Gokhale Institute of Politics and Economics
Deemed to be University u/s 3 of the UGC Act, 1956
Pune 411004

M.Sc. (Population Studies and Health Economics)
Syllabus

This course is designed to impart in-depth knowledge of Population Studies- dynamics of population change along with its linkages with humanities. It is primarily for understanding the interrelationship of population with different social, economic, health and nutrition phenomena. Introduction of Health Economics completes the missing link of the courses on Population and Health. This gap is bridged here, considering importance of functioning of health system, healthcare delivery and utilization along with health financing and health insurance. This course is expected to shape scholars interested in Population, Public Health and Health Economics.

Duration of the Course
The course, M.Sc. PSHE, is a two-years, four semester course.

Number of Papers
Every student has to complete minimum 20 papers (16 Compulsory Papers and 4 Elective Papers) for completion of the course. Students can select some elective papers, after discussing with the Co-ordinator of the course and concerned faculty members.

M.Sc. (Population Studies and Health Economics)

Course Structure

Compulsory Papers

Semester 1

PSHE-A-01: Population, Size and Structure

This is a course on fundamentals of population studies and nature of population. Objective of the course to enrich knowledge of the students about nature and scope of population studies, population growth and distribution around the world and India, and selected theories of population.

Unit 1

- Interdisciplinary nature of Population studies
- Components of population change - Fertility, Mortality, Migration, and their interrelationships
- World population size and growth
- Indian population size and growth - by regions
  - Growth and Population momentum
  - Growth rate of population – decadal, annual

Unit 2 - Sources of Population data

- Population Census
  - History of Census taking in India
  - Housing Data – Assets and amenities
  - Population Data – Individual information
  - Uses of Census data
- Sample Registration System
- Vital registration System
- National Sample Survey
- Large sample demographic Surveys-National Family Health Survey

Unit 3 - Characteristics and Structure

- Housing – Assets and Amenities
- Age structure - Age pyramids - Population ageing
- Demographic window of opportunity
- Population sex ratios and its variation; Child sex ratio, Sex ratio at birth, Sex ratio of elderly
- Factors affecting age and sex structure
- Changing patterns of sex ratio in India, North-south divide, 'Missing women'

- Literacy and education
- Work force participation
- Religion, Scheduled caste and Scheduled Tribe population
- Disability

Unit 4 - Population Theories

- Malthusian Theory: Theme and Criticism.
- Optimum population theory,
- Mathematical and Biological theories
- Demographic Transition

PSHE-A-02 : Fertility

This paper presents the different features of fertility and nuptiality as well as theories of fertility. The course also enables students to understand different aspects of fertility and nuptiality and its correlates. It provides knowledge about various concepts of fertility and nuptiality, measures of fertility and nuptiality, factors affecting fertility and nuptiality along with levels and trends of fertility and nuptiality and socio-economic theories of fertility.

Unit 1

- Importance of the study of fertility
- Physiology, concepts and definitions of basic terms – fecundity, fertility, conception, contraception, pregnancy, abortion, still- birth, menarche – menstrual cycle, menopause, family size
- Marriage, widowhood, divorce, separation, sources of data and limitations.
- Concepts and measurements of cohort and period fertility
- Fertility levels and Trends in the World - Developed and Developing countries scenario
- Fertility Levels, trends and differentials in India

Unit 2 – Measures of fertility

- Crude birth rate, child-women ratio, children-ever born, childlessness, general fertility rate, age-specific fertility rate, total fertility rate, marital fertility rate, rates specific for parity and duration of marriage, parity progression ratios, closed and open birth intervals, cohort fertility, gross reproduction rate, net reproduction rate
- Indirect estimation of fertility
- Family planning

Unit 3 - Nuptiality

- Concept and analysis of marital status
- Measurements of Nuptiality: Singulate mean age at marriage, Synthetic cohort methods
- Trends in age at marriage and its significance, Age at marriage and fertility
- Demographic, physiological, social, cultural, economic and psychological factors affecting nuptiality and fertility

Unit 4 - Theories of fertility

- Social and Economic Theories of Fertility: Social capillarity theory, Theory of change and response, Fertility transition theory, Threshold hypothesis, Wealth flow theory. Micro economic theories of fertility (theories by Liebenstein, Becker and Easterlin).
- Davis-Blake intermediate variables framework
- Bongaart's proximate determinants of fertility

PSHE-A-03 : Mortality and Morbidity

This paper enables assumes importance on the background of Population Studies as also Health Economics; primarily because efforts are usually to control morbidity and mortality with respect to available resources. This would make students basic concepts and measures of mortality and morbidity along with burden of disease, life table and cause of death.

Unit 1

- Concepts and measurement of mortality, Importance of the study mortality, Sources of data and limitations
- Basic measures of mortality: Crude death rate; age, sex, marital status, Specific and standard death rates.
- Levels, trends and determinants of mortality in modern times, Developed and Developing countries scenario - Levels and trends, Indian scenario – Levels, trends and Differentials
- Determinants of mortality

Unit 2

- Importance of the study of infant and childhood mortality, infant mortality rate; neonatal, post- neonatal and peri-natal mortality rate
- Reasons for high IMR in India and prospects of decline, Maternal mortality rate, ratio, levels and trends, Maternal mortality – Estimates. Trends, Importance of indicator
- Differentials and trends in developed and developing countries and in India,
- Major child survival initiatives, Healthcare utilization

Unit 3

- Definition of morbidity, sources of data and measures of morbidity, incidence and prevalence of disease, Healthy Life Expectancy comparisons.
- WHO classification of causes of death, changing patterns of causes of death;
- Epidemiological transition in developed and developing countries with special reference to India
- Social determinants of health inequalities (education, employment, income, etc.) The Gender perspective in the study of health inequalities; Health inequalities and welfare regimes
- Non-communicable diseases, Global burden of Diseases
- Undernutrition and Over nutrition

Unit 4 - Life tables

- Concepts, definitions of columns, Current and cohort life tables
- Construction of life tables
- Complete life tables and abridged life tables

- Model life tables
- Application of life table in demographic analysis.
- Multiple decrement life table

PSHE-A-04 : Introduction to Principles of Economics

This course is an attempt to develop the understanding of theoretical structure of microeconomics and macroeconomics which are necessary for the understanding of Population studies and health economics. The objective of this course is to develop an understanding of the basic principles of economics. It is intended to improve student's analytical skills and ability to solve problems, which will be useful in several other areas of the program. The topics have been chosen in a way that it should match the basic spirit of the program. By the end of this course the student is expected to be familiar with basic concepts of microeconomics and macroeconomics and acquire analytical skills to analyze problems of economic policy. Examples and exercises would be covered to provide a flavour of various applications. It does not require any previous knowledge of economics. Familiarity with calculus and optimization theory will be helpful.

Unit 1 - Theory of demand and supply:

Theory of demand and supply, theory of production and cost, brief introduction of neo-classical utility theory, revealed preference theory, brief introduction to behavioural Economics, Nudge theory, experimental economics, concept of supplier induced demand and concept of merit good here

Unit 2 - Theory of Market

Perfect Competition, Monopoly, and Monopolistic Competitions, oligopoly, short run and long run market equilibrium. Efficiency and welfare. Monopoly: Monopoly power, Equilibrium output and prices, Effect on welfare, Price discrimination – first, second, and third degree, Quality choice under monopoly. Monopolistic Competition, mergers and acquisition, economics of regulations and competitions oligopoly and economic theoretical models, externalities and market failures, missing markets

Unit 3 - Macroeconomic Measurement

- An overview of National Accounting, Conventions about National Accounting Sectors, Concept of value added by production, National Product at market price and factor cost, Gross and Net Production
- Methods of Income Estimation - The Product Approach, The Expenditure Approach, The Income Approach
- Accounting for environmental and Social Dimensions, Physical quality of life index and Human Development Index, Environmentally Adjusted Net Domestic Product, Accounting of healthcare expenditure

Unit 4 - Public Expenditure Theory

Pure theory of public expenditure- Empirical evidence on public expenditure theories. Public Sector Pricing- Pricing of Public Utilities. Public expenditure management and

control, Social infrastructure and financing of human development. Growth, nature and composition of public expenditure in India, Sustainability issues of Centre and State expenditure in India, Concept, measurement and magnitude of subsidies, Issues related to subsidies in India

Unit 5 -

- Taxation and Distribution
- Transfer Program Economies of the elderly

PSHE-A-05 : Biostatistics (Statistical Methods)

This is to enable the students to understand the theoretical aspects of basic statistical methods and its applications. After completing this courses students will understand the use of basic statistical methods including descriptive statistics – various measures, probability theory and distributions, testing of hypothesis, nonparametric tests and correlation and regression.

Unit 1 - Use of statistical methods

- Description of data
- Types of measurements: Nominal, ordinal, interval and ratio scales.
- Frequency distributions: Raw data, frequency distributions, histograms and frequency polygons, relative frequency distributions, cumulative frequency distributions, ogives, frequency curves.

Unit 2 - Descriptive Statistics

- Measures of Central tendency – Arithmetic, Geometric, Harmonic mean, weighted mean, median, mode
- Measures from grouped data
- Measured of location; quartiles, deciles and percentiles.
- Measures of dispersion; mean deviation, quartile deviation, standard deviation, variance, computation of these measures from ungrouped and grouped data, co- efficient of variation, standardized variables and scores.

Unit 3 – Probability Distributions

- Definition of probability, conditional probability
- independent and dependent events, mutually exclusive events.
- Random variables
- Discrete and continuous probability distributions.
- Mathematical expectation.
- The binominal distribution, the Poisson distribution, the normal distribution properties,
- Fitting theoretical distributions to sample data.

Unit 4 -Testing of Hypothesis

- Concepts of statistical hypothesis,
- Decision rule, critical region
- Level of significance
- Type I and type II errors
- Large and small sample tests for means and proportions
- One sample test, two sample tests, one-way ANOVA

- Introduction to multivariate analysis

Unit 5 - Correlation and Regression

- Concept of correlation
- Pearson correlation coefficient and its properties
- Linear / Bivariate regression
- Multiple linear regressions
- Logit and Probit regression
- One-way Analysis of Variance

Unit 6 - Non-Parametric Tests

- What is non-parametric tests
- One-Sample tests
- Paired sample test
- Independent sample test
- Chi-Square test

Unit 7: Introduction to Multivariate and Survival Analysis

- Introduction to Multivariate analysis
- Principle component analysis
- Factor analysis
- Introduction to Survival Analysis
- Life tables, failure rate
- Mean residual life and their elementary properties.
- Estimation of survival function
- Actuarial estimator, Kaplan - Meier estimator,
- Estimation under the assumption of IFR/DFR

Semester II

PSHE-A-06 : Migration and Urbanization

Migration of population is one of the parameters of population change. This paper is for understanding of distribution of population and movement of population - migration and as a consequence, urbanization. Students will study spatial distribution of population, concept and measurement of migration, migration theories and also urbanization.

Unit 1 - Spatial Distribution of Population

- Importance of the study and Measures of density or concentration
- Factors affecting the spatial population distribution and temporal changes
- Population distribution in the World and in India.

Unit 2 - Migration

- Importance of the study of migration, Basic concepts and definitions
- Sources of data and limitations
- Types of migration: internal, international, temporary and refugee,
- Trends and differentials in internal migration in India and its states
- Causes and consequences of migration

Unit 3 – Measures of migration

- Measuring Migration: Place of Birth, Place of Last Residence, Duration of Stay and Combinations of the three
- Indirect methods of estimating Migration: Growth Rate method, Vital Statistics method, Life Table and Census Survival Ratio methods

Unit 4 - Theories of Migration

- Theories of migration: pull and push factors, Ravenstein's laws of migration, Lee's theory of migration

Unit 5 - Urbanization

- Basic concepts and importance of study, Sources of data
- Concept of urban and its definitional change in the Indian censuses
- Land Use, Urbanisation and its impact of Environment, Land use pattern theory
- Measures of degree, tempo and concentration of urban population
- Levels and trends of urbanization in developed and developing countries and India
- Process of urbanization and suburbanization, and rural urban continuum; Smart cities

- Problems associated with and policies and programmes affecting urbanization in India

PSHE-A- 07 : Population and Development, Population Projections

This paper includes population and development as well as population projections. It is about various aspects of development and its inter-relationship with different aspects of population. Students will understand about basic concepts of development, especially in relation to Demography. Population projections is a requirement for planners so the thought and techniques of population projections are necessary.

Unit 1 - Basic Concepts in Development

- Concept and Indicators of Economic Development
- Classical and Harrod - Domar Models of Economic Growth
- Approaches to Development
- Changing Concept of Development
- Emphasis of Distributive Aspect, Social Aspects,
- Physical Quality of Life Index (PQLI) and Human Development Index (HDI)
- Population Growth and Development: Effects of Change in Population Size and Structure, and Composition on Economic and Social Development, and vice-versa, Sustainable Development Goals

Unit 2 - Demographic Aspects of Development

- Development and Modernization
- Population and Natural Resources
- Factors of Production, Socio-economic and Demographic factors influencing Capital Formation
- National Income, Per Capita Income, Savings and Investment

Unit 3 - Manpower and Labour Force

- Economic Structure of Labour Force
- Manpower Demand and Utilization, Unemployment and Underemployment
- Factors Influencing Manpower Supply and Patterns
- Effects of Factor Pricing and Factor Proportions on the Labour Market

Unit 4 - Labour Force in India

- Measurement of Labour Force Participation in India, Census and NSS Data,
- Changes in the Concept, Structure, Levels and Trends in Labour Force Participation
- Economic Development and Labour Force Participation
- Labour Force and Migration, and Brain Drain

Unit 5 – Population Projections

- Population Projections: Importance of population projections, Issues and principles
- Methods of population projections: Component method of population projection, Age-disaggregated method, Projection of fertility, mortality and migration, Ratio method of population projection, Projection of population at the sub-national level, Methodology of projecting total population, age-wise population,

PSHE-A-08 : Public Health and Epidemiology

This paper is for the introduction of concept and system of public health. It is about methods of prevention and health promotion. This is to understand determinants and measures of health / morbidity. Along with it the paper includes Epidemiology to familiarize students about science, methods and applications of epidemiology in public health decision making

Unit 1- Concepts and definitions of Public Health and its components

- Health, its determinants
- Public health, The science and practice of public health, History of public health
- Public Health Structure in India
- Disease, its measures and prevention (Communicable and non-communicable)

Unit 2- Measurements and Evolution of Public Health initiatives

- Measures of disease in population
- Global health and epidemiological transition
- Sources of global health data
- Evolution of global public health initiatives: primary health care, selective primary health care, MDGs, SDGs

Unit 3 - Healthcare Systems and Policy

- Health systems – goals, elements and characteristics, multi-levels of operations, interactions and interrelationships
- Health systems frameworks: six building blocks of health systems – Governance, Financing, Human resource
- Health Care Systems in India: health care system includes many sectors or subsystems, types of service providers, sources and methods of financing, and regulations
- Model of health care system in India
- Health system development and strengthening
- Challenges in Public health delivery system: with ref to delivery, performance, effectiveness, efficiency, and equity
- Discussion about the sources of problems and potential solutions
- Health Policy and analysis – policy actors, focus and forms of policy analysis – policy analysis triangle

Unit 4 - Fundamentals of Epidemiology

- Historical aspects, evolution, definition, aim and uses
- Tools of epidemiology: measuring disease frequency (prevalence, incidence, mortality rates morbidity rate etc.)
- Define exposure variables, outcome variables
- Commonly used health measures such as relative risk, attributable risk, and odds ratio; appropriate methods for estimating such measures
- Epidemiological study designs (observation research, experimental research and qualitative research)
- Bias, confounding and interaction, measurement issues
- Causal association
- Definition and understanding- Natural history of disease
- Survey methodology including census procedures and sampling
- Principles of measurement
    - Types of measures (Morbidity and Mortality: Incidence, Prevalence, Age-adjustment and survival analysis, Use of Morbidity and Mortality)
    - Details of reliability validity and accuracy
    - Questionnaire construction
    - Diagnostic tests
    - Disease Surveillance

PSHE-A-09: Health Economics – I

This course basically discusses on basics of health economics like its scope, subject matter and the micro and macro issues in healthcare. At the end of the course students are expected to have knowledge of what is health economics and under that what is health expenditure, quality and disability adjusted life years, cost-benefit analysis of healthcare, equity and efficiency in healthcare etc. Basic knowledge of microeconomics and macroeconomics are desirable for better understanding.

Unit 1 - Economic Development and Health,

- State and Scope of Health Economics, Normative economics and health
- Difference between health and healthcare, Equity and Efficiency
- Socio-economic determinants of health
- Overview of health system
    - Industrialized countries
    - Low and middle income countries

Unit 2 - Healthcare market and Demand for healthcare

- Health and wellbeing
- Healthcare as an input in health
- Notion of need, Supplier Induced demand
- Economics of mental health and Issues of Moral Hazard

Unit 3 – Analysis

- Cost-effective analysis, Cost-benefit analysis, Cost-Utility analysis and Efficiency analysis
- Economic analysis- reporting for projects, interpretation of finding of report on economic evaluation

Unit 4 - Measurements of Health

- Morbidity and Mortality, Burden of Diseases
- Concepts of DALY and QALY, Epidemiology and Morbidity Transition
- Heath Technology assessment and real world evidence

Unit 5 - The Micro Scenario: Issues related to Healthcare Utilization

- Preventive and Curative Healthcare
- Public Health and political economy
- Intergenerational aspects of healthcare

Unit 6

- Health and Education
- Health and Nutrition
- Setting Priorities in healthcare

Semester III

PSHE-A-10 : Population and Health Policies and Programmes

This paper highlights the various aspects of population policies, programmes and evaluation. It facilitates students to learn the different policies and programmes, and evaluation of family planning programmes along with other schemes, cash transfer schism for maternal and child health with special reference to India. It is a look at the budget through the gender lens. It is not a separate budget for women, but an analysis of the budget to examine its gender-specific impact, and to translate gender commitments into budgetary operations.

Unit 1

- Family Welfare Programme Implementation
- Organization set up of Family Planning (Welfare) programme at National, State, District, and Primary Health Centre (PHC) levels in India
- Approaches:
  - Cafeteria, Extension, Camp, Incentives and Disincentives
  - Target Setting
- Programme Expenditure
- Evolution of population policy in India – the shift in policy from population control to family welfare, to women empowerment
- Coercion versus cooperation as elements in population policy
- Contraceptive Prevalence Rate
- Characteristics of acceptors of contraception
- Reproductive and Child Health Approach
- National Rural Health Mission. National Urban Health Mission

Unit 2 - Population Policy

- Population Policy, Definitions, Policy goals and Types of policies; Overview of population policy in; Developed and Developing countries
- World Population and Health Conferences: Bucharest, Alma Ata, Cairo and Beijing
- History of Population Policy in India, National Population Policy 2000
- Policies and/or Legal measures related to Age at Marriage and Health
- Evaluation of population policy programmes, Indicators of evaluation, Evaluation on ethical ground

Unit 3

- Medical and non-medical benefits of reproductive health services to the individual, family, and community
- National Health Policy
- Mental health care act

Unit 4

- Other Health and population related Programmes (Social Protection)
  - Integrated Child Development Services-This is not a scheme rather the oldest program to monitor child growth.
  - Conditional cash transfer schemes- like JSSK
  - Mid-day meal
  - Jananai Surksha Yojana- Janani Shishu Suraksha Karyakram
- Impact of these schemes and programmes

Unit 5 - Gender budgeting

- Overview and Introduction, Gender Budgeting in India, Institutional Mechanism and Tools, Needs Assessment, Experiences of different countries in gender budgeting, Monitoring and Evaluation Issues, Gender Audit, Case Studies.

PSHE-A-11: Health Economics-II

The objective of this course is to deliver a detailed understanding of demand for and supply of healthcare. As we know the healthcare market is characterized by asymmetric information to a large extent, it is extremely important to understand the underlying economics to analyse the behaviour of different agents in healthcare market. One of the objectives of this course is to impart the knowledge on economics of health insurance in detail to make the students understand how health insurance market actually works. The economic consequences of critical illness and prolonged illness also will be covered.

Unit 1 - The Macro Scenario

- Cross Country comparison
- Healthcare Cost Growth
- Pattern of Health expenditure in India: Public (centre and state) and private
- Quality and Sustainability
- Organization and Management of Public Health Institution.

Unit 2 – Economic Aspects of Healthcare Provision

- Private sector
- Public sector
- Alternative medicine
- Short term, Long term (Acute and Chronic)
- Health Education

Unit 3 - Quality of Healthcare

- Measurement of quality of care
- Measurement of health state utilities
- QALYs and its alternatives- different approaches of valuing health
- Multi-attribute utility instruments and their development

Unit 4: Economics of Health Insurance

- Competitive health insurance and risk adjustment, standard and sub-standard risk
- Demand and supply of health insurance, asymmetric information and agency, market insurance, Market Failures, Asymmetric information, Adverse selection within health insurance, the market for lemons, full coverage, partial coverage, moral hazard, Incidence of a Tax Theory Applied to Employer-Sponsored Health Insurance, Target Effectiveness and Target Efficiency Applied to Covering the Uninsured, Social insurance
- Pricing Health Insurance Product
- Self-insurance and protection, employment based insurance, health insurance in India

- Health insurance in India: Private insurance, community-based insurance schemes
- Effectiveness of Insurance, Health production function

Unit 5: Economics of Critical Illness and Policy Initiatives

- The economic consequences of chronic disease, critical illness, prolonged illness
- The rational for public policy intervention
- Cost effectiveness of intervention

PSHE-A-12 : Research Methodology

This paper enables students to understand the basics of research methods, concepts and types of research. It also includes various research designs and steps in research. It familiarizes students with quantitative and qualitative techniques of data collection and its actual process. Various software for data collection and analysis are introduced in this paper. The introduction of research communication, an important aspect of any research, makes this course extremely important. Further, students will get acquainted with how to write a research grant or fellowship application including ethical guidelines and other regulatory requirements.

Unit 1 – Scientific Methods of Research

- Definition of Research
- Aims, objectives and scope of social research, Assumptions, Operations and Aims of Scientific Research, Steps in research, Formulation of a research problem, Operationalisation of concepts, Research Process: conceptual, Empirical and Analytical Phases of Research, Essentials Criteria of Scientific methods.

Unit 2 - Research Designs and Logic in research

- Experimental research design: Pre experimental, True experimental and Quasi experimental research design, RCT
- Non-experimental research design: Descriptive, exploratory, Explanatory and Monitoring and Evaluation
- Reliability and Validity- Face, content, construct, convergent, concurrent, and predictive validity
- Inductive and deductive reasoning; Measurements
- Non-random and random errors, Scaling and composite indices

Unit 3 – Data collection – Quantitative and Qualitative

- Quantitative: Survey methods and their application to public health research, Conceptual framework; Mixed-method design; Survey design and planning, sampling; Construction of questionnaire; Data collection and analysis; Large sample surveys – Techniques
- Qualitative: Types of qualitative research, approaches in qualitative Research- Ethnography, Grounded Theory, Historical research
- Qualitative data collection methods: In Depth Interview, Focus Group Discussion, Observation, Case Study, Participatory methods, KII
- Sampling and Analytical approaches- thematic analysis, content analysis, narrative analysis

Unit 5 – Communication and Proposal Development

- Scientific writing, Writing and Presentation of literature review, report, papers, manuals, Research Brief, Plagiarism, Ethics in research
- Select a topic, identify a research gap, Frame research questions, Develop objectives
- Select a study design, Write the detailed methodology, Develop the analysis format
- Write proposal for grant

Unit 6 - Monitoring and Evaluation

- Principles of Monitoring & Evaluation: Introduction to M&E – roles and uses; Results paradigm: inputs, activities, outputs, outcomes and impact/goal; M&E in Project Cycle; Stakeholder Analysis – who, needs and roles.
- M&E Frameworks: LFA; Logic model; Results frame; M&E plan in general
- Theory of Change: Theory of change – project design, M&E frame Knowledge & Skills for efficiency and productivity in development
- Quantitative Impact Evaluation: Estimation of Counterfactual – Theoretical concept; Descriptive comparison - Why simple difference is insufficient; Difference in Differences (DiD); Regression Discontinuity Design (RDD); Propensity Score Matching (PSM)

PSHE-A-13 : Actuarial Methods for Health and Life Insurance

This paper basically focuses on actuarial methods for insurances, measurement and management of risk and uncertainty. It will give detailed understanding of risk premium, annuity, pricing of health care product, life insurance products etc. At the end of the course the student is expected to learn pricing and forecasting methods and models used by actuaries.

Unit 1 – Life Assurance Contracts

Concept of compound interest rate, discount factor, present value of the money, nominal rate of interest, force of interest, Assurance contracts with level and varying benefits, such as whole life insurance, term insurance endowment insurance. Means and variances of the present value random variables of the payments under these contracts under the assumption of constant force of interest, when the benefit payments are made at the end of year of death (discrete set up) or when it is paid at the epoch of death (continuous set up). Actuarial present value of the benefit, Net single premiums. Future life time random variable, its distribution function and density function, concept of force of mortality, curtate future life time random variable its probability mass function, deferred probabilities, all these functions in terms of international actuarial notation.

Unit 2 – Life Annuity Contracts

Annuity contracts, annuity certain, discrete annuity, monthly annuity, continuous annuity, deferred annuity, present values and accumulated values of these annuities. Continuous life annuity, discrete life annuity, such as whole life annuity, temporary life annuity, n-year certain and life annuity, life annuities with mthly payments, Present value random variables for these annuity payments, their means and variances, Actuarial present value of the annuity

Unit 3 – Gross Premium Reserves

Loss at issue random variable, various principles to decide net premiums for insurance products and annuity schemes defined in unit II and III, fully continuous premiums and fully discrete premiums, True monthly payment premiums. Extended equivalence principle to decide gross premiums, Concept of reserve, prospective & retrospective approach, Fully continuous reserve, Fully discrete reserve, Gross and net premium reserves; profit contracts

Unit 4 - Joint Life Probabilities

Joint life probabilities, annuities and insurances; cash flow dependent upon death or survival of either or both of two lives; competing risks; transition intensities for given dependent probability

Unit 5 - Health and care Products

Demonstrate an understanding of health and care product design, principles by which health and care insurance contracts are designed and the interest of the various stakeholders in the process, suitable design for a product in a given situation, relative merits of different product designs, Different sources of risk to a health and care insurance company: • data • claim rates • claim amounts • investment performance • expenses and inflation • persistency • mix of new business • volume of new business • guarantees and options • competition • actions of management • actions of distributors • counterparties • legal, regulatory and tax developments • reputation • internal audit failures/fraud • physical risks • aggregation and concentration of risk • catastrophes • non-disclosure and anti-selection

Unit 6 - Multiple-Decrement Theory and Pension Fund Mathematics

Multiple decrement theory; pension fund mathematics-techniques of discounting emerging cost, for use in pricing, reserving and assessing profitability for all contract types and for pensions; expected cash flow dependent upon more than one decrement; expected cash flow contingent upon risks other than human risks

Unit 7 - Principal Forms of Heterogeneity within a Population

Variations in mortality and morbidity; main forms of selection-temporary initial selection, time and class selections, spurious and adverse selection, different mortality tables for different lives; risk classification of life insurance, genetic information of risk classification in life insurance, directly and indirectly standardized mortality rates

Semester IV

PSHE-A-14 : Applications of Statistical Software

This paper is a focus on data management and analysis. The subsequent sections of the paper include the topic on data management software tools (Quantitative and qualitative), secondary data analysis considering reusing secondary data, reading and reflecting on data collected by others, meaning and use of documentation and other contextual materials. Additionally, this paper focus on the strategies for secondary data analysis, as well as topics on critiquing and assessing rigour in quantitative and qualitative research and presenting qualitative analysis in health research reports.

Unit 1- Basic understanding of different type of data set

- Structure of Demographic Health Survey Data (DHS)
- Structure of National Sample Survey Data (NSS)
- Any other data source

Unit 2- Getting started with quantitative software

- Introduction of the software and its interface
- Basic commands of the software
- Import and export of data file

Unit 3- Data Manipulation

- Creating new variables, Recode and replace, Keep and drop variables, Append, merge the data files
- Converting string variable into numeric and vice versa, Combining and dividing variables
- Graphical presentation of data (bar, histogram, line, scatter, box plot etc.)

Unit 4- Working with a secondary dataset

- Data entry
- Writing the syntax file
- Restructure/reshaping the data
- Extraction of DHS and NSS data

Unit 5 – Basic Statistical Analysis with the help of statistical software

- Generating the Univariate and bivariate tables
- Measure of central tendency
- Chi-square and ANOVA test

Unit 6 - Multivariate technique with the help of statistical software

- Linear regression
- Multiple linear regression
- Logistic regression
- Survival Analysis

Unit 7 - Working with qualitative data software

- Data organization and exploration: Import and organise data in a project, manage a literature review, Explore textual data, Links to external information, Memoing's one research
- Data coding and comparison: Autocode structured data, generate codes inductively, manage a coding scheme, Generate / falsify hypotheses, Visualise the coding process, Work with cases and variables
- Data analysis and visualisation: Search tools, Prepare the analysis with sets, run coding and matrix queries, Present findings with visualisations, Generate summary reports, Export data and findings

Unit 6- Working with mapping and spatial analysis software

- ArcGIS- Display map features, add data to your map, edit geographic data, work with data tables, query and select geographic features, create a summary graph. lay out and print a map. Discrete data: point, and polygon data, Raster and vector data, layouts preparation. Geocoding and basics of digitization in ArcGIS.

PSHE-A-15: Health Economics-III

Another extremely important intake from this course will be two entirely devoted modules on health and ecology and the interlinkages between health and environmental policy. The course imparts economic aspects of pharmaceutical industry across the World and in India. This course also intends to impart knowledge on healthcare services, healthcare reforms, healthcare finances and healthcare delivery system in India.

Unit 1 – Pharmaceutical Industry

- Size, Spread, Turnover, Products, Main players, Capacities, Research and Development - World
- Size, Spread, Turnover, Products, Main players, Capacities, Research and Development - India

Unit 2: Ecology and Health

- Exposure, dose and response
- Indoor and outdoor air pollution; effects of air pollution on children, adults
- Effects of climate variability and climate change on mortality and morbidity
- Environmental toxicology; environmental carcinogenesis;
- Water-borne diseases; municipal, industrial and hazardous waste – health implications
- Prevention and Control of Environmental Occupational health issues - Food safety, Food contamination - Waste management, POET variables- Population, Organisation, Environment and Technology.

Unit 3: Environmental Health and Policy – Inter-linkages

- Global policy initiatives: national environmental and health action plans
- Health impacts from Air and water pollution;
- Variations in the weather and impact on mortality
- Disease incidence
- Economic and health effects of weather related disturbances

Unit 4 - Issues related to Healthcare Reform, Policy and Healthcare Finance in India

- Experiences of healthcare reform, Impact of reform
- Financing health services-current spending in developing countries, correct level of funding, inadequacy of tax based funding
- Capital investment
- Changes in Healthcare Finance
- Public and private finance and provision - Public Private Partnership

Unit 5 - Healthcare Services and Healthcare Delivery Systems in India

- Healthcare services and Healthcare Delivery System in India: Primary, Secondary, and Tertiary level
- Issues in Healthcare Delivery System: Accessibility, Efficiency, Equity, Affordability, Quality and Sustainability, Organization and Management of Public Health Institutions
- Economic Evaluation of National Health Programme

PSHE-A-16 : Term Paper

This will be in consultation with the Faculty

Elective Papers

PSHE-B-01: Basic Econometrics

The objective of this paper is to introduce basic econometric techniques that are widely used in empirical work in economics and other related disciplines. It covers the problems faced in estimation and inference in the context of single and multiple equations regression model. The focus is on conceptual understanding and 'hands on' applications using economic data drawn from real-world examples, rather than on formal theoretical proofs alone. By the end of the course, students should be able to develop simple econometric models and interpret the econometric and statistical results reported in other studies.

Unit 1:
The nature of Econometrics and Economic Data: Introduction, Model Specification and applied research, the role of data in model specification, The Structure of Economic Data, Steps in Empirical Analysis, Causality and the Notation of Ceteris Paribus in Econometrics, etc.

Unit 2: The Classical Linear Regression Model: Estimation and Inference: Ordinary least squares (OLS) estimation, the Classical assumptions, the Gauss-Markov theorem and properties of the OLS estimators, interval estimation and hypothesis testing and prediction, reporting and interpreting regression results, Maximum Likelihood techniques, Restricted Least Square estimation, Likelihood Ratio (LR), Wald and Lagrange Multiplier (LM) Test, Minimum Variance Bound (Rao-Cramer Inequality Theorem).

Unit 3:
Non-linear regression: Conversion of non-linear forms into linear forms, testing linear verses non-linear functional form, appropriateness and relevance of the choice of functional form.

Unit 4:
Regression Analysis with Qualitative information: Binary (or Dummy) Variables: Exogenous Dummy Variable- Formulating and interpreting coefficients on dummy explanatory variables, interactions involving dummy variables and use of dummy variables in seasonal analysis, piece wise regression analysis, the dummy variable alternative to chow test.
Discrete and Limited Dependent variable - Linear Probability Model, Problems relating to LPM, Logit and Probit Model, Multinomial Choice Models: Ordered Response Model; Unordered Response Model, Censored and Truncated Regression Model

Unit 5:
Multicollinearity: Introduction, perfect verses imperfect Multicollinearity, Consequences, tests for detection and remedies for Multicollinearity.

Unit 6:
Violation of the OLS Assumptions: Introduction, Consequences of violation of OLS assumption, GLS Estimation- Aitken's generalization of Gauss Marks Theorem. Heteroscedasticity & Autocorrelation: Causes and consequences, diagnostic tests and remedial procedural

Unit 7:
Specifications: Choosing the Independent Variables and Functional Form Omitted variables: Too few variables, Irrelevant variables: variable overload, Criterion of choice, superfluous variables etc. The use and Interpretation of constant term, Alternative Functional forms, Problem with incorrect functional form, test for choosing the appropriate functional form.

Unit 8:
Lagged Variables and Distributed- Lag Models: Introduction, Consequences of applying OLS, Almon's lag approach, Koyak Transformation: Partial adjustment hypothesis and adaptive expectations hypothesis, estimation of distributed lag models etc.

Unit 9:
Simultaneous Equation Models (SEM): Introduction, Structural, reduced form and final form model, Rational behind the use of SEM - simultaneous bias and inconsistency of the OLS estimator, Problem of Identification: Rank and Orders conditions, Methods of estimation: ILS, 2SLS, Instrumental Variable, LIML (LVR), Mixed estimation Method, 3 SLS and FIML methods.

Note: Students will be taught software packages for performing econometric applications. Computer exercises will be given

PSHE-B-02 : Business Analytics

This Learning path enables participants to gain three critical skills: data analysis and problem solving framework, the ability to perform descriptive analytics and visualization, and the expertise to build and implement the most widely used data science and machine learning algorithms in use today, with R

Unit 1 - The need for Analytics and Understanding Analytics

- Decision Making – Heuristics and Biases
- The need for analytics
- Impact of analytics on business
- Being analytically competitive
- The difference between analytics and BI
- Introduction to the business Analytics model
- Types of analytics
- Models and algorithms in Analytics
- The Analytics Methodology

Unit 2 - Tool and Tech Landscape

- A review of technology used in data storage, data processing, and data science
- Popular tools used in Data Science and when to use each

Unit 3 - Descriptive Analytics with excel and Tableau

- An introduction to Tableau
- Using descriptive statistics in analysis and reporting
- Advanced reporting with Tableau

Unit 4 - R programming

- An introduction to R
- Importing and exporting data in R
- Data Manipulation with R
- Advanced Data Manipulation with R
- Data Visualization with R

Unit 5 - Data Pre-processing

- Data Exploration and Assessment for Data Science
- Identifying and dealing with noise in Data
- Preparing data for Data Science Modelling

Unit 6 - Predictive Models in R

- Linear Regression Models and their applications
- Logistics Regression Models and Their applications
- Time Series Forecasting

Unit 7 - ML Models in R

- Clustering Algorithms and application
- Decision Tree Algorithms and applications
- Random Forest Algorithms and applications

Unit 8 - Storytelling with Data

- Communicating data science results
- Effective presentation skills
- Using Data visualizations for storytelling

PSHE-B-03 : Health Informatics I

In this Course students will understand the basic framework required for health informatics. Structure and collection of data using controlled terminology assists interoperability and analysis. The curriculum includes introduction to human anatomy and physiology in health and disease. Introduction to the vocabulary used to describe various body systems will help the student to understand multi systemic diseases, economics of which will be of interest to students of this course.

Unit 1: Introduction to health informatics

- Introduction to the program, Healthcare informatics, computers, networks, internet and cloud computing.
- Practical on what information you want to collect, designing database to collect information, code table for one disease, integrated code table for many diseases, Appreciate need of ICD, SCT, LOINC etc, Refine data structure to answer queries

Unit 2: Data collection and interoperability

- Introduction to Data, Information and knowledge, examples,
- Database, RDBMS
- Internet and internet searching, Understanding information sources
- Medical literature searching and Pubmed
- Interoperability HL7

Unit 3: Controlled terminology

- International Classification of Diseases (ICD)
- Logical Observation Identifiers Names and Codes **(**LOINC)
- Code of Procedural terminologies (CPT)
- RxNorm
- Systematised Nomenclature of Medicine - Clinical Terminology SNOMED-CT

Unit 4: Data structure and analysis

- Databases and Sequential Query Language (SQL)
- Social media
- XML
- DICOM and PACS
- Big data analysis

Unit 5: Anatomy and physiology of body systems

- Introduction to cell and biological feedback mechanism
- Infection, immunity and inflammation
- Blood and its characteristics, clotting, groups
- Cardiovascular, respiratory, Urogenital systems
- Sensory organs, nervous and musculoskeletal system
- Biochemistry, Pathology and Pharmacology

Unit 6: Vocabulary of Medical specialties

Obstetrics, Gynaecology, Paediatrics and Medicine; Surgery, Orthopaedics, ENT and Ophthalmology; Neurology, neurosurgery, psychiatry and endocrinology; Respiratory medicine, cardiology and cardiothoracic surgery; Nephrology, Urology, skin and cosmetology

PSHE-B-04 : Health Informatics II

In this course students will learn application of knowledge gained in the previous term. They will understand how medical information is actually collected, what is being done under the National digital health mission (NDHM) and how projects can be managed for various application areas. Telemedicine and mobile health is the current technology in healthcare. Students will understand how public health can be measured, assessed and improved to reduce the economic burden of diseases and epidemics.

Unit 1: EHR, HIS and NDHM

- Personal Health Record, Electronic Health Record
- Clinical Informatics: Electronic Medical Records, Hospital Information Systems
- NDHM overview, Provider Registry, Hospital registry, Unique Health ID and patient registry
- Project Management, Requirement gathering, Requirement analysis

Unit 2: Application areas

- Bioinformatics, Image Informatics
- Maintaining of record book of cases in electronic format, Store, transmit data over a range of connectivity options
- Clinical Decision Support Systems, Artificial Intelligence
- Tour of Hospital using various Health Informatics Tools, Project on evaluation of hospital information system
- Information protection (privacy, security, confidentiality), HIPAA

Unit 3: Telemedicine and mobile health

- Telemedicine : clinical setting, ethical, technical, legal aspects, implementation
- Introduction about digital bio - medical sensors,
- mHealth, Mobile Apps useful for clinicians

Unit 4: Public Health Informatics

- Outbreak of diseases, epidemics, detection and prevention
- eLearning for medical and healthcare learning
- Medical Blogging, Social media

Unit 5: Economic Burden of Diseases

- Economic burden, health economics and outcomes research
- Tuberculosis, asthma, COPD, Ischemic Heart Disease
- Paralysis and disability
- Intensive Care Unit management and economics,

- Clinical trials, pharmaceutical and vaccine economics

Unit 6: Economic Burden of epidemics

- Dengue,
- Malaria,
- H1N1,
- COVID-19
- Typhoid

PSHE-B-05 : Population and Health

This paper is to familiarize students to the linkages between population and health and understanding of the data sources. It also demonstrates different aspects of population, health and nutrition education and their importance. It familiarizes students, health issues of specific sub-groups of the population. These sub-groups have different needs and visualizing that various efforts taken by the public health system would be understood. It also to understand the role of nutrients in the physiological processes and identify public health nutrition interventions.

Unit 1 – Linkages of Population, Health and Health system

- Introduction to population and health: definition and scope
- Sources of health data: Population census, DHS, National Family Health Survey (NFHS), WHO-Sage, LASI, Health Management Information System (HMIS), National Sample Survey (NSS) etc.
- Public health delivery system and its challenges
- Indian system of Medicine: AYUSH Systems: Ayurveda, Yoga, Unani, Siddha, Sowa Rigpa, Naturaopathy, Homeopathy, Herbal medicine and health traditions

Unit 2 – Reproductive, Maternal and Child Health

- Concept, Burden of reproductive ill-health: unintended pregnancies, unsafe abortions, MTP act, non-sexually transmitted infections, infertility, violence against women,
- Evolution of the concept of reproductive health and Rights and its implications: ICPD-1994, MDGs Nairobi conference and SDGs
- Common morbidities among young children; lower respiratory tract infections, diarrhoea; Immunization- coverage, implication and determinants

Unit 3 - Tribal Health

- Overview of territorial distribution and classification of tribes in India
- Tribal health issues
- Tribal health programmes, strategies, initiatives and schemes
- Poverty, Nutrition and Food Security in tribal regions
- Tribal development, displacement, rehabilitation and its impact on health

Unit 4 - Public Health Nutrition

- Introduction to public health nutrition, Inter relationship between food, nutrients and health.
- Nutrition Transition: Demographic, economic transition, poverty alleviation, food consumption patterns

- Undernutrition and Over Nutrition: global and Indian prevalence, risk factors, consequences
- Micronutrient deficiency disorders: prevalence, risk factors, Interventions that worked globally, lessons learnt.
- Food Security: Factors affecting food security, economics food security and community development, Food security bill
- Life style disease, NCDs, Guidelines for prevention of NCDs

Unit 5 – Elderly Health

- Demographic trends and epidemiological description of the major health problems and issues for older populations
- Implications of elderly health for public health
- Components of usual versus successful aging, behavioural, social and environmental factors that influence successful ageing
- Health care services for older adults: strategies to prevent diseases and promote health in elderly
- Policy and programmes for elderly – India and World

Unit 6 – Mental Health

- Concept, Definition, Types, trends in mental illness, underlying drivers, Burden of mental health globally and at national level
- Life course: mental health and youth, adults, and geriatrics
- Mental health and sustainable development
- Social determinants, Violence, Stigma, and human rights
- Prevention and Promotion- Policies, Programme and legislative framework for mental health- research development in mental health policy, mental health care systems
- Understanding of mental disorders
    - Historical perspective on mental disorders
    - Current Understanding of the main types of mental disorders
    - Broad knowledge of diagnosis and causes, of mental disorders
    - Current views of mental disorder treatments and care of persons with mental disorders
    - Disability burden of mental disorders
    - Direct and indirect economic costs of mental disorders
    - Social costs of mental disorders

PSHE-B-06 : Social Exclusion and Inclusive Policy

Indian society is characterized by a highly entrenched system of social stratification. This created the hindrances and denied the access to economic, cultural and educational resources to the disadvantaged groups of the society particularly, the scheduled castes, scheduled tribes, women, minorities, physically challenged and old aged groups. To understand their problems, we need to study the components of social exclusion and to formulate policy paradigms for their inclusion in the economy. This course is designed to give basic understanding of the phenomenon of 'social exclusion'. It will make possible to create awareness about the social excluded people from an economic and social policy perspective as well as to analyze social inclusive policy for them.

Unit 1: Understanding Social Exclusion

- Conceptualizing Social Exclusion, Origin and Basis of Social Exclusion; Forms of Social Exclusion:
- Religion, Race, Caste, Gender, Ethnicity, Region, Culture, Language, Disability, Migrants and
- Refugees; Excluded Groups and Socio- Economic Disparities: Scheduled Castes, Tribals, Minorities, Women, Old Aged and the Physically Challenged; Contemporary Discussions on Social Exclusion

Unit 2: Theoretical Perspectives on discrimination

- Economics of Discrimination; Marxist and Liberal Perspective; Capability Approach and Theories of Poverty; Economic Justice, Economic Freedom and Welfare; Social Choice and Human Rights Approach

Unit 3: Social Exclusion of Caste, Tribe and Minority

- Indian society: Social Order in Caste, Tribe and Minority; Caste System as an Institution of Exclusion; Exclusion of Tribes: Nation-State Formation, Industrialization, Urbanization, Globalization etc.; Dimensions of Exclusion for Marginality: Development, Issues of Identity and Human Rights Violation

Unit 4: Dimensions of exclusions and inclusive policy perspectives

- Scheduled Castes, Minorities and Affirmative Action; The Question of Reservation and Affirmative Action – Constitutional Provisions and Contemporary Debates with reference to the Mandal Commission Report and the Sachar Committee Report; Labour Market Discrimination, Wage Differentials, Problems of Employability, Social Security and Pension; Access to Finance, Micro Finance and Financial Inclusions of the Excluded People

Unit 5: Physically challenged and Old Aged Social Exclusion

- Physically Challenged and Social Exclusion: Constitutional Provisions, National and State Policies and Social Security Policy; Community Support, Awareness and Assimilation Activities; Aging: Social and Economic Exclusion; Gerontology Outlook in Policy Framework: Government Laws and Welfare Programmes

Unit 6: Institutions and Inclusive Policies

- Inclusive Policy Agenda: United Nations Organization, Constitutional Provisions, Nodal Government Agencies and Planned State Interventions; Human Rights Framework, Affirmative Action and Reservation Policies; Designing Innovative Strategies for Inclusive Policies

PSHE-B-07 : Academic Writing - (Swayam Platform)

{ HYPERLINK "https://onlinecourses.swayam2.ac.in/cec20_ge29/preview" }

Course Objectives

1. To differentiate between various kind of academic writings.
2. To identify and avoid the plagiarism.
3. To practice the basic skills of performing quality literature review.
4. To practice the basic skills of research paper, review paper and thesis writing.
5. To target the research work to suitable journal and communicate for publication
6. To practice the Time and team management.
7. To practice digital writing or develop Open Educational Resources (OER).
8. To write research proposals, conference abstract and book chapters/ book proposals.

Course Duration 15 week - Credits: 04

Week 1

Academic & research writing: Introduction; Importance of academic writing; Basic rules of academic writing

Week 2

English in academic writing I & II; Styles of research writing

Week 3

Plagiarism: Introduction; Tools for the detection of plagiarism; Avoiding plagiarism

Week 4

Journal Metrics

Week 5

Author Metrics

Week 6

Literature review: Introduction, Source of literature; Process of literature review

Week 7

Online literature databases; Literature management tools

Week 8

Review Paper Writing, I & II

Week 9

Research paper writing I, II, III

Week 10

Referencing and citation; Submission and; Post submission

Week 11

Thesis Writing I, II & III

Week 12

Empirical Study I, II & III

Week 13

Challenges in Indian research & writing; Team management (mentor and collaborators); Time Management

Week 14

Research proposal writing; Abstract/ Conference Paper/ Book/ Book Chapter writing; OERs: basic concept and licenses

Week 15

Open Educational Resources (OERs) for learning & Research; OERs development I & II

PSHE-B-08 : Behavioural Economics

This course introduces the concepts of behavioural economics and their importance in economic decision-making in case of risk, uncertainty and strategic interactions. It particularly tries to explain economic choices which deviate from predictions of neo-classical economics. It also attempts to incorporate insights from sociology, institutions, evolutionary psychology to understand human behaviour and offer directives for better developmental outcomes. It also discusses standard research methods of the subject viz. laboratory and field experiments to understand their contribution to the advancement of the subject.

Unit 1: Introduction: decision-making theories

- Neo-classical economics – rationality assumption, optimization
- Origin of Behavioural economics - Bounded Rationality, Rationality in Psychology and Economics by H. Simon
- Duel System theory, Prospect theory

Unit 2: Decision-making under risk and uncertainty

- Heuristics and Biases programme- Representativeness, Availability, Anchoring and adjustment, mental accounting
- Biases: Overconfidence, Confirmation bias, Framing, Status Quo Bias, Endowment Bias, Self-Control Bias
- Fallacies: conjunction and disjunction fallacies, gambler's fallacies

Unit 3: Inter-temporal choices

- The discounted utility model, exponential discounting
- Hyperbolic discounting

Unit 4: Strategic interactions

- Fairness, trust, cooperation, reciprocity, altruism
- Norms and Culture

Unit 5: Applications of Behavioural Economics

- Introduction to Behavioural Labour Economics, Behavioural Finance
- Taxation and the contribution of Behavioural Economics
- Choice architecture: The role of nudging
- Public Policies: Psychological and social perspectives on policy in the area of Poverty, Health, Climate Change

Unit 6: Research methods for behavioural economics

- Survey: hypothetical choices, self-reported perceptions & biases
- Laboratory experiments – Precepts of laboratory experiments, internal and external validity
- Field experiments – Randomized Control Trails