**2022-23**

## Regular Course on STATISTICAL THEORY AND APPLICATIONS 74th Term

### PROSPECTUS
### and
### WELCOME BROCHURE

**INTERNATIONAL STATISTICAL EDUCATION CENTRE**

C. D. Deshmukh Bhawan
202 B. T. Road
Kolkata 700 108, INDIA

Regular Course
on

# STATISTICAL THEORY AND APPLICATIONS

74th Term (2022 – 23)

## PROSPECTUS
### and
## WELCOME BROCHURE

# INTERNATIONAL STATISTICAL EDUCATION CENTRE

An Associate Institution of Indian Statistical Institute

and

A Partner Institution of ITEC, Ministry of External Affairs, Government of India

## C. D. Deshmukh Bhawan
## 202 B. T. Road
## Kolkata 700 108, INDIA

# INTERNATIONAL STATISTICAL EDUCATION CENTRE

## An Associate Institution of Indian Statistical Institute

202 Barrackpore Trunk Road, Kolkata 700 108

Telephone: (91) (33) 2575-2028/2027/2016

URL :http://www.isical.ac.in/~isecweb

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203 Barrackpore Trunk Road, Kolkata 700 108, INDIA

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# Contents

# INTRODUCTION

## International Statistical Education Centre

The International Statistical Education Centre (ISEC) is an Associate Institution of the Indian Statistical Institute.

It was founded in 1950 through the initiative of Prof. P. C. Mahalanobis and is currently run by the Indian Statistical Institute under the auspices of the Government of India. It was opened in Kolkata by an agreement between the *International Statistical Institute* and the *Indian Statistical Institute*. According to the agreement made between the two Institutes, the latter placed its existing facilities for teaching and training at the disposal of the Centre. The International Statistical Institute agreed to provide the services of teachers from outside India to the maximum extent possible either by direct payment from UNESCO grants or by arrangements with various national or international organizations. Currently, the International Statistical Institute is not involved with the ISEC. Beginning with the third term of the ISEC Programme, the Central Statistical Office of the Government of India (GOI) is collaborating with the ISEC by organizing courses on Official Statistics.

The centre operates under a Board of Directors. Prof. C. R. Rao had been functioning as the Chairman of the Board since the demise of Prof. P. C. Mahalanobis in 1972. Prof. S. P. Mukherjee took over the chairmanship of the ISEC Board of Directors in November 2015. On behalf of the Board of Directors, the Member-Secretary shoulders the responsibilities of selecting the candidates for various courses and conducting the Regular and the Special Courses with the collaboration of different wings of the Indian Statistical Institute and the Central Statistical Office of the Government of India. He/she also participates in the teaching programme.

Participants for the courses offered by ISEC in the past were selected from a large number of applicants from the following countries:

Afghanistan, Australia, Bangladesh, Bhutan, Brunei, Cambodia, Republic of China (Taiwan), Cuba, Egypt, Ethiopia, Fiji Islands, Gambia, Georgia, Ghana, Grenada, Hong Kong, Indonesia, Iran, Iraq, Israel, Ivory Coast, Japan, Kazakhstan, Kenya, Republic of Korea, Laos, Liberia, Malawi, Malaysia, Maldives, Mali, Mauritius, Mongolia, Myanmar, Namibia, Nepal, New Zealand, Niger, Nigeria, Oman, Pakistan, Papua, New Guinea, Peoples' Republic of China, Philippines, Republic of Russia, Sierra Leone, Seychelles, Singapore, Somalia, Republic of South Africa, South Sudan, Sri Lanka, St. Christopher and Nevis (W. Indies), St. Lucia (W. Indies), Sudan, Swaziland, Syria, Tanzania, Thailand, Tonga, Uganda, United Arab Emirates (Abu Dhabi), Uzbekistan, Vietnam, Western Samoa, Zambia.

The number of countries represented each year has been, on the average, about ten in recent years. Given the ISEC objectives, candidates from the three stated groups in India are also encouraged to take part in the ISEC programmes.

## Objectives

The main purpose of the Centre is to provide regular and special courses in theoretical and applied statistics at various levels to selected international participants from the developing countries in general, and the countries of the Middle East, South and South-East Asia, the Far East, and the Commonwealth Countries of Africa in particular. Today, the ISEC accepts participants from all over

the world. The Centre also provides facilities for research work and advanced studies to senior visiting statisticians from abroad.

Trainees usually belong to one of the following groups:

A – Officials from national statistical offices and other government departments   and from business organizations who have experience in statistical work;

B – Teachers and research workers in Statistics from universities and other institutions;

C – Officials in non-statistical fields, desiring to acquire knowledge in Statistics.

## Courses

The **regular course** on STATISTICAL THEORY AND APPLICATIONS has been conducted for the past 73 terms. Presently, the duration of this course is ten months. Its syllabus has been revised with the emphasis being on the methodology and applications, rather than on the theory. The course will be held physically at the **ISEC Campus, Kolkata, India**.

Duration of **special courses** vary according to the needs of the trainees. Most of the candidates are officials from national statistical offices and other government departments or from financial and other business organizations.

## Teachers

Teaching at the Centre is undertaken by members of the staff of the Indian Statistical Institute, visiting teachers, and by experts in collaboration with the statistical offices of the various Ministries of the Government of India through the Ministry of Statistics and Programme Implementation and through such bodies as the Reserve Bank of India.

## Teaching Facilities

The teaching programmes are arranged through a collaboration between the Indian Statistical Institute and the Ministry of Statistics and Programme Implementation of the Government of India. All the facilities of the Indian Statistical Institute at Kolkata are made available to the Centre, including classrooms, study rooms, a computation and data processing centre containing variety of equipment including electronic computers, and a library of more than 200,000 up-to-date volumes, past and current professional journals, and international and national reports from all over the world. The Centre is in close touch with all branches of work of the Indian Statistical Institute.

# Course on STATISTICAL THEORY AND APPLICATIONS

Seventy-Fourth Term (November 2022 – August 2023)

## Number of participants

The proposed intake for this term is **15 (fifteen).**

A limit on the number of enrolments in the Centre is placed in order to ensure adequate attention to the educational needs of individual participants. In previous years, about 20 candidates per year on an average have been admitted, which depends on the Scholarship approved by Ministry of External Affairs (Government of India).

## Time Schedule

The 74[th]Term of the Regular Course will commence on 1st November 2022 and continue till end of August 2023. Participants are expected to arrive in Kolkata a few days prior to the commencement of the course, in order to make personal arrangements.

## Essential Qualifications

In view of the varying needs of countries in Asia, Africa and the Far East for training statisticians, the Centre has set only some minimum prerequisites for admission. Flexibility in the instruction provided ensures that candidates need not have knowledge of advanced mathematics, but they must have knowledge of mathematics up to what may be called the GCE O-Level[1]. Proficiency in high school Mathematics, especially high school algebra is essential if the candidates wish to derive real benefit from the course.

They must also be able to follow classroom instruction in English and express themselves clearly through spoken and written English. Candidates **must** be graduates, below 35 years of age, and **have a minimum of 5 years of experience of statistical work.** They should be alert and serious about their career in statistics and capable of assuming increased technical responsibilities on their return. They should, of course, be of good health and be certified fit to undertake training in a foreign country. **All candidates must declare their pre-existing medical illnesses, if any.**

## Plan of Instruction

The Regular Course will be conducted in four phases, which are outlined below:

Phase I (November to February): This phase consisting of four months will primarily be preparatory in nature and review background material and essential topics. It will be divided into three modules of uneven length. They will be as follows:

**Module A:** (First Two Weeks): The following papers will be covered:

      (a)     Mathematics
      (b)     Descriptive Statistics
      (c)     Data Processing I

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[1]GCE Ordinary Level Mathematics syllabus includes topics like simultaneous linear equations, graphs of simple functions with easy applications, arithmetic and geometric progressions and use of the logarithm.

**Module B:** (From 3rd week of November to December end)

1) Mathematics
2) Descriptive Statistics
3) Data Processing I
4) Probability
5) Economic Statistics I
6) Sample Survey I

**Module C:** (January to February)

1) Mathematics
2) Descriptive Statistics
3) Data Processing I
4) Probability
5) Economic Statistics I
6) Sample Survey I
7) Statistical Methods I

**Phase II (March)** This involves training in Official Statistics conducted by the CSO and other Government organizations, part of which may be in New Delhi.

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 course may be modified depending upon the specific needs of the trainees:

1. Agricultural statistics. 2. Capital formation statistics. 3. Index numbers of prices. 4. Social statistics. 5. Balance of payments statistics. 6. Public finance statistics. 7. National income statistics &related studies. 8. Transport statistics. 9. Money and banking statistics. 10. Wholesale and retail sales statistics. 11. Population and vital statistics. 12. Education and cultural statistics.13. Foreign trade statistics. 14. Industrial statistics.

**Phase III (from April to early-June)** The following subjects will be taught:

1) Demography
2) Statistical Method II
3) Sample Survey II
4) Data Processing II
5) Economic Statistics II

**Phase B-IV (Mid-June to Mid-August)** One of the following specializations is to be chosen. All the specialization may not be offered in a particular year.

1) Statistical Data Analysis
2) Applied Sample Surveys
3) Price Statistics
4) System of National Accounts
5) Economic Development
6) Time Series Analysis
7) Vital Statistics & Demography

The mode of instruction will consist of classroom lecture sessions followed by practical/tutorial sessions. A monthly session on discussion/presentation is encouraged. There will be practical classes and trainees are encouraged to make presentations of their projects, especially in Phase IV.

## Assessment

A mid-semestral examination will be held after the completion of Module B. A semestral examination will be held after the completion of Module C. For subjects covered both in Module B and Module C, there will be equal weightage for the mid-semestral and semestral examinations.

Outline of the syllabus for the different courses is given in APPENDIX A.

## Diploma on satisfactory completion

Final examinations are held at the end of each of the four phases of the training programme. Periodical examinations may also be held during the course for assessment of progress by the trainees. **The pass mark in each subject is 40%.** If a trainee obtains less than 45%, s/he can take a back paper examination to improve her/his score. However, the maximum marks that can be obtained in a back-paper examination is limited to 45%.

- A candidate obtaining at least 80% in the aggregate and having passed all the subjects will be placed in **First Class with Distinction**.
- A candidate obtaining at least 60% but less than 80% in the aggregate and having passed all the subjects will be placed in **First Class**.
- A candidate obtaining less than 60% in the aggregate and having passed all the subjects will be placed in **Second Class**.

Candidates who satisfactorily attend and complete the course, but do not pass the examinations, are awarded **Certificate of Attendance.**

## Accommodation

The Indian Statistical Institute maintains a Guest House in the Institute premises in Kolkata exclusively for the ISEC trainees, and all trainees are offered accommodation in this Guest House. There is a nominal charge for the accommodation which is debited at prevalent rates from the

funding received by trainees.

## Expenses of participants

Participants must meet their costs for travel to, from and within India, and their living costs and other necessary items, with such assistance as may be needed from their governments or other sources. Monthly living allowances at the rate of ₹ 1,200/- per day are provided to each trainee **while in India**. Generally, the first month's allowance is delayed, so trainees should carry enough cash to cover for at least the first two weeks of their expenses. The scholarships usually provide ₹ 5,000/- to each trainee for the purchase of relevant books and other relevant academic materials, which they can retain as the nucleus of a professional library upon returning to their countries. These purchases must be made in India, and proper bills must be submitted for reimbursement.

## Training Grants

In previous years, some candidates attending the Centre have been financially supported by their respective national governments. Others have availed themselves of fellowships or scholarships awarded by the United Nations and other international organizations like the Commonwealth Fund for Technical Co-operation, Asian Development Bank, etc., as also by the Government of India.

For the Regular Course, some of the possible training grants are the following:

The Government of India offers a number of fellowships (see below) to be awarded to selected candidates under the Indian Technical and Economic Cooperation (ITEC), the Special Commonwealth African Assistance Plan (SCAAP), and the Technical Co-operation Scheme (Colombo Plan). Facilities under these fellowships are as follows:

1. Fares: Air passage from port of embarkation in the home country to Kolkata and back inclusive of road journey from Kolkata Airport to the place of training.

2. Living allowance: ₹1200/-per trainee per day for **ten months in India**.

3. Book allowance: ₹ 5000/- per trainee for the entire ten month in-person instruction period in Kolkata. These purchases must be made in India and appropriate bills submitted for reimbursement.

4. Study tour expenses: More than ₹1 lakh per trainee is spent by the Institute on accommodation, conveyance, etc. for Study Tour across India during the ten-month training in India, which is generally reimbursed by the sponsoring authorities.

Candidates who require such training grants should obtain the particulars from awarding authorities and make efforts sufficiently in advance with the help of their governments or employers to secure the grants. Information is given below about some of the training grants offered by the Government of India.

### The Indian Technical and Economic Co-operation (ITEC) Programme

Technical Assistance by Government of India is offered to developing countries, including

neighboring countries, under the ITEC programme for attending the ISEC course. Providing grants for training in India is one of the six components of the ITEC.

### The Special Commonwealth African Assistance Plan (SCAAP)

The Government of India also offers a number of grants for training of foreigners in India under the Special Commonwealth African Assistance Plan (SCAAP). This is a programme of assistance meant for Commonwealth Countries in Africa. Classification of fellowships/scholarships, terms and conditions are similar to those of the Colombo Plan training grants (see Part *c*. below). Only officially sponsored candidates are eligible for these training grants.

### Under Colombo Plan Training Grants (TCS of Colombo Plan)

The authority of the Technical Cooperation Scheme (Colombo Plan) of the Government of India has transferred its activities to the administrative control of the Ministry of External Affairs, Government of India.

For detailed information, kindly visit the website of the Ministry of External Affairs (MEA), Government of India at http://itec.mea.gov.in/. Information regarding these grants may also be obtained from the Indian Mission in each country.

# APPLICATION PROCEDURE

All applications for admission to a Course and/or any Government of India Fellowship should be forwarded through the respective Indian Missions.

## Admission

All new applications for the Regular Course where the candidates wish to avail of ITEC scholarships have to be filled in at https://www.itecgoi.in/meaportal/registerApplicant by the applicants themselves. They can choose their own login email ID and create their login password, which would be used to keep them posted of their application processing status. After a candidate has applied for a course, he/she must take a printout of the application and send it through the nominating ministry/organizations to the Indian Mission.

Candidates sponsored by other agencies should write directly to the Member-Secretary at the address given in the previous paragraph.

## Application Deadline

Applications for admission to the Regular Course must reach the above address not later than 15th October 2022. Applications for admission to a Special Course should reach the above addresses at least four months in advance of the date from which a candidate proposes to start undergoing

the course.

# IMPORTANT INFORMATION FOR PROSPECTIVE TRAINEES

**Note:** Sponsoring authorities are urged to acquaint the candidates with the following items of information about the ISEC before forwarding the applications for admission. Further details about any specific item may be obtained on request.

- The office of the Centre is located in the Indian Statistical Institute, 202 Barrackpore Trunk Road, C.D. Deshmukh Bhawan, Kolkata 700 108, India.
- Normal working hours of the Centre is from 10 A.M. to 6.30 P.M. (local time).
- The Centre is closed on all notified holidays (up to 17 days per year), Saturdays and Sundays.
- The day-to-day activities of the Centre are carried out by a small number of staff, all of whom are employees of the Indian Statistical Institute and posted at the Centre, with Member-Secretary of the Board of Directors as its head.
- All the facilities at Indian Statistical Institute are made available to the Centre and use of such facilities are governed by the rules of the Indian Statistical Institute.
- It is the responsibility of a trainee to report to the Centre for training before 1st November 2022. Guest House accommodation will be made available from October 31, 2022.
- Airport pick-up and drop-off, free of charge, is arranged by the Centre provided travel itinerary is intimated by email to [isec@isical.ac.in](mailto:isec@isical.ac.in) at least ten days in advance.

The Indian Statistical Institute maintains a Guest House at the Institute campus in Kolkata in which rooms are reserved for the ISEC trainees.

- Each room is air-conditioned, is for single occupancy and is moderately furnished.
- Rooms are allotted on a first-come first-serve basis.
- Cooking is strictly prohibited in the rooms.
- Consumption of alcohol is not allowed in the Guest House.
- Visitors of opposite sex are not allowed in the rooms of the trainees.
- Participants are not allowed to bring along their spouses or families for the duration of the course.
- Following the rules and the regulations of the Guest House is compulsory for all trainees.
- The Indian Statistical Institute provides cooks and service boys to serve food to the trainees of the Centre at the ISEC Guest House.
- <u>There is no facility to cook for the trainees themselves. Beef and pork are not allowed/served in the Guest House.</u>
- There is also no facility to cook food exclusively for vegetarians.

The trainees of the Centre are allowed to become members of the Indian Statistical Institute Library free of charge and they are treated as equivalent to the Indian Statistical Institute students for use of library facilities. The trainees may also become members of the Indian Statistical Institute Club and the Circulating Library upon payment of yearly (January-December) subscription and admission

fee.

The trainees are responsible for keeping their travel documents validated and for following all immigration regulations. Trainees may seek assistance from the Centre in this regard.

Possession of foreign currency, without valid documents, is illegal in India. Foreign currency should be declared, and the declaration should be certified by the Indian Customs at the time of arriving in India.

Indian Missions in the respective countries should be requested to issue

- multiple entry visas
- endorsement regarding exemption from 'Reporting to FRRO'.

Participants should obtain required transit visas, if any, on their own.

# Contact Details

**Telephone:** (91) (33) 2575 2028/2027/2016 (during 10.00 A.M. to 6.30P.M.)

**E-mail:** isec@isical.ac.in

**Prof. Amita Pal**
*Member-Secretary*
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**Dr. Md. Zafar Anis**
*Assistant Secretary*
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**Mobile No.** +91 9748952418

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**Mobile No.** +91 7407307402

**Dr. Arindam Kar**
*ITEC Coordinator*
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**Mobile No.** +91 9883353462

THE CURRENT ISEC TEAM (As on March 1, 2022)

| **Prof. Amita Pal** | : Member-Secretary, ISEC |
| **Dr. Md. Zafar Anis** | : Assistant Secretary, ISEC |

# ANNEXURE A

## SYLLABI FOR TOPICS OF INSTRUCTION

### Phase I (November - February)

### Mathematics (Theory: 30 Lectures   Practical: 20 Lectures)

Review of Fundamentals. Solutions of Linear Equations in two variables. Graphs of Simple Functions. Laws of Indices. Permutations and Combinations. Common and Natural Logarithms. Linear Interpolation. Matrices and Determinants, Elements of Set Theory, Introduction to Differential and Integral calculus with applications.

### References:
Goldie, S; Moore, C; Hanrahan, V; Muscat, JP & Whiteouse, S. *A Level Mathematics Year I* (4th Edition). Linsky, J; Nicholson, J & Western, B. *Complete Pure Mathematics 1* (for Cambridge International AS & A Level)

### Descriptive Statistics (Theory: 30 Lectures   Practical: 20 Lectures)

Basic concepts and definitions. Role of Statistics – uses and misuses. Variable types.   Tabular and diagrammatic representation of data. Central tendency and dispersion – concepts and measures. Moments and measures of skewness and kurtosis.  Frequency table and plots for bivariate data. Concept of covariance.  Pearson's correlation coefficient. Rank correlation.

### References:
Gun, AM; Gupta, MK; & Dasgupta, B: *Fundamentals of Statistics* Vol. 1 (World Press)
Rohatgi, VK & Saleh, AKME: *An Introduction to Probability and Statistics*
Stine, R & Foster, D: *Statistics for Business: Decision Making and Analysis*
Holcomb, Z: *Fundamentals of Descriptive Statistics* (Routledge)
Freedman, D; Pisani, R; Purves, R & Adhikari, A: *Statistics* (W W Norton & Company, Inc. New York)
Mills, FC: *Statistical Methods*. (Sir Issac Pitman & Sons, London)

### Data Processing I (Theory: 30 Lectures   Practical: 20 Lectures)

Fundamentals of Computers: Spreadsheet, Concept of Database. MS Access. Generation of Tables using MS Excel. Statistical computation using MS Excel.
Introduction to R.

### References:
Harvey, G: *Excel 2019 for Dummies* (John Wiley & Sons)
Winston, W: *Microsoft Excel 2019 for Data Analysis & Business Modelling,* 6th Edition. (Pearson Educational Inc.)

## Probability (Theory: 30 Lectures   Practical: 20 Lectures)

Random experiments. Sample space.   Concept of classical theory of probability. Elements of combinatorics. Related problems from classical theory. Probability of union of events. Conditional probability and independence of two or more events.  Total Probability.  Bayes' Theorem. Random variables. Discrete and continuous random variables.  Expectation, Variance. Special distributions including binomial, Poisson and normal distribution. Joint distributions of two random variables. Conditional distributions. Independence of two random variables. Covariance and correlation coefficient. Conditional expectation and variance. Law of large numbers and central limit theorem (statements only).

### References:
Devore, JL: *Probability and Statistics for Engineering and the Sciences*.
Rukmangadachari, E & Reddy, EK: *Probability and Statistics*
Ross, SM: *Introduction to Probability Models*

## Economic Statistics I (Theory: 30 Lectures    Practical: 20 Lectures)

*Review of Official Statistics*: General Scope & Coverage of Official Statistics; Fundamental Principles of Official Statistics; Domains of official statistics; Overview of National Statistical Systems (NSSs) and role of National Statistical Offices (NSOs).

*Scope and Coverage of Economic Statistics*: Economic accounts, Sectoral statistics and other economic statistics.

*Industrial Standards:* Standard International classifications used for compilation of economic statistics – International Standard Industrial Classification (ISIC Rev. 4); Central Product Classification (CPC Version 2.1), Purpose Classifications, Standard International Trade Classification (SITC), Rev. 3.

*Major Sources of Data*: Administrative data, Business Registers, Economic surveys, Economic Census and use of area frame.

*A Brief Overview of Sectoral Statistics*: Agriculture, forestry, fisheries; Mining, Manufacturing, Energy & construction, Domestic Trade and Transport, Banking, insurance, financial statistics, Government finance statistics, and Services sector statistics.

*Introduction to Other Economic Statistics*: Employment & Labour, Prices, A brief overview of Merchandise trade statistics and Statistics on International Trade in Services.

*System of National Accounts 2008-Basic Macro-economic framework:* (i) National Income Identity, (ii) Circular flow of Income and (iii) Product, labour and money market.

***SNA Basic Concepts:*** (i) Domestic economy and institutional sectors, (ii) Economic assets and economic flows, Production & Assets boundary, (iii) Kinds of transactions, (iv) Valuation – Taxes & subsidies and basic, producers and purchasers' prices, Three Approaches of measuring GDP & related concepts and an overview of Macro-economic aggregates at constant-prices.

### References:

*National Accounts: A Practical Introduction*. United Nations, New York, 2003 *Business Registers - Recommendations Manual.* EUROSTAT, 2010

*International Standard Industrial Classification of All Economic Activities*, Revision 4. United Nations, New York, 2008.

*Classifications of Expenditure according to Purpose*. United Nations, New York, 2000.
*International Recommendations for Industrial Statistics*. United Nations, New York, 2008.

## Sample Surveys – I (Theory: 32 Lectures    Practical: 16 Lectures)

Introduction to the terms: Population, units, sample. Objectives of sample surveys, and benefits of sample surveys versus census.

The need for probability sampling; Sampling versus non-sampling errors; Types of Non-sampling errors, Assessment and control of non-sampling errors.

An overview of principal steps in planning and conducting a sample survey. Methods of drawing a sample and data collection. Preparation of questionnaires/schedules.

Simple Random Sampling with replacement (SRSWR), Simple Random Sampling without replacement (SRSWOR), Examples, Use of random numbers to draw SRSWR and SRSWOR.

Idea about all possible samples and sampling distribution of an estimator intending to estimate population mean and total. Idea about unbiasedness of an estimator. Concept of sampling variance and standard error of an estimator. Determination of sample size.

Stratified sampling and its use/advantages with examples. Estimation of population mean and total. Estimator for standard error. Allocation of sampling units to strata.

Systematic sampling - method and relevant estimators.

### References:

Bethlehem, J: (2009). *Applied Survey Methods: A Statistical Perspective*. (John Wiley & Sons).
Chaudhuri, A: (2010). *Essentials of Survey Sampling.* (Eastern Economy Edition. PHI Learning Pvt. Ltd).
Cochran, WG: (1977). *Sampling Techniques,* 3rd Edition. (John Wiley & Son.)

Groves, RM; Fowler, FJ; Couper, MP; Lepkowski, JM; Singer, E & Tourangeau, R: (2010). *Survey Methodology,* 2nd Edition. (John Wiley & Son.)

Kish, L: (1995). *Survey Sampling* (Wiley, New York.)

Lohr, S: (2010). *Sampling: Design and Analysis*. 2nd Edition. (Brooks/Cole, Boston.)

Thompson, SK: (1992). *Sampling* (John Wiley & Son).

## Statistical Methods I (Theory: 20 Lectures    Practical: 10 Lectures)

Concept of population and sample. Notion of statistic, sampling distribution and standard error of a statistic. Properties of sample mean and sample proportion. Concept of estimation: Point and Interval Estimation. Methods of Estimation: Moments, MLE. Properties of Estimators - unbiasedness.

### References:
Gun, AM; Gupta, MK & Dasgupta, B: *Fundamentals of Statistics*, Vol. 1 (World Press)

Hogg, RV; Tanis, EA & Zimmerman, DL: *Probability and Statistical Inference* (Pearson)

Mills, FC. *Statistical Methods.* (Sir Issac Pitman & Sons, London)
Rice, JA: (2007) *Mathematical Statistics and Data Analysis,* 3rd Edition (Thomson and Brooks Cole).
Rohatgi, VK & Saleh, AKME: *An Introduction to Probability and Statistics*
Stine, R & Foster, D: *Statistics for Business: Decision Making and Analysis*

## Phase II (March)

## Official Statistics, Systems & 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 course may be modified depending upon the specific needs of the trainees:
1. Agricultural statistics. 2. Capital formation statistics. 3. Index numbers of prices. 4. Social statistics. 5. Balance of payments statistics. 6. Public finance statistics. 7. National income statistics & related studies. 8. Transport statistics. 9. Money and banking statistics. 10. Wholesale and retail sales statistics. 11. Population and vital statistics. 12. Education and cultural statistics. 13. Foreign trade statistics. 14. Industrial statistics.

### References:
*Statistical Yearbooks.* Food and Agricultural Organisation (FAO) Rome.

http://www.fao.org/economic/ess/ess-publications/ess-yearbook/en/#.XbgCz9xhmM8FAO (2010).

FAO Statistical Development, Series 12, Rome 2010.

FAO (1989). *Sampling methods for agricultural surveys.* FAO Statistical Development Series 3, Rome,1989

UN-DESA (2010). *International Recommendations for Industrial Statistics 2008.*  United Nations, New York 2010.

Balk, BM: (2008). *Price and Quantity Index Numbers*. (Cambridge University Press)

Ralph, J.; O'Neill, R. & Winton, J: (2015). *A Practical Introduction to Index Numbers*. (John Wiley & Sons).

ILO (2004). *Consumer Price Index Manual: Theory and Practice*, 2004 https://www.ilo.org/public/english/bureau/stat/download/cpi/cpi_manual_en.pdf

IMF *Producer Price Index Manual* 2004

https://www.imf.org/external/pubs/ft/ppi/2010/manual/ppi.pdf

IMF (2005). *Balance of Payments Manual*. International Monetary Fund

Cartas, J & Harutyunyan, AK: (2017). *Monetary and Financial Statistics Manual and Compilation Guide*. International Monetary Fund (IMF) 2017.

IMF (2015). *Government Finance Statistics Manual 2014.* International Monetary Fund (IMF) 2015

UN-DESA (2009). *International Recommendations for Distributive Trade Statistics 2008*. United Nations, New York 2009.

UN-DESA (2010). *Handbook on Population and Housing Census Editing Revision 1*. United Nations, New York 2009.

United Nations. *The Follow-up Method in Demographic Sample Surveys*.

UNSD*. Handbook of National Accounting – Accounting for Production: Sources and Methods*

UNSD. *National Accounts: A Practical Introduction*

UNSD. *Handbook of National Accounting – Input-Output Table Compilation and Analysis*

Kendrick, JW: (1996). *The New System of National Accounts*. (Kluwer Academic Publishers).

## Phase III (April to early June)

### Data Processing II (Theory: 16 Lectures    Practical: 9 Lectures)

Basic concepts of networks. SQL. Use of R software for solving statistical problems including processing of survey data.

**References:**
https://www.w3schools.com/sql
https://www.javatpoint.com/sql-tutorial

https://www.tutorialspoint.com/data_communication_computer_network/data_communication_computer_network_tutorial.pdf
Everitt, BS & Hothorn, T. *A Handbook of Statistical Analyses Using R.*

Kundu, S. *Fundamentals of Computer Networks*

Nield, T: *Getting Started with SQL*

### Sample Surveys – II (Theory: 16 Lectures    Practical: 9 Lectures)

Estimation of population proportion in SRSWR and SRSWOR. Estimation of population total, mean, proportion and ratio in probability proportional to size sampling. Ideas about Cluster sampling,

multistage sampling. Non-contact, non- response follow-ups and/or adjustment. Post-survey adjustments. Examples of large scale surveys including household surveys, establishment/enterprise surveys and crop estimation surveys, factory surveys, etc.

### References:
Bethlehem, J: (2009). *Applied Survey Methods: A Statistical Perspective*. (John Wiley & Sons).

Chaudhuri, A: (2010). *Essentials of Survey Sampling.* (Eastern Economy Edition. PHI Learning Pvt. Ltd).

Cochran, WG: (1977). S*ampling Techniques,* 3rd Edition. (John Wiley & Son.)

Groves, RM; Fowler, FJ; Couper, MP; Lepkowski, JM; Singer, E & Tourangeau, R: (2010). *Survey Methodology,* 2nd Edition. (John Wiley & Son.)

Kish, L: (1995). *Survey Sampling* (Wiley, New York.)

Lohr, S: (2010). *Sampling: Design and Analysis*. 2nd Edition. (Brooks/Cole, Boston.)

Thompson, SK: (1992). *Sampling* (John Wiley & Son).

## Statistical Methods II (Theory: 17 Lectures    Practical: 8 Lectures)

Testing of hypothesis, notion of null and alternative hypotheses. Two types of Error in Tests of Hypotheses. Large sample tests and confidence interval for means and proportions in one- and two-sample problems. Level of significance.  Test for zero correlation. One-way ANOVA (Analysis of Variance).

### References:
Gun, AM; Gupta, MK & Dasgupta, B: *Fundamentals of Statistics*, Vol. 1 (World Press)

Hogg, RV; Tanis, EA & Zimmerman, DL: *Probability and Statistical Inference* (Pearson)

Mills, FC. *Statistical Methods.* (Sir Issac Pitman & Sons, London)

Rice, JA: (2007) *Mathematical Statistics and Data Analysis,* 3rd Edition (Thomson and Brooks Cole).

Rohatgi, VK & Saleh, AKME: *An Introduction to Probability and Statistics*

Stine, R & Foster, D: *Statistics for Business: Decision Making and Analysis*

## Economic Statistics II (Theory: 15 Lectures    Practical: 10 Lectures)

*Economic Indicators:* (i) Human Development Index (HDI); (ii) Human Poverty Index (HPI); (iii) Measurement of labour productivity; and (iv) GDP deflator.

*Economic Surveys:* Choice of statistical units; Questionnaire design and survey techniques.

*Index Numbers:* Basic Concepts and Definitions. Commonly used Index Numbers including Consumers and Producers price index; Exports and Imports price index etc.

Fixed base and Chain base index numbers.

*Time Series Analysis:* Time Series data, objective of time series analysis (Decomposition analysis and Stochastic Analysis), Need for adjustments in time series. Components of Time Series - Secular Trend, Seasonal Variation, Cyclical Variation.

## References:

Gun, AM; Gupta, MK & Dasgupta, B: *Fundamentals of Statistics*, Vol. 2 (World Press).

ILO/IMF/OECD/UNECE/Eurostat/The World Bank Consumer Price Index Manual: Theory and Practice. Geneva, International Labour Office, 2004

Chatfield, C: *The Analysis of Time Series: An Introduction,* 6th Edition. (Chapman and Hall/CRC).

## Demography (Theory: 17 Lectures Practical: 8 Lectures)

Scope and Importance of Demography. Data sources: Population Census, Vital Registration, Population Register, Demographic and Health Surveys, Other Sources. Limitations of the sources.

Evaluation and adjustment of Census and survey data on Age-Sex distribution.

Growth of human population: Rate of natural increase, arithmetic, geometric and exponential Growths.

International Statistical Classification of Diseases and Related Health Problems, Injuries and Causes of Death. Measures Based on Diseases (i.e., Morbidity), Death (i.e., Mortality) and Birth (i.e., Fertility) Statistics Including Measures such as Infant Mortality Rate, Neonatal and post-neonatal Mortality Rates, Total Fertility Rate, Gross and Net Reproduction Rates, Mean Length of Generation, and Census Measures of Fertility.

Life Tables: Definition, Simple Construction and Applications. Concept of Migration.

## References:

Gun, AM; Gupta, MK & Dasgupta, B: *Fundamentals of Statistics*, Vol. 2 (World Press).

Giri, PK & Banerjee, J: *Statistical Tools and Techniques*, 5th Edition (Academic Publishers, India).

Preston, SH; Heuveline, P & Guillot, M: *Demography: Measuring and Modeling Population Processes* (Wiley-Blackwell)

Ramakumar, R & Gopal, YS: *Technical Demography* (Wiley Eastern Ltd.).

Rowland, DT: *Demographic Methods and Concepts* (Oxford University Press)

Shryock, HS: *The Methods and Materials of Demography* (Vol - 1 & 2) JS Siegel and Associates. (U.S. Bureau of the Census, U.S. Govt. Printing Office, Washington, D.C.)

Spiegelman, M: *Introduction to Demography* (Harvard University Press)

Srinivasan, K: *Training Manual on Demographic Techniques* – (ORGI and UNFPA)

Srinivasan, K: *Basic Demographic Techniques and Applications* (Sage Publications, India).

This phase is devoted towards specialization. Each trainee has to choose one specialization. A subset of the specialization topics will be offered in a particular year. Each chosen specialization includes about 10 lecture hours and 20 contact hours for project related discussions. Four to six special/advanced topics from the specialization, depending on the need and interest of the trainee, would be selected for lectures followed by Project work. The specialization topics which may be offered are the following:-

1. Statistical Data Analysis
2. Applied Sample Surveys
3. Price Statistics
4. System of National Accounts
5. Economic Development
6. Time Series Analysis
7. Vital Statistics & Demography

A brief outline of the syllabus follows.

# 1. Statistical Data Analysis

Fitting of Binomial, Poisson and Normal distributions. Chi-square goodness of fit test. Introduction to multiple regression analysis. Transformation of variables for regression. Nonparametric methods including sign test, Wilcoxon rank test and signed rank test. Project work.

**References:**
Conover, WJ: *Practical Nonparametric Statistics.* 3rd Edition. (John Wiley)
Gun, AM; Gupta, MK & Dasgupta, B: *Fundamentals of Statistics*, Vol. 1 (World Press)

Rohatgi, VK & Saleh, AKME: *An Introduction to Probability and Statistics*
Stine, R & Foster, D: *Statistics for Business: Decision Making and Analysis*
Hogg, RV; Tanis, EA & Zimmerman, DL: *Probability and Statistical Inference* (Pearson)
Mills, FC. Statistical Methods. (Sir Issac Pitman & Sons, London).
Sprent, P: *Applied Nonparametric Statistical Methods.*

# 2. Applied Sample Surveys

Recapitulation of topics from Sample Surveys – I & II. Cluster sampling and multi-stage sampling. Half-sampling and IPNS approach for variance estimation. Data processing for surveys. Project work.

**References:**
Bethlehem, J: (2009). *Applied Survey Methods: A Statistical Perspective*. (John Wiley & Sons).

Chaudhuri, A: (2010). *Essentials of Survey Sampling.* (Eastern Economy Edition. PHI Learning Pvt. Ltd).
Cochran, WG: (1977). *Sampling Techniques,* 3rd Edition. (John Wiley & Son.)

Groves, RM; Fowler, FJ; Couper, MP; Lepkowski, JM; Singer, E & Tourangeau, R: (2010). *Survey Methodology,* 2nd Edition. (John Wiley & Son.)

Kish, L: (1995). *Survey Sampling* (Wiley, New York.)

Lohr, S: (2010). *Sampling: Design and Analysis.* 2nd Edition. (Brooks/Cole, Boston.)

Thompson, SK: (1992). *Sampling* (John Wiley & Son)

## 3. Price Statistics

Compilation of Consumer Price Index (CPI) and Producers Price Index (PPI). Scope, coverage and uses of CPI & PPI; classification and weights; choice of index formula, base period; price collection – selection of outlets and products, periodicity, substitution; quality adjustment – Hedonic; other compilation issues. Project work.

**Reference:**
Balk, BM: (2008). *Price and Quantity Index Numbers*. (Cambridge University Press)
ILO/IMF/OECD/UNECE/Eurostat*The World Bank Consumer Price Index Manual: Theory and Practice* Geneva, International Labour Office, 2004
Ralph, J.; O'Neill, R. & Winton, J: (2015). *A Practical Introduction to Index Numbers*. (John Wiley & Sons)
Ryan, WTL: *Price Theory.* (Macmillan).
Stigler, GJ: *Theory of Price* (Maxwell Macmillan International Library)

Zieschang, KD: *Framework of Price Statistics.*

## 4. System of National Accounts

Measuring production-, income- and expenditure aggregates in practice. Price, volume and value indexes and their use in compiling volume measures. Methods of working out constant-price estimates. Rebasing national account series. Project work.

**References:**
Blades, DW & Lequiller, F: *Understanding National Accounts*. OECD 2006.

Ruggles, N & Ruggles, R:  *National Accounting and Economic Policy.* (Edward Elgar, Yale University).
Kendrick, JW. (1996). *The New System of National Accounts*. Kluwer Academic Publishers.

## 5. Economic Development

Why Study Development Economics? Basic indicators of development, Millennium Development goals, Sustainable Development Goals. Theories of Economic Growth and Development: Rostow, Lewis, Dualistic Development thesis, Big Push, Harrod Domar Model, Solow model, Todaro Migration model. Malthusian Population trap. Living Standard Measurement. Measuring inequality and poverty: Absolute poverty, Head-count ratio and poverty gap measure, Lorenz curve and Lorenz ratio, Foster-Greer-Thorbeck Index. Multidimensional poverty measure. Size Distribution Analysis: Income and other size distributions and distributional inequality. Pareto and Lognormal distributions and fitting data. Project work.

**References:**

World Bank: *Living Standard Measurement Study* – https:
microdata.worldbank.org/index.php/catlog/lsms

Todaro, MP & Smith, SC: *Economic Development*
Khandker, SR & Haughton, J: (2009). *Handbook on Poverty and Inequality* (World Bank Group Publications).

# 6. Time Series Analysis

Decomposition Analysis- Components of Time Series: Secular Trend, Seasonal Variation, Cyclical Variation, Measurement of Secular Trend: Curve fitting, Moving Average, Method using mathematical curves, Measurement of Seasonal fluctuations: Method of monthly/quarterly Averages, Ratio to Moving average, Ratio to Trend Method, Method of link Relatives, Measurement of Cyclical Variation: Periodogram analysis, Stochastic Time Series Analysis: Fundamental Concepts. Project work.

**References:**

Brockwell, PJ & Davis, RA: (2002). *Introduction to Times Series and Forecasting.*

Chatfield, C: *The Analysis of Time Series: An Introduction,* 6th Edition. (Chapman and Hall/CRC)

Gun, AM; Gupta, MK & Dasgupta, B: *Fundamentals of Statistics*, Vol. 2 (World Press).

# 7. Vital Statistics & Demography

Rates, Ratios and Proportions for Finding out Various Measures of Mortality, Fertility and Migration. Demonstration of the Measures Using Different Sources of Demographic Data: Registration, Population Census, Demographic Surveys.

Study of Life Tables and Applications of Model Life Tables. Measures of morbidity. Fertility Analysis. Birth Order, Parity and Parity Progression Ratio. Evaluation and Adjustment of Census and Survey Data on Population. Mortality – levels, trends and differentials, causes of death. Fertility – levels, trends and differentials. Factors Affecting Fertility.  Migration and Urbanization. Standardization of Vital Rates. General Health Surveys: Items of Information Usually Collected, Methods of Survey. Health Programme Evaluation. Population Estimation, Projection & Policy.

Substantive Demography (findings of previous demographic research): Age Distribution of Population and Its Socio-economic Implications. Demographic factors in economic development, economically active and inactive population. Family planning movement in the context of economic development programmes.  Project work.

**References:**

 Gun, AM; Gupta, MK & Dasgupta, B: *Fundamentals of Statistics*, Vol. 2 (World Press).

Giri, PK & Banerjee, J: *Statistical Tools and Techniques*, 5th Edition (Academic Publishers, India)

Preston, SH; Heuveline, P & Guillot, M: *Demography: Measuring and Modeling Population Processes* (Wiley-Blackwell)

Ramakumar, R & Gopal, YS: *Technical Demography* (Wiley Eastern Ltd.).

Rowland, DT: *Demographic Methods and Concepts* (Oxford University Press)

Shryock, HS: *The Methods and Materials of Demography* (Vol - 1 & 2) JS Siegel and Associates. (U.S. Bureau of the Census, U.S. Govt. Printing Office, Washington, D.C.)

Spiegelman, M: *Introduction to Demography* (Harvard University Press)

Srinivasan, K: *Training Manual on Demographic Techniques* – (ORGI and UNFPA)

Srinivasan, K: *Basic Demographic Techniques and Applications* (Sage Publications, India).

## Suggested URLS:

http://iase-web.org/islp/apps/gov_stats_populations/

http://iase-web.org/islp/apps/gov_stats_priceindices/

https://iase-web.org/islp/apps/gov_stats_populations/

https://iase-web.org/islp/apps/gov_stats_graphing/

http://cast.massey.ac.nz/init/public_about.html

http://archive.stats.govt.nz

danielsoper.com

vassar.edu

stattrek.com

https://www.stats.otago.ac.nz

http://www.fao.org/economic/ess/ess-publications/ess-yearbook/en/#.XbgCz9xhmM8

https://www.ilo.org/public/english/bureau/stat/download/cpi/cpi_manual_en.pdf

https://www.imf.org/external/pubs/ft/ppi/2010/manual/ppi.pdf

https://www.w3schools.com/sql
https://www.javatpoint.com/sql-tutorial


https://www.tutorialspoint.com/data_communication_computer_network/data_communication_computer_network_tutorial.pdf

https://microdata.worldbank.org/index.php/catalog/lsms

# ANNEXURE B

Country-wise Number of Officials Trained under the ISEC Regular Course during Last Ten Years

| Sl. No. | Country | No. of Officials | Sl. No. | Country | No. of Officials |
|---|---|---|---|---|---|
| 1 | Afghanistan | 23 | 21 | Myanmar | 12 |
| 2 | Bangladesh | 6 | 22 | Maldives | 4 |
| 3 | Bhutan | 3 | 23 | Namibia | 2 |
| 4 | Cambodia | 3 | 24 | Niger | 8 |
| 5 | D.R. of Congo | 4 | 25 | Nigeria | 2 |
| 6 | Cuba | 2 | 26 | Oman | 5 |
| 7 | Ethiopia | 4 | 27 | Papua New Guinea | 25 |
| 8 | Fiji | 10 | 28 | Tajikistan | 1 |
| 9 | Gambia | 8 | 29 | Senegal | 3 |
| 10 | Georgia | 1 | 30 | Seychelles | 2 |
| 11 | Ghana | 4 | 31 | Sri Lanka | 14 |
| 12 | Grenada | 2 | 32 | South Sudan | 8 |
| 13 | Indonesia | 1 | 33 | Tanzania | 5 |
| 14 | Iran | 4 | 34 | Thailand | 3 |
| 15 | Ivory Coast | 4 | 35 | Togo | 1 |
| 16 | Kenya | 2 | 36 | Tonga | 2 |
| 17 | Laos | 2 | 37 | Uganda | 1 |
| 18 | Mali | 1 | 38 | Uzbekistan | 2 |
| 19 | Mauritius | 21 | 39 | Vietnam | 2 |
| 20 | Mongolia | 33 | 40 | Zambia | 4 |
| 41 | Malawi | 1 | 42 | Tunisia | 2 |

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