevent or minimize errors.

2.5 Methods for reconciling suspicious data with the collected information are highlighted for use during editing.

2.6 Editing of captured data is supplemented with the human eye and good judgement for quality data purposes.

2.7 Data set is archived to ensure that all relevant information is included.

2.8 Simple report is prepared to summarize the data capturing activity.

Associated Assessment Criteria for Exit-Level-Outcome 3:

3.1 The use of an editing screen is emphasised and its limitations are explained in order to ensure quality data.

3.2 Different sources of errors are identified and edited from captured data set within a supervised environment.

3.3 Methods of data exploration to spot outliers are examined and suspicious observations are singled out, checked and verified for the purpose of ensuring quality data.

3.4 Suspicious data are reconciled with other available sources in order to correct inconsistencies in the data set.

3.5 Conditions under which outlying and anomalous observations are stated, critiqued and implemented within a supervised environment to improve coherence and consistency.

3.6 Criteria for qualifying a data set as "clean" are utilised to data recommend for statistical analysis.

> Range: Clean data include but are not limited to consistent, coherent and void of outliers.

Associated Assessment Criteria for Exit-Level-Outcome 4:

4.1 Graphical and tabular representations are obtained using statistical software.

4.2 The different and appropriate measures of central tendency and measures of variation are calculated using statistical software.

4.3 Statistical summaries are interpreted to reflect an understanding of basic statistical concepts.

4.4 The uses of economic indicators and other statistical summaries are demonstrated to reflect their influences in decision making.

4.5 Statistical summaries, graphical representations and economic and social indicators are reported in order to communicate the results.

4.6 Basic probability principles are discussed to enable statistical inference.

4.7 Statistical methods are applied to demography to reflect on the status of the socio-economic conditions.

Associated Assessment Criteria for Exit-Level-Outcome 5:

5.1 The key economic concepts are defined and interpreted in order to reflect the relationship between economics and statistics.

> Range: Key economic concepts include but are not limited to macro-economics, microeconomics, econometrics, economic growth and development, Poverty, Informal Sector, Sustainability, concepts and assumptions used in constructing and interpreting real and nominal GDP accounts and international trade statistics, migration.

5.2 Economic experiences of women and men are explained by using gender statistics.

5.3 Economic issues related to the areas of statistical theory are discussed and interpreted in order to reflect the relationship between economics and statistics.

> Range: Issues related to the areas of statistical theory include but are not limited to methods of calculating GDP, basic economic principles underpinning the methods, causes of economic underdevelopment, changes in human populations.

5.4 Indicators associated with economic underdevelopment are described to aid interpretation and reporting requirements.

5.5 Different economic scenarios are discussed to reflect the processes of socio-economic change, their implications for data collection and the use of statistics.

Integrated Assessment:

The applied competence (practical, foundational and reflexive competencies) of the respective qualifications will be achieved if a candidate is able to achieve all the exit level outcomes of the qualification.

The identification and solving of problems, team work, organising one-self, the using of applied science and IT, the implication of actions and reactions in the world as a set of related systems must be assessed during any combination of practical, foundational and reflexive competencies assessment methods and tools to determine the whole person development and integration of applied knowledge and skills. Applicable assessment tool(s) will be developed to establish the foundational, reflective and embedded knowledge to problem solving and application of the world as a set of related systems within the field of official statistics. A detailed portfolio of evidence is required to prove practical, applied and foundational competencies of the learner.

Assessors and moderators should develop and conduct their own integrated assessment by making use of a range of formative and summative assessment methods. Assessors should examine the work and give credit for the evidence of learning that has already been acquired through formal, informal and non-formal learning and work experience.

Unit standards in the qualifications must be used to assess specific and critical cross-field outcomes. During integrated assessments the assessor should make use of formative and summative assessment methods and should assess combinations of practical, applied, foundational and reflective competencies.

INTERNATIONAL COMPARABILITY

The countries selected for this exercise include Tanzania, Uganda, United Kingdom, Australia and India. These countries surveyed have developed related desired programmes in Official Statistics.

In the design of this qualification, we found that the qualification frameworks for the Eastern Africa Statistical Training Centre (EASTC) in Dar es Salaam and for the Institute of Statistics and Applied Economics (ISAE) of Makerere University, had many similarities with the Diploma qualification that can be obtained from the International Statistics Education Centre (ISEC) of the Indian Statistical Institute at Kolkata (Calcutta). Furthermore, we found that the Australian Bureau of Statistics was conducting a comprehensive work-skills in-house training programme from where we could draw lessons in designing our qualification which is essentially a workskills development programme.

As the proposed qualification is meant to be an entry level programme into Official Statistics, we were mindful of the prevailing South African environment where it was necessary to introduce the courses at a fairly low level while at the same time doing everything possible to improve the level and understanding of foundational mathematics. When all these have been put into effect, a trainee who has successfully completed the proposed qualification should be able to pass both Paper I and Paper II of the Royal Statistical Society (RSS) Ordinary Certificate examinations.

A short review of a selected number of international programmes is presented here. We have also included the Statistical Services Centre at the University of Reading, in UK, because they are the ones who were contracted to develop the Harmonized Syllabus for the Southern African Development Community (SADC) for the Official Statistics Training Programme for the National Statistics Offices, on which some of the training materials for the proposed qualification will be based.

African Countries:

Tanzania:

Eastern African Statistical Training Centre (EASTC) in Tanzania:

The Eastern African Statistical Centre (EASTC) was established in 1965 by the United Nations as a training institution for offering courses in the Certificate and Diploma programmes for employees working in National Statistical Offices in Eastern and Southern Africa. The emphasis was placed on the acquisition of skills that were needed in data collection, data entry, data management and supervision of fieldwork activities at middle-level management of National Statistical Offices (NSO's). Graduates from EASTC were needed to support the high level statistical activities at the NSO's.

The minimum entry requirement into the EASTC (one-year) Certificate programme was GCE O-Level with a credit in Mathematics. Candidates who successfully completed the Certificate studies were eligible for enrollment into the one-year Diploma programme, also at EASTC.

The curriculum for the EASTC programme made provision for both theoretical and practical skills training. Students spent more hours studying Applied Statistics and Statistical Methods where practical aspects of statistics were covered than studying mathematics and Statistical theory, but the idea of teaching the theoretical subjects was to give the candidates a firm foundation for the understanding the higher level courses in statistics and economics.

The EASTC curriculum consisted of the following courses:

Certificate (one-year programme):

- > Mathematics I.
- > Applied Statistics I.
- > Statistical Methods I.
- > Economics I.
- > Statistical Computing I.
- > Statistical Theory I.
- > Student Project I.

Diploma (one-year programme):

> Mathematics II.

Source: National Learners' Records Database

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- > Applied Statistics II.
- > Statistical Theory II.
- > Statistical Methods II.
- > Large Scale Surveys.
- > Economics II.
- > Statistical Computing II.
- > Student Research Project II.

Candidates who completed the certificate programme had the option of continuing directly into the Diploma programme or of going back to the NSO to work, and when conditions permitted, a graduate of the certificate programme who had gone to the NSO to work after completing the training, would later come back to EASTC to undertake the Diploma studies there. This arrangement allowed some flexibility whereby the candidates could return to work if they wished to do so, and the NSO's had the liberty to grant a candidate permission to stay for an extra year and earn a diploma qualification, or to call the candidate for work at the office depending on the need for statistical support.

Uganda:

The Institute of Statistics and Applied Economics (ISAE) at Makerere University in Uganda:

The first graduates of the Diploma qualification from EASTC came out in 1967 and a need was realized by the United Nations to establish a Statistical Training institution that would offer these graduates the opportunity to study for the degree in official statistics.

The syllabus of the degree programme (B Sc) at the Institute of Statistics and Applied Economics was deliberately designed to accommodate the entry of Diploma graduates from EASTC. Candidates who had passed the diploma with a credit or distinction would be eligible for entry into ISAE in the second year of the three-year undergraduate degree programme. Otherwise, normal entry into ISAE was the GCE A-Level certificate with a principal pass in Mathematics.

The undergraduate BStat degree programme had the following course structure:

- > Probability and Distribution Theory.
- > Statistical Inference.
- > Statistical Computing I.
- > Advanced Calculus I.
- > Linear Algebra I.
- > Sampling Theory and Methods.
- > Design of Experiments and ANOVA.
- > Economic Statistics and National Accounts.
- > Statistical Computing II.
- > Real and Functional Analysis.
- > Econometrics.
- > Advanced Calculus II.
- > Linear Algebra II.
- > Introductory Complex Analysis.
- > Multivariate Analysis I.
- > Probability Theory and Distribution Theory.
- > Sampling Techniques I.
- > Statistical Computing I.
- > Economic Statistics and National Accounts.
- > Multivariate Analysis II.
- > Sampling Techniques II.
- > Statistical Inference, Source: National Learners' Records Database

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- > Statistical Computing II.
- > Agricultural Statistics.
- > Advanced Econometrics.
- > Advanced Social Statistics.
- > Industrial Statistical Modelling.
- > Research Methods.

Developed Countries:

United Kingdom:

The Statistical Services Centre, University of Reading, UK:

Statistical Training and Research:

The Statistical Services Centre at the University of Reading specializes in statistical training and research. The Centre works in Europe and world wide offering training and advisory services in statistics and data management.

Most of the training courses offered are of a short term nature. A list of some of the courses is provided here:

- > A Review of Basic Statistics.
- > What Sample Size Do | Need.
- > Statistics for University Administrators.
- > A Review of Basic Statistics.
- > Regression Analysis: A Hands-on Approach.
- > Practical Bayesian Analysis.
- > Excel 2007 for Statistics: What You Can and Cannot Do.
- > Taking Excel 2007 Further: Macros for Data Management and Statistics.
- > The Incomplete and Utter Guide to Statistics.
- > Survival Analysis for Medical & Health Professionals.

Consultancy Services:

The Statistical Services Centre has, for over 20 years, provided consultancy services to clients outside the University. The consultancy services unit provides the following kinds of services:

Advice or assistance in areas such as the statistical analysis of data from designed experiments, surveys or observational studies, the design of a research investigation to meet stated objectives in a cost-effective manner, efficient data management, Independent reviews of reports with a statistical component, Specialist advice on the use of advanced statistical methodology, and a regular on-site statistical "help-desk".

The SADC Statistics Training Pack was developed by the Statistical Services Unit of the University of Reading under the auspices of the European Union and the SADC Secretariat in Gaborone, Botswana. The Pack contains up-to-date training materials in Official Statistics suitable for work-skills training programmes in the SADC region.

Australia:

The Australian Bureau of Statistics Training Programme:

National Statistical Training Institute:

Source: National Learners' Records Database

The National Statistical Training Institute (NSTI) at the Australian Bureau of Statistics (ABS) is a discrete organisational unit that is responsible for the provision of training opportunities against statistical job-specific capabilities.

The NSTI was created in 2003, the same year that the ABS-wide capability framework project was established. One of the drivers for the NSTI initiative was that development and delivery of statistical training in the ABS had had mixed success. There was a need to develop a statistical training program that was targeted, cohesive, curriculum based and structured that would provide ABS staff with the knowledge, understanding and skills to meet the organization's current and future statistical needs. A statistical training program was subsequently developed and was mapped to the statistical capabilities defined within the system. This has enabled the NSTI to partner with Learning and Development in addressing whole of agency capability development needs.

One of the primary objectives of the NSTI is to provide a statistical learning pathway for economic and social statisticians, populated with appropriate training opportunities. The learning pathway is presently comprised of training courses but these are not the only development activities available to ABS statisticians. In the future, the NSTI aims to integrate complementary learning activities with those offered on the statistical learning pathway.

Statistical Training Curriculum:

The NSTI offers ABS employees training opportunities that enable them to progress from an entry level statistical skill set, through a series of intermediate and practitioner development activities, up to advanced professional/statistical leadership activities. The learning pathway guides participants to step through the range of courses that NSTI develops and/or delivers:

> Overviews of ABS activities (e.g. Collecting Data in the ABS, Introduction to Statistical Collections).

- > Subject matter specific (e.g. Introduction to Macroeconomic Statistics).
- > Collection conduct and management (e.g. Editing, Estimation and Imputation).
- > Statistical methods (e.g. Basic Statistical Analysis, Graduate Certificate in Statistics).
- > Statistical leadership (e.g. Data Quality in the ABS).

The current priority is to run and develop courses to meet known statistical training needs. Much of NSTI's early focus was on revising and bedding down existing courses and undertaking course development to meet the needs of new employees or staff who were changing jobs. With an increase in capacity over the past 12 months, the NSTI has been developing more intermediate and advanced courses. The aim for this work, combined with new initiatives from Learning and Development Section, is to better address the needs of longer-term employees.

In addition, all new and existing statistical training run by other parts of the ABS are progressively being integrated into the curriculum. This is to ensure:

- > There is no overlap or duplication in the training materials.
- > Gaps in the training program can be identified and addressed.
- > A national focus for the training can be provided.

Continually, parts of the organisation re-engineer their work, necessitating a review of the training curriculum. The NSTI seeks organisational direction on priorities for support for new and emerging needs identified through this review process.

Provision of Statistical Training:

Establishing the NSTI focused resources on the provision of high level statistical national training across all nine ABS offices. In order to determine when and where to provide training,

training needs planning system is in place, whereby NSTI receives advice from all offices on their training needs for the six months ahead. Around October and May of each year, regional offices consult with their employees and then indicate to the NSTI their training needs for the following six month period respectively. This enables NSTI to negotiate venues, presenters and a balance between internal and external training delivery.

The ABS draws on its own skilled professionals to develop and deliver statistical training. These professionals are experienced statisticians or staff with specialized skills who manage, develop, administer and/or deliver the range of courses. The statisticians may be current employees or retirees contracted in to deliver specific training courses. The strategy is to maximise the learning experience of course participants whilst minimizing the loss to the ABS of the skills and knowledge of its ageing workforce.

Statistical training has been primarily developed to increase the capability of ABS employees but there is increasing interest from other organisations in this type of training. A smaller number of courses are available for external delivery and, given rising demand, the ABS anticipates that the volume and range of external statistical training will increase in the medium term. NSTI currently absorbs increasing demand for external training by:

> Accommodating external participants on internal courses (e.g. staff from Statistics New Zealand recently attended an advanced module on Government Finance Statistics delivered at the ABS in Canberra).

> A small range of generic external training courses being offered from the ABS head office and each ABS Regional Office for the staff from other government agencies.

> Tailoring training for external organisations (e.g. using some of their organisational issues and data in the training package).

The provision of nationalised external training is a relatively new focus that meets a longer term NSTI objective: To develop statistical skills across the national statistical system. This is linked to a key aim in the Corporate Plan, of the ABS working in partnership with other organisations to expand and improve awareness of available statistical services.

Transition Countries:

India:

The Indian Statistical Institute, Kolkata (Calcutta):

ISI Calcutta:

The Indian Statistical Institute (ISI) is a renowned institution devoted to the research, teaching and application of statistics as well as to natural sciences and social sciences.

Divisions and Units of ISI Calcutta:

The following units constitute the various academic divisions of ISI:

- > Administrative Services Division.
- > ISEC Office, Kolkata.
- > Sankhya Office, Kolkata.
- > Applied Statistics Division.
- > Applied Statistics Unit (ASU), Kolkata.
- > Bayesian and Interdisciplinary Research Unit (BIRU), Kolkata.
- > Statistical Quality Control and Operations Research Division.
- > Theoretical Statistics and Mathematics Division.

The ISI runs the International Statistical Education Centre (ISEC) which offers a nine-month qualification to candidates from national statistical offices from all over the world.

We found that the ISEC training programme had much in common with our training objectives, and so we present it here in some detail.

The International Statistical Education Centre (ISEC) at ISI Calcutta:

Objectives of ISEC:

The main purpose of the Centre is to provide courses in theoretical and applied statistics at various levels to selected participants from the countries of the Middle East, South and South-East Asia, the Far East, and the Commonwealth Countries of Africa.

Courses:

The Centre has been providing a Regular Course of training given over a term of 10 months duration. The first seven terms were of six months duration and the next twelve terms were of nine months duration. From the Twentieth term, the nine-month course was replaced by a 10-month Regular Course with a revised curriculum providing greater emphasis on subjects of specialization.

In addition to the Regular Course, a few persons are admitted on an individual basis, for Special Courses of varying duration and in different subject-fields. Facilities for research work and advanced studies by senior visiting statisticians from abroad are also available at the Centre.

Plan of instruction:

The Regular Course is currently conducted in four phases, which are outlined below:

During June to September, the participants are taught compulsory courses in preparatory mathematics, theory and applications of statistics (including Economic Statistics) and data processing, all at Indian Statistical Institute (ISI), Kolkata. Mathematics II and Probability II, though optional, are offered during the last two months of Phase I of the Regular Course, i.e., during the third and fourth months of the course (August and September) so that the trainees can follow the optional courses during mid-November to mid-January better. During October to mid-November, the trainees undergo training in Official Statistics conducted by Central Statistical Organization (CSO), New Delhi. The last two weeks of this course are devoted to specialization in some topic of Official Statistics at appropriate offices in places like Delhi, Mumbai, Simla or Lucknow. During mid-November to mid-January, the trainees study at least three from a variety of optional courses offered at ISI, Kolkata, in mathematics, economics and theory and applications of statistics. The trainees are encouraged to attend more than three optional courses and thereby earn extra credits. Data Processing II has been introduced as a compulsory course at this phase. Thus the trainees are to take at least four courses including Data Processing II. In the last phase, from mid-January to mid-March, each trainee specializes in one particular field, like (i) large scale sample surveys, (ii) data processing, (iii) vital statistics and demography, (iv) statistical quality control and operations research and (v) economic planning.

Final examinations are held at the end of each of the four phases of the training programme. Periodic examinations may also be held during the course for assessment of progress by the students. Candidates passing the examinations will be awarded Statistical Training Diplomas. Candidates who satisfactorily attend and complete the course, but do not pass the examinations, will be awarded Certificates of Attendance.

Curriculum:

Source: National Learners' Records Database

The curriculum of the basic part of instruction in the Regular Course is given below under four groups corresponding to the four phases:

Phase I: (All are compulsory except Mathematics II and Probability II):

- > Mathematics I.
- > Probability I.
- > Descriptive Statistics I.
- > Sample Survey I.
- > Economic Statistics I.
- > Economic Statistics II.
- > Statistical Methods I.
- > Data Processing |.
- > Mathematics II (optional).
- > Probability II (optional).

Phase II: (Compulsory):

Official Statistics, Systems and Procedures:

This part of the course offers the participants an opportunity to become acquainted with the basic concepts, definitions and classifications of all principal subjects of official statistics. The methods of data collection are also discussed, with particular reference to the conditions prevailing in developing countries. Conceptual problems are covered using the international standards recommended by the United Nations and other international agencies, as a basis. Emphasis is placed upon the development of an integrated system of economic and social statistics.

The curriculum will normally cover the following subjects, but the programme may be modified depending upon the specific needs of the trainees:

- > Agricultural statistics.
- > Industrial statistics.
- > Index numbers of prices.
- > Foreign trade statistics.
- > Balance of payments statistics.
- > Public finance statistics.
- > Money and banking statistics.
- > Transport statistics.
- > Wholesale and retail sales statistics.
- > Social statistics.
- > Population and vital statistics.
- > Education and cultural statistics.
- > National income statistics and related studies.
- > Capital formation statistics.

Phase III: (All are optional except Data Processing II):

At least three courses out of the following set of optional courses are to be chosen by the trainee:

- > Descriptive Statistics II.
- > Sample Survey II.
- > Statistical Methods II.

Source: National Learners' Records Database

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- > Economic Statistics III.
- > Demography.
- > Statistical Quality Control.
- > Operations Research.
- > Data Processing II (compulsory).
- > Economic Theory.
- > Economic Development and Planning.

Phase IV: (Specialization):

One of the following courses is to be chosen by the trainee:

> Large Scale Sample Surveys.

- > Economic Planning.
- > Data Processing.
- > Statistical Quality Control and Operations Research.
- > Vital Statistics and Demography.

Special Courses (Individual Basis):

Scope:

For persons who have already some background in statistics, and are interested in specialization in some branches of statistics and who do not find it necessary to attend the Regular Course during a Term, facilities exist for Special Courses, on an individual basis. Special Courses may also be offered to the candidates at lower levels. The duration of such courses is usually less than six months. A candidate can opt for such a course at any time of the year.

Subjects for specialization:

Subjects in which such special courses are provided may be mathematical or non-mathematical, theoretical or applied. Some such subjects are: Sample Surveys, Electronic Data Processing, Statistical Quality Control and Operations Research, Probability, Statistical Inference, Theory of Experimental Design, Demography and Vital Statistics, Economic Statistics, Econometrics and Economic Planning, Biometric Methods and Psychometric Methods. These courses may be given through lectures and lecture-cum-practical sessions or through in-service training involving participation in on-going projects in some departments of the Indian Statistical Institute or at the Department of Statistics, Government of India or at other departments/wings of the Government of India. In addition to subjects mentioned above, training may also be organized in subjects like Crop Estimation Surveys and Socio-economic Sample Surveys such as those conducted by the Indian National Sample Survey Organization, Presentation of Statistics relating to various fields like Population, Prices, National Income, Industrial Production, etc. A participant may also elect to do research work on a selected topic.

Conclusion:

Please rework the conclusion. What is similar, How does it compare with others-leaders, best practices.

From what has been discussed above, it is difficult to establish the equivalencies between our proposed NQF Level 5 qualification and those qualifications offered elsewhere, but suffice it to say that this entry level qualification into Official Statistics will be an important milestone and will be followed in subsequent years by the Advanced Certificate at NQF Level 6 and by the Diploma in Official Statistics at NFQ Level 7. As the candidates move through various levels

Source: National Learners' Records Database

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they will acquire more sophistication in terms of handling theoretical foundations of Official Statistics as well as practical knowledge and skills that will enhance their involvement in the application of statistics in National Statistical Services organizations.

ARTICULATION OPTIONS

Vertical articulation:

> National Diploma: Official Statistics NQF Level 6 (under construction).

Horizontal articulation:

> ID 16217: National Certificate: Applied Statistics.

MODERATION OPTIONS

> Anyone assessing a learner or moderating the assessment of a learner against this Qualification must be registered as an assessor with an appropriate Education, Training, Quality Assurance (ETQA) Body or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

> Any institution offering learning that will enable the achievement of this Qualification must be accredited as a provider with the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

> Moderation of assessment will be overseen by the relevant ETQA or by an ETQA that has a Memorandum of Understanding with the relevant ETQA, according to the ETQA's policies and guidelines for assessment and moderation.

> Moderation must include both internal and external moderation of assessments at exit points of the Qualification, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described both in individual Unit Standards as well as in the Exit Level Outcomes described in the Qualification.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

For an applicant to register as an assessor, the applicant needs:

> Assessment competencies and subject matter experience of the assessor can be established by recognition of prior learning.

> Well-developed interpersonal skills, subject matter and assessment experience.

> To be competent in the planning and conducting assessment of learning outcomes as described in the unit standards Plan and Conduct assessment of Learning outcomes NQF Level 5.

> A relevant tertiary qualification and/or 3 years experience in the relevant field.

> To be registered with the relevant Education and Training Quality Assurance Body.

> Detailed documentary proof of educational qualification, practical training undergone, and experience gained by the applicant must be provided (Portfolio of evidence).

NOTES

If any learner wishes to enter this qualification but have not acquired Mathematics at NQF Level 4 it is advisable that they have mathematical literacy at NQF Level 4 and at least mathematical competencies related to the following unit standards:

ID; Unit Standard Title; NQF Level; Credits:

> ID 119368; Describe, interpret and represent mathematical patterns, functions and algebra in different contexts; NQF Level 1; 6 Credits.

> ID 243833; Manipulate and simplify mathematical statements involving complex numbers, polynomials and rational functions; NQF Level 2; 6 Credits.

> ID 243827; Solve equations and inequalities in the real and complex number systems, using algebraic and graphical methods; NQF Level 3; 4 Credits.

> ID 243841; Find the derivatives of a range of functions and apply them to problems; NQF Level 3; 6 Credits.

> ID 243842; Find the derivatives of a range of simple functions, including the trigonometric functions and apply them to problems; NQF Level 4; 6 Credits.

> ID 243832; Develop and apply a variety of techniques to find both indefinite and definite integrals; NQF Level 4; 5 Credits.

> ID 242865; Use data entry and retrieval skills to input and retrieve computer data; NQF Level 3; 4 Credits.

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	243835	Understand linear relationships and predicting linear	Level 4	5
		trends using appropriate models		
Fundamental	262497	Apply social statistics	Level 5	8
Fundamental	262502	Demonstrate an understanding of the National Statistics System	Level 5	6
Fundamental	262517	Explain the basic concepts of demography	Level 5	8
Fundamental	262520	Use economic indicators to describe the state of the economy	Level 5	6
Core	252208	Record raw data	Level 4	3
Core	242714	Apply elementary statistical methods	Level 5	5
Core	262557	Apply the techniques of data processing	Level 5	8
Core	262558	Produce and interpret time series and index numbers	Level 5	12
Core	262559	Select and use sampling methods	Level 5	8
Core	262537	Use of probability to measure uncertainty	Level 5	8
Core	262538	Use statistical methods to analyse data	Level 5	12
Core	262539	Utilise alternative methods to collect data	Level 5	8
Elective	110475	Demonstrate and apply a knowledge and understanding of the basic economic concepts central to local economic development	Level 4	6
Elective	110501	Identify and explain the application of a range of concepts and tools for local economic development	Level 4	8
Elective	242559	Analyse and interpret qualitative and quantitative data from relevant reports in order to make a recommendation or inform a decision for an entity	Level 5	5
Elective	119351	Apply principles of computerised systems to manage data and reports relevant to the public sector administration	Level 5	10
Elective	119349	Apply principles of risk management to manage and report risk situations	Level 5	8
Elective	119333	Conduct and apply mathematical analyses relating to economics and finance	Level 5	15
Elective	246536	Conduct and interpret upper air observation data	Level 5	6
Elective	243819	Coordinate the closure of a simple to moderately complex project	Level 5	8
Elective	244455	Demonstrate an understanding of port and harbour economics	Level 5	6
Elective	258123	Demonstrate an understanding of real estate economics in the South African context	Level 5	8
Elective	255794	Demonstrate an understanding of the economics of transport	Level 5	10
Elective	243825	Determine project cost and schedule performance using earned value management techniques	Level 5	20
Elective	243811	Determine the work required to accomplish the objectives and organise the scope of a simple to moderately complex project	Level 5	7
Elective	243823	Develop a preliminary project scope statement for a simple to moderately complex project	Level 5	12
Elective	243813	Develop a project cost management plan for a simple to moderately complex project	Level 5	12
Elective	117763	Prepare, verify and distribute reports	Level 5	16
Source: National L	eamers' Records	Database Qualification 65649	06/02/2009	Page 16

UNIT STANDARDS

Qualification 65649

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	243840	Use and apply matrices and graphs to solve systems of	Level 5	2
		equations and network problems		

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION None

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UNIT STANDARD:

Apply social statistics

SAQA US ID	UNIT STANDARD TITLE	UNIT STANDARD TITLE		
262497	Apply social statistics	Apply social statistics		
ORIGINATOR		PROVIDER		
SGB Statistics)S			
FIELD	SUBFIELD			
10 - Physical, Mather	10 - Physical, Mathematical, Computer and Life Mathematical Sciences		nces	
Sciences				
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS	
Undefined	Regular	Level 5 8		

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1

Discuss the importance of the major social statistics data collected in the country.

SPECIFIC OUTCOME 2

Critically examine the data sources for social statistics.

SPECIFIC OUTCOME 3

Describe the National Development Goals, calculate and interpret the indicators.

	ID	QUALIFICATION TITLE	LEVEL
Fundamental	65649	National Certificate: Official Statistics	Level 5



UNIT STANDARD:

Demonstrate an understanding of the National Statistics System

SAQA US ID	UNIT STANDARD TITLE				
262502	Demonstrate an understandir	Demonstrate an understanding of the National Statistics System			
ORIGINATOR	PROVIDER				
SGB Statistics					
FIELD		SUBFIELD	SUBFIELD		
10 - Physical, Mathema	itical, Computer and Life	Mathematical Sciences			
Sciences					
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS		
Undefined	Regular	Level 5 6			

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1

Describe the National Statistics System (NSS), the National Statistics Office (NSO) and their roles in social-economic development.

SPECIFIC OUTCOME 2

Describe the implementation of the Principles of Official Statistics in the NSS within the framework of the National Statistics Act.

SPECIFIC OUTCOME 3

Describe census, major surveys and administrative data collection activities conducted regularly in South Africa and explain their relevance to national development.

	ID	QUALIFICATION TITLE	LEVEL
Fundamental	65649	National Certificate: Official Statistics	Level 5



Explain the basic concepts of demography

SAQA US ID	UNIT STANDARD TITLE			
262517	Explain the basic concepts of	demography		
ORIGINATOR	PROVIDER			
SGB Statistics				
FIELD	FIELD SUBFIELD			
10 - Physical, Mathema	tical, Computer and Life	Mathematical Science	es	
Sciences				
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS	
Undefined	Regular	Level 5 8		

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1

Define the basic terminology in demography and explain their role in describing populations.

SPECIFIC OUTCOME 2

Prepare and present demographic information.

SPECIFIC OUTCOME 3

Use statistical methods for demographic data.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Fundamental	65649	National Certificate: Official Statistics	Level 5



UNIT STANDARD:

Use economic indicators to describe the state of the economy

SAQA US ID	UNIT STANDARD TITLE				
262520	Use economic indicators to de	Use economic indicators to describe the state of the economy			
ORIGINATOR	PROVIDER				
SGB Statistics					
FIELD SUBFIELD					
10 - Physical, Mathema	tical, Computer and Life	Mathematical Sciences			
Sciences					
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS		
Undefined	Regular	Level 5	6		

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1

Discuss the compilation of the national accounts.

SPECIFIC OUTCOME 2

Explain economic trends using business cycles.

SPECIFIC OUTCOME 3

Describe the various measures of international trade.

	ID	QUALIFICATION TITLE	LEVEL
Fundamental	65649	National Certificate: Official Statistics	Level 5



UNIT STANDARD:

Use of probability to measure uncertainty

SAQA US ID	UNIT STANDARD TITLE			
262537	Use of probability to measure uncertainty			
ORIGINATOR	PROVIDER			
SGB Statistics				
FIELD SUBFIELD				
10 - Physical, Mathema	itical, Computer and Life	Mathematical Sciences		
Sciences				
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS	
Undefined	Regular	Level 5 8		

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1

Explain different approaches used to define probability.

SPECIFIC OUTCOME 2

Use Venn diagrams to explain the laws of probability.

SPECIFIC OUTCOME 3

Calculate probability of events using the laws of probability.

SPECIFIC OUTCOME 4

Interpret probability contextually and explain the role of probability in life tables.

	ID	QUALIFICATION TITLE	LEVEL
Core	65649	National Certificate: Official Statistics	Level 5



UNIT STANDARD:

Use statistical methods to analyse data

SAQA US ID	UNIT STANDARD TITLE			
262538	Use statistical methods to an	Use statistical methods to analyse data		
ORIGINATOR	GINATOR PROVIDER			
SGB Statistics				
FIELD		SUBFIELD		
10 - Physical, Mathematical, Computer and Life		Mathematical Sciences		
Sciences				
ABET BAND	UNIT STANDARD TYPE	NIT STANDARD TYPE NQF LEVEL CREDITS		
Undefined Regular Level 5 12			12	

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1 Use graphical methods to explore and present data.

SPECIFIC OUTCOME 2 Calculate and interpret sample statistics.

SPECIFIC OUTCOME 3

Fit and interpret linear regression models.

SPECIFIC OUTCOME 4

Perform chi-square tests.

SPECIFIC OUTCOME 5

Perform non-parametric tests.

	ID	QUALIFICATION TITLE	LEVEL
Core	65649	National Certificate: Official Statistics	Level 5



Utilise alternative methods to collect data

SAQA US ID	UNIT STANDARD TITLE	UNIT STANDARD TITLE		
262539	Utilise alternative methods to	Utilise alternative methods to collect data		
ORIGINATOR	ORIGINATOR			
SGB Statistics				
FIELD		SUBFIELD		
10 - Physical, Mathematical, Computer and Life		Mathematical Sciences		
Sciences				
ABET BAND	UNIT STANDARD TYPE NQF LEVEL CREDITS		CREDITS	
Undefined	Regular	Level 5	8	

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1

Compare various data collection methods.

SPECIFIC OUTCOME 2

Explain the basic principles of data collection.

SPECIFIC OUTCOME 3

Explain the main stages in planning a survey.

SPECIFIC OUTCOME 4

Design and evaluate questions for simple survey objectives.

	ID	QUALIFICATION TITLE	LEVEL
Core	65649	National Certificate: Official Statistics	Level 5



UNIT STANDARD:

Apply the techniques of data processing

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SAQA US ID	UNIT STANDARD TITLE			
262557	Apply the techniques of data	Apply the techniques of data processing		
ORIGINATOR	PROVIDER			
SGB Statistics				
FIELD	SUBFIELD			
10 - Physical, Mathematical, Computer and Life Mathematical Sciences		nces		
Sciences				
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS	
Undefined Regular Level 5 8			8	

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1

Code, enter, verify and validate data.

SPECIFIC OUTCOME 2

Check and edit data.

SPECIFIC OUTCOME 3

Impute missing values under supervision.

SPECIFIC OUTCOME 4

Transform the structure of data and tabulate the data.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	65649	National Certificate: Official Statistics	Level 5



Produce and interpret time series and index numbers

SAQA US ID	UNIT STANDARD TITLE	UNIT STANDARD TITLE		
262558	Produce and interpret time se	Produce and interpret time series and index numbers		
ORIGINATOR	RIGINATOR PROVIDER			
SGB Statistics				
FIELD		SUBFIELD		
10 - Physical, Mathematical, Computer and Life		Mathematical Scier	nces	
Sciences				
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL CREDITS		
Undefined Regular Level 5 12		12		

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1

Produce and critically assess descriptive time series analyses, including the decomposition of trends and seasonal patterns.

SPECIFIC OUTCOME 2

Explain the meaning of the components into which time series data are decomposed using additive and multiplicative models.

SPECIFIC OUTCOME 3

Discuss the context in which time series data are commonly used in practice.

SPECIFIC OUTCOME 4

Demonstrate an understanding of the consumer and producer price index numbers.

SPECIFIC OUTCOME 5

Compute and interpret the consumer and producer price index numbers.

SPECIFIC OUTCOME 6

Identify and discuss the roles and analyse the implications of consumer and producer price index numbers on the economy.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	65649	National Certificate: Official Statistics	Level 5



UNIT STANDARD:

Select and use sampling methods

SAQA US ID	UNIT STANDARD TITLE			
262559	Select and use sampling meth	Select and use sampling methods		
ORIGINATOR	PROVIDER			
SGB Statistics				
FIELD SUBFIELD				
10 - Physical, Mathematical, Computer and Life Mathe		Mathematical Sciences	Mathematical Sciences	
Sciences				
ABET BAND	BET BAND UNIT STANDARD TYPE NQF LEVEL CREDITS		CREDITS	
Undefined Regular		Level 5	8	

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1

Identify population, select sampling frame and potential errors.

SPECIFIC OUTCOME 2

Define and compare different methods of sampling.

SPECIFIC OUTCOME 3

Use different sampling methods.

SPECIFIC OUTCOME 4

Design a sample for given survey objective and associated resource constraint.

	ID	QUALIFICATION TITLE	LEVEL
Соге	65649	National Certificate: Official Statistics	Level 5