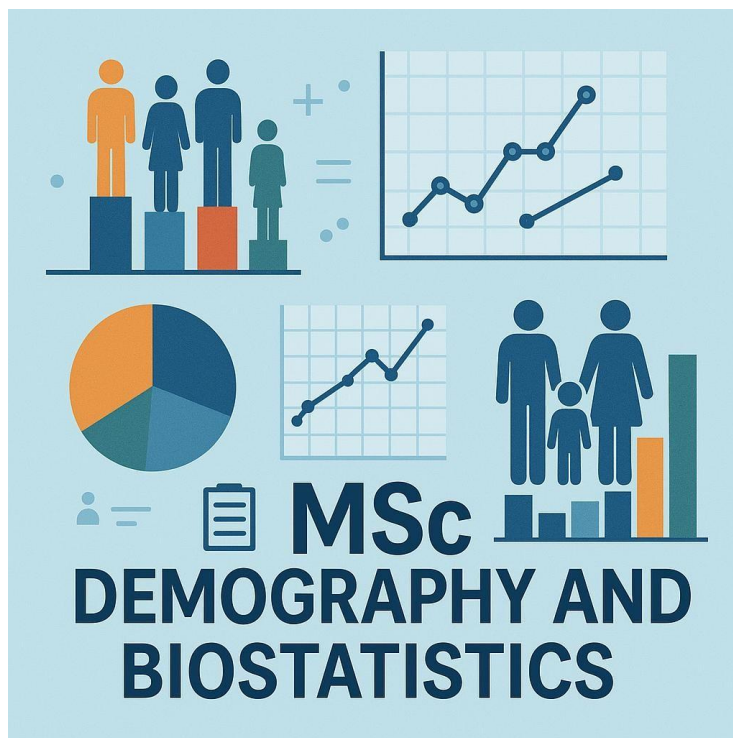


Learning Outcomes-based Curriculum Framework (LOCF) for Post-graduate Programme



UNIVERSITY OF KERALA

2026

PREAMBLE

The role of higher education is vital in securing gainful employment and providing further access to higher education comparable to the best available in the world-class institutions elsewhere. The improvement in the quality of higher education, therefore, deserves to be given top-most priority to enable the young generation of students to acquire skill, training and knowledge to enhance their thinking, comprehension and application abilities and prepare them to compete, succeed and excel globally. Sustained initiatives are required to reform the present higher education system for improving and upgrading the academic resources and learning environments by raising the quality of teaching and standards of achievements in learning outcomes across all undergraduate programs in science, humanities, commerce and professional streams of higher education.

One of the significant reforms in higher education is to introduce the Learning Outcomes-based Curriculum Framework (LOCF), which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. The University Grants Commission (UGC) took the initiative of implementing the LOCF in the Colleges and Universities of the country. Accordingly, the University of Kerala has decided to implement the LOCF in all its departments under the auspices of the Internal Quality Assurance Cell (IQAC). A series of teacher training workshops were organised by IQAC and the office of the Credit and Semester System (CSS), and the departments have revised the syllabus accordingly, through workshops and in consultation with academic experts in the field.

GRADUATE ATTRIBUTES (GAs)

The Graduate Attributes (GAs) reflect particular qualities and abilities of an individual learner, including knowledge, application of knowledge, professional and life skills, attitudes and human values that are required to be acquired by the graduates of the University of Kerala. The GAs include capabilities to strengthen one's professional abilities for widening current knowledge and industry-ready skills, undertaking future studies for global and local application, performing creatively and professionally, in a chosen career and ultimately playing a constructive role as a socially responsible global citizen. The GAs define the characteristics of learners and describe a set of competencies that are beyond the study of a particular area and programme.

The GAs of the University of Kerala

- Continue lifelong learning as an autonomous learner
- Continuously strive for excellence in education
- Apply and nurture critical and creative thinking
- Promote sustainable development practices
- Promote co-operation over competition
- Balance rights with responsibilities
- Understand and respect diversity & difference
- Not be prejudiced by gender, age, caste, religion, or nationality.
- Use education as a tool for emancipation and empowerment of humanity

ABOUT THE DEPARTMENT OF DEMOGRAPHY

The University of Kerala has the distinction of being the first University in India to introduce Demography as a scientific discipline at the post-graduate level (M.Sc. in Demography) in 1963 at the Department of Statistics. Initially attached to the Department of Statistics, it became a full-fledged department-Department of Demography and Population Studies in 1979 under the leadership of the late Dr R. Ramakumar, who was then Professor and Head of the Department of Statistics. In 1997, the department was renamed as the Department of Demography.

The department offers MSc, MPhil and PhD programmes and also carries out research and extension activities in the field of population. The department also provides an MSc programme in Actuarial Science since 2013. The MPhil programme in Demography was initiated in 1983, and that of Actuarial Science was instituted in 2011. The curriculum and Syllabus prepared and finalised by the Board of Studies are updated once in three years to incorporate the latest developments in the respective areas. Based on demand from the industry, we redesigned the MSc programme in Demography to include sufficient content from Biostatistics, and the course was renamed as MSc Programme in Demography and Biostatistics in 2018.

The department actively researches in various fields of mortality, fertility, migration, urbanisation, reproductive and child health, ageing of the population and periodically publishes reports. The research outcomes of the department and the PRC, apart from providing valuable information to Governmental and non-governmental organisations, create awareness among the public regarding the current population scenario.

Publication of an internationally accepted journal "Janasamkhyā" was started by the department in the year 1983 and has been published semi-annually. Research articles, notes and reviews on topics relating to Population Studies, particularly Technical demography, will be considered for publication in the Journal.

Workstation for Research on Micro-data from Census has been set up at the Department of Demography, by the Directorate of Census Operations, Kerala, Ministry of Home Affairs, Government of India and the University of Kerala. The objective of setting up the workstation is to permit qualified researchers to use anonymised micro-data from the Census optimally for in-depth research by allowing access for generating cross-tabulations not published by the Census. The facility is open to all, including those who are not enrolled or part of the University.

The workstation is fully equipped with all the facilities for research on confidential micro-data from Census 2001 and Census 2011. The researcher will be permitted only to use the software made available at the workstation for tabulation. The researchers may also use the printer installed in the workstation to print the approved outputs. She/he will, however, not be allowed to take out the soft copy of the microdata in any format.

The department has a library with about 7000 books related to different areas of population, which are Catalogued and arranged for easy access. The library is used by students, teachers, and researchers from inside and outside the University campus.

In honour of the late Prof. R. Ramakumar, the founder Professor and Head, the department has instituted the Professor R. Ramakumar Memorial Endowment Lecture. The endowment lecture is held biannually and will be delivered by eminent demographers in India. Started in the year 2003, six endowment lectures have already been conducted. The prominent speakers of the endowment lecture include Dr Vijayanunni, former Registrar General of India, Dr P. H. Reddy, former Director, Population Research Centre, Bangalore, Prof. Arvind Pandey, Director, National Institute of Medical Statistics, New Delhi and Prof. K.

Srinivasan, former Director, International Institute for Population Sciences, Mumbai.

UNIVERSITY OF KERALA

Syllabus for M.Sc. Demography and Biostatistics

Programme Specific Outcomes (PSO) for M.Sc. Demography and Biostatistics	
PSO 1	Explain the various demographic events and processes of population change and their determinants
PSO 2	Apply the principles of biostatistics and statistical software packages in public health and demographic research
PSO 3	Utilise demographic tools to examine the levels, trends, and prospects of population
PSO 4	Make use of the tools available in epidemiology to design clinical trials and other research studies
PSO 5	Demonstrate an understanding of the principles and methods of monitoring and evaluation to conduct evaluation research
PSO 6	Examine the interrelationship between demographic, development and public health issues

Programme Structure of M.Sc. Demography and Biostatistics

Semester	Course Code	Name of the course	CC	DSE	GC	Credit
I	DEM-CC-511	Introduction to Demography	+			4
	DEM-CC-512	Fundamentals of Biostatistics	+			2
	DEM-CC-513	Fertility: Theories, Determinants and Methods	+			4
	DEM-CC-514	Estimation And Hypothesis Testing in Health Research	+			4
	DEM-CC-515	Data Analysis Using SPSS and MS Excel	+			2
	DEM-DE-516	Principles of Epidemiology		+		2
II	DEM-CC-521	Mortality: Determinants And Methods	+			4
	DEM-CC-522	Design of Experiments and Clinical Trials	+			4
	DEM-CC-523	Migration and Urbanisation - Theories, Determinants and Techniques	+			4
	DEM-DE-524	Sampling Techniques		+		2
	DEM-DE-525	Research Methodology		+		2
III	DEM-CC-531	Population, Environment, And Development	+			4
	DEM-CC-532	Life Table and Survival Analysis	+			4
	DEM-CC-533	Public Health, Monitoring and Evaluation	+			4
	DEM-CC-534	Applied Statistical Modelling	+			4
	DEM-CC-535	Data Management and Analysis Using STATA	+			2
	DEM-DE-536	Population Growth, Stable Population, and Projection		+		2
IV	DEM-CC-541	Population Models and Indirect Estimation	+			4
	DEM-CC-542	Regression Techniques and Time Series Analysis	+			4
	DEM-CC-543	Biostatistics Using R Software	+			2
	DEM-CC-544	Dissertation	+			6
	DEM-GC-501	Fundamentals of Demography			+	2

Generic Courses	DEM-GC-502	Population Education			+	2
	DEM-GC-503	Introduction to Public Health			+	2

Semester	Course Code	Course Name	Credits
1	DEM-CC-511	INTRODUCTION TO DEMOGRAPHY	4

Course Outcomes (CO):

CO1: Explain the concept of demography and to comprehend the process and events in demography and the relationship with other Disciplines

CO2: Summarise population composition and components of population change

CO3: Choose appropriate data sources for demographic data

CO4: Compare and contrast population growth trends between developed and developing

countries CO5: Examine population policies of developed and developing nations **Tagging course outcomes:**

CO	PSO	CL	KC
CO1	1	R, U	F
CO2	1, 3	U, Ap	C
CO3	1, 3	U, Ap	C
CO4	1, 3	U, Ap	C
CO5	1, 3	U, Ap	C

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

Module I

Development of the subject, Present day concepts, Definitions, Origin and Scope of Demography, Demography and other sciences-Mathematics, Economics, Sociology, Anthropology, Psychology, Public health and Biological Sciences. Rates, Ratio, Proportion, percentages, density, person-years, Sex-ratio, Sex-ratio at birth, Child-Women ratio, Median Age, Dependency Ratio (Child Dependency Ratio, Old Dependency Ratio, Total Dependency Ratio), Demographic dividend

Module outcomes:

MO1: Explain the historical development, present-day concepts, key definitions, and scope of Demography (Understand)

MO2: Identify its interdisciplinary linkages of Demography with social, mathematical, biological, and health sciences (Understand)

MO3: Calculate and interpret basic demographic measures using real or hypothetical datasets. (Analyse)

MO4: Explain the concept of demographic dividend and its implications in the context of population structure, ageing, and development planning (Understand)

Module II

Population composition-Age, Sex – Population Pyramid, Religion, Caste, Education, Language, Income - Marriage and Family – Concepts and definitions- structural changes in households and family, Population ageing. Components of population change- Fertility, Mortality, Migration and Urbanization. Age and sex structure of population in developed and developing countries Balancing equation: definition and limitations, use of the balancing equation

Module outcomes:

MO1: Explain the key elements of population composition (Understand)

MO2: Analyse the components of population change using relevant demographic concepts (Analyse)

MO3: Interpret population pyramids and age-sex structures of developed and developing countries (Understand)

Module III

Demographic Data- Needs and Sources- Census, Vital Registration System- Civil Registration System (CRS), Sample Registration System (SRS), Population Register, Sample Surveys-NFHS, DLHS, LASI, NSSO. International Data Sources- UN Population Division, US bureau of Census, Population Reference Bureau, DHS

Module outcomes:

MO1: Explain the importance of demographic data and identify various national and international sources used for collecting and analysing population information (Understand).

MO2: Differentiate between key demographic data systems in terms of purpose, methodology, and coverage (Understand).

MO3: Evaluate the strengths and limitations of different demographic data sources for research and policy planning (Analyse).

MO4: Identify and access major international demographic databases and understand their relevance for global comparative studies (Understand).

Module IV

History of Population growth- World, India and Kerala. Rate of Population Growth: Arithmetic, Geometric and Exponential growth rates, Decadal growth rate Doubling time, concept of population stabilization. Population theories- Malthusian, Marx, Optimum population, Demographic Transition.

Module outcomes:

MO1: Describe the historical trends in population growth at global, national (India), and regional (Kerala) levels, and explain key demographic milestones (Understand).

MO2: Calculate and interpret different measures of population growth, including arithmetic, geometric, exponential growth rates, decadal growth rate, and doubling time (Analyse).

MO3: Explain the concept of population stabilization and its relevance to sustainable development in the Indian and global context (Understand).

MO4: Critically compare classical and modern population theories (Malthusian, Marxist, Optimum Population, and Demographic Transition), and assess their relevance to contemporary population dynamics (Analyse).

Module V

Population Policy- Definitions, Policy goals and Types of policies – Overview of population policy in Developed and Developing countries. History of Population Policy in India, Population Policy Goals and Five-Year Plans, Population Policy of India. Role of UN and other International Agencies, World Population Conferences – Bucharest, Mexico and Cairo, Millennium Development Goals- Sustainable Development Goals – Current status.

Module outcomes:

MO1: Define population policy and explain its goals and types, distinguishing between the approaches adopted in developed and developing countries (Understand).

MO2: Describe the historical evolution of population policy in India, including its alignment with Five Year Plans and national development goals (Understand).

MO3: Assess the role of the United Nations and other international agencies in shaping global population policies, with reference to major population conferences (Bucharest, Mexico City, Cairo) (Understand).

MO4: Analyse the linkages between population policies and global development frameworks, including the Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), and evaluate their current status and relevance (Analyse).

Module VI

Population growth and demographic transition in Kerala, Fertility and mortality trends: achievements and challenges, Migration patterns: internal, inter-state, and international, Ageing and population decline: implications for health care and social security, Health transition in Kerala, Kerala model of development, Reproductive health and women empowerment in Kerala, Comparison with national demographic indicators

Module outcomes:

MO1: Describe the demographic transition and patterns of population growth in Kerala (Understand)

MO2: Analyse the implications of ageing and population decline in Kerala, particularly in relation to health care systems, social security, and economic development (Analyse).

MO3: Evaluate the role of reproductive health, women's empowerment, and public health initiatives in shaping Kerala's demographic outcomes and health transition (Analyse)

MO4: Compare Kerala's demographic indicators and development trajectory with national averages, and critically assess the relevance and limitations of the "Kerala model of development" (Understand).

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

Suggested Readings

- Bhende, Asha A and Tara Kanitkar: Principles of Population Studies – 5th rev. ed. Himalaya Publishers, Delhi, 1997
- Pathak, K.B. and F. Ram- Techniques of Demographic Analysis, 2nd Edition, Himalaya Publications
- Bogue, Donald J: Principles of Demography, John Wiley and Sons, New York, 1969
- Berelson, Bernard, Ed.: Population Policy in Developed Countries, MC Graw Hill, New York 1974

- Bose, Ashish: India's Urbanization 1901 – 2001, 2nd Ed, Tata Mc Graw Hill, New Delhi, 1978
- Davis, Kingsley: The population of India and Pakistan; Princeton, New Jersey 1951
- Hinde, Andrew (1998). Demographic Methods. London: Hodder Arnold Publications. John Hopkins University and San Beck (2008).
- Gelbard, et al. (1999). "World Population Beyond Six Billion," Population Bulletin, Vol. 54, No.1, Population Reference Bureau.
- Hauser, Philip M and Otis Dudley Duncan, Ed: The study of population: an inventory and appraisal, University of Chicago Press, Chicago, 1951
- India, Government of National Population Policy 2000, New Delhi, Dept. of Family Welfare
- Misra, B.D: An Introduction to the Study of Population, South Asian, New Delhi 1981
- Misra, B.D: Introduction to the study of Population Trends – New York, UN, 1953
- Shryock, Henry S et. al.: The Methods and Materials of Demography, New York, Academic Press, 1976
- Population Growth in Kerala; Its Implications – Trivandrum – Govt. Press, 1986
- Prakasa, Rao VLS : Urbanisation in India : Spatial Dimensions – New Delhi, Concept, 1983
- Ramakumar.R and Gopal Y S: Technical demography – New Delhi, Wiley Eastern, 1986
- Sinha and Zachariah: Elements of Demography, Allied Publishers Private Ltd, 1986

ASSESSMENT

40 per cent Continuous Assessment

60 per cent End Semester Assessment: 3-Hour Written Examination

Semester	Course Code	Course Name	Credits
1	DEM-CC-512	FUNDAMENTALS OF BIOSTATISTICS	2

Course Outcomes (CO):

CO1: Summarise the scope of Biostatistics, types of data, and describe basic descriptive statistics.

CO2: Compute probabilities using the addition and multiplication theorems, and apply conditional probability.

CO3: Identify different types of random variables and calculate their expected values.

CO4: Compare and contrast discrete and continuous probability distributions.

CO5: Interpret correlation coefficients and apply simple linear regression to evaluate relationships between variables.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	2	R, U	F
CO2	2,4	U, Ap	C
CO3	2,4	U, Ap	C
CO4	2,4	U, Ap	C
CO5	2,4	U, Ap	C

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KCKnowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT:

Module I: Biostatistics: definition and scope, Types of data, Variables and their types, Graphical Methods, Descriptive Statistics.

Module outcomes:

MO1: Define and explain key concepts in biostatistics, including types of data and variables. *(Understanding)*

MO2: Classify data and choose appropriate graphical and descriptive methods for summarization. *(Understanding)*

MO3: Construct and interpret tables, charts, and summary statistics for given datasets. *(Applying)*

Module II: Probability Theory: Random experiments, events, Sample space, various definitions of

probability, properties of probability, addition and multiplication theorems of probability, conditional probability, and Bayes theorem.

Module outcomes:

MO1: State and explain the fundamental principles of probability theory. (*Understanding*)

MO2: Solve problems using addition, multiplication, and conditional probability rules. (*Applying*)

MO3: Apply Bayes' theorem to solve real-life probabilistic problems. (*Applying*)

Module III: Random variable: Types of Random variable, probability mass function (pmf), probability density function (pdf), cumulative distribution function, Mathematical Expectation, joint, marginal, and conditional distributions.

Module outcomes:

MO1: Differentiate between types of random variables and their associated functions. (*Understanding*)

MO2: Compute expectations and probabilities for single and joint distributions. (*Applying*)

MO3: Analyze joint, marginal, and conditional distributions for given variables. (*Analyzing*)

Module IV: Discrete Probability distributions: Bernoulli distribution, Binomial distribution, Poisson distribution, Geometric distribution, Multinomial distribution, Hypergeometric distribution, Negative Binomial Distributions (Properties and Applications).

Module outcomes:

MO1: Describe various discrete probability distributions and their properties. (*Understanding*)

MO2: Apply discrete distributions to solve practical problems. (*Applying*)

MO3: Compare and choose appropriate discrete distributions based on problem characteristics. (*Analyzing*)

Module V: Continuous Probability distributions: Uniform, Exponential, Gamma, Rectangular distribution Normal Distributions, and Lognormal distribution (Properties and Applications).

Module outcomes:

MO1: Summarize the properties and applications of common continuous probability distributions. (*Understanding*)

MO2: Use continuous probability models to compute probabilities and expectations. (*Applying*)

MO3: Interpret real-world phenomena using appropriate continuous distributions. (*Analyzing*)

Module VI: Correlation and Regression: Pearson's correlation coefficient, spearman rank correlation coefficient, Simple linear regression- lines of regression, Angle between the regression lines, and coefficients of Regression

Module outcomes

MO1: Explain the concept of correlation and regression with their coefficients. (*Understanding*)

MO2: Calculate and interpret Pearson's and Spearman's correlation coefficients. (*Applying*)

MO3: Fit a simple linear regression model and analyze the angle and coefficients of regression lines. (*Analyzing*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

Suggested Readings

- Altman, D. G. (1990). *Practical statistics for medical research* (1st ed.). Chapman and Hall/CRC.
- Le, C. T., & Eberly, L. E. (2016). *Introductory biostatistics* (2nd ed.). Wiley.
- Srivastava, S. (2010). *Understanding biostatistics*. Discovery Publishing House Pvt. Limited.
- Sullivan, L. M. (2022). *Essentials of biostatistics for public health*. Jones & Bartlett Learning.
- Vashisth, A. K. (2008). *Text book of biostatistics*. Arise Publishers & Distributors.

ASSESSMENT

40 per cent Continuous Assessment

60 per cent End Semester Assessment: 3 Hour Written Examination

Semester	Course Code	Course Name	Credits
1	DEM-CC-513	FERTILITY:THEORIES, DETERMINANTS AND METHODS	4

Course Outcomes (CO):

CO1: Explain the various determinants of Fertility

CO2: List the sources of data on fertility

CO3: Compute rates and indices on the measurement of fertility

CO4: Examine various measures of nuptiality

CO5: Examine theories on fertility

CO6: Describe the human reproductive system

CO7: Compute various measures of family planning

CO8: Explain the history of family planning in India **Tagging**

course outcomes:

CO	PSO	CL	KC
CO1	1,6	R, U	F
CO2	1, 3	U, Ap	C
CO3	1, 3	U, Ap	C
CO4	1, 3	U, Ap	C
CO5	1, 3	U, Ap	C
CO6	1, 3	U, Ap	C
CO7	1, 3	U, Ap	C
CO8	1, 3	U, Ap	C

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Introduction, concepts and definitions, Review, Determinants of Fertility, Social, Economic, Cultural, Biological, Psychological and Political. Fertility Measures: Introduction, Concepts, Types of Analysis: Period and Cohort measures – Crude birth rate (CBR), General Fertility Rates (GFR) , ASFR, TFR, , Specific rates- Marriage fertility rates- -Crude marriage rate, ASMR, OSDR, Parity specific fertility rates, PPR, Standardised fertility Rates. Replacement level of fertility and Replacement Index.

Module outcomes:

MO1: Define key concepts and determinants of fertility across social, economic, and biological domains (Understand)

MO2: Classify and calculate fertility measures including period and cohort indicators (Apply)

MO3: Interpret specific fertility rates such as ASFR, TFR, parity-specific rates, and PPR (Apply)

MO4: Evaluate fertility replacement level and replacement index in demographic analysis (Evaluate)

MODULE II: Measures of Nuptiality: Introduction, Crude Marriage Rate, General Marriage Rate, Age-specific marriage Rate, Total marriage Rate, mean age at Marriage, Singulate Mean Age at Marriage (John Hajnal) method.

Module outcomes:

MO1: Define nuptiality and describe measures such as CMR, GMR, and ASMR (Understand)

MO2: Calculate singulate mean age at marriage using John Hajnal's method (Apply)

MO3: Analyse trends and patterns in nuptiality using summary indices (Analyse)

MODULE III: Determinants of Fertility- Direct and Indirect determinants. Factors responsible for reduction of fertility- Developed countries, Developing countries, India and Kerala. Levels and Trends in Fertility: World, India and Kerala.

Module Outcomes:

MO1: Distinguish between direct and indirect determinants of fertility (Understand)

MO2: Analyse factors contributing to fertility decline across regions and countries (Analyse) MO3:

Compare fertility levels and trends in India, Kerala, and globally (Analyse)

MODULE IV: General Theories- Malthus & Demographic Transition Theories. Economic Theories of Fertility, Easterlin, Leibenstein, Caldwell, Social Theories of fertility- Freedman, Davis and Blake and Becker, and Biological Theories of fertility.

Module Outcomes:

MO1: Summarise general, economic, social, and biological theories of fertility (Understand)

MO2: Compare classical and contemporary fertility theories and their relevance (Analyse) MO3:

Evaluate theoretical explanations for fertility behaviour and transitions (Evaluate)

MODULE V: Family planning – Measures of family planning-unmet need, Couple Protection Rate (CPR), m-CPR; National Family Planning Programme in India-History, MCH Programmes, Family welfare programmes - Target free Approach Reproductive and Child Health Programmes

Module Outcomes:

MO1: Define key family planning indicators such as unmet need, CPR, and m-CPR (Understand)

MO2: Describe the evolution of India's family planning and welfare programmes (Understand)

MO3: Assess the impact of target-free approaches and RCH programmes on fertility (Evaluate)

MODULE VI: Reproductive Physiology, Male and Female Reproductive Systems, Menstrual Cycle, Fertilization, Conception and gestation, Fecundity and Sterility.

Module Outcomes:

MO1: Describe male and female reproductive anatomy and functions (Understand)

MO2: Explain physiological processes related to conception, gestation, and fertility (Understand)

MO3: Differentiate between fecundity, infertility, and sterility from a biological perspective (Analyse)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

Suggested Readings

- Bhende, Asha, and Tara Kanitkar. *Principles of Population Studies* (5th revised edition). New Delhi: Himalaya Publishing House, 2004.
- Bogue, Donald J. *Principles of Demography*. New York: John Wiley and Sons, 1969.
- Freedman, Ronald. "The Sociology of Human Fertility: A Trend Report and Bibliography." In *Sociology of Law*, edited by Kingsley Davis. London: London School of Economics and Political Science, 1962.
- Ghosh, B.N. *Population Theories and Demographic Analysis*. New Delhi: Meenakshi Prakashan.

- Hajnal, John. "Age at Marriage and Proportions Marrying." *Population Studies*, Vol. 7, No. 2.
- *International Encyclopedia of the Social Sciences*. 17 volumes. New York: Macmillan, 1968.
- Mishra, B.D. *An Introduction to the Study of Population*. New Delhi: South Asian Publishers Pvt. Ltd., 1981.
- Pathak, K.B., and F. Ram. *Techniques of Demographic Analysis*. Mumbai: Himalaya Publishing House, 1998.
- Ramakumar, R. *Technical Demography*. New Delhi: Wiley Eastern Ltd.
- Siegel, Jacob S., and David A. Swanson. *The Methods and Materials of Demography* (Second Edition). USA: Elsevier Academic Press, 2004.
- Sinha, V.C., and K.C. Zachariah. *Elements of Demography*.
- Srinivasan, K. *Basic Demographic Techniques and Applications*. New Delhi: Sage Publications, 1998.
- Sujatha, D. Sai. *Determinants of Fertility*. New Delhi: Serial Publications, 2012.
- United Nations. *World Population Policies*. 3 vols. New York: United Nations, 1987.

ASSESSMENT

40 per cent Continuous Assessment

60 per cent End Semester Assessment: 3 Hour Written Examination

Semester	Course Code	Course Name	Credits
1	DEM-CC-514	ESTIMATION AND HYPOTHESIS TESTING IN HEALTH RESEARCH	4

Course Outcomes (CO):

CO1: Describe the concepts of sampling distribution, standard error, and probability distributions used in statistical inference.

CO2: Explain the principles of point and interval estimation and interpret confidence intervals for population parameters.

CO3: Apply hypothesis testing procedures for means, proportions, and variances using appropriate test statistics.

CO4: Analyze categorical data using chi-square tests, tests of variance, and interpret ANOVA results in real-world scenarios.

CO5: Apply non-parametric tests to analyze data that do not meet parametric assumptions.

CO6: Compute and justify appropriate sample sizes for estimating population parameters and testing hypotheses.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1	R, U	C
CO2	1, 3	U, Ap	C
CO3	1, 3	U, Ap	P
CO4	1, 3	Ap, An	P
CO5	1, 3	Ap	P
CO6	1, 3	Ap, E	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT:

Module I: Sampling Distribution: Normal theory, standard error, Central limit theorem (statement only), distribution of mean, proportions and variance, t-distribution, F-distribution, and Chi-Square Distribution.

Module outcomes:

MO1: Define the concepts of sampling distribution, standard error, and the central limit theorem. *(Understanding)*

MO2: Explain the distributions of sample mean, proportion, and variance under normal theory. *(Understanding)*

MO3: Apply t, F, and Chi-square distributions in the context of sampling and inference. *(Applying)*

Module II: Estimation: Point Estimation: Parameter, statistic, estimate and estimator. Properties of a good estimator- unbiased, sufficiency, efficiency and consistency; minimum variance unbiased estimator, Cramer-Rao inequality and Rao-Blackwell theorem (statement and examples only). Methods of point estimation -Maximum likelihood estimation, Moment estimation and Method of least squares. Interval Estimation- confidence interval- background, interpretation, confidence interval for population mean, difference between two population means, confidence interval for population proportion & difference between two proportions, confidence interval for the variance, confidence interval for the ratio of two variances

Module outcomes:

MO1: Describe point and interval estimation methods and properties of good estimators. *(Understanding)*

MO2: Apply estimation techniques such as maximum likelihood, moments, and least squares. *(Applying)*

MO3: Interpret and compute confidence intervals for various population parameters. *(Analyzing)*

Module III: Testing of hypothesis I- Need for hypothesis testing, null and alternate hypothesis, types of errors, test statistic, critical value, level of significance, power of the test, p value and its interpretation, statistical & clinical significance; Steps involved in Testing of a hypothesis. Large and small sample tests, Applications of t-test – one sample, independent sample, paired, correlation coefficient, regression coefficient. Hypothesis test for single population proportion, Hypothesis test for difference between two population proportions; Bootstrapping.

Module outcomes:

MO1: Explain the logic of hypothesis testing, including null and alternative hypotheses, errors, and significance levels. *(Understanding)*

MO2: Perform t-tests for means, proportions, and correlation/regression coefficients using large and small samples. *(Applying)*

MO3: Interpret hypothesis test results, including p-values and their implications in statistical and clinical contexts. *(Analyzing)*

Module IV: Testing of hypothesis II: Chi-square test-independence of attributes, Goodness of fit, Fisher's exact test. Homogeneity of variance- F-test, Bartlett's test, Levene's test. Tests for normality, Clinical agreement: kappa statistics, Mantel-Haenszel test, Analysis of Variance (ANOVA): One way ANOVA, two way ANOVA and Repeated Measures ANOVA.

Module outcomes

MO1: Explain and apply chi-square tests for independence and goodness of fit. (*Applying*)

MO2: Conduct tests for homogeneity of variances and assess normality. (*Applying*) **MO3:** Analyze variance using one-way, two-way, and repeated measures ANOVA, including interpretation. (*Analyzing*)

Module V: Non-parametric Tests–Introduction to non-parametric statistics-data & variable type for non-parametric analysis, Sign Test, Median test, Wilcoxon Signed rank Test, The Mann Whitney Test, Kruskal-Wallis Test, Runs test, McNemar test, Kendall's tau.

Module outcomes

MO1: Describe the rationale for using non-parametric methods and identify appropriate data types. (*Understanding*)

MO2: Apply rank-based non-parametric tests for comparing groups. (*Applying*) **MO3:** Interpret the results of various non-parametric tests in real-life contexts. (*Analyzing*)

Module VI: Sample Size Estimation- Importance of sample size in research design, methods of calculating minimum sample size: estimation of mean and proportion, comparison of two means and proportions

Module outcomes

MO1: Explain the importance of sample size in research design and statistical validity. (*Understanding*)

MO2: Compute sample sizes for estimation and hypothesis testing involving means and proportions. (*Applying*)

MO3: Evaluate sample size requirements for different study objectives and designs. (*Evaluating*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

Suggested Readings

- Altman, D. G. (1990). *Practical statistics for medical research* (1st ed.). Chapman and Hall/CRC.
- Le, C. T., & Eberly, L. E. (2016). *Introductory biostatistics* (2nd ed.). Wiley.
- Srivastava, S. (2010). *Understanding biostatistics*. Discovery Publishing House Pvt. Limited.
- Sullivan, L. M. (2022). *Essentials of biostatistics for public health*. Jones & Bartlett Learning.
- Vashisth, A. K. (2008). *Text book of biostatistics*. Arise Publishers & Distributors.

ASSESSMENT

40 per cent Continuous Assessment

60 per cent End Semester Assessment: 3 Hour Written Examination

Semester	Course Code	Course Name	Credits
1	DEM-CC-515	DATA ANALYSIS USING SPSS AND MS EXCEL	2

Course Outcomes (CO):

CO1: Understand what data is and how to manage it

CO2: Create hands-on experience in data preparation, data cleaning & data analysis using SPSS

CO3: Apply the knowledge for Data documentation, Data collection and Data Sharing using SPSS and Excel

CO4: Understand effective visualization of data using SPSS and Excel.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	2	U, An	C
CO2	2	Ap, Cr	P
CO3	2, 3	Ap, E	P
CO4	2	U, Ap	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENTS

MODULE I: Getting started with SPSS - Familiarising SPSS windows, menus, and dialogue boxes- Open, save, and close SPSS data and output files - Prepare a data entry codebook and Create a SPSS data file.

Module Outcomes:

MO1: Identify key features of the SPSS interface including windows, menus, and dialogue boxes (Understand)

MO2: Create a codebook and enter data in SPSS following appropriate formats (Apply) MO3: Save, open, and manage SPSS data and output files (Apply)

MODULE II: Editing and Manipulating Data-Enter data into an SPSS data file - Check a data file for errors - Correct errors in the data file - Preliminary Analyses- Obtain descriptive statistics – frequencycrosstabs-Reducing and Transforming data -Compute procedure, Sorting the data file. Descriptive Analysis- Describing levels of measurements, Exploring the data- Create a variety of graphs and charts (histograms, bar graphs, line graph, Pie chart, line graph, scatter plot, dot plot, box plot etc.).

Module Outcomes:

MO1: Enter and clean data in SPSS using editing and checking procedures (Apply)

MO2: Perform basic descriptive analysis including frequencies, cross-tabs, and transformations (Apply)

MO3: Generate various graphs and charts for data exploration and presentation (Create)

MO4: Interpret graphical and descriptive summaries of data (Analyse)

MODULE III : Parametric tests using SPSS

Module Outcomes:

MO1: Identify appropriate parametric tests based on data type and research objective (Understand)

MO2: Conduct t-tests and ANOVA using SPSS (Apply)

MO3: Interpret output from parametric tests for statistical decision-making (Analyse)

MODULE IV: Non-parametric tests using SPSS

Module Outcomes:

MO1: Differentiate between parametric and non-parametric tests and identify suitable situations for each (Understand)

MO2: Perform non-parametric tests such as Chi-square, Mann–Whitney, Wilcoxon, and Kruskal–Wallis using SPSS (Apply)

MO3: Interpret SPSS output from non-parametric analyses (Analyse)

MODULE V: Overview of excel: Introducing excel, Entering and editing worksheet data, performing basic worksheet operations, working with excel ranges and tables, performing basic worksheet functions, printing in excel, creating charts in excel.

Module Outcomes:

MO1: Enter and manage worksheet data using basic Excel operations (Apply)

MO2: Perform formatting, printing, and organizing data into tables and ranges (Apply)

MO3: Create basic charts and visualizations in Excel (Create)

MODULE VI: Working with formulas and functions in excel: Introducing formulas and functions, using excel formulas- mathematical operations, date and time, conditional analysis, matching and Lookups and statistical analysis; analyzing data with pivot tables.

Module Outcomes:

MO1: Apply formulas for mathematical, logical, date/time, and conditional operations (Apply)

MO2: Use lookup, matching, and statistical functions to analyse data (Apply)

MO3: Summarise and analyse datasets using pivot tables in Excel (Analyse)

Suggested Readings

- Aldrich, J. O. and J. B. Cunningham. 2015. Using IBM SPSS Statistics: An interactive hands-on approach. 2nd Edition. SAGE Publications, Washington DC, USA.
- Cronk, B. C. 2017. How to use SPSS: a step-by-step guide to analysis and interpretation. 9th Edition. Routledge, New York, USA.
- Denis, D. 2019. SPSS Data Analysis for Univariate, Bivariate and Multivariate Statistics. John Wiley & Sons, Inc. Hoboken, NJ.
- Field, A. P. 2018. Discovering Statistics using SPSS (Introducing Statistical Method). 5th Edition. SAGE Publications Ltd., California, USA.
- George, D. and P. Mallery. 2018. SPSS Statistics 23 Step-by-Step: A Simple Guide and Reference 15th Edition. Routledge, New York, USA.
- Ho, Robert. 2014. Handbook of Univariate and Multivariate Data Analysis and Interpretation with SPSS. 2nd Edition. CRC Press, Boca Raton, Florida, USA.
- Kerr, A. W., H. K. Hall., and S. A. Kozub. 2014. Doing Statistics with SPSS. SAGE Publications, California, USA.
- Nicholson, J. R., & Nicholson, S. R. (1997). *Discover Excel 97*. New Delhi: IDG Books India (P) Ltd.
- Pallant, J. 2016. SPSS Survival Manual. 6th Edition. McGraw Hill, Berkshire, England
- Wagner, W. E. 2016. Using IBM SPSS Statistics for Research Methods and Social Science Statistics. 6th Edition. SAGE, California, USA.
- Wilson-Doenges, G. 2014. SPSS for Research Methods: A Basic Guide. John Wiley and Sons, New York : W. W. Norton & Company, Inc.

ASSESSMENT

- Record Book: 20 Marks. All students should prepare a fair record book and should be produced at the time of evaluation
- Viva-Voce: 20 Marks
- 60 Marks End Semester Assessment: 3-Hour Computer-Based Examination

Semester	Course Code	Course Name	Credits
1	DEM-DE-516	PRINCIPLES OF EPIDEMIOLOGY	2

Course Outcomes (CO):

CO1: Describe the aims, components, and uses of epidemiology and its role in public health practice

CO2: Explain modes of disease transmission, prevention levels, and control strategies for communicable and non-communicable diseases

CO3: Calculate basic epidemiological measures and standardise rates using appropriate methods **CO4:** Distinguish between various descriptive epidemiological study designs and assess their applications

CO5: Interpret the role of screening and diagnostic tests using key validity and reliability indicators

CO6: Evaluate epidemiological evidence while identifying and addressing potential biases in medical research

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1, 6	R, U	C
CO2	1, 4	U, Ap	C
CO3	2, 4	Ap, An	P
CO4	2, 4	An, E	C
CO5	4	Ap, An	P
CO6	4, 5	E, Cr	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

Module I: Foundations of Epidemiology- Epidemiology - Definition, Aims, Components & Approach,

Role of Epidemiology in Public Health Practice, Epidemics, Endemics, and Pandemics, Theories of Disease causation, Epidemiology Triad, Historic developments in Epidemiology. Association and causation explained. Uses of Epidemiology.

Module Outcomes:

MO1: Define epidemiology and explain its aims, components, and approaches (Understand) MO2: Describe the role of epidemiology in public health and classify epidemics, endemics, and pandemics (Understand)

MO3: Summarise major theories of disease causation and the epidemiological triad (Understand)

MO4: Analyse historical developments and uses of epidemiology in disease prevention and control (Analyse)

Module II: Epidemiology of Disease Transmission- Modes of disease transmission, Natural History of disease, Levels of prevention, Practical Concepts relating to Field Epidemiology - Communicable and Non communicable Diseases prevention and Control, Classification of diseases. National Health programs. Environmental & Occupational health.

Module Outcomes:

MO1: Explain modes of disease transmission and the natural history of disease (Understand)

MO2: Differentiate levels of prevention and their applications to disease control (Analyse)

MO3: Classify diseases and describe the scope of major national health programmes (Understand)

MO4: Assess environmental and occupational health risks using epidemiological principles (Evaluate)

Module III: Measurements in Epidemiology: Basic Measurements in Epidemiology – Rates, Ratios, Proportions, Basic epidemiological indicators including morbidity (incidence & prevalence), mortality indicators; Standardisation, Risk measures

Module Outcomes:

MO1: Calculate epidemiological indicators such as incidence, prevalence, and mortality rates (Apply)

MO2: Differentiate between rates, ratios, and proportions and their relevance in public health (Analyse)

MO3: Apply standardisation techniques to adjust for differences in population structures (Apply) MO4:

Interpret risk measures in epidemiological research (Analyse)

Module IV: Epidemiological Methods-1: Descriptive Study Designs in Epidemiology - Ecologic Study, Case Reports and Case Series, Cross-Sectional Surveys, Serial Surveys.

Module Outcomes:

MO1: Describe the characteristics and uses of ecologic studies, case reports, and case series (Understand)

MO2: Compare cross-sectional and serial surveys and their application in health research (Analyse)

MO3: Evaluate the strengths and limitations of descriptive epidemiological designs (Evaluate)

Module V: Epidemiological Methods-2: Analytical Observational Study Designs, Case-Control Study Design – Odds ratio, Bias - Selection Bias, Observation Bias, Misclassification, Confounding, Cohort studies, Nested Case-Control Study Design, Advantages and disadvantages of these study designs.

Module Outcomes:

MO1: Explain the structure and use of case-control and cohort study designs (Understand)

MO2: Calculate odds ratios and identify different types of bias in analytical studies (Apply)

MO3: Analyse the advantages and limitations of nested case-control and cohort studies (Analyse)

MO4: Evaluate strategies to reduce bias in analytical epidemiological research (Evaluate)

Module VI: Epidemiology in Medical Practice: Basic principles of Screening and Diagnostic tests, Sensitivity and Specificity, Reliability, Validity; Predictive Value Positive and Negative, Positive and Negative Likelihood Ratio; Prognosis - Lead-Time Bias, Length Bias, Selection Bias, Over diagnosis Bias, Avoiding Bias

Module Outcomes:

MO1: Explain the principles of screening and diagnostic test evaluation (Understand)

MO2: Calculate and interpret sensitivity, specificity, predictive values, and likelihood ratios (Apply)

MO3: Identify types of bias in prognosis and screening, including lead-time and length bias (Analyse)

MO4: Evaluate methods to minimise bias and ensure validity in medical practice (Evaluate)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

Suggested Readings

- Bouter, L., Zeegers, M., & Li, T. (2023). Textbook of Epidemiology. United Kingdom: Wiley.
- Friis, R. H., & Sellers, T. A. (2009). Epidemiology for Public Health Practice. United Kingdom: Jones and Bartlett Publishers.
- Nieto, F. J. (2018). Epidemiology. United Kingdom: Jones & Bartlett Learning.
- Park, J. E., & Park, K. (2004). *Textbook of Preventive and Social Medicine*. Jabalpur: Banarsidas Bhanot Publishers.
- Social Epidemiology. (2014). United Kingdom: Oxford University Press.
- Rothman, K. J. (2012). Epidemiology: An Introduction. United Kingdom: OUP USA.

- Webb, P., & Bain, C. (2010). Essential Epidemiology: An Introduction for Students and Health Professionals. Cambridge: Cambridge University Press.

ASSESSMENT

40 per cent Continuous Assessment

60 per cent End Semester Assessment: 3 Hour Written Examination

Semester	Course Code	Course Name	Credits
II	DEM-CC-521	MORTALITY: DETERMINANTS AND METHODS	4

Course Outcomes (CO):

CO1: Explain the fundamental concepts and definitions used in mortality studies

CO2: Make use of various sources of data on mortality

CO3: Identify the determinants and differentials of mortality

CO4: Examine the levels and trends of mortality at global, national (India) and regional (Kerala)

CO5: Apply various measures of mortality

CO6: Apply life table techniques in demographic analysis

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1	U	C
CO2	1, 3,6	U	C
CO3	1, 3,6	U	C
CO4	1, 3	U, E	C
CO5	1, 3	A	P
CO6	1,3,6	U, A	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

Module I

Mortality: Concepts and Definitions – mortality rate, Miscarriage, abortion, fetal deaths, still births, live birth, deaths, early and late neonatal death, infant death, child death, life expectancy, morbidity, survivorship. Source of data – census, vital statistics and sample surveys.

Module outcomes:

MO1: Define key concepts and definitions in mortality (Remember)

MO2: Summarize how data from census, vital statistics and surveys contribute to mortality analysis. (Understand)

Module II

Determinants of mortality: Social – education, income, social support networks, health care access, economic – poverty, unemployment, economic inequality, healthcare expenditure, biological- genetic factors, infectious diseases, chronic conditions, cultural – practices, beliefs, norms, healthcare seeking behaviors, psychological – mental health, stress, coping mechanisms and political – government policies, healthcare infrastructure, public health interventions. Levels and trends of mortality – World, India, Kerala

Module outcomes:

MO1: Explain the relationship between mortality and social, economic, biological and cultural factors (Understand)

MO2: Categorize determinants of mortality based on social, economic, biological, cultural, psychological and political dimensions (Apply)

MO3: Compare mortality trends across different regions and assess the factors contributing to regional disparities. (Evaluate)

Module III

Mortality Measures – Introduction, Crude and Specific Rates, Infant Mortality – Infant Mortality Rate, Neonatal mortality rate, Post neonatal mortality, Perinatal mortality, Foetal Death, Childhood mortality rates

Module outcomes:

MO1: Recall the basic formulas and components of mortality measures (Remember)

MO2: Describe the significance of the mortality measures in assessing the health status of populations. (Understand)

MO3: Categorize determinants of mortality based on social, economic, biological, cultural, psychological and political dimensions (Apply)

Module IV

Determinants of infant and child mortality: Social, economic, biological, cultural, psychological and political, role of public health policies. Levels and trends of infant mortality – World, India, Kerala

Module outcomes:

MO1: Explain the social, economic, biological, cultural, psychological and political factors influencing infant and child mortality (understanding).

MO2: Analyze the trends and levels of infant mortality at global, national and state levels using relevant demographic data (Analyze).

MO3: Summarize the impact of various public health policies on reducing infant and child mortality (Understanding).

Module V

Life table: Introduction, concepts, assumptions, types of life table, Columns of Life table, construction and interpretation – Linear, exponential, Reed and Merrell, Greville, Chiang, Keyfitz and Fraunthal, Applications and Uses of Life table – in demographic analysis – life expectancy, mortality differentials, net reproduction rates and projecting populations

Module outcomes:

MO1: Construct different types of life tables using appropriate demographic data and assumptions (Applying)

MO2: Analyze the components and columns of a life table to interpret measures like life expectancy, mortality rates and survival probabilities (Analyze).

MO3: Utilize life table techniques in demographic analysis (Applying).

Module VI

Maternal Mortality: Definition and measures – maternal mortality rate, maternal mortality ratio, Determinants – social, economic, biological, cultural, psychological and political factors. Levels and trends - Global, national (India) and regional (Kerala)

Module outcomes:

MO1: Define various measures of maternal mortality (Understand).

MO2: Explain the social, economic, biological, cultural, psychological and political determinants of maternal mortality (Understand).

MO3: Compare the levels and trends of maternal mortality at global, national, and regional levels (Understanding).

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation
- Debates
- Quiz
- Demonstration and use of software

Suggested Readings

- Bogue, Donald J: Principles of Demography, John Wiley and Sons, New York, 1969
- Bhende, Asha A and Tara Kanitkar: Principles of Population Studies – 5th rev. ed. Himalaya Publishers, Delhi, 1997
- Donald, T. Rowland (2003). Demographic Methods and Concepts. New York. Oxford University Press Inc.
- Hinde, Andrew (1998). Demographic Methods. London: Hodder Arnold Publications. John Hopkins University and San Beck (2008).
- Majumdar, P. K. (2010). *Fundamentals of Demography*. New Delhi: Rawat Publications.
- Misra, B.D: An Introduction to the Study of Population, South Asian, New Delhi 1981
- Shryock, Henry S et. al.: The Methods and Materials of Demography, New York, Academic Press, 1976
- Pathak, K.B. and F. Ram- Techniques of Demographic Analysis, 2nd Edition,
- Himalaya Publications
- Pollard, A.H., Yusuf, F. & Pollard, G.N. (1990). Demographic Techniques. (3rd ed.). Sydney: Pergamon Press.
- Ramakumar, R and Gopal Y S: Technical demography – New Delhi, Wiley Eastern, 1986
- Sinha and Zachariah: Elements of Demography, Allied Publishers Private Ltd, 1986
- Weeks, John R. (2005). Population. An Introduction to Concepts and Issues. 10th edition. • Various UN Reports

ASSESSMENT

40 per cent Continuous Assessment

60 per cent End Semester Assessment: 3 Hour Written Examination

Semester	Course Code	Course Name	Credits
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II	DEM-CC-522	DESIGN OF EXPERIMENTS AND CLINICAL TRIALS	4
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Course Outcomes (CO):

CO1: Explain the core principles of experimental design and identify sources of error and strategies for enhancing research validity.

CO2: Apply appropriate experimental designs to various research contexts and interpret the statistical results.

CO3: Describe the foundational elements, ethical considerations, and methodological standards in clinical trial design.

CO4: Apply statistical principles such as randomization, power, and sample size estimation in planning and analyzing clinical trials.

CO5: Evaluate different clinical trial designs and phases, including advanced strategies like crossover, factorial, and multicenter trials.

CO6: Implement quality control and data management practices in clinical research and address complex issues like subgroup analysis and multiplicity.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1	R, U	C
CO2	1, 3	U, Ap	C
CO3	1, 3	U, Ap	P
CO4	1, 3	Ap, An	P
CO5	1, 3	Ap, E	P
CO6	1, 3	U, Ap	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

Course Content

Module I: Fundamentals of Experimental Research Designs:

Introduction to Concepts & Design of experiments, Issues unique to Experimental Research, Basic principles of experimental design such as Randomization, Blinding, Measurement issues, Replication & blocking etc, Cause of errors: assignable and chance causes, Essential steps in planning experiments, Ensuring accuracy of experiments, Strength of Evidence, Standardization

Module Outcomes:

MO1: Explain the fundamental principles of experimental design including randomization, blinding, replication, and blocking. (*Understanding*)

MO2: Identify sources of experimental errors and outline strategies to minimize them. (*Understanding*)

MO3: Apply planning steps to ensure accuracy and standardization in experimental research. (*Applying*)

Module II: Experimental designs:

Completely Randomized design, Randomised complete block design, Balanced incomplete block design, Response surface experiments, Group allocation design, Factorial design and Latin square design and incomplete Latin Square design etc. (Description of the design, model and its assumptions, components, hypothesis testing steps, interpretation, application.)

Module Outcomes:

MO1: Describe the structure and assumptions of various experimental designs such as CRD, RCBD, and factorial designs. (*Understanding*)

MO2: Apply statistical models and perform hypothesis testing for different experimental designs. (*Applying*)

MO3: Interpret the results from experimental designs and assess their suitability for specific research objectives. (*Analyzing*)

Module III: Introduction to clinical trials:

Controlled & Uncontrolled trials, Historical perspectives of clinical trials, Objectives of clinical trials & Endpoints, Concept of clinical equipoise, Importance of Patient selection, Source of bias and its control, Randomization, Methods of Randomization, Blinding.

Module Outcomes:

MO1: Differentiate between controlled and uncontrolled clinical trials and explain their historical development. (*Understanding*)

MO2: Describe key clinical trial concepts including endpoints, equipoise, bias control, and patient selection. (*Understanding*)

MO3: Apply methods of randomization and blinding in clinical trial planning. (*Applying*)

Module IV: Applied Clinical Trials / Clinical Trials in practice

Phases of clinical trials (Drug Trails), Field clinical trials, Alternate clinical trial designs such as Cross over, Factorial, Equivalence, Noninferiority, Cluster randomized, Multicenter trial designs, Basic statistical inputs for understanding and interpreting clinical trials which should include Data types, distribution, significance tests, Sample size estimation and principles as applied to trials & Power estimation. Introduction to Meta-analysis.

Module Outcomes:

MO1: Describe various clinical trial phases and alternate design types such as crossover and factorial designs. *(Understanding)*

MO2: Interpret basic statistical principles applied in clinical trials, including sample size and power estimation. *(Applying)*

MO3: Explain the purpose and methodology of meta-analysis in the context of clinical research. *(Understanding)*

Module V: Ethical issues:

Ethical issues in clinical research; ICMR guidelines on ethical issues in medical research, International guidelines, Trials registries, Standardized quality assurance statements

Module Outcomes:

MO1: Describe the key ethical considerations in clinical research, including informed consent and participant safety. *(Understanding)*

MO2: Explain the role of ICMR and international guidelines in ensuring ethical clinical practices. *(Understanding)*

MO3: Identify requirements for clinical trial registration and standard quality assurance frameworks. *(Applying)*

Module VI: Quality Control & Management

Data safety, monitoring concept and Analysis, Reporting formats used for trials and experiments, Standard methods for analysis and reporting, flow sheet, Data quality control steps missing data, range and logical checks, data transfer and storage protocols. Specific issues relating to data analysis of clinical trials such as subgroup analysis, Interaction, confounding, Multiplicity of measurements, missing data etc. Publication & Reporting.

Module Outcomes:

MO1: Explain principles of data safety monitoring and reporting formats used in clinical trials. *(Understanding)*

MO2: Apply quality control techniques such as logical checks, handling missing data, and ensuring data security. *(Applying)*

MO3: Analyze trial data for specific issues like subgroup effects, multiplicity, and confounding. *(Analyzing)*

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation
- Debates
- Quiz
- Demonstration and use of software

Suggested Readings

- Anderson, V. L., & McLean, R. A. (1974). *Design of experiments: A realistic approach*. Taylor & Francis.
- Das, M. N., & Giri, N. C. (n.d.). *Design and analysis of experiments*. Wiley Eastern.
- Dean, A., & Voss, M. (n.d.). *Design and analysis of experiments*.
- Dunn, G., & Everitt, B. (1995). *Clinical biostatistics: An introduction to evidence-based medicine*. Edward Arnold.
- Everitt, B. S., & Pickles, A. (2004). *Statistical aspects of the design and analysis of clinical trials* (2nd ed.). Imperial College Press.
- Federer, W. T. (n.d.). *Experimental designs: Theory and methods*. Oxford & IBH.
- Friedman, L. M., Furberg, C. D., & DeMets, D. L. (1982). *Fundamentals of clinical trials*. PSG.
- Goon, A. M., Gupta, M. K., & Dasgupta, B. (n.d.). *Fundamental of statistics* (Vol. II). World Press.
- Khuri, A., & Cornell, M. (n.d.). *Response surface methodology*. Marcel Dekker.
- Park, K. (2023). *Park's textbook of preventive and social medicine*. Bhanot.
- Pocock, S. J. (1983). *Clinical trials: A practical approach*. Wiley Medical Publication.

ASSESSMENT

- 40 per cent Continuous Assessment
- 60 per cent End Semester Assessment: 3 Hour Written Examination

Semester	Course Code	Course Name	Credits
II	DEM-CC-523	MIGRATION AND URBANISATION - THEORIES, DETERMINANTS AND TECHNIQUES	4

COURSE OUTCOMES (CO):

CO1: To relate their knowledge of migration to the process of urbanisation.

CO2: To equip with different techniques for measuring migration and urbanisation.

CO3: To develop the skills of using different measures and techniques for understanding labour force.

CO4: To get aware about ancient theories and the Levels and trends in migration and urbanisation in the world, India and Kerala

CO5: To understand the concepts of labour force, labour migration, dependency ratio and work partition rates and explain their levels at National and state wise.

CO6: To understand the urban population growth in past and future and main driving forces of urbanisation in any economy

CO7: Understanding theories, concepts, models, and approaches to planning that have influenced the planning process.

CO8: Acquaint with planning terminologies & systems in India.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1	R, U	C
CO2	1, 3	U, Ap	C
CO3	1, 3	U, Ap	P
CO4	1, 3	Ap, An	P
CO5	1, 3	Ap, E	P
CO6	1, 3	U, Ap	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Concepts, definition and scope of migration, types of migration, factors affecting migration, consequences of migration, Determinants of Internal Migration, Sources of migration, Measures of migration – Crude migration rate, Age specific migration rate, migration streams, efficiency of streams, index of preference, Hamilton's rates, estimation of net migration from vital

statistics and survival rate, Estimation of Lifetime and Intercensal Migration from Place of Birth Data, Employment related migration among males and females

Module outcomes:

MO1: Define the key concepts, types, and scope of migration and identify the major determinants and consequences of migration (Understand)

MO2: Differentiate between the various measures of migration including crude and age-specific migration rates, migration streams, and indices such as efficiency and preference (Analyse) MO3: Estimate migration using indirect techniques such as survival rate, net migration from vital statistics, and place-of-birth data (Apply)

MO4: Examine employment-related migration trends and gender differences in internal labour mobility (Analyse)

MODULE II: Concepts and definition of urbanisation, Factors affecting urbanisation, consequences of urbanisation, measures of urbanisation – level of urbanization, speed of urbanization, Index of urbanization, Size of locality of residence of the median inhabitant, Rural to urban migration: trends and patterns in India.

Module outcomes:

MO1: Describe the concept and scope of urbanisation and identify the key factors influencing urban growth (Understand)

MO2: Analyse the socio-economic and environmental consequences of urbanisation at national and regional levels (Analyse)

MO3: Calculate and interpret measures of urbanisation such as level, speed, index, and median locality size (Apply)

MO4: Examine rural to urban migration trends and patterns in India, and assess their impact on urbanisation (Analyse)

MODULE III: Theories of migration and Urbanisation - Push and Pull Factors, Everett Lee's "PushPull theory", W.J. Reilly and G.K. Zipf, Ravenstein's Law of Migration, Stouffer's Theory of Mobility, Michal Todaro's Model of Rural-Urban Migration, Theories of urban growth-concentric zone model, Sector model, multiple nuclei model, Central place theory - Urban hierarchy.

Module outcomes:

MO1: Summarise major theories of migration including push-pull models, and historical laws of migration (Understand)

MO2: Analyse the relevance and application of selected migration theories in the Indian context (Analyse)

MO3: Describe the classical models of urban structure and growth, including concentric zone, sector, and multiple nuclei models (Understand)

MO4: Evaluate the applicability of central place theory and the concept of urban hierarchy in explaining urban spatial patterns (Evaluate)

MODULE IV: Migration Trends and Patterns in India - Migration from India in Pre-Independence Era, Reasons for Migration, Regional pattern in migration, Pattern of Temporary Labour migration, Determinants and consequences of internal migration - Determinants of Internal Migration, Consequences of Internal Migration, Stages of urbanization, Urbanisation and Shift from Agriculture to Non-agricultural Activities, Trends in Urbanisation- World, India and Kerala, The Determinants of Urbanisation, Urbanization and Environmental Issues.

Module outcomes:

MO1: Trace the historical and contemporary patterns of internal and international migration in India, including pre-independence migration (Understand)

MO2: Analyse the determinants and consequences of internal migration, with special reference to temporary labour migration (Analyse)

MO3: Interpret trends and regional patterns of urbanisation in India, Kerala, and globally using secondary data (Analyse)

MO4: Evaluate the interlinkages between urbanisation, sectoral shift from agriculture, and environmental challenges (Evaluate)

MODULE V: Labour Force - measures of Dependency- Work Participation Rates-Labour migration, Periodic Labour Force Survey.

Module outcomes:

MO1: Define labour force concepts and compute measures such as work participation rates and dependency ratios (Apply)

MO2: Analyse the patterns and determinants of labour migration in India using data from the Periodic Labour Force Survey (Analyse)

MO3: Evaluate the gendered dimensions of labour migration and their implications for employment policy and social protection (Evaluate)

MODULE VI: Urban planning systems in India, 5 stages of multi-level planning in India, Plan formulation and planning process, Types of Plans its contents and their interrelationships- Perspective Plan, Regional Plan, Development Plan, Master Plan, Special plans, Zonal Plan and Local Area Plans, Annual Plans, Projects and schemes, etc., Urban renewal,

Module outcomes:

MO1: Describe the multi-level planning structure in India, including the roles of national, state, district, and local planning bodies (Understand)

MO2: Differentiate between various types of plans—perspective, regional, master, zonal, and annual and explain their interrelationships (Understand)

MO3: Analyse the process of plan formulation and implementation, with special focus on decentralised and participatory planning approaches (Analyse)

MO4: Evaluate selected urban renewal programmes and planning case studies in light of the 73rd and 74th Constitutional Amendments (Evaluate)

Suggested Class Room Activities:

- Assignments
- Seminar Presentation on selected topics
- Test Paper
- Debates
- Quiz

SUGGESTED READINGS

- Bhagat, R. B. (2008). Assessing the measurement of internal migration in India. *Asia Pacific Migration Journal*, 17(1), 91–102.
- Bhagat, R. B. (2011). Emerging pattern of urbanization in India. *Economic and Political Weekly*, 46(34), 10–12.
- Bhende, A., & Kanitkar, T. (2006). *Principles of Population Studies*. New Delhi: Himalaya Publishing House.
- Henry, L. (1972). *Population Analysis and Models*. London: Edward Arnold.
- India Migration Report 2020: Kerala Model of Migration Surveys. (2020). India: Taylor & Francis.
- Keshri, K., & Bhagat, R. B. (2012). Temporary and seasonal migration: Regional pattern, characteristics and associated factors. *Economic and Political Weekly*, 47, 81–88.
- Keshri, K., & Bhagat, R. B. (2013). Socioeconomic determinants of temporary labour migration in India: A regional analysis. *Asian Population Studies*, 9(1), 81–88.
- Land, K. C., & Rogers, A. (1982). *Multidimensional Mathematical Demography*. New York:
- Mukherji, S. (2013). *Migration in India: Links to Urbanization, Regional Disparities and Development Policies*. New Delhi: Rawat Publications.
- National Sample Survey Organisation. (2010). *Migration in India 2007–2008* (Report No. 533, 64/10.2/2). New Delhi: Ministry of Statistics and Programme Implementation, Government of India.

- Pathak, K. B., & Ram, F. (1998). Techniques of Demographic Analysis. New Delhi: Himalaya Publishing House..
- Rajan, S. I., & Prabha, G. R. (2008). Measuring international migration to India. Asia Pacific Migration Journal, 17(3–4), 277–286.
- Ramakumar, R. (1986). Technical Demography. New Delhi: Wiley Eastern Ltd.
- Shryock, H. S., Siegel, J. S., & Associates. (1976). The Methods and Materials of Demography. New York: Academic Press.
- United Nations. (1956). Manual III: Methods for Population Projections by Sex and Age. New York: United Nations.
- United Nations. (1970). Methods of Analysing Census Data on Economic Activities of the Population. New York: United Nations.
- Weeks, J. R. (2008). Population: An Introduction to Concepts and Issues. Belmont, CA: Thomson/Wadsworth.

ASSESSMENT

- 40 per cent Continuous Assessment
- 60 per cent End Semester Assessment: 3 Hour Written Examination

Semester	Course Code	Course Name	Credits
II	DEM-DE-524	SAMPLING TECHNIQUES	2

Course Outcomes (CO):

CO1: Describe the fundamental concepts, types, and errors associated with survey sampling.

CO2: Explain and apply simple random sampling methods, including estimation of population parameters and sample size determination.

CO3: Apply stratified and systematic sampling techniques and compute estimates with associated sampling variances.

CO4: Analyze complex sampling designs such as probability proportional to size, cluster, and multistage sampling

CO5: Compare different non-random sampling methods and evaluate their appropriateness in various research contexts.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1	R, U	C
CO2	1, 3	U, Ap	C
CO3	1, 3	U, Ap	P
CO4	1, 3	Ap, An	P
CO5	1, 3	Ap, E	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT:

Module I: Basic Concepts in Sampling: Notions of population, sample and Sampling; Need for conducting a survey; Basic principles of sample surveys, principal steps in sample surveys; Notions used in survey sampling; Sampling and Non-Sampling Errors; Probability Sampling and NonProbability Sampling

Module Outcomes:

MO1: Define key terms such as population, sample, and sampling errors. (*Remembering*)

MO2: Explain the principles and steps involved in conducting a sample survey. (*Understanding*) MO3: Distinguish between probability and non-probability sampling methods and identify sources of errors in surveys. (*Analyzing*)

Module II: Simple Random Sampling Methods: Description; Methods of Selection; Simple Random Sampling with and without replacement-Methods of selection, Estimation of Population Mean and Total, Estimation of Population Variance, Estimation of Variance of Sample Mean; Simple Random Sampling for attributes; Determination of Sample size. Sampling weight concept and computation.

Module Outcomes:

MO1: Describe the procedures for simple random sampling with and without replacement. (*Understanding*)

MO2: Compute estimates of population parameters and their variances using simple random sampling. (*Applying*)

MO3: Apply sample size determination methods and understand the concept of sampling weights. (*Applying*)

Module III: Stratified and Systematic Sampling: Stratified sampling- Description-Stratification and Stratified Populations; Allocation and Selection of Units; Estimation of parameters-Total, Mean and Proportion; Sampling Variance of Estimates- Mean, Total and Proportion. Systematic Sampling-Description; Method of selection; Advantages and Disadvantages of Systematic Sampling; Estimation of Parameters and their Sampling Variances.

Module Outcomes:

MO1: Explain the concept and implementation of stratified sampling and allocation methods. (*Understanding*)

MO2: Estimate population parameters and their variances using stratified sampling. (*Applying*) MO3: Describe and evaluate systematic sampling procedures, including advantages and limitations. (*Analyzing*)

Module IV: Varying Probability Sampling Schemes- Probability Proportional to Size Sampling with and without replacement- Description, Selection Procedures of a sample; Sampling variance of estimators. Cluster Sampling- Description; Preparation of artificial clusters; Methods of selection; Estimation of sampling variance.

Module Outcomes:

MO1: Describe the concept and selection procedures of probability proportional to size (PPS) sampling. (*Understanding*)

MO2: Compute estimators and sampling variances for PPS sampling designs. (*Applying*) MO3: Explain cluster sampling procedures and assess sampling variance estimation in clustered designs. (*Analyzing*)

Module V: Multi-stage designs- Two-stage design with equal and unequal size clusters; selection of sampling units at different stages-selection of PSUs, selection of second-stage units, selection of individuals within a household.

Module Outcomes:

MO1: Explain the structure and rationale for multi-stage sampling designs. (*Understanding*)

MO2: Describe the selection process of sampling units at various stages. (*Understanding*) MO3: Apply multi-stage sampling concepts in designing complex surveys involving multiple units. (*Applying*)

Module VI: Non-Random Sampling Methods- Concept of Non-Random Sampling, its types: convenient, purposive, quota, double, and snowball sampling methods. Advantages and disadvantages of non-random sampling methods.

Module Outcomes:

MO1: Define and distinguish between types of non-random sampling methods. (Remembering) MO2: Explain the applications, advantages, and limitations of various non-probability sampling methods. (Understanding)

MO3: Evaluate the appropriateness of non-random sampling designs in specific survey contexts. (Evaluating)

Suggested Class Room Activities:

- Assignments
- Seminar Presentation
- Test Paper
- Quiz

Suggested Readings

- Chaudhuri, A. (2018). *Survey sampling*. CRC Press.
- Kish, L. (1965). *Survey sampling*. Wiley.
- Ladusingh, L. (2018). *Survey sampling methods*. Prentice Hall India Pvt. Limited.
- Latpate, R., Kshirsagar, J., Kumar Gupta, V., & Chandra, G. (2021). *Advanced sampling methods*. Springer Nature Singapore.
- Murthy, M. N. (1967). *Sampling theory and methods*. Statistical Publishing Society.
- Roy, T. K., Acharya, R., & Roy, A. (2016). *Statistical survey design and evaluating impact*. Cambridge University Press.

ASSESSMENT

40 per cent Continuous Assessment

60 per cent End Semester Assessment: 2 Hour Written Examination

Semester	Course Code	Course Name	Credits
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II	DEM-DE-525	RESEARCH METHODOLOGY	2
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Course Outcomes (CO):

CO1: Explain the scope and types of social research and differentiate major research approaches

CO2: Describe research designs and identify appropriate measurement techniques

CO3: Design quantitative tools and apply methods for data collection and organization

CO4: Apply qualitative methods in diverse research settings through field-based practice

CO5: Summarise systematic review steps and perform meta-analysis CO6:

Conduct field research, analyse data, and prepare a research report.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1, 2	R, U	C
CO2	2	U, Ap	C
CO3	2	U, Ap	P
CO4	2, 6	Ap, An	P
CO5	2, 5	Ap, E	P
CO6	2, 5	Ap, Cr	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Social Research, Scope of Social Research, Development of Research Methodology- Nature and Importance of research, aims of social research, research process, pure research vs. applied research, qualitative research vs quantitative research, exploratory research, descriptive research and experimental research, Stages of research process, Hypotheses.

Module Outcomes:

MO1: Explain the nature, scope, and significance of social research in public health and demography (Understand)

MO2: Distinguish among different types of research approaches such as pure vs. applied and qualitative vs. quantitative (Analyse)

MO3: Describe the stages of the research process and formulate research questions and hypotheses (Apply)

MO4: Compare exploratory, descriptive, and experimental research designs and evaluate their relevance to specific research problems (Evaluate)

MODULE II: Research Designs- Meaning of Research Design. Functions and goals of Research Design, characteristics, phases, designs for different types of research and levels of Measurement of variables.

Module Outcomes:

MO1: Define research design and explain its purpose, goals, and characteristics (Understand)

MO2: Identify the phases of research design and their role in shaping a study's methodology (Understand)

MO3: Select appropriate research designs for various types of research questions and levels of measurement (Apply)

MO4: Analyse the suitability of different research designs in demographic and public health studies (Analyse)

MODULE III: Quantitative Methods of Data Collection - Primary data and secondary data, tools and techniques of collecting data. Construction of Questionnaire/interview schedule-Principles and Designs, Types of questions, framing of questions, sequencing of sections and questions and Interview techniques. Index construction and Scaling methods

Module Outcomes:

MO1: Differentiate between primary and secondary data sources and describe their relevance in demographic research (Understand)

MO2: Construct a structured questionnaire or interview schedule using appropriate principles of design and question framing (Apply)

MO3: Apply various techniques of data collection including interviews, scaling methods, and index construction (Apply)

MO4: Evaluate the strengths and limitations of quantitative tools in capturing population-level information (Evaluate)

MODULE IV: Qualitative Methods of Data Collection: Walk through and observation (participatory and non-participatory), Social mapping, key informant interview, In-depth interviews, Case Studies, Focus group discussion, content analysis, free listing, pile sorting. **Module Outcomes:**

MO1: Describe various qualitative techniques such as observation, case studies, and focus group discussions (Understand)

MO2: Apply participatory tools like social mapping, free listing, and pile sorting in data collection (Apply)

MO3: Conduct in-depth interviews and key informant interviews using appropriate strategies (Apply)

MO4: Analyse qualitative data using techniques such as content analysis and thematic categorization (Analyse)

MODULE V: Systematic Review and Meta Analysis. Research Proposal writing, Project Report Writing, Bibliography, Citation, Reference Managers. Ethical Issues in Social Research- Informed Consent, Privacy & Confidentiality, Minimising harm, Justice, Beneficence, Plagiarism.

Module Outcomes:

MO1: Explain the process and purpose of systematic reviews and meta-analysis in evidence synthesis (Understand)

MO2: Prepare a research proposal and project report following standard academic formats (Apply)

MO3: Use citation styles and reference management tools for scholarly writing (Apply)

MO4: Evaluate ethical issues in research, including plagiarism, and demonstrate academic integrity (Evaluate)

MODULE VI: Field practical

Module Outcomes:

MO1: Design and execute a small-scale field study addressing a demographic or public health issue (Apply)

MO2: Collect and manage primary data using appropriate quantitative and/or qualitative methods (Apply)

MO3: Analyse field data and prepare a structured research report (Analyse) MO4: Reflect on fieldwork experience and assess challenges in real-world research settings (Evaluate)

Suggested Classroom Activities:

- Assignments,
- Seminar Presentations
- Debates & Discussions
- Quiz
- Field Work

Suggested Readings

- Blalock, H. M., & Blalock, A. B. (Eds.). (1968). *Methodology in Social Research*. New York: McGraw-Hill.
- Finil, A., & Kosecoff, J. (n.d.). *How to Conduct Surveys: A Step-by-Step Guide*. New Delhi: Sage Publications.
- Kothari, C. R. (2010). *Research Methodology: Methods and Techniques*. New Delhi: New Age International Publishers.
- Mills, J., & Birks, M. (2014). *Qualitative Methodology: A Practical Guide*. United Kingdom: SAGE Publications.
- Nachmias, D., & Frankfort-Nachmias, C. (1976). *Research Methods in the Social Sciences*. New York: St. Martin's Press.
- *Qualitative Secondary Analysis*. (2019). United Kingdom: SAGE Publications.
- Wilkinson, T. S., & Bhandarkar, P. L. (n.d.). *Methodology and Techniques of Social Research*. Mumbai: Himalaya Publishing House.

ASSESSMENT:

40 per cent Continuous Assessment.- 20 marks for mid-semester examination, 10 marks for the report of field practicum, 10 marks for viva-voce based on the field practicum

60 per cent End- Semester Assessment: (2 hour Written Exam.)

Semester	Course Code	Course Name	Credits
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III	DEM-CC-531	POPULATION, ENVIRONMENT, AND DEVELOPMENT	4
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Course Outcomes (CO):

CO1: Describe the interaction between population growth and various dimensions of environment and development

CO2: Explain the theories describing the relation between population and development

CO3: Analyse various dimensions of human development through the various measures of human development

CO4: Relate population growth and age structure transitions with unemployment, factors of production, saving, etc., sustainable development and window of opportunity

CO5: Explain the decentralized planning and panchayatiraj system in India CO6:

Describe the basic concepts on environment and environmental policies **Tagging**

course outcomes:

CO	PSO	CL	KC
CO1	1, 6	U, An	C
CO2	1, 6	U, An	C
CO3	2, 6	An, E	C
CO4	1, 3	An, E	C
CO5	5, 6	U, Ap	C
CO6	6	R, U	C

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Basic concepts and definitions of development. Sen's concept of development. Sustainable development. Economic development versus economic growth. Globalisation and global economy. Indicators of development - Utility, Consumption, Production, Distribution and exchange

Module outcomes:

MO1: Define key concepts and dimensions of development including Sen's capabilities approach and sustainable development (Understand)

MO2: Differentiate between economic development and economic growth in the context of globalisation and global economy (Analyse)

MO3: Interpret various indicators of development such as utility, consumption, production, and distribution (Apply)

MO4: Evaluate the relevance of traditional and modern development indicators in measuring human progress (Evaluate)

MODULE II: Effects of economic development on population growth and vice versa -Coale and Hoover study. Various debates - Malthusian theory, Marxian approach, Leibenstein's critical minimum effort theories, Easterlin's hypotheses. Human Development. Population and employment. Labour force. Work participation. Unemployment. Types of unemployment. Unemployment in India and Kerala Underemployment **Module outcomes**

MO1: Analyse the reciprocal relationship between population growth and economic development using classical and modern theories (Analyse)

MO2: Compare the perspectives of Malthus, Marx, Leibenstein, and Easterlin on the populationdevelopment nexus (Analyse)

MO3: Examine the role of human development and labour force dynamics in shaping employment trends (Understand)

MO4: Evaluate the nature and types of unemployment in India and Kerala, and their implications for economic policy (Evaluate)

MODULE III: Demographic aspects of development. Linkages among population, environment and development, Population and natural resources, Factors of production,

Socioeconomic and demographic factors influencing savings, capital formation and investment, Millennium Development Goals (MDG), Sustainable development goals (SDG), Age structural transition in India, Demographic dividend

Module outcomes

MO1: Examine the interlinkages between population, environment, and development (Analyse) MO2: Assess how demographic and socioeconomic factors influence savings, capital formation, and investment (Evaluate)

MO3: Explain the relevance of global frameworks such as MDGs and SDGs in shaping population and development policies (Understand)

MO4: Analyse the implications of age-structural transition and demographic dividend in India's development trajectory (Analyse)

MODULE IV: Population and Environment, Density and Carrying capacity- Population Growth and Density Changes, Geographical distributions of Population-Ecology and Eco system-Major procurement pattern, Human Ecological Organization Environmental Degradation-Pollution-Slums and urban poor-Environmental quality- Women and Environment-Waste management- Land Use Urbanisation and its impact on Environment- Land use pattern theory

Module outcomes

MO1: Explain the ecological foundations of population growth and spatial distribution, including concepts of density and carrying capacity (Understand)

MO2: Analyse the human ecological organization and patterns of environmental degradation including slums, pollution, and waste (Analyse)

MO3: Evaluate the gendered dimensions of environmental challenges with special reference to women and urban poor (Evaluate)

MO4: Assess the impact of urbanisation and land-use changes on environmental quality using relevant theories (Evaluate)

MODULE V: Development of human capital. Concepts and measures. PQLI, HDI, Gender adjusted HDI, Human poverty index. Human development in India, Women and development - Concept and indicators of status of women, interrelationship between status of women and demographic change

Module outcomes

MO1: Define human capital and identify its key indicators such as PQLI, HDI, gender-adjusted HDI, and HPI (Understand) MO2: Interpret trends in human development in India with emphasis on regional disparities (Analyse)

MO3: Analyse the interrelationship between women's status and demographic outcomes using appropriate indicators (Analyse)

MO4: Evaluate policy approaches to promoting gender equity and human capital development in India (Evaluate)

MODULE VI: Environmental policy-Basic aspects of Environmental policy- International Environmental Policy, India's Environmental Policy, Industrial Location Policy-Law and Environmental Protection in India – UN Environmental summits – Rio, Kyoto, etc. Decentralized planning people's participation in rural development in India. Panchayatiraj system Kerala's case

Module outcomes

MO1: Summarise the evolution of international and national environmental policies and agreements (Understand)

MO2: Analyse India's environmental protection laws and industrial location policies (Analyse) MO3: Evaluate the effectiveness of decentralised planning and people's participation in rural development with reference to Panchayati Raj (Evaluate) MO4: Assess Kerala's environmental and participatory planning initiatives as a model of grassroots governance (Evaluate)

Suggested Class Room Activities:

- Assignments
- Seminar Presentation on selected topics
- Quiz
- Group discussion

Suggested Readings:

- Helen James (2019): Population Development and the Environment: Challenges to achieving the Sustainable Development Goals in the Asia Pacific, Palgrave Macmillan, Singapore
- Gareth Covington (2010): International Encyclopedia of Sustainable Development, Apple Academic Press, Oakville
- Jain R K (2019): Population, Development & Environment: Omega Publications, New Delhi
- Coale, Ansley J and Edger M Hoover: Population growth and economic development in low income countries a case study of India's prospects, New Nursey, Princeton, University Press, 1958
- Shivaramen : Democratic Decentralization in Panchayat Raj system. MD publication Pvt. Ltd., New Delhi
- Sundar Ram D (2007) Panchayati Raj Reforms in India: Power to the People at the Grassroots, Kanishka Publishers, Delhi
- Kumar R and Meenal Kumar (2009): Encyclopaedia of women health and empowerment, Deep & Deep, New Delhi
- Goryacheva,A M : Population and Economic Growth in India, Agricole Publishing Academy
- Ghosh,B N: Studies in Population and Economic Development Vol.1&II Deep and Deep Publication
- Bogue, Donald J: Principles of demography, John, Wiley and Sons, New York, 1969 • CDS Working Paper; Panchayat Raj System in Kerala

Assessment

40 per cent Continuous / Formative Assessment

60 per cent End-semester/Summative Assessment: 3 hour written Exam.

Semester	Course Code	Course Name	Credits
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III	DEM-CC-532	LIFE TABLE AND SURVIVAL ANALYSIS	4
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Course Outcomes (CO):

CO1: Explain concepts, types, and methods of life table construction

CO2: Construct and interpret multiple decrement and cause-elimination life tables

CO3: Analyse health and disability-free life expectancy using statistical methods

CO4: Apply multistate life tables and estimate health transition probabilities

CO5: Interpret survival models and test differences between survival curves CO6:

Apply proportional hazard and Cox regression models to analyse survival data

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1, 2	R, U	C
CO2	1, 2	Ap, An	P
CO3	2, 3	An, E	C
CO4	2, 3	Ap, An	P
CO5	2	Ap, E	P
CO6	2	Ap, An	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

Course Content

MODULE 1: Brief history, The concept, Assumptions, The Columns, other life table rates and its relationships, Various type of Life tables, construction of Life tables, mortality laws, Various methods of life table construction, linear, exponential, Reed and Merrell, Greville's, Keyfitz model, Keyfitz and Fraunthal, Chiang's method, Different ways of handling censoring.

Module outcomes:

MO1: Explain the basic concepts, assumptions, and structure of life tables (Understand)

MO2: Describe different types of life tables and their interrelated functions (Understand)

MO3: Apply classical and modern methods for constructing life tables, including Greville, Keyfitz, Chiang, and others (Apply)

MO4: Compare mortality models and evaluate approaches to handle censored data (Evaluate)

MODULE 2: Multiple Decrement Life table and Cause Elimination: Nuptiality tables, Contraceptive Effectiveness, Computation of Cause-of- Death Life Tables – Calculation of age specific and age and cause specific death rates, Distribution of cause of deaths in each age groups, Calculation of probability of death by each specified cause, Calculation of life table by cause elimination, Construction of decrement life table by cause elimination.

Module outcomes:

MO1: Construct nuptiality tables and using decrement models (Apply)

MO2: Compute cause-specific and age-specific death rates and probabilities of death by specified causes (Apply)

MO3: Construct decrement life tables incorporating cause-elimination techniques (Apply)

MO4: Evaluate the impact of eliminating causes of death on life expectancy (Evaluate)

MODULE 3: Healthy (Disability Free) Life Expectancy: Concept of Health, Concept of Health Expectancy, Measures of Health Expectancy, Methods of Calculating Health Expectancy, Data sources, Trends in Life Expectancy, Trends in Healthy Life Expectancy, Trends in Prevalence of Disability, Trends in Unhealthy life Expectancy, Proportion of Life with and w/o Disability.

Module outcomes:

MO1: Explain the concept and relevance of health expectancy and its components (Understand) MO2: Identify data sources and interpret trends in life expectancy, disability prevalence, and unhealthy life expectancy (Analyse)

MO3: Apply statistical techniques to compute disability-free life expectancy and proportion of life with disability (Apply)

MO4: Assess the implications of changing health expectancy for public health and ageing (Evaluate)

MODULE 4: Multistate Life Tables and Health Transition Probabilities: Health Expectancies for various stages of Health, Flow Diagram for a Three State Markov chain Model, Methods of calculation of Various Health Expectancies. Working Life Table.

Module outcomes:

MO1: Describe multistate life tables and three-state Markov chain models for health transitions (Understand)

MO2: Construct health expectancies using multistate models and flow diagrams (Apply)

MO3: Apply methods for estimating working life expectancy and transition probabilities (Apply)

MO4: Analyse the demographic and policy implications of multistate life tables (Analyse)

MODULE 5: Survival Models, Part-I: Survival models, Actuarial Life tables – Statistical inference, Testing the difference between two survival curves, calculation of life tables from the proportional hazard Model.

Module outcomes:

MO1: Explain the basics of survival models and their connection to actuarial life tables (Understand)

MO2: Apply methods to statistically test differences between survival curves (Apply)

MO3: Construct survival curves using proportional hazard assumptions (Apply)

MO4: Interpret survival functions in demographic and biostatistical contexts (Analyse)

MODULE 6: Survival Models, Part-II : Proportional Hazard Models, Basic form of the Proportional Hazard Model, Cox Regression, Redefinition of Baseline Hazard Function, Relative risk as measures of effect on the Hazard, Hazard regression coefficient as measures of effect on the Log Hazard, Effect on the Hazard when the predictor variable with more than two categories, Changing the reference category of a categorical predictor variable.

Module outcomes:

MO1: Explain the structure and assumptions of the proportional hazard model (Understand) MO2: Apply Cox regression to estimate the effect of covariates on hazard rates (Apply)

MO3: Interpret hazard ratios and log-hazard coefficients in models with categorical predictors (Analyse)

MO4: Evaluate changes in model interpretation due to changes in reference categories (Evaluate)

Suggested Class Room Activities:

- Assignments
- Seminar Presentation on selected topics
- Quiz
- Group discussion

Suggested Readings:

- Chiang, C. L. (1984). *Life Table and Its Applications*. Malabar, FL: R.E. Krieger Publishing Company.
- Elandt-Johnson, R. C., & Johnson, N. L. (1999). *Survival Models and Data Analysis* (Wiley Classics Library ed.). New York: Wiley.
- Hinde, A. (1998). *Demographic Methods*. London: Arnold.
- Kalbfleisch, J. D., & Prentice, R. L. (1980). *The Statistical Analysis of Failure Time Data* (Wiley Series in Probability and Mathematical Statistics). New York: Wiley.
- Keyfitz, N. (1977). *Applied Mathematical Demography*. New York: John Wiley and Sons.
- Namboodiri, K., & Suchindran, C. M. (1987). *Life Table Techniques and Their Applications*. Orlando: Academic Press.
- Shryock, H. S., & Siegel, J. S. (2007). *The Methods and Materials of Demography*, Vol. 2. China: Emerald.
- Pathak, K.B., and F. Ram. *Techniques of Demographic Analysis*. Mumbai: Himalaya Publishing House, 1998.
- Ramakumar, R. (1986). *Technical Demography*. New Delhi: Wiley Eastern Ltd
- Srinivasan, K. *Basic Demographic Techniques and Applications*. New Delhi: Sage Publications, 1998.

Assessment

40 per cent Continuous Assessment

60 per cent End-semester Assessment: 3 hour written Exam.

Semester	Course Code	Course Name	Credits
III	DEM-CC-533	PUBLIC HEALTH, MONITORING AND EVALUATION	4

Course Outcomes (CO):

CO1: Define key concepts of health, morbidity, reproductive health, and health transitions **CO2:** Identify nutritional needs and analyse nutrition-related issues using national data **CO3:** Explain the design and methodology of large-scale health surveys in India **CO4:** Distinguish between health projects and programmes, and apply principles of programme management **CO5:** Construct monitoring and evaluation (M&E) plans and assess HMIS tools and data quality **CO6:** Analyse the structure and evolution of national health programmes in India with focus on MCH and NHM

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1, 6	R, U	C
CO2	1, 2	U, An	C
CO3	2, 3	U, An	P
CO4	5, 6	U, Ap	C
CO5	2, 5	Ap, E	P
CO6	5, 6	An, E	C

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT:

MODULE I: Concepts of health and morbidity- Various definition of Health, Physical Development, indices of Physical Development, HDI. Health Transition – Epidemiologic, demographic and nutrition transitions; Determinants of health; Reproductive Health, Definition, General concepts, Maternal and child health, Prenatal and Antenatal care, sanitation, Hygiene, Reproductive Rights, STD,RTI,HIV/AIDS, Male involvement in Reproductive health- Indian Scenario

Module outcomes:

MO1: Define health, morbidity, and related developmental indices such as HDI (Understand)

MO2: Explain the stages of health transition including epidemiologic, demographic, and nutrition transitions (Understand)

MO3: Describe the determinants of reproductive health and maternal-child health components (Understand)

MO4: Analyse issues related to sanitation, hygiene, reproductive rights, and male involvement in reproductive health in India (Analyse)

MODULE II: Nutrition: Nutrients, Nutritional deficiency diseases, Nutritional requirement of special groups- Pregnant and lactating women, infants, children and aged- Nutrition Survey, Nutritional Tables Nutritional situation in India, Anaemia.

Module outcomes:

MO1: Identify major nutrients and nutritional deficiency disorders (Understand)

MO2: Describe nutritional needs of vulnerable groups like pregnant women, children, and elderly (Understand)

MO3: Interpret nutrition survey data and nutritional tables (Apply)

MO4: Analyse trends in nutritional indicators using NFHS data (Analyse)

MODULE III: Health Surveys; Need for surveys, complete enumeration surveys, sample surveys, Sampling methodology used in large surveys namely NFHS, DLHS and similar national health surveys conducted by NSSO. (change the contents of this module) include evaluation designs

Module outcomes:

MO1: Explain the purpose and types of health surveys including complete enumeration and sample surveys (Understand)

MO2: Describe sampling methods used in national health surveys (Understand)

MO3: Evaluate the design and methodology of NFHS, DLHS, and NSSO health surveys (Evaluate)

MODULE IV: Health Project and programmes – differences, evolution, characteristics, and different phases of a project; Programme management – principles, approaches, challenges, factors affecting success of a project, ethical issues; Logical Framework Approach (LFA)

Module outcomes:

MO1: Differentiate between health projects and programmes and describe their phases (Understand)

MO2: Apply principles of programme management and identify key challenges (Apply) MO3: Evaluate ethical issues and success factors in health programme implementation (Evaluate)

MO4: Use the Logical Framework Approach (LFA) in planning health projects (Apply)

MODULE V: Monitoring and Evaluation – Definitions, differences, scope. M&E Plan – functions, construction; Evaluation designs; Health Management Information Systems (HMIS) – Uses, methods. HMIS in the public health system in India – tools, quality of data. Publications of Central Bureau of Health Intelligence

Module outcomes:

MO1: Define monitoring and evaluation and explain their scope and differences (Understand)

MO2: Construct M&E plans and select appropriate evaluation designs (Apply)

MO3: Describe the structure and functions of HMIS in India (Understand)

MO4: Assess data quality and reporting practices using HMIS and CBHI publications (Evaluate)

MODULE VI: National Health and Family Planning Programme in India-History, MCH Programmes, Reproductive and Child Health Programmes, Target free Approach-ARSH, NHM; Use of M&E in National Health programmes in India

Module outcomes:

MO1: Summarise the history and components of India's national health programmes (Understand)

MO2: Explain the structure and objectives of MCH, RCH, NHM, and ARSH programmes (Understand)

MO3: Analyse the role of M&E in improving national health programme outcomes (Analyse) MO4:

Evaluate the effectiveness of target-free approaches in reproductive health initiatives (Evaluate)

Suggested Class Room Activities:

- Assignments
- Seminar Presentation on selected topics
- Quiz
- Group discussion

Suggested Readings:

- Mary-Jane Schneider (2006): Introduction to public health, Jones and Bartlett (Publisher)
- James F McKenzie, Robert R Pinger (2014): Introduction to community health, Jones and Bartlett Publishers
- Srivastava R K(2011): Public health system in India DPS Publishing House
- Magnuson, J. A (2014): Public health informatics and information systems: Springer
- Park J E (1991): Textbook of preventive and social medicine, Banarsidas Bhanot, 1991.
- Kark, S L (1974): Epidemiology and Community Medicine
- Charles, H Hennekens and Julie, E Burning (1987), Epidemiology in medicine, edited by Sherry L Meyrent; Little, Brown and Company

Assessment

40 per cent Continuous Assessment.

60 per cent End-semester Assessment: 3 hour written Exam.

Semester	Course Code	Course Name	Credits
III	DEM-CC-534	APPLIED STATISTICAL MODELLING	4

Course Outcomes

CO1: Describe the structure and interpretation of multivariate data, including key concepts such as variance-covariance matrix, correlation, and multivariate normality.

CO2: Apply simple and multiple linear regression models and assess model assumptions and goodness of fit.

CO3: Construct and interpret regression models with categorical predictors and interaction effects.

CO4: Apply MANOVA techniques to evaluate group differences across multiple dependent variables.

CO5: Perform and interpret exploratory factor analysis to identify latent constructs in observed variables.

CO6: Explain and apply the basic principles of Structural Equation Modelling, including path analysis and model validation.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1	R, U	C
CO2	1, 3	U, Ap	C
CO3	1, 3	U, Ap	P
CO4	1, 3	Ap, An	P
CO5	1, 3	Ap, E	P
CO6	1, 3	U, Ap	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

Course Content

Module I: Basic Concepts of Multivariate Analysis: Multivariate Data Presentation, the variate, measurement scales, measurement error and multivariate measurement; Distribution Types- Linear combinations of random variables, Bivariate normal distributions; Multivariate normality; Mean vector, variance-covariance matrix, correlation matrix, Inference Techniques for sample mean vector, Hotelling's T^2 statistic-single sample, two samples, paired comparisons; Mahalanobis D^2 statistic; Cook's Distance, Partial correlation, Intraclass correlation, Multiple correlation.

Module Outcomes:

MO1: Describe key concepts in multivariate data, including measurement scales, measurement error, and types of distributions. (*Understanding*)

MO2: Compute and interpret measures such as mean vector, variance-covariance matrix, and correlation matrix. *(Applying)*

MO3: Apply inferential techniques such as Hotelling's T^2 and Mahalanobis D^2 statistics for hypothesis testing. *(Applying)*

Module II: Linear Regression: Two variable regression model, Concept of population regression function (PRF), Linearity, stochastic error term, the method of ordinary least squares, its assumptions- Autocorrelation, Homoscedasticity, Multicollinearity- methods to detect, consequence and remedial measures, Properties- The Gauss–Markov Theorem, Normality assumption, Confidence Interval for regression coefficients, Hypothesis Testing, Regression on Standardized Variables; Multiple Regression-Partial Regression coefficients, Testing the overall significance.

Module Outcomes:

MO1: Explain the assumptions and structure of simple and multiple linear regression models. *(Understanding)*

MO2: Apply ordinary least squares (OLS) to estimate parameters and interpret regression output. *(Applying)*

MO3: Analyze diagnostic issues such as multicollinearity, autocorrelation, and heteroscedasticity and suggest appropriate remedies. *(Analyzing)*

Module III: Dummy-variable regression and Interaction: Concept of dummy variables; a simple dummy variable model; uses of more than one qualitative variable; Interaction/Moderation effects- Product term approach; Step wise estimation.

Module Outcomes:

MO1: Describe the use of dummy variables in regression analysis and construct models with qualitative predictors. *(Understanding)*

MO2: Apply interaction terms to examine moderation effects using the product term approach. *(Applying)*

MO3: Estimate and interpret stepwise models involving both continuous and categorical predictors. *(Applying)*

Module IV: Multivariate analysis of variance (MANOVA): Multivariate procedures for assessing group differences, objectives of MANOVA, Assumptions, estimation of the model, assessing the overall fit, and interpretation of results.

Module Outcomes:

MO1: Explain the purpose, assumptions, and design of MANOVA. *(Understanding)* MO2: Estimate MANOVA models to assess group differences across multiple dependent variables. *(Applying)*

MO3: Interpret multivariate test results and evaluate model fit. *(Analyzing)*

Module V: Exploratory Factor Analysis: Introduction, Concept of factor analysis, Factor loading, factor scores, eigen values, Rotation of factors, Naming of factors.

Module Outcomes:

MO1: Explain the conceptual basis of factor analysis including factor loadings and eigenvalues.

(Understanding)

MO2: Conduct exploratory factor analysis and interpret rotated factor solutions. *(Applying)*

MO3: Evaluate factor models for meaningful interpretation and naming of factors. *(Analyzing)*

Module VI: Structural Equation Modelling: Estimation of Multiple Interrelated Dependence relationships, the role of theory in SEM, specifying Structural Model, Assessing the Structural Model Validity, Estimating the Relationship using path analysis.

Module Outcomes:

MO1: Describe the components and conceptual framework of SEM including latent and observed variables. *(Understanding)*

MO2: Specify simple structural models and assess their validity using model fit indices. *(Applying)*

MO3: Interpret SEM results and estimate direct and indirect effects using path analysis. *(Analyzing)*

Suggested Readings

- Graeme, H., & Sofroniou, N. (1999). *The multivariate for social scientist*. SAGE Publications.
- Gujarati, D. N., & Sangeetha. (2007). *Basic econometrics* (4th ed.). Tata McGraw Hill.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2013). *Multivariate data analysis: Pearson new international edition PDF eBook*. Pearson Education.
- Jones, A. (2007). *Applied econometrics for health economists*. Radcliffe Publishing Ltd.
- Maddala, G. S. (1989). *Introduction to econometrics*. Macmillan Publishing Company.
- Pandey, M. (2015). *Biostatistics: Basic and advanced*. Viva Books Private Limited.
- Retherford, R. D., & Choe, M. K. (1993). *Statistical models for causal analysis*. John Wiley & Sons.

ASSESSMENT

- 40 per cent Continuous Assessment
- 60 per cent End Semester Assessment: 3 Hour Written Examination

Semester	Course Code	Course Name	Credits
III	DEM-CC-535	DATA MANAGEMENT AND ANALYSIS USING STATA	2

Course Outcome

CO1: Describe the STATA interface, file types, and basic data input procedures using log and do-files.

CO2: Perform data management tasks including variable generation, modification, formatting, and subsetting using STATA.

CO3: Generate and interpret descriptive statistics and perform dataset restructuring through appending, merging, and reshaping.

CO4: Create and interpret univariate and bivariate graphs for exploratory data analysis in STATA.

CO5: Conduct hypothesis testing and correlation analysis using both parametric and non-parametric tests.

CO6: Apply simple and multiple linear regression techniques and interpret STATA output for statistical modeling.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1	R, U	C
CO2	1, 3	U, Ap	C
CO3	1, 3	U, Ap	P
CO4	1, 3	Ap, An	P
CO5	1, 3	Ap, E	P
CO6	1, 3	U, Ap	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT:

Module I: Introduction to STATA: the Stata interface, entering and importing data; creating a dataset; the data editor; Log-file and do-file; file formats in STATA

Module Outcomes:

MO1: Identify the components of the STATA interface and understand different file types used in STATA. *(Understanding)*

MO2: Enter, import, and create datasets using the STATA data editor and command interface. *(Applying)*

MO3: Use log files and do-files to document and automate basic operations. *(Applying)*

Module II: Data Management: Importing data, managing data formats (numeric, string), examining data, generating variables, making changes to the variables, subsetting data, labelling variables, and Creating value labels.

Module Outcomes:

MO1: Import datasets and manage data formats including numeric and string variables. *(Applying)*

MO2: Generate, modify, and label variables using appropriate STATA commands. *(Applying)*

MO3: Subset, examine, and organize data through labeling, value assignment, and dataset manipulation. *(Applying)*

Module III: Descriptive Statistics: Frequency distributions, Summary Statistics, appending data, merging data, and reshaping data, STATA programming using loops and locals/globals, and return lists.

Module Outcomes:

MO1: Compute and interpret frequency distributions and summary statistics using STATA. *(Applying)*

MO2: Perform dataset transformations through appending, merging, and reshaping. *(Applying)*

MO3: Use loops, macros, and return lists to create efficient STATA programs. *(Analyzing)*

Module IV: Graphs using STATA: Univariate and Bivariate graphs in STATA

Module Outcomes:

MO1: Create univariate graphs such as histograms, boxplots, and bar charts in STATA. *(Applying)*

MO2: Generate bivariate visualizations including scatter plots and line graphs. *(Applying)*

MO3: Interpret STATA-generated graphs for exploratory data analysis. *(Analyzing)*

Module V: Inferential statistics: Tests for mean and proportions, test for normality, chi-squared test, Bivariate correlation, and non-parametric tests

Module Outcomes:

MO1: Conduct hypothesis testing for means, proportions, and normality using STATA. *(Applying)*

MO2: Perform chi-square tests, correlation analysis, and non-parametric tests. *(Applying)*

MO3: Interpret statistical test results in the context of research questions. *(Analyzing)*

Module VI: Simple linear regression and Multiple regression

Module Outcomes:

MO1: Estimate and interpret simple linear regression models using STATA. *(Applying)*

MO2: Fit multiple regression models and assess regression assumptions. *(Applying)*

MO3: Evaluate model output and determine the statistical significance of predictors. *(Analyzing)*

Suggested Classroom Activities:

- Assignments
- Quiz
- Record Book

Suggested Readings

- Acock, A. C. (2006). *A gentle introduction to Stata*. Taylor & Francis.
- Daniels, L., & Minot, N. (2025). *An introduction to statistics and data analysis using Stata®: From research design to final report*. SAGE Publications.
- StataCorp. (2021). *Stata survey data reference manual: Release 17*. StataCorp LLC.
- StataCorp. (2021). *Stata user's guide: Release 17*. StataCorp LLC.
- Suárez, E. L., Pérez, C. M., Noguerras, G. M., & Moreno-Gorrín, C. (2016). *Biostatistics in public health using STATA*. Taylor & Francis.

ASSESSMENT

- Record Book: 20 Marks. All students should prepare a fair record book and should be produced at the time of evaluation
- Viva-Voce: 20 Marks
- 60 Marks End Semester Assessment: 3-Hour Computer-Based Examination

Semester	Course Code	Course Name	Credits
III	DEM-DE-536	POPULATION GROWTH, STABLE POPULATION, AND PROJECTION	2

Course Outcomes:

CO1: Explain the components and utilize various measures of population composition

CO2: Make use of suitable methods in assessing the quality of age data

CO3: Apply various measures of population growth

CO4: Construct stable and stationary populations

CO5: Apply methods of population estimation and projection

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1	U	C
CO2	1	U	C
CO3	1	U	C
CO4	1, 3	U, E	C
CO5	1, 3	A	P
CO6	1,3	U, A	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT:

Module I: Measures of Age and Sex. Quality of Age data- Errors in demographic data – Whipple’s Index, Myer’s Index, UN Joint Score Index, Age Pyramid. Quality of Data – Evaluation and Adjustment of Demographic Data Interpolation and Graduation

Module outcomes:

MO1: Describe the various measures of age and sex structure in a population and the types of errors commonly found in demographic data (Understand).

MO2: Calculate and interpret quality indices for assessing the accuracy of age data (Apply).

MO3: Analyze age-sex pyramids to evaluate the quality of age data (Analyze).

Module II: Population Estimation and Projections: Measures of Population growth – Balancing Equation Arithmetic growth- Geometric growth- Exponential growth, Logistic growth - Doubling Time.

Module outcomes:

MO1: Explain different measures of population growth (Understand).

MO2: Make use of the balancing equation and growth models to estimate future population size based on available demographic data (Apply).

Module III: Methods of Population estimation and Projection – Mathematical and Cohort Component methods, Assumptions, on fertility, Mortality and Migration

Module outcomes:

MO1: Describe the mathematical and cohort component methods of population estimation and projection (Understand).

MO2: Apply mathematical and cohort component techniques to estimate and project population size for different demographic groups (Apply).

MO3: Illustrate the limitations of population projections (Understanding).

Module IV: Sub-National Population Projections – Ratio Method, Apportionment Method, URGD Method, Regression Method, Projection of Labour Force, Educational Population

Module outcomes:

MO1: Explain various methods of sub-national population projection (Understand).

MO2: Make use of appropriate projection techniques to estimate future labour force and educational population at sub-national levels (Apply).

MO3: Illustrate the limitations of sub-national population projections (Understanding).

Module V: Structure of Population – Stable, Stationary Population- Lotka's Stable Population Theory, Population momentum, Construction of Stable population.

Module outcomes:

MO1: Describe the concepts of stable and stationary populations (Understand).

MO2: Construct a stable population using fertility and mortality schedules (Apply).

Module VI: Population ageing: Concepts, measures, components, Inter-relationship with fertility, mortality and migration, age structural transition.

Module outcomes:

MO1: Explain the concepts, components and measures of population ageing and its significance in demographic studies (Understand).

MO2: Analyze the inter-relationship between population ageing and demographic factors (Analyze).

Suggested Class Room Activities:

- Assignments
- Seminar Presentation on selected topics

- Debates
- Quiz
- Demonstration using SPECTRUM Software

Suggested Readings

- Barclay, G W: Techniques of Population Analysis, John Wiley and Sons, New York
- Hinde, Andrew: Demographic Methods, London, 1998
- Jaffe, A J: Hand Book of Statistical Methods for Demographers, US Govt. Printing Office, Washington.
- Majumdar, P.K: Fundamentals of Demography, Rawat Publications, Jaipur, 2010
- MISRA, B D: An Introduction to the Study of Population, New Delhi: South Asian Publishers, Pvt Ltd.,
- Pathak, K.B. & F.RAM: Techniques of Demographic Analysis, Himalaya Publishing house, Mumbai, 1998
- Pollard, J .H: Demographic Techniques, Pengamon Press, Australia.
- Preston, Samuel H, Patrick Heuveline and Michel Guillot: Demography – Measuring and Modeling Population Processes
- Ramakumar, R: Technical Demography, Wiley Eastern Ltd., New Delhi
- Shryock, Henry S, Jacob S Seigel and Associates: The Methods and Materials of Demography, Vol. 1 & 2, US Bureau of the Census, Washington DC
- Speegelman, M: Introduction to Demography, Harvard University Press, Cambridge
- Srinivasan, K: Basic Demographic Techniques and Applications, Sage Publications, New Delhi
- World Population Ageing Reports published by United Nations

ASSESSMENT

- 40 per cent Continuous Assessment
- 60 per cent End Semester Assessment: 2 Hour Written Examination

Semester	Course Code	Course Name	Credits
IV	DEM-CC-541	POPULATION MODELS AND INDIRECT ESTIMATION	4

Course Outcomes (CO):

CO1: Explain the structure, assumptions, and uses of mortality, fertility, and nuptiality models **CO2:** Apply mathematical and stochastic models to analyse fertility and demographic processes **CO3:** Interpret migration patterns using model migration schedules such as the Rogers–Castro model **CO4:** Apply indirect techniques to estimate fertility and mortality using incomplete or census-based data

CO5: Evaluate various indirect methods of fertility estimation including P/F ratio, reverse survival, and own-children methods

CO6: Estimate internal migration using indirect methods such as proportional adjustment and censusbased techniques

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1, 3	U, An	C
CO2	2, 3	Ap, An	P
CO3	1, 3	U, Ap	P
CO4	2, 3	Ap, An	P
CO5	2, 3	An, E	P
CO6	2, 3	Ap, E	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

Module: I Mortality models - Model Life Tables (Review), Model Stable Population, Nuptiality Models, Marriage Functions, Model Fertility Tables, Coales Fertility Models.

Module outcomes:

MO1: Explain the structure and applications of model life tables and model stable populations (Understand)

MO2: Describe nuptiality models and associated marriage functions (Understand)

MO3: Interpret model fertility tables and Coale's fertility models (Apply)

MO4: Evaluate the demographic assumptions underlying classical fertility and mortality models (Evaluate)

Module: II Mathematical Models of Fertility ; Stochastic Models , Mathematical Models of Fertility – Concepts and Definition of Stochastic Process, Pure Birth and Death process, Birth-Death Migration Model Markov Chain, renewal process, Fertility Models of Brass, Singh, Sheps and Srinivasan, Mathematical Models of Fertility, Non Stochastic Models -Mathematical Models of fertility, Coale &Trussel, Brass Relational Gompertz Model, Bongaarts Model, Demographic basis, uses and general evaluation of the validity of the models.

Module outcomes:

MO1: Define stochastic processes and describe their use in fertility modeling (Understand)

MO2: Apply birth-death, migration, Markov chain, and renewal processes in demographic analysis (Apply)

MO3: Use and compare fertility models by Brass, Singh, Sheps, and Srinivasan (Apply)

MO4: Evaluate the assumptions and validity of non-stochastic models such as the Gompertz, Coale–Trussell, and Bongaarts models (Evaluate)

Module: III Migration Models: Model Migration Schedule - An Introduction – Rogers & Castro Model Migration Schedules.

Module outcomes:

MO1: Explain the logic and construction of model migration schedules (Understand) MO2: Apply Rogers–Castro model to represent and analyse migration patterns (Apply)

Module: IV Indirect Estimation: Introduction, need and logic, Estimation of vital rates using incomplete information using survey data, using census data, using information from related data, Indirect Estimation-Fertility and Mortality estimation using model stable age distribution, Estimation of infant and Child mortality from information on children ever born and children surviving (Brass, Sullivan, Trussell and Pathak) Estimation of Adult Survivorship probabilities from information on Orphanhood and widowhood, estimation of adult mortality using successive census age distribution.

Module outcomes:

MO1: Justify the need for indirect estimation techniques and explain their logic (Understand) MO2: Apply Brass, Sullivan, Trussell, and Pathak methods to estimate child and adult mortality (Apply) MO3: Estimate survivorship probabilities using orphanhood, widowhood, and census age distribution data (Apply)

MO4: Evaluate the effectiveness of model-based estimation using stable age distributions (Evaluate)

Module : V Indirect Estimation of Fertility-Estimation of Fertility based information about children ever born – Brass P/F ratio Method, Trussell Modification, Estimation of Fertility from age distribution of a population Reverse Survival Method - Original Method, Own-Children method, Rele’s Method, Stable population method, Method using General Population Model.

Module outcomes:

MO1: Use Brass P/F ratio and Trussell modification methods for fertility estimation (Apply) MO2: Apply reverse survival, own-children, and Rele’s methods for fertility estimation (Apply)

MO3: Interpret fertility trends using general population models and stable population methods (Analyse)

MO4: Compare the strengths and limitations of various indirect fertility estimation methods (Evaluate)

Module: VI Indirect Method of Estimating Migration – Gross Period Migration flows by proportional Adjustment.

Module outcomes:

MO1: Explain the rationale and assumptions of indirect migration estimation methods (Understand)

MO2: Apply proportional adjustment techniques to estimate gross period migration flows (Apply)

MO3: Evaluate census-based techniques for estimating internal migration in data-deficient contexts (Evaluate).

Suggested Class Room Activities:

- Assignments
- Seminar Presentation on selected topics
- Debates
- Quiz

Suggested Readings

- Barclay, G W: Techniques of Population Analysis, John Wiley and Sons, New York
- Hinde, Andrew: Demographic Methods, London, 1998
- Jaffe, A J: Hand Book of Statistical Methods for Demographers, US Govt. Printing Office, Washington.
- Majumdar, P.K: Fundamentals of Demography, Rawat Publications, Jaipur, 2010
- MISRA, B D: An Introduction to the Study of Population, New Delhi: South Asian Publishers, Pvt Ltd.,
- Pathak, K.B. & F.RAM: Techniques of Demographic Analysis, Himalaya Publishing house, Mumbai, 1998
- Pollard, J .H: Demographic Techniques, Pengamon Press, Australia.
- Preston, Samuel H, Patrick Heuveline and Michel Guillot: Demography – Measuring and Modeling Population Processes
- Ramakumar, R: Technical Demography, Wiley Eastern Ltd., New Delhi
- Shryock, Henry S, Jacob S Seigel and Associates: The Methods and Materials of Demography, Vol. 1 & 2, US Bureau of the Census, Washington DC
- Speegelman, M: Introduction to Demography, Harvard University Press, Cambridge
- Srinivasan, K: Basic Demographic Techniques and Applications, Sage Publications, New Delhi
- Indirect Techniques for Demographic Estimation. (1983). Manual X, United States: UN.
- Keyfitz, N. (1968). *Introduction to the Mathematics of Population*. Reading, MA: Addison Wesley.
- Keyfitz, N. (1977). *Applied Mathematical Demography*. New York: John Wiley and Sons.
- Krishnan Namboodiri, K., & Suchindran, C. M. (1987). *Life Table Techniques and Their Applications*. Florida: Academic Press.

- Chiang, C. L. (1984). Life Table and Its Applications. Malabar, FL: R.E. Krieger Publishing Company.

ASSESSMENT

- 40 per cent Continuous Assessment
- 60 per cent End Semester Assessment: 3 Hour Written Examination

Semester	Course Code	Course Name	Credits
IV	DEM-CC-542	REGRESSION TECHNIQUES AND TIME SERIES ANALYSIS	4

Course Outcomes

CO1: Explain the principles and applications of logistic regression for binary and multinomial outcomes.

CO2: Apply discriminant analysis techniques to classify observations and interpret group separation.

CO3: Select and implement appropriate models for analyzing count and censored data, including Poisson, Negative Binomial, and Tobit regressions.

CO4: Construct and interpret multilevel models to account for hierarchical data structures and grouplevel variation.

CO5: Assess stationarity and model non-stationary time series using classical and statistical tests.

CO6: Build and evaluate ARIMA models using the Box–Jenkins approach for forecasting timedependent data.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1	R, U	C
CO2	1, 3	U, Ap	C
CO3	1, 3	U, Ap	P

CO4	1, 3	Ap, An	P
CO5	1, 3	Ap, E	P
CO6	1, 3	U, Ap	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

Course Contents

Module I: Logistic Regression: Linear Probability Model, Regression with binary dependent variable, estimating logistic regression model, assessing the goodness-of-fit of the estimation model, testing for significance of the coefficients, and interpreting the coefficients. Multinomial Logistic Regression.

Module Outcomes:

MO1: Describe the limitations of linear probability models and explain the rationale for using logistic regression. (*Understanding*)

MO2: Estimate and interpret binary and multinomial logistic regression models. (*Applying*)

MO3: Assess model fit and perform hypothesis testing for logistic regression coefficients. (*Analyzing*)

Module II: Discriminant Analysis: Objectives, research design, assumptions, estimation of models, and assessing the overall fit and interpretation of results.

Module Outcomes:

MO1: Explain the objectives and assumptions of discriminant analysis in classification problems. (*Understanding*)

MO2: Estimate discriminant function models and compute classification results. (*Applying*)

MO3: Interpret model performance and evaluate the effectiveness of discriminant analysis. (*Analyzing*)

Module III: Count and Censored data: Poisson, Negative Binomial Regression and Tobit models

Module Outcomes:

MO1: Describe the nature of count and censored data and identify appropriate models. (*Understanding*)

MO2: Apply Poisson, Negative Binomial, and Tobit regression models to relevant data. (*Applying*)

MO3: Interpret model parameters and assess fit for count and censored data models. (*Analyzing*)

Module IV: Multilevel Modelling: A multilevel model for group effects, estimating group effects, random vs. fixed effects, random intercept model.

Module Outcomes:

MO1: Explain the structure and assumptions of multilevel models for grouped data. (*Understanding*)
MO2: Estimate random intercept models and distinguish between fixed and random effects. (*Applying*)
MO3: Analyze model output to assess the presence and magnitude of group-level effects. (*Analyzing*)

Module V: Time series analysis: Key concepts, Measurement of trend-semi-average method, moving average method. Stochastic Process, Spurious Regression, Tests for Stationarity-Graphical Analysis, ACF and Correlogram, The Unit Root Test- The Augmented Dickey-Fuller test, The Phillips-Perron Unit root test, transforming non-stationarity time series

Module Outcomes:

MO1: Describe key concepts of time series and identify deterministic trends using classical methods. (*Understanding*)
MO2: Detect and transform non-stationary series using ADF, PP tests, and correlograms. (*Applying*)
MO3: Evaluate time series plots and autocorrelation structure for stationarity assessment. (*Analyzing*)

Module VI: Time series modeling and Forecasting: An Autoregressive Process (AR), A Moving Average (MA) Process, ARMA Process, ARIMA Process, Box-Jenkins Methodology, Estimation of ARIMA Model, Diagnostic Checking, Forecasting.

Module Outcomes:

MO1: Identify appropriate AR, MA, ARMA, and ARIMA models for time series data. (*Understanding*)
MO2: Estimate ARIMA models using Box-Jenkins methodology and conduct diagnostic checks. (*Applying*)
MO3: Generate forecasts and assess model performance using appropriate validation metrics. (*Applying*)

Suggested Readings

- Graeme, H., & Sofroniou, N. (1999). *The multivariate for social scientist*. SAGE Publications.
- Gujarati, D. N., & Sangeetha. (2007). *Basic econometrics* (4th ed.). Tata McGraw Hill.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2013). *Multivariate data analysis: Pearson new international edition PDF eBook*. Pearson Education.
- Jones, A. (2007). *Applied econometrics for health economists*. Radcliffe Publishing Ltd.
- Maddala, G. S. (1989). *Introduction to econometrics*. Macmillan Publishing Company.
- Pandey, M. (2015). *Biostatistics: Basic and advanced*. Viva Books Private Limited.
- Retherford, R. D., & Choe, M. K. (1993). *Statistical models for causal analysis*. John Wiley & Sons.
- Snijders, T. A. B., & Bosker, R. J. (1999). *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. SAGE Publications.

ASSESSMENT

- 40 per cent Continuous Assessment
- 60 per cent End Semester Assessment: 3 Hour Written Examination

Semester	Course Code	Course Name	Credits
IV	DEM-CC-543	BIostatISTICS USING R SOFTWARE	2

Course Outcomes

CO1: Identify and manipulate various data structures and control flow elements in R programming.

CO2: Perform essential data management tasks including recoding, reshaping, merging, and sampling using R.

CO3: Create effective data visualizations using ggplot2 for univariate and bivariate analysis.

CO4: Conduct statistical inference in R using appropriate tests for means, proportions, normality, association, and non-parametric analysis.

CO5: Apply linear regression, logistic regression, and survival analysis models in R and interpret the output for biostatistical research.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1	R, U	C
CO2	1, 3	U, Ap	C
CO3	1, 3	U, Ap	P
CO4	1, 3	Ap, An	P
CO5	1, 3	Ap, E	P
CO6	1, 3	U, Ap	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KCKnowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive) **Tagging course outcomes:**

CO	PSO	CL	KC
CO1	1	R, U	C

CO2	1, 3	U, Ap	C
CO3	1, 3	U, Ap	P
CO4	1, 3	Ap, An	P
CO5	1, 3	Ap, E	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT:

Module I: Introduction to R- Basic Operations in R; Data Structures in R- Vectors, Matrices, Arrays, Data Frames and Lists. Conditional and Control Flow- Relational Operators, Logical Operators. Functions In R

Module Outcomes:

MO1: Identify and use basic data structures such as vectors, matrices, arrays, data frames, and lists in R. (*Understanding*)

MO2: Perform basic operations and implement control flow using conditional, relational, and logical operators. (*Applying*)

MO3: Create and use user-defined functions to automate tasks in R. (*Applying*)

Module II: Data Management: Generating new variable, recording variables, replacing variables, renaming variables. Data Management of Datasets- Selecting and excluding variables, selecting observations, merging datasets by variables and observations, sorting dataset, Reshaping data, drawing random samples from a dataset, Piping (chaining).

Module Outcomes:

MO1: Modify and manage variables through generating, recoding, replacing, and renaming operations. (*Applying*)

MO2: Manage datasets through selection, exclusion, merging, sorting, and reshaping. (*Applying*) MO3: Utilize R tools such as sampling and piping to streamline data workflows. (*Applying*)

Module III: Data Visualization using R: Understanding ggplot2-Structure of a layer, components affecting all layers. Univariate graphs and Bivariate graphs

Module Outcomes:

MO1: Describe the structure and components of a ggplot2 layer. (*Understanding*) MO2: Create univariate and bivariate visualizations using ggplot2. (*Applying*)

MO3: Interpret data visualizations to identify key patterns and relationships. (*Analyzing*)

Module IV: Statistical Inference: Tests for mean and proportions, test for normality, chi-squared test, Bivariate correlation, and non-parametric tests

Module Outcomes:

MO1: Perform statistical tests for means, proportions, and normality. (*Applying*) MO2: Conduct chi-squared tests, correlation analysis, and non-parametric tests using R. (*Applying*) MO3: Interpret the results of statistical inference in the context of biostatistical research. (*Analyzing*)

Module VI: Regression Analysis: Bivariate and Multiple linear regression, Logistic Regression, Survival Analysis.

Module Outcomes:

MO1: Fit and interpret bivariate and multiple linear regression models in R. (*Applying*) MO2: Apply logistic regression models to binary outcome data. (*Applying*)

MO3: Conduct survival analysis and interpret survival curves and regression output. (*Applying*)

Suggested Class Room Activities:

- Assignments
- Seminar Presentation on selected topics
- Quiz
- Record Book

Suggested Readings

- Crawley, M. J. (2012). *The R book*. John Wiley & Sons. <https://doi.org/10.1002/9781118448908>
- Lafaye de Micheaux, P., Drouilhet, R., & Liqueur, B. (2014). *The R software: Fundamentals of programming and statistical analysis*. Springer New York.
- Lepš, J., & Šmilauer, P. (2020). *Biostatistics with R: An introductory guide for field biologists*. Cambridge University Press.
- Mehmetoglu, M., & Mittner, M. (2021). *Applied statistics using R: A guide for the social sciences*. SAGE Publications.
- Wickham, H., & Grolemund, G. (2016). *R for data science: Import, tidy, transform, visualize, and model data*. O'Reilly Media.

ASSESSMENT

- Record Book: 20 Marks. All students should prepare a fair record book and should be produced at the time of evaluation
- Viva-Voce: 20 Marks
- 60 Marks End Semester Assessment: 3-Hour Computer-Based Examination

Semester	Course Code	Course Name	Credits
IV	DEM-CC-544	DISSERTATION	6

CO1: Formulate a research problem relevant to demographic issues and design an appropriate study framework

CO2: Collect and manage primary or secondary demographic data using suitable tools and techniques

CO3: Apply appropriate statistical or analytical methods to examine research questions

CO4: Interpret research findings and draw valid, evidence-based conclusions

CO5: Prepare and present a structured research report in a specified format

Suggested Classroom Activities:

Seminar Presentations

Discussions on Questionnaire and Research Topics.

Data Collection (Primary/ secondary)

Report Preparation

ASSESSMENT:

75 per cent Project Report Evaluation.

25 per cent Viva-voce.

GENERIC COURSES

Course Code	Course Name	Credits
DEM-GC-501	FUNDAMENTALS OF DEMOGRAPHY	2

Course Outcomes (CO):

CO1: Explain the concept of demography and to comprehend the process and events in demography and the relationship with other Disciplines

CO2: Summarise population composition and components of population change

CO3: Choose appropriate data sources for demographic data

CO4: Compare and contrast demographic parameters in India

CO5: Explain Kerala model of development

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1	R, U	F
CO2	1, 3	U, Ap	C
CO3	1, 3	U, Ap	C
CO4	1, 3	U, Ap	C
CO5	1, 3	U, Ap	C
CO6	1,3	R, U	F

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

Module I

Definitions and concepts used in demography-rates and ratios population growth, Population composition-Age, Sex – Population Pyramid, Religion, Caste, Education, Language, Income - Marriage and Family – Concepts and definitions- structural changes in households and family, Population ageing. Components of population change- Fertility, Mortality, Migration and Urbanization.

Module outcomes:

MO1: Explain fundamental demographic concepts, Definitions and key rates related to population growth, fertility, mortality, life expectancy, morbidity, migration (Understand)

MO2: Construct and interpret population pyramids (Apply)

Module II

Sources of Demographic data in India. Census, Sample registration System (SRS), Sample surveys, Vital registration, Fertility Surveys, National Family Health Surveys **Module outcomes:**

MO1: Explain the major sources of demographic data in India (Understand).

MO2: Analyze data from census, vital statistics and surveys that contribute to demographic analysis. (Analyze)

MO3: Use appropriate data sources to support demographic research and interpret trends in fertility, mortality and population growth in India (Apply)

Module III

Population trends in India since 1901, including patterns of growth, fertility and mortality. Inter State Variations – causes and consequences

Module outcomes:

MO1: Describe the major population trends in India since 1901. (Understand)

MO2: Analyze the inter- state variations in population growth and demographic indications (Analyze)

Module IV

Trends in Fertility, Mortality, Migration and Urbanisation in India, Demographic Transition and Policy Implications

Module outcomes:

MO1: Explain the historical and current trends in fertility, mortality, migration and urbanisation in India within the framework of demographic transition theory (understand).

MO2: Analyze the interconnectedness of demographic trends and their influence on India's demographic transition phases (Analyze).

MO3: Evaluate the policy implications of these demographic trends for sustainable development and social planning. (Evaluate).

Module V

Demographic transition , Age structural transition- Demographic dividend, Population Ageing

Module outcomes:

MO1: Describe the concept of age structural transition and explain its stages and demographic implications (Understand).

MO2: Analyse the conditions under which a demographic dividend can occur and its relevance to economic growth (Analyze).

MO3: Evaluate the consequences of population ageing on social, economic and health systems within the context of age structural change (Evaluate).

Module VI

Kerala Model of Development –Education, Gulf migration, low mortality, women’s status, health system, etc., Kerala’s Demographic Transition

Module outcomes:

MO1: Explain the relationship between education, health and demographic indicators in Kerala (Understand)

MO2: Analyze the role of policy and social reform movements in shaping Kerala’s development (Analyze).

MO3: Evaluate the strengths and limitations of the Kerala Model. Assess whether Kerala’s development model can be replicated in other Indian states (Evaluate).

Suggested Readings

- Bogue, Donald J: Principles of Demography, John Wiley and Sons, New York, 1969
- Bhende, Asha A and Tara Kanitkar: Principles of Population Studies – 5th rev. ed. Himalaya Publishers, Delhi, 1997
- Donald, T. Rowland (2003). Demographic Methods and Concepts. New York. Oxford University Press Inc.
- Hinde, Andrew (1998). Demographic Methods. London: Hodder Arnold Publications. John Hopkins University and San Beck (2008).
- Majumdar, P. K. (2010). *Fundamentals of Demography*. New Delhi: Rawat Publications.
- Misra, B.D: An Introduction to the Study of Population, South Asian, New Delhi 1981
- Shryock, Henry S et. al.: The Methods and Materials of Demography, New York, Academic Press, 1976
- Pathak, K.B. and F. Ram- Techniques of Demographic Analysis, 2nd Edition, Hiamalaya Publications
- Pollard, A.H., Yusuf, F. & Pollard, G.N. (1990). Demographic Techniques. (3rd ed.). Sydney: Pergamon Press.
- Ramakumar, R and Gopal Y S: Technical demography – New Delhi, Wiley Eastern, 1986
- Sinha and Zachariah: Elements of Demography, Allied Publishers Private Ltd, 1986
- Weeks, John R. (2005). Population. An Introduction to Concepts and Issues. 10th edition.

ASSESSMENT

40 per cent Continuous Assessment

60 per cent End Semester Assessment: 2 Hour Written Examination

Course Code	Course Name	Credits
DEM-GC-502	POPULATION EDUCATION	2

Course Outcomes:

CO1: Explain the scope and tools of population education and identify the role of stakeholders in addressing population issues

CO2: Differentiate between formal, non-formal, and informal population education and analyse communication strategies

CO3: Describe the components of family life education and evaluate its role in improving adolescent health and family wellbeing

CO4: Analyse gender issues in population education and assess strategies for women's empowerment

CO5: Examine key social issues related to population and propose context-specific remedial measures

CO6: Develop instructional modules for delivering population education effectively

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1, 6	U, An	C
CO2	1, 2	An, Ap	P
CO3	1, 6	U, E	C
CO4	1, 6	An, E	C
CO5	1, 6	An, Cr	C
CO6	2, 5	Ap, Cr	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Introduction, Concepts, Definitions, nature and scope of the subject, tools and techniques, education and development programmes, population problems in general, role of NGOs“ opinion leaders, religious leaders and teachers in helping the public for findings out solutions in population problems.

Module outcomes:

MO1: Explain the nature, scope, and objectives of population education (Understand) MO2: Identify tools, techniques, and programmes used in population education (Understand) MO3: Analyse population problems and the role of stakeholders in addressing them (Analyse) MO4: Assess the contribution of NGOs, teachers, and community leaders in solving population issues (Evaluate)

MODULE II: Formal, non-formal and informal education, Definitions, population communication, skills and strategies role of media in communication

Module outcomes:

MO1: Differentiate between formal, non-formal, and informal education approaches (Analyse)
MO2: Define population communication and describe its strategies (Understand)

MO3: Evaluate the role of mass media and communication skills in population education (Evaluate)

MODULE III: Family life education, goals, role of parents and teachers in disseminating knowledge about sex education, care for adolescents, responsible parenthood, safe motherhood, child care and value of children, quality of life, development of better attitude towards society and family, resource management, family resources, human and nonhuman resources, Diseases STI, RTI, HIV/AIDS.

Module outcomes:

MO1: Explain the goals and components of family life education (Understand)

MO2: Describe the role of parents and teachers in adolescent care and sex education (Understand)

MO3: Analyse concepts like responsible parenthood, quality of life, and value of children (Analyse)

MO4: Interpret health issues related to STIs, RTIs, and HIV/AIDS in the context of family life education (Apply)

MODULE IV: Gender Issues, Gender discrimination, Status of women in family and society. Empowerment of women, decision making power, Women and employment, Women and poverty

Module outcomes:

MO1: Identify key gender issues and patterns of discrimination in society (Understand) MO2:

Analyse the status of women in families and society (Analyse) MO3: Evaluate strategies for women's empowerment and decision-making (Evaluate)

MO4: Discuss the role of education and employment in reducing gender inequality (Understand)

MODULE V: Social issues, alcoholism drug abuse, prostitution, violence dowry deaths and suicide, possible remedial measures

Module outcomes:

MO1: Explain the impact of social problems such as alcoholism, drug abuse, and prostitution (Understand)

MO2: Analyse the relationship between population pressures and violence, dowry deaths, and suicide (Analyse)

MO3: Propose remedial measures to address selected population-related social issues (Create)

MODULE VI: Preparation of modules for imparting Population Education

Module outcomes:

MO1: Identify key elements of effective instructional modules in population education (Understand)

MO2: Apply principles of educational design to create population education modules (Apply)

MO3: Design context-specific instructional materials for various target groups (Create)

Suggested Class Room Activities:

- Assignments
- Seminar Presentation on selected topics
- Test Paper
- Debates
- Quiz

Suggested Readings

- Agarwala, S. N. (1972). *Indian Population Problem*. New Delhi: Tata McGraw-Hill Publishing Co. Ltd.
- Aggarwal, J. C. (2010). *Population Education*. New Delhi: Shipra Publications.
- Ahuja, R. (1992). *Rights of Women: A Feminist Perspective*. Jaipur: Rawat Publications.
- Basu, A. M. (1992). *The Status of Women and Demographic Behaviour*. New York: Oxford University Press.
- Bhandarkar, K. M. (1983). *A Study of Population Education Knowledge and Attitude of Secondary Teachers: An Evaluation Study*. Madhya Pradesh.
- Bonar, J. (1926). *First Essay on Population, 1798 by Thomas Robert Malthus. With Notes by James Bonar*. Great Britain: Royal Economic Society.
- David, K., & Harman, D. (Eds.). (1976). *Issues in Population Education*. Lexington, MA: Lexington Books.
- Gopal Rao, D. (1974). *Population Education: A Guide to Curriculum and Teacher Education*. New Delhi: Sterling Publishers.
- Hutter, I. (1999). *Implementing a Reproductive Health Agenda in India: The Beginning*. New Delhi: Population Council.
- Kathuria. (1993). *Methods of Teaching Population Education*.
- Lakshmi Reddy, M. V. (1993). *Population Education Programmes in India*. New Delhi: Uppal Publishing House.

- Lakshmi Reddy, M. V. (1994). *Population Education: Misconceptions and Clarifications*. New Delhi: Ashish Publishing House.
- Lane, M. T., & Wileman, R. E. (1974). *A Structure for Population Education*. Chapel Hill, NC: Carolina Population Center.
- Mehta, T. S., & Chandra, R. (Eds.). *Population Education: Selected Readings*. New Delhi: NCERT.
- Ministry of Health & Family Welfare. *Reproductive and Child Health Programme: Manual for India and Karnataka*. New Delhi.
- Premi, M. K., & Saxena, P. C. (1991). "Population Dynamics." In C. Seshadri & J. L. Pandey (Eds.), *Population Education: A National Source Book*, Vol. I.
- Ramasubban, R., & Jejeebhoy, S. J. *Women's Reproductive Health in India*. Jaipur: Rawat Publications.
- Seshadri, C., & Madhusudhan, U. S. (Eds.). *Population Education: A Manual for Teacher Educators*.
- Seshadri, C., & Pandey, J. L. (1991). *Population Education: A National Source Book*. New Delhi: NCERT.
- Srinivasan, K., & Pathak, K. B. (Eds.). (1992). *Dynamics of Population Education and Family Welfare 1991*. Bombay: Himalaya Publishing House.
- UNESCO. (1971). *Population and Family Education: Report of an Asian Regional Workshop*. Bangkok: UNESCO.

ASSESSMENT

40 per cent Continuous Assessment

60 per cent End Semester Assessment: 2 Hour Written Examination

Course Code	Course Name	Credits
DEM-GC-503	INTRODUCTION TO PUBLIC HEALTH	2

Course Outcomes (CO):

CO1: Explain the scope, evolution, and core functions of public health and its relevance in health systems

CO2: Analyse morbidity patterns and disease burdens using public health data and indicators

CO3: Assess the relationship between health and development through social determinants and transition theories

CO4: Describe key components and challenges of reproductive health in the Indian context

CO5: Interpret national health survey data and evaluate sampling and survey designs

CO6: Explain nutritional requirements and assess trends in nutritional status using national datasets

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1, 6	U, An	C
CO2	1, 2	An, E	C
CO3	1, 6	An, E	C
CO4	1, 6	U, An	C
CO5	2, 3	An, E	P
CO6	1, 2	U, An	C

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

Course Content:

Module I: Public Health- Definition, History and Evolution. Core functions and scope of public health

Module outcomes:

MO1: Define the concept and scope of public health and distinguish it from clinical health (Understanding).

MO2: Describe the historical evolution and milestones in the development of public health (Understanding).

MO3: Identify and explain the core functions and essential services of public health (Understanding).

MO4: Evaluate the relevance of public health principles in contemporary health systems and policies (Analyse).

Module II: Health and morbidity. Measures of Morbidity, Patterns of morbidity in developing and developed countries, communicable and non-communicable diseases- Trends and patterns in India and Kerala

Module outcomes:

MO1: Define morbidity and explain various measures used to assess it (Understanding)..

MO2: Compare and contrast the patterns of morbidity in developed and developing countries (Analyse).

MO3: Analyze the burden of communicable and non-communicable diseases in the Indian and Kerala context (Analyse)

MO4: Interpret morbidity data to identify public health priorities and interventions (Analyse).

Module III: Morbidity and mortality linkages, Epidemiological and demographic Transition theories, Health and Development- Social determinants of health, interlinkages between health and Development at local and national levels, impact of development Policies on health, Health equity.

Module outcomes:

MO1: Explain the relationship between morbidity and mortality using epidemiological frameworks (Understanding).

MO2: Describe epidemiological and demographic transition theories and their relevance to public health ((Understanding).

MO3: Analyze the impact of social determinants on health outcomes at individual and population levels (Analyse).

MO4: Assess how development policies influence health and contribute to or mitigate health inequities (Understanding).

Module IV: Reproductive Health, Definition, General concepts, Maternal and child health, Prenatal and Antenatal care, sanitation, Hygiene, Reproductive Rights, STD,RTI,HIV/AIDS, Male involvement in Reproductive health- Indian Scenario

Module outcomes:

MO1: Define reproductive health and explain its scope within public health (Understanding)..

MO2: Discuss key components of maternal and child health, including prenatal and antenatal care (Understanding)..

MO3: Examine reproductive health challenges such as STDs, RTIs, and HIV/AIDS in the Indian context (Analyse).

MO4: Explain the role of gender and male involvement in promoting reproductive health (Understanding).

MO5: Interpret policies and programs related to reproductive rights and hygiene in India (Understanding).

Module V: Health Surveys; Need for surveys, complete enumeration surveys, sample surveys, Sampling methodology used in large surveys namely NFHS, DLHS and similar national health surveys conducted by NSSO.

Module outcomes:

MO1: Explain the need and importance of health surveys in public health research and planning (Understanding).

MO2: Differentiate between complete enumeration surveys and sample surveys, with examples (Understanding).

MO3: Describe various sampling methodologies used in national-level health surveys (Understanding).

MO4: Analyze the design and implementation strategies of major surveys like NFHS, DLHS, and NSSO health rounds (Analyse).

Module VI: Nutrition: Nutrients, Nutritional deficiency diseases, Nutritional requirement of special groups- Pregnant and lactating women, infants, children and aged- Nutrition Survey, Nutritional Tables-Nutritional situation in India (NFHS-1,2,3,4) Anemia.

Module outcomes:

MO1: Identify essential nutrients and understand their role in maintaining health (Understanding).

MO2: Explain the causes, symptoms, and prevention of common nutritional deficiency diseases (Understanding).

MO3: Explain the nutritional requirements of special populations including children, pregnant/lactating women, and the elderly (Understanding).

MO4: Interpret data from nutrition surveys (NFHS-1 to NFHS-4) and analyze trends in India's nutritional status (Understanding).

Suggested Class Room Activities:

- Assignments
- Seminar Presentation on selected topics
- Test Paper
- Debates
- Quiz

Suggested Readings

- Mary-Jane Schneider (2006): Introduction to public health, Jones and Bartlett (Publisher)
- James F McKenzie, Robert R Pinger (2014): Introduction to community health, Jones and Bartlett Publishers

- Srivastava R K(2011): Public health system in India DPS Publishing House
- Park J E (1991): Textbook of preventive and social medicine, Banarsidas Bhanot, 1991.
- Kark, S L (1974): Epidemiology and Community Medicine
- Charles, H Hennekens and Julie, E Burning (1987), Epidemiology in medicine, edited by Sherry L Meyrent; Little, Brown and Company

ASSESSMENT

40 per cent Continuous Assessment

60 per cent End Semester Assessment: 2 Hour Written Examination