ECONOMIC COMMISSION FOR AFRICA
Meeting of Directors of Middle Level
Statistical Training Centres
Addis-Ababa, 16-20 April 1965

STATISTICAL ASSISTANTS TRAINING COURSE,

LAGOS,

1964-65

SYLLABUS

I. MATHEMATICS (MT)

Arithmetic operations. Numbers; number scales; change of origin and change of scale or unit of measurement; fundamental operations with numbers; fractions and decimals; powers and roots of numbers and tables of squares, square roots and reciprocals; system of real numbers; imaginary numbers.

Basic algebra. Symbolism and algebraic expressions; fundamental operations with algebraic expressions; simple algebraic equations and their solution; special algebraic products; factorisation; exponents and radicals; laws of indices and handling of surds.

Ratios. Ratio and proportion; percentages; arithmetic geometric and harmonic averages; weighted averages.

Functions. Variation, variables, constant; function and functional relations; type of functions – implicit and explicit function, single valued and multivalued functions, inverse functions; sequence and functions; limits of functions.

Equations. Further treatment of simple linear equations in one unknown; simultaneous linear equations in two and three unknowns; quadratic equation in one unknown; inequalities.

Graphical representation. Cartesian Coordinates; graphing of straight lines and parabolas from given equations; the inverse process of building up an equation from the graph; correspondence between functions and curves; graphical solution of linear, quadratic, simultaneous equations.

Geometrical properties of equations. Slope and gradient; trigonometric ratios of angles and their basic relations; radian and degree; properties and equations of straight line and parabola.

Series. Sequence and series; arithmetic and geometric progression; summation of arithmetic and geometric series; sum of natural numbers and their squares.

   <u>Binomial theorem</u>. Permutation and Combination; Binomial theorem
for positive integral exponent only; Binomial coefficients, Pascal's
Rule and Pascal's triangle; relationship between successive binomial
coefficients.

   <u>Calculus</u>. Notion of differential and integral calculus, rate of
change and summation concepts; basic rules and their application to
simple algebraic forms.

II. NUMERICAL CALCULATIONS (NC)

<u>Accuracy</u>. Accuracy and approximation – significant digits; rounded figures; absolute and relative errors; laws of errors; approximate numbers and short cut methods of calculation; accuracy of primary data and derived results.

<u>Logarithms</u>. Logarithms of numbers and their components; entilogarthms; use of log-tables for multiplication, division, powers and roots of numbers; negative log.

<u>Slide rules</u>. Principles; parts of the slide rule, scales A and B and C and D; practice for multiplication, division, square roots; slide rule and accuracy.

<u>Desk calculators</u>. Practice and use; worksheets for computation of statistical measures.

<u>Interpolation</u>. Simple differences of first and second order and their applications; error in interpolation; inverse interpolation; idea of extrapolation; graphic interpolation and extrapolation.

<u>Nomograms</u>. Simple nomograms – object of nomography; nomograms for addition and subtraction, multiplications and divisions, and simultaneous equations; specialised nomograms.

III. DESCRIPTIVE STATISTICS (DS)

Introductory. Meaning of statistics; Purpose and function of statistics; Nature and scope of statistical methods and their applications; Uses of statistics - for practical action in Government and business, for research in economic, social and scientific fields.

Process of statistical observation. Statistical characteritics; statistical unit, statistical data; population, census and sample; description of sample, inferences about properties of populations; reliability of statistical measures and estimates; quality and comparability of statistics - importance of concepts, definitions and classifications.

Sources of statistics. Government, business associations, private firms and individuals; primary and secondary statistics; derived statistics, care in the use of statistics.

Collection of primary data

(i) General : purpose of collection; nature and items of
information required, their definition and grouping; scope,
and coverage; time reference or period of reference; forms
for recording and communication of information. Agency -
existing or new, full-time or part-time, temporary of
permanent, internal or external; check and accuracy, speed
and timeliness.

(ii) In the field - information buildup-form existing records,
from records to be maintained, by memory recall by respondents,
or by observation, measurement or enumeration. Method of
collection - census or sample, regular or ad hoc, on statutory
or voluntary basis, by post or through employment of
enumerators. Types of errors in data collection and steps
to avoid them. Cost of collection.

(iii) By-product of administration - importance of this source, functions and activities of Government and organized business. Method of collection - registration, applications, permits or licenses. Use and users' interest.

Collection of data from secondary sources. Clarity of purpose and information requirement; location of sources; study of limitations, if any, of information available, from the point of view of the quality of primary data and quality of processing used in the available source material; judgement as to use of processed or unprocessed data; adjustments.

Processing of statistical data - manual method. Receipt of data, registration, check, scrutiny and editing of returns for completeness, accuracy and consistency of information; system of checks on accuracy at each stage of processing from initial copying to final presentation. Filing of data. Systems of filing; supply of information. Aids to reduction of labour in manual processing of data - record cards, multiple key stroke counting machines, record counting machines, edge punch card method, slide rules, desk calculators, mathematical tables, nomograms; principles of editing returns and tabulation to ensure accuracy.

Processing of statistical data - mechanized or punch card methods. Principles; principal types of equipment; advantages over manual system; considerations for use; effect on form and tabulation designs; code systems and card designs; operational processes - receiving, batching, check, scrutiny and editing of documents; coding and code checking; control totals; punching, verification, sorting and tabulation; scrutiny of final results; demonstration and practice.

Presentation of data - statistical tables. Purpose; types of tables; essential of a good table; parts and construction of a statistical table; notes to a table; derived statistics (totals), percentages, ratios, index numbers, averages, etc. and their use in tabular presentation; interpretation of a statistical tables, (Refer - statistical abstracts).

Presentation of data - graphic presentation. Purpose; types of charts and graphs - their description, construction, and comparative merits and the conditions under or purpose for which to be used; their layout; interpretation of charts; care against misleading distortions. Pictorial presentation and symbols to use.

(a) Bar charts - simple vertical or horizontal bars; single or multiple bars; histogram; piramid bar charts; plus and minus bar charts; shaded or overlapping bar charts; gantt progress charts.

(b) Line charts - single or multiple line charts, index graph, band curve chart, (net) balance chart, silhouette charts, range or high and low charts.

(c) Special charts - line progress chart; Z-chart; break-even point chart; lorenz curve; pie chart; statistical maps.

(d) Use of double or multiple scales and charts.

Index numbers. General purpose and principles; selection of base period, items series, weighting pattern, averaging formula; Laspeyre's and Passche's formulae and their merits; significance, construction and use of index numbers of consumer prices, wholesale prices, agricultural and industrial production, wages and earnings, volume and value of imports and exports.

Vital rates. Rates and ratios in vital statistics; birth rates, death or mortality rates, morbidity rates; gross and net reproduction rates.

Time series. General graph and component parts of a time series - trend, periodic variations and random fluctuations; principles of analysis of time series; estimation of trend by method of moving averages; interpolation and extrapolation of the trend; estimation of seasonal variation and adjustment therefor.

IV. STATISTICAL METHODS (SM)

Attributes - classification with reference to attributes; order of classes and class frequencies; inter-relations between class frequencies of different order; association and independence of attributes; contigency tables.

Variable - continuous and discontinuous variables; observations, classification, choice of class intervals and number of classes; frequency distribution; frequency histogram, polygon, and curve; cumulative frequency curve; relative frequency distributions; frequency distributions with equal and unequal class intervals; interpretation of frequency distribution; forms and comparison of frequency distributions.

Measures of central tendency - purpose, criterion for a good measure; mean, median, mode, geometric and harmonic means - their comparative merits and demerits; their practical uses and their calculations for grouped and ungrouped data, with equal and unequal intervals and with closed and open ends; geometrical methods of calculating median and mode; inter-relation between the mean, the median and mode; quartiles, deciles and percentiles, and their calculation, algebraically and geometrically; usefulness of frequency distributions by quartiles, deciles and percentiles as class limits, or with equal class frequencies and unequal class intervals; moving average; averaging of averages and percentages.

Measures of dispersion - purpose or function of measures of dispersion; criteria for selection of a suitable measure; range, quartile deviation, mean deviation, and standard deviation and their comparative merits; their inter-relationship and specialized uses; calculations of these mesures for grouped and ungrouped frequency distributions. Measure of relative dispersion and its uses; standardization of variates and its significance.

Moments - definition and uses; general methods of calculating moments, and check on the accuracy of these calculations; moments about origin and mean and their relationships; correction of moments for grouping, need and method of adjustments; skewness and kurtosis.

Probability - concept and meaning of probability; concept of elementary and compound, mutually exclusive, and independent and depended events; summation and multiplication laws of probability; simple exercises based on permutations and combinations; relative frequency and probability; probability and frequency distributions.

Standard distributions - binomial, poisson and normal and their properties - empirical approach and probability - approach.

Sampling distributions - concept and derivation, estimation and standard errors of means, proportions, sums and differences, and of standard deviation; principles and methods of tests of significance for large samples.

Statistical quality control - meaning, principles, advantages; control charts for averages, standard deviation, range and proportion defective.

Curve fitting - straight line and parabola, by methods of least squares; binomial, poisson, normal curves by methods of moments; test of goodness of fit.

Bivariate distribution - functional relationship and relationship due to causation, scatter diagram; linear regression and co-efficient of correlation; physical meaning of correlation, spuruous correlation; standard error and significance of correlation and regression co-efficients; rank correlation.

V. SAMPLE SURVEYS (SS)

Basic concepts - population and sample; need and uses of sampling; basic laws of sampling; random sampling; census and sample surveys; sampling errors; estimation and inference; requirements of a good sample - representativeness, adequacy of size, avoidance of biases - non-sampling errors; large and small samples.

Types of samples - random samples, stratified samples, systematic samples, quota samples, multi-stage sampling.

Sampling procedure - sampling units; frame; random numbers; use of random numbers for sampling; sampling with or without replacement.

Organization of a sample survey.

a) Planning - defining of aim, administrative preparation, finance and procedure; type of sample and sampling procedure; field procedure; questionnaires and instructions; method and agency for collection of information; tabulation plans; try-out and pilot enquiries.

b) Execution - procurring of frame, selection of samples, recruitment and training of staff, programme for collection of information; field supervision to ensure progress of work and quality of information; problems of non-response; control on quality of information.

c) Processing - manual or mechanized; organization of flow of work from stage to stage; organization of processing operations and preparation of final tables, and graphs; use of internal and external checks on the accuracy of results; computations of estimates and errors.

d) Report writing - basic elements of a survey report; care in the interpretation of results.

Illustrations from different fields.

Practical project to acquaint trainees of steps from planning to report writing.

VI.   OFFICIAL STATISTICS (OS)

General - purpose and importance of statistics; role or statistics in Government and in industry; statistics and economic policy; statistics for planning.

National and international statistical system - need and purpose; evolution, organization, functions, publications; statistical system of the United Nations and its specialized agencies; statistical system in Nigeria.

Statistical system in Nigeria (with appropriate reference to other countries). Reporting as a by-product or as integral part of administrative activities; reporting under special legislative enactments or on a voluntary basis; sample surveys, past and of current interest.

Sources of Nigerian statistics relating to subject specified below. For each subject field knowledge should extend to the periodical publications titles, periodicity, publishing authority, broad contents; primary source of published statistics; utilization and limitations of available statistics; procedure and organization for collection - their scope and limitations.

Population; vital statistics, labour and employment, agriculture, mining, industry and power, external trade; transport - railway, road, shipping and civil aviation; communications - posts and telegraphs telephone and broadcasting; education and culture; housing; prices; public finance; money and banking; balance of payment; national income and national account; planning.

Internal statistics of a business firm - the general nature of statistics appropriate to personnel studies, research, production, inspection, management and control.

Assignment - intensive study of statistics in one field by each student.

VII. ECONOMICS (EC)

Economics – what it is about; economic systems; main features of economic activity and economic institutions with special reference to Nigeria and referring to agriculture; Industry, Trading and Banking.

Economic concepts – Product and Production; resources; factors of production; investment; saving and consumption; stocks and flows; demand and supply.

Consumer theory – maximisation of satisfaction; constraint of Income; effect of changes in price and income.

Production theory – organization of production; industry and firm, location of industry with special reference to Nigeria; firms and their aims; determination of production level and price; division of labour and specialisation; market structure; private and Public enterprises; income shares.

Domestic economy and the outside world – imports and exports; their broad distribution in relation to Nigeria.

Money – its different forms; the monetary system of Nigeria; the functions of a bank; Central Bank.

Sources of capital finance – the Capital market; the determination of interest rates.

International payments – foreign currencies; exchange control.

Economic control – Monetary measures; fiscal measures.

The role of government – the main kinds of taxes; the main objects of Public expenditure.

Some special public institutions – the marketing boards and licensed buying agents; the cooperative societies; commodity agreements; public and private enterprises; statutory corporations.

VIII. ACCOUNTING (AC)

1. Nature of business transactions; double entry system; ledgers.

2. Balance sheet; trading and profit and loss accounts.

3. Ascertainment of capital, revenue and profits.

4. Valuation of assets and liabilities; depreciation and appreciation.

5. Accounting for companies and government.

6. Reserve and sinking funds.

IX. FRENCH (FR)

A short course in French to enable Trainees to consult statistical publications of French speaking countries.