

Objective This course is intended to provide an overview of microeconomic theory and its applications. The course starts with the theory of consumer behaviour consisting of consumer's utility maximization problem and demand theory. It intends to provide fundamental concepts and models in the theory of production and costs and sets out to provide a basic understanding of price and / or output determination under different types of market structures including factor markets. This course will also expose the students to the theory of general equilibrium and welfare economics.

Theory

- UNIT I** Theory of Consumer Behaviour-Cardinal Utility Approach-Ordinal Utility Approach-Income effect and substitution effect-Applications of Indifference curve approach-Revealed Preference Hypothesis-Consumer surplus- Derivation of Demand curve-Elasticity of demand.
- UNIT II** Theory of Production-Production functions>Returns to scale and economies of scale-Technical progress-Theory of Costs-Cost curves-Profit maximization and cost minimization-Derivation of supply curve-Law of Supply - Producers' surplus.
- UNIT III** Market Equilibrium-Behaviour of Firms in Competitive Markets-Perfect Competition-Effect of Taxation and Subsidies on market equilibrium- Monopoly-Monopolistic - Oligopoly- Theory of Factor Markets.
- UNIT IV** General Equilibrium Theory-Welfare Economics-Pareto Optimality - Social welfare criteria - Social Welfare functions.

Suggested Readings

- David M Kreps 1990. A Course in Microeconomic Theory. Princeton University Press.
- Dewitt KK. 2002. Modern Economic Theory. Sultan Chand & Co.
- Henderson JM & Quandt RE. 2000. Microeconomic Theory A Mathematical Approach. McGraw-Hill.
- Koutsoyiannis A. 2003. Modern Microeconomics. The Macmillan Press.
- Silberberg E & Suen W. 2001. The Structure of Economics-A Mathematical Analysis. McGraw-Hill.
- Varian Hal R. 1999. Intermediate Microeconomics. Affiliated East-West Press.

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- Objective** Macro economics and Policy course is intended to expose the students to macroeconomic concepts and theory, the application of the macro economic theory, and implication of the macroeconomic policies.
- Theory**
- UNIT I** Nature and Scope of Macro Economics-Methodology and Keynesian Concepts National Income-Concepts and measurement- Classical theory of Employment and Say's Law-Modern theory of Employment and Effective Demand.
- UNIT II** Consumption function- Investment and savings-Concept of Multiplier and Accelerator-Output and Employment-Rate of interest-Classical, Neo classical and Keynesian version- Classical theory Vs Keynesian theory – Unemployment and Full employment.
- UNIT III** Money and classical theories of Money and Price-Keynesian theory of money and Friedman Restatement theory of money - Supply of Money - Demand for Money - Inflation Nature, Effects and control.
- UNIT IV** IS & LM frame work - General Equilibrium of product and money markets - Monetary policy - Fiscal policy- Effectiveness of Monetary and Fiscal policy - Central banking.
- UNIT V** Business cycles-Balance of Payment-Foreign Exchange Rate determination.

Suggested Readings

Ahuja HL. 2007. Macroeconomics Theory and Policy. S. Chand & Co.
 Eugene A Diulio 2006. Macroeconomics. 4th Ed. Schaums' Outlines.
 Gardner Ackely 1987. Macro Economic Theory and Policy. Collier Macmillan.
 Dornbusch. 2006. Macroeconomics. McGraw Hill Publication

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Objective To introduce the students to the evolution of economic thought over a period of time, the background of emanation of thoughts and approaches, as acts of balancing and counter balancing events and criticisms. The course will also in a comprehensive way help the students to know and appreciate the contributions of the Galaxy of Economists.

Theory

UNIT I Approaches for the study of history of economic thought – Absolutist vs. Relativist approaches – Evolution of Economic Thought vs. Economic History. Ancient economic thought – medieval economic thought – mercantilism – physiocracy – Forerunners of Classical Political Economy.

UNIT II Development of Classical Thoughts (Adam Smith, Robert Malthus and David Ricardo) – Critics of Classical Thoughts- Socialist critics – Socialist and Marxian Economic Ideas – Austrian School of Thought – Origins of Formal Microeconomic Analysis – William Stanley Jevons, Cournot and Dupuit.

UNIT III The birth of neoclassical economic thought – Marshall and Walras – General Equilibrium Theory – Welfare Theory – Keynesian economics.

UNIT IV The Era of globalization – Experiences of developing world - Rigidity of the past vs. emerging realism – The changing path of international Institutions to economic growth and development approaches.

UNIT V Economic Thought in India – Naoroji and Gokhale – Gandhian Economics - Economic thought of independent India – Nehru's economic philosophy - Experiences of the Structural adjustment programmes of the post liberalization era.

Suggested Readings

Blaug M. 1964. Economic Theory in Retrospect. Heineman.

Blaug M. 1986. Economic History and the History of Economic Thought. Wheatsheaf Books, Brighton.

Ekelund RB & Hebert RF. 1975. A History of Economic Theory and Methods. McGraw-Hill.

John Mills A. 2002. Critical History of Economics Missed Opportunities. Palgrave Macmillan.

Screpanti E & Zamagni S. 1995. An Outline of the History of Economic Thought. Clarendon Press, Oxford.

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Objective To expose the students to the concept, significance and uses of agricultural production economics.

Theory

UNIT I Nature, scope and significance of agricultural production economics- Agricultural Production processes, character and dimensions-spatial, temporal - Centrality of production functions, assumptions of production functions, commonly used forms - Properties, limitations, specification, estimation and interpretation of commonly used production functions viz. Linear, Quadratic, Square root, Cubic and Cobb Douglas Function etc.

UNIT II Factors of production, classification, interdependence, and factor substitution - Determination of optimal levels of production and factor application, Optimal factor combination and least cost combination of input - Theory of product choice; selection of optimal product combination.

UNIT III Cost functions and cost curves, components, and cost minimization – cost and production functions and its applications -Derivation of firm's input demand and output supply functions - Economies and diseconomies of scale.

UNIT IV Technology in agricultural production, nature effects and measurement - Measuring farm efficiency in agricultural production; technical, allocative and economic efficiencies - Yield gap analysis-concepts-types and measurement - Nature and sources of risk, Risk and uncertainty in Agril..

Practical

Different forms of production functions - specification, estimation and interpretation of production functions – returns to scale, factor shares, elasticity of production, physical optima-economic, optima, least cost combination, optimal product choice-cost function estimation, interpretation-estimation of yield gap - Incorporation of technology in production functions- measuring returns to scale risk.

Suggested Readings

- Beattie BR & Taylor CR. 1985. The Economics of Production. John Wiley & Sons.
 Doll JP & Frank O. 1978. Production Economics - Theory and Applications. John Wiley & Sons.
 Gardner BL & Raussier GC. 2001. Handbook of Agricultural Economics. Vol. I. Agricultural Production. Elsevier.
 Heady E.O. Economics of Agricultural Production and Resource Use. Prentice- Hall.
 Sankayan P.L. 1983. Introduction to Farm Management, Tata Mc Graw Hill.

Objective To impart adequate knowledge and analytical skills in the field of agricultural marketing issues, and enhance expertise in improving the performance of the marketing institutions and the players in marketing of agricultural commodities.

Theory

UNIT I Concepts of Agricultural Marketing, Characteristic of Agricultural product and Production, Problems in Agricultural Marketing from Demand Supply and Institutions sides. Market intermediaries and their role - Need for regulation in the present context, Marketable & Marketed surplus estimation. Marketing Efficiency, Market Structure Conduct and Performance analysis – Vertical, Horizontal and conglomeration integration - Integration over space, time.

UNIT II Co-operative marketing – APMC Regulated Markets - Direct marketing, Contract farming and Retailing - Supply Chain Management - State trading, Warehousing and other Government agencies -Performance and Strategies – Market infrastructure needs, performance and Government role, Value Chain Finance.

UNIT III Role of Information Technology and telecommunication in marketing of agricultural commodities, Market research, Market information service - electronic auctions (e-bay), e-Chaupals, Agmarket and Domestic and Export market Intelligence Cell (DEMIC) Market extension.

UNIT IV Concept of Agril. Price and its function and importance, Spatial and temporal price relationship price forecasting Time series analysis time series models. Price policy and economic development, Non-price instruments.

UNIT V Theory of storage - Introduction to Commodities markets and future trading, Basics of commodity futures, Operation Mechanism of Commodity markets, Price discovery, Hedging. Role of Government in promoting commodity trading and regulatory measures.

Practical

- Price spread and marketing efficiency analysis. Marketing structure analysis through concentration ratios.
- Performance analysis of Regulated market and other marketing institution. Analysis on contract farming and supply chain management of different agricultural commodities.
- Supply and demand elasticities in relation to problems in agricultural marketing.
- Chain Analysis - quantitative estimation of supply chain efficiency, Market Intelligence, Characters, Accessibility, and Availability Price forecasting.
- Exercise on time series analysis
- Online searches for market information sources and interpretation of market intelligence reports, Technical Analysis for important agricultural commodities, Fundamental Analysis for important agricultural commodities, Presentation of the survey results and wrap-up discussion.

Suggested Readings

- Purecell WD & Koontz SR. 1999. Agricultural Futures and Options Principles and Strategies. 2nd Ed. Prentice-Hall.
- Rhodes VJ. 1978. The Agricultural Marketing System. Grid Publ., Ohio.
- Shepherd SG & Gene AF. 1982. Marketing Farm Products. Iowa State Univ. Press.
- Singhal AK. 1986. Agricultural Marketing in India. Annual Publ., New Delhi.

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Objective The Course Objective of the course is to impart knowledge on econometric tools to the students of agricultural economics. Training in econometrics will help the student to analyze the economic problem by applying quantitative techniques.

Theory

UNIT I Introduction-relationship between economic theory, mathematical economics, models and econometrics, methodology of econometrics-regression analysis.

UNIT II Basic two variable regression - assumptions estimation and interpretation approaches to estimation - OLS, MLE and their properties - extensions to multi variable models-multiple regression estimation and interpretation.

UNIT III Violation of assumptions-identification, consequences and remedies for Multicollinearity, heteroscedasticity, autocorrelation-data problems and remedial approaches - model misspecification.

UNIT IV Use of dummy variables-limited dependent variables-specification, estimation and interpretation.

UNIT V Simultaneous equation models-structural equations-reduced form equations - identification and approaches to estimation.

Practical

- Single equation two variable model specification and estimation – hypothesis testing-transformations of functional forms and OLS application.
- Estimation of multiple regression model - hypothesis testing - testing and correcting specification errors.
- Testing and managing Multicollinearity - testing and managing heteroscedasticity - testing and managing autocorrelation.
- Estimation of regressions with dummy variables - estimation of regression with limited dependent variable.
- Identification of equations in simultaneous equation systems.

Suggested Readings

- Gujarati DN. 2003. Basic Econometrics. McGraw Hill.
Johnson AG Jr., Johnson MB & Buse RC. 1990. Econometrics - Basic and Applied. MacMillan.
Kelejan HH & Oates WE. 1994. Introduction to Econometrics Principles and Applications. Harper and Row Publ.
Koutsoyianis A. 1997. Theory of Econometrics. Barner & Noble.
Maddala GS. 1992. Introduction to Econometrics. MacMillan.
Maddala GS. 1997. Econometrics. McGraw Hill.
Pindyck RS & Rubinfeld DL. 1990. Econometrics Models and Econometric Forecasts. McGraw Hill.

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Objective The Course Objective of the course is to impart knowledge of Linear programming techniques.

Theory

UNIT I Decision Making- Concepts of decision making, introduction to quantitative tools, introduction to linear programming, uses of LP in different fields, graphic solution to problems, formulation of problems.

UNIT II Simplex Method Concept of simplex Method, solving profit maximization and cost minimizations problems. Formulation of farms and non farm problems as linear programming models and solutions.

UNIT III Extension of Linear Programming models Variable resource and price programming, transportation problems, recursive programming, dynamic programming.

UNIT IV Game Theory- Concepts of game theory, two person constant sum, zero sum game, saddle point, solution to mixed strategies, the rectangular game as Linear Programme.

Practical

- Graphical and algebraic formulation of linear programming models.
- Solving of maximization and minimization problems by simplex method. Formulation of the simplex matrices for typical farm situations.

Suggested Readings

Dorfman R. 1996. Linear Programming & Economic Analysis. McGraw Hill.

Loomba NP. 2006. Linear Programming. Tata McGraw Hill.

Shenoy G. 1989. Linear Programming-Principles & Applications. Wiley Eastern Publ.

Vaserstein. 2006. Introduction to Linear Programming. Pearson Education Publication

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AG ECON 509 AGRICULTURAL FINANCE AND PROJECT MANAGEMENT

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Objective

The Course Objective of the course is to impart knowledge on issues related to lending to priority sector credit management and financial risk management. The course would bring in the various appraisal techniques in project - investment of agricultural projects.

Theory

UNIT I

Role and Importance of Agricultural Finance. Financial Institutions and credit flow to rural/priority sector. Agricultural lending – Direct and Indirect Financing - Financing through Co-operatives, NABARD and Commercial Banks and RRBs. District Credit Plan and lending to agriculture/priority sector. Micro-Financing and Role of MFI's - NGO's, and SHG's.

UNIT II

Lending to farmers – The concept of 5 C's, 7 P's and 3 R's of credit. Estimation of Technical feasibility, Economic viability and repaying capacity of borrowers and appraisal of credit proposals. Understanding lenders and developing better working relationship and supervisory credit system. Credit inclusions – credit widening and credit deepening.

UNIT III

Financial Decisions – Investment, Financing, Liquidity and Solvency. Preparation of financial statements - Balance Sheet, Cash Flow Statement and Profit and Loss Account. Ratio Analysis and Assessing the performance of farm/firm.

UNIT IV

Project Approach in financing agriculture. Financial, economic and environmental appraisal of investment projects. Identification, preparation, appraisal, financing and implementation of projects. Project Appraisal techniques – Undiscounted measures. Time value of money – Use of discounted measures - B-C ratio, NPV and IRR. Agreements, supervision, monitoring and evaluation phases in appraising agricultural investment projects. Net work Techniques – PERT and CPM.

UNIT V

Risks in financing agriculture. Risk management strategies and coping mechanism. Crop Insurance programmes – review of different crop insurance schemes – yield loss and weather based insurance and their applications.

Practical

- Development of Rural Institutional Lending. Branch expansion, demand and supply of institutional agricultural credit and Over dues and Loan waiving- An overview.
- Rural Lending Programmes of Commercial Banks, Lead Bank Scheme- Preparation of District Credit Plan.
- Rural Lending Programmes of Co-operative Lending Institutions.
- Preparation of financial statements using farm/firm level data.
- Farm credit appraisal techniques and farm financial analysis through financial statements, Performance of Micro Financing Institutions - NGO's and Self-Help Groups. Identification and formulation of investment projects, Project appraisal techniques – Undiscounted Measures and their limitations.
- Project appraisal techniques – Discounted Measures, Network techniques – PERT and CPM for project management.
- Case Study Analysis of an Agricultural project, Financial Risk and risk management strategies.

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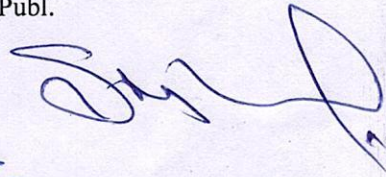
- Crop insurance schemes, Financial instruments and methods – E banking, Kisan Cards and core banking.

Suggested Readings

- Dhubashi PR. 1986. Policy and Performance - Agricultural and Rural Development in Post Independent India. Sage Publ.
- Gittinger JP 1982. Economic Analysis of Agricultural Projects. The Johns Hopkins Univ. Press.
- Gupta SC. 1987. Development Banking for Rural Development. Deep & Deep Publ.
- Little IMD & Mirlees JA. 1974. Project Appraisal and Planning for Developing Countries. Oxford & IBH Publ.
- Muniraj R. 1987. Farm Finance for Development. Oxford & IBH Publ.

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EXT 502

DEVELOPMENT COMMUNICATION AND INFORMATION MANAGEMENT

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Objective In this course, students will learn about the concept, meaning and process of communication and various methods and modern media of communication. Besides, the students will also learn the information management and journalistic writing of various information materials and also study their readability.

Theory

UNIT I Communication process –concept, elements and their characteristics– Models and theories of communication – Communication skills– fidelity of communication, communication competence and empathy, communication effectiveness and credibility, feedback in communication, social networks and Development communication – Barriers in communication, Message – Meaning, dimensions of a message, characteristics of a good message, Message treatment and effectiveness, distortion of message.

UNIT II Methods of communication–Meaning and functions, classification. Forms of communication–Oral and written communication, Non-verbal communication, interpersonal communication, organizational communication. Key communicators–Meaning, characteristics and their role in development.

UNIT III Media in communication–Role of mass media in dissemination of farm technology, Effect of media mix for Rural People. Modern communication media–Electronic video, Tele Text, Tele conference, Computer Assisted Instruction, Computer technology and its implications.

UNIT IV Agricultural Journalism as a means of mass communication, Its form and role in rural development, Basics of writing–News stories, feature articles, magazine articles, farm bulletins and folders. Techniques of collection of materials for news stories and feature articles; Rewriting Art of clear writing, Readability and comprehension testing procedures; photo journalism, communicating with pictures, Radio and TV Journalism, Techniques of writing scripts for Radio and TV.

Practical A study of different Agriculture Newspapers, Agriculture magazine and different journals of communications,
Interpersonal Mass media channels utilized by various farmers for obtaining agriculture information with their credibility preference.
Measurement of information channels utilization, identification of localite and Cosmo polite interpersonal channels and mass media in rural community
Identification of key communicator through different methods with their advantages and limitations.
Techniques of writing script for radio and T.V.
Handling of computer

Suggested Readings

- Dahama OP & Bhatnagar OP. 2005. Education and Communication for Development. Oxford & IBH.
Grover I, Kaushik S, Yadav L & Varma SK. 2002. Communication and Instructional Technology. Agrotech Publ. Academy.
Jana BL & Mitra KP. 2005. Farm Journalism. Agrotech Publ. Academy.
Ray GL. 2006. Extension Communication and Management. Kalyani Publ.

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Rayudu CS.2002. Communication. Himalaya Publ. House.
Reddy AA. 1987. Extension Education. Sree Lakshmi Press, Bapatla.
Sandhu AS. 2004. Textbook on Agricultural Communication Process and Methods. Oxford & IBH.

EXT 506 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT IN EXTENSION
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Objective

The first part of the course is intended to provide overall picture of planning and development of enterprises for extending sustainable livelihoods for rural people. The second part of the course is structured to help the students to gain knowledge and skills in different concepts and techniques of management in extension organizations.

Theory

- UNIT I** Entrepreneurship–Concept, characteristics, Approaches, Theories, Need for enterprises development Agri–entrepreneurship–Concept, characteristics, Nature and importance for sustainable Livelihoods. Traits of entrepreneurs –Risk taking, Leadership, Decision making, Planning, Organising, Coordinating and Marketing, Types of Entrepreneurs. Stages of establishing enterprise–Identification of sound enterprise, steps to be considered in setting up an enterprise, feasibility report, product selection, risk and market analysis, legal requirements. Project Management and Appraisal–Market, Technical, Financial, Social Appraisal of Projects.
- UNIT II** Micro enterprises–Profitable Agri enterprises in India–Agro Processing, KVIC industries. Micro financing–meaning, Sources of Finance, Banks, Small scale industries development organizations. Marketing for enterprises –Concept, planning for marketing, target marketing, Competition, market survey and strategies, Product sales and promotion. Gender issues in entrepreneurship development–Understanding gender and subordination of women, Gender as a development tool, Policy approaches for women entrepreneurship development. Success and Failure stories for enterprises – Issues relating to success and failure of enterprises, Personal, Production, Finance, Social, Marketing.
- UNIT III** Management–Meaning, concept, nature and importance, Approaches to management, Levels of management, Qualities and skills of a manager. Extension Management–Meaning Concept, Importance, Principles of management, Classification of Functions of Management. Planning–Concept, Nature, Importance, Types, Making planning effective. Change Management–factors, process and procedures. Decision making–Concept, Types of decisions, Styles and techniques of decision making, Steps in DM Process, Guidelines for making effective decisions. Organizing–Meaning of Organization, Concept, Principles, Organizational Structure, Span of Management, Departmentalization, Authority and responsibility, Delegation and decentralization, line and staff relations.
- UNIT IV** Coordination–Concept, Need, Types, Techniques of Coordination. Interpersonal relations in the organization. Staffing–Need and importance, Manpower planning, Recruitment, Selection, Placement and Orientation, Training and Development–Performance appraisal– Meaning, Concept, Methods. Direction–Concept, Principles, Requirements of effective direction, Giving orders, Techniques of direction. Leadership–Concept, Characteristics, Functions, Approaches to leadership, Leadership styles. Organizational Communication–Concept, Process, Types, Net Works, Barriers to Communication. Managing work motivation–Concept, Motivation and Performance, Approaches to motivation. Supervision–Meaning, Responsibilities, Qualities and functions of supervision, Essentials of effective supervision. Managerial Control–Nature, Process, Types, Techniques of Control, Budgeting, Observation, PERT and CPM, MIS.

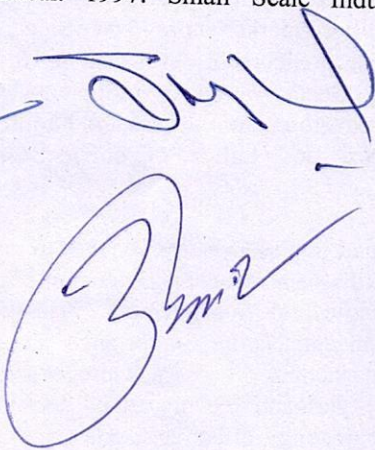
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- Field visit to Successful enterprises-Study of Characteristics of Successful entrepreneurs.
- Development of Project Proposal-Case Studies of Success / Failure enterprises-Exercise on Market Survey.
- Field visit to Financial institutions-Simulated exercise to understand management process.
- Field visit to extension organizations to understand the functions of management
- Group exercise on development of short term and long term plan- Simulated exercise on techniques of decision making-Designing organizational structure-Group activity on leadership development skills.

Suggested Readings

- Gupta CB. 2001. Management Theory and Practice. Sultan Chand & Sons.
 Indu Grover. 2008. Handbook on Empowerment and Entrepreneurship. Agrotech Public Academy.
 Khanka SS. 1999. Entrepreneurial Development. S. Chand & Co.
 Singh D. 1995. Effective Managerial Leadership. Deep & Deep Publ.
 Tripathi PC & Reddy PN. 1991. Principles of Management. Tata McGraw Hill.
 Vasanta Desai. 1997. Small Scale Industries and Entrepreneurship. Himalaya Publ. House.

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EXT 505 E- EXTENSION

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Objective Students will gain knowledge and skills in understanding the concepts of Information and communication technologies and how these ICT tools can be used for Agricultural Extension. Besides, he studies various ICT projects which are successful in delivering the services to the clientele fulfilling the objective of Transfer of Technology i.e. Reaching the unreached.

Theory

UNIT I ICTs- Concept, definition, tools and application in extension education. Reorganizing the extension efforts using ICTs, advantages, limitations and opportunities.

UNIT II ICTs projects, case studies in India and developing world. Different approaches (models) to ICTs. ICT use in field of extension- Expert systems on selected crops and enterprises; Self learning CDs on package of practices, diseases and pest management, Agricultural web sites and portals related crop production and marketing etc.

UNIT III Community Radio, Web, Tele, and Video conferencing. Computer Aided Extension. Knowledge management, Information kiosks, Multimedia. Online, Offline Extension. Tools-Mobile technologies, e-learning concepts.

UNIT IV ICT Extension approaches-pre-requisites, information and science needs of farming community. Need integration. Human resource information. Intermediaries. Basic e-extension training issues. ICT enabled extension pluralism. Emerging issues in ICT.

Practical

Agril. content analysis of ICT Projects. Handling of ICT tools.
Designing extension content. Online extension service.
Project work on ICT enabled extension.
Creation of extension blogs.
Visit to ICT extension projects.

Suggested Readings

- Batnakar S. & Schware R. 2000. Information and Communication Technology in Development- Cases from India. Sage Publ.
Meera S.N. 2008. ICTs in Agricultural Extension Tactical to Practical. Ganga-Kaveri Publ. House. JangamWadiMath, Varanasi.
Willem Zip. 1994. Improving the Transfer and Use of Agricultural Information-A Guide to Information Technology. The World Bank, Washington.

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EXT- 503

DIFFUSION AND ADOPTION OF INNOVATIONS**Minor Course
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The students will learn how the agricultural innovations spread among the farmers in the society by getting into the insights of diffusion concept and adoption process, stages of adoption and innovation decision process, adopter categories and their characteristics, opinion leaders and their characteristics, attributes of innovations, and factors influencing adoption. In addition, the students would be learning various concepts related to diffusion and adoption of innovations.

Theory**UNIT I**

Diffusion-concept and meaning, elements; traditions of research on diffusion; the generation of innovations; innovation-development process; tracing the innovation-development process, converting research into practice.

UNIT II

The adoption process- concept and stages, dynamic nature of stages, covert and overt processes at stages, the innovation-decision process—a critical appraisal of the new formulation.

UNIT III

Adopter categories—Innovativeness and adopter categories, adopter categories as ideal types, characteristics of adopter categories; Perceived attributes of Innovation and their rate of adoption, factors influencing rate of adoption.

UNIT IV

Diffusion effect and concept of over adoption, opinion leadership-measurement and characteristics of opinion leaders, monomorphic and polymorphic opinion leadership, multi-step flow of innovation; concepts of homophily and heterophily and their influence on flow of innovations; Types of innovation-decisions—Optional, Collective and Authority and contingent innovation decisions; Consequences of Innovation-Decisions—Desirable or Undesirable, direct or indirect, anticipated or unanticipated consequences; Decision making – meaning, theories, process, steps, factors influencing decision-making.

Practical

- Case studies in individual and community adoption process.
- Content analysis of adoption studies, identification of adopter categories on a selected technology.
- Study of attributes of current farm technologies, identification of opinion leaders.
- Sources of information at different stages of adoption on a selected technology, study of factors increasing or retarding the rate of adoption.
- Presentation of reports on adoption and diffusion of innovations.

Suggested Readings

- Dasgupta. 1989. Diffusion Agricultural Innovations in Village India. Wiley Eastern
 Jaliha KA & Veerabhadraiah V. 2007. Fundamentals of Extension Education and Management in Extension. Concept Publ. Co.
 Ray GL. 2005. Extension Communication and Management. Kalyani Publ.
 Reddy AA. 1987. Extension Education. Sree Lakshmi Press, Bapatla.
 Rogers EM. 2003. Diffusion of Innovations. 5th Ed. The Free Press, New York.

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STAT- 511 STATISTICAL METHODS FOR APPLIED SCIENCES

Objective The student is exposed statistical methods and statistical inference to help them in understanding the concepts involved in data presentation, analysis and interpretation.

Theory

UNIT I Classification, tabulation and graphical representation of data. Box-plot, Descriptive statistics. Exploratory data analysis; Theory of probability. Random variable and mathematical expectation.

UNIT II Discrete and continuous probability distributions Binomial, Poisson, Negative Binomial, Normal distribution, Beta and Gamma distributions and their applications. Concept of sampling distribution chi-square, t and F distributions. Tests of significance based on Normal, chi-square, t and F distributions. Large sample theory.

UNIT III Introduction to theory of estimation and confidence-intervals. Correlation and regression. Simple and multiple linear regression model, estimation of parameters, predicted values and residuals, correlation, partial correlation coefficient, multiple correlation coefficient, rank correlation, test of significance of correlation coefficient and regression coefficients. Coefficient of determination. Polynomial regression models and their fitting. Probit regression analysis by least squares and maximum likelihood methods, confidence interval for sensitivity; Testing for heterogeneity.

UNIT IV Non-parametric tests - sign, Wilcoxon, Mann-Whitney U-test, Wald Wolfowitz run test, Run test for the randomness of a sequence. Median test, Kruskal- Wallis test, Friedman two-way ANOVA by ranks. Kendall's coefficient of concordance.

UNIT V Introduction to multivariate analytical tools- Hotelling's T^2 Tests of hypothesis about the mean vector of a multinormal population. Classificatory problems and discriminant function, D^2 -statistic and its applications; Cluster analysis, principal component analysis, canonical correlations and Factor analysis.

Practical

- Exploratory data analysis, Box-Cox plots; Fitting of distributions ~ Binomial, Poisson, Negative Binomial, Normal; Large sample tests, testing of hypothesis based on exact sampling distributions ~ chi square, t and F ; Confidence interval estimation and point estimation of parameters of binomial, Poisson and Normal distribution; Correlation and regression analysis, fitting of orthogonal polynomial regression; applications of dimensionality reduction and discriminant function analysis; Nonparametric tests.

Suggested Readings

- Anderson TW. 1958. An Introduction to Multivariate Statistical Analysis. John Wiley.
 Dillon WR & Goldstein M. 1984. Multivariate Analysis - Methods and Applications. John Wiley.
 Goon AM, Gupta MK & Dasgupta B. 1977. An Outline of Statistical Theory. Vol. I. The World Press.
 Goon AM, Gupta MK & Dasgupta B. 1983. Fundamentals of Statistics. Vol. I. The World Press.
 Hoel PG. 1971. Introduction to Mathematical Statistics. John Wiley.
 Hogg RV & Craig TT. 1978. Introduction to Mathematical Statistics. Macmillan.
 Morrison DF. 1976. Multivariate Statistical Methods. McGraw Hill.
 Siegel S, Johan N & Casellan Jr. 1956. Non-parametric Tests for Behavior Sciences. John Wiley.
 Learning Statistics <http://freestatistics.altervista.org/en/learning.php>.
 Electronic Statistics Text Book <http://www.statsoft.com/textbook/stathome.html>.

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STAT 513 SAMPLING TECHNIQUES

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Objective It would help student understanding the concepts involved in planning and designing their surveys, presentation of survey data analysis of survey data and presentation of results. This course would be especially important to the students of social sciences.

Theory

UNIT I Concept of sampling, sample survey vs complete enumeration, planning of sample survey, sampling from a finite population.

UNIT II Simple random sampling, sampling for proportion, determination of sample size; inverse sampling, Stratified sampling.

UNIT III Cluster sampling, PPS sampling, Multi-stage sampling, double sampling, systematic sampling; Use of auxiliary information at estimation as well as selection stages.

UNIT IV Ratio and regression estimators. Construction and analysis of survey designs, sampling and non-sampling errors; Preparation of questionnaire Non-sampling errors.

Practical

- Random sampling ~ use of random number tables, concepts of unbiasedness, variance, etc.; simple random sampling, determination of sample size; Exercises on inverse sampling, stratified sampling, cluster sampling and systematic sampling; Estimation using ratio and regression estimators; Estimation using multistage design, double sampling and PPS sampling.

Suggested Readings

- Cochran WG. 1977. Sampling Techniques. John Wiley.
 Murthy MN. 1977. Sampling Theory and Methods. 2nd Ed. Statistical Publ. Soc., Calcutta.
 Singh D, Singh P & Kumar P. 1982. Handbook on Sampling Methods. 17 IASRI Publ.
 Sukhatme PV, Sukhatme BV, Sukhatme S & Asok C. 1984. Sampling Theory of Surveys with Applications. Iowa State University Press and Indian Society of Agricultural Statistics, New Delhi.

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S.K.S.

Signature