
	Department of Agricultural Economics Mahatma Phule Krishi Vidyapeeth Rahuri-413 722, Dist. Ahmednagar (MS)	
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Master's Programme *in* Agricultural Economics

Course Layout

Minimum Credit Requirements

Sr. No.	Subject	Minimum credit(s)
1.	Major	20
2.	Minor	09
3.	Supporting	06
4.	Seminar	01
5.	Research	20
	Total Credits	56
	Compulsory Non Credit Courses	06

Sr. No.	Course Number	Course Title	Credits
A) Major subjects (Min. 20 credits)			
1	AG.ECON-501	Micro Economic Theory And Applications	2+0=2
2	AG.ECON-502	Macro Economics And Policy	2+0=2
3	AG.ECON-503	Evolution Of Economic Thought	1+0=1
4	AG.ECON-504	Agricultural Production Economics	1+1=2
5	AG.ECON-505	Agricultural Marketing & Price Analysis	2+1=3
6	AG.ECON-506	Research Methodology For Social Sciences	1+1=2
7	AG.ECON-507	Econometrics	2+1=3
8	AG.ECON-508	Linear Programming	1+1=2
9	AG.ECON-509	Agricultural Finance And Project Management	2+1=3

B) Minor Subjects (Min. 09 credits)			
1	AG.ECON- 517	Computer Applications For Agril. Economics	2+1=3
2	EXT 503	Diffusion And Adoption Of Innovations	2+1=3
3	Ext 507	Human Resource Development	2+1=3
C) Supporting Subjects (Min. 06 credits)			
1	AG.STAT-501	Mathematical Methods For Applied Sciences	3+0=3
2	AGSTAT-511	Statistical Methods For Applied Sciences	2+1=3
D) Seminar (01 credit)			
3	AG.ECON-591	Seminar	0+1=1
E) Master's Research (20 credits)			
4	AG.ECON-599	Research Work	0 + 20=20
F) Non Credit Compulsory Courses			
1	PGS 501	Library And Information Services	0+1=1
2	PGS 502	Technical Writing and Communications Skill	0+1=1
3	PGS 503	Intellectual Property and Its Management	1+0=1
4	PGS 504	Basic Concept In Laboratory Techniques	0+1=1
5	PGS- 505	Agricultural Research, Research Ethics and Rural Development Programmes	1+0=1
6	PGS 506	Disaster Management	1+0=1

Course Contents

A) Major Subjects:

Course No. : AG ECON 501

Course Title : Micro Economic Theory and Application

Credit : 2+0=2

Semester : I

Theory Syllabus :

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 - Behavior 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.
 - Dewett KK. 2002. Modern Economic Theory.
 - Henderson JM and Quandt RE. 2000. Microeconomic Theory : Mathematical Approach.
 - Koutsoyiannis A. 2003. Modern Microeconomics.
 - Silberberg E and Suen W. 2001. The Structure of Economics- A Mathematical Analysis.
 - Varian Hal R. 1999. Intermediate Microeconomics.
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Course No. : AG ECON 502

Course Title : Macro Economics

Credit : 2+0=1

Semester: I

Theory Syllabus :

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:

- a. Ahuja HL. 2007 Macroeconomics: Theory and Policy.
- b. Eugene A Diulio 2006. Macroeconomics. 4th Ed.
- c. Gardner Ackely 1987. Macro Economic: Theory and Policy.

Course No. : AG ECON 503

Course Title: Evaluation of Economic Thought

Credit : 1+0=1

Semester : II

Theory Syllabus :

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'

Course No. : AG ECON 504

Course Title: Agricultural Production Economics

Credit : 1+1= 2

Semester : II

Theory Syllabus :

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.

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 production - Theory of product choice; selection of optimal product combination.

UNIT III

Cost functions and cost curves, components, and cost minimization -Duality theory – 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 and effects and measurement – Measuring efficiency in agricultural production; technical, allocative and economic efficiencies - Yield gap analysis- concepts-types and measurement - Nature and sources of risk, modeling and coping strategies.

Practical Syllabus:

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 analysis through linear programming.

Suggested Readings:

1. Beattie BR & Taylor CR. 1985. The Economics of Production. John Wiley & Sons.
2. Doll JP & Frank O. 1978. Production Economics - Theory and Applications. John Wiley & Sons.
3. Gardner BL & Rausser GC. 2001. Handbook of Agricultural Economics. Vol. I. Agricultural Production. Elsevier.
4. Heady EO. Economics of Agricultural Production and Resource Use. Prentice- Hall.
5. Sankayan PL. 1983. Introduction to Farm Management. Tata Mc Graw Hill.

Course No. : AG ECON 505

Course Title : Agricultural Marketing and Price Analysis

Credit : 2+1= 3

Semester : I

Theory Syllabus :

UNIT I

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

UNIT II

Marketing Co-operatives – 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

Spatial and temporal price relationship – price forecasting – time series analysis – time series models – spectral analysis. 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 and Basis - Fundamental analysis - Technical Analysis - Role of Government in promoting commodity trading and regulatory measures.

Practical Syllabus:

Supply and demand elasticities in relation to problems in agricultural marketing. Price spread and marketing efficiency analysis. Marketing structure analysis through concentration ratios. Performance analysis of Regulated market and marketing societies. Analysis on contract farming and supply chain management of different agricultural commodities, milk and poultry products. Chain Analysis - quantitative estimation of supply chain efficiency - Market Intelligence

– Characters, Accessibility, and Availability Price forecasting. Online searches for market information sources and interpretation of market intelligence reports –

commodity outlook - 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 and Koontz SR. 1999. Agricultural Futures and Options: Principles and Strategies.
- Rhodes VJ. 1978. The Agricultural Marketing System. Grid Publ., Ohio
- Shepherd SG and Gene AF. 1982. Marketing Farm Products. Towa State Univ. Press.
- Singhal AK. 1986. Agricultural Marketing in India. Annual Publ., New Delhi.

Course No. : AG ECON 506

Course Title: Research Methodology for Social Sciences

Credit: 1+1= 2

Semester: I

Theory Syllabus

UNIT I

Importance and scope of research in agricultural economics. Types of research - Fundamental vs. Applied. Concept of researchable problem—research prioritization – selection of research problem. Approach to research – research process.

UNIT II

Hypothesis – meaning - characteristics - types of hypothesis – review of literature– setting of Course Objective and hypotheses - testing of hypothesis.

UNIT III

Sampling theory and sampling design – sampling error - methods of sampling – probability and non-probability sampling methods - criteria to choose. Project proposals – contents and scope – different types of projects to meet different needs– trade-off between scope and cost of the study. Research design and techniques – Types of research design.

UNIT IV

Data collection – assessment of data needs – sources of data collection – discussion of different situations. Mailed questionnaire and interview schedule – structured, unstructured, open ended and closed-ended questions. Scaling Techniques. Preparation of schedule – problems in measurement of variables in agriculture. Interviewing techniques and field problems - methods of conducting survey – Reconnaissance survey and Pre testing.

UNIT V

Coding editing – tabulation – validation of data. Tools of analysis – data processing. Interpretation of results – Preparing research report / thesis – Universal procedures for preparation of bibliography – writing of research articles.

Practical Syllabus:

Exercises in problem identification. Project proposals – contents and scope. Formulation of Objective and hypotheses. Assessment of data needs – sources of data – methods of collection of data. Methods of sampling – criteria to choose – discussion on sampling under different situations. Scaling Techniques – measurement of scales. Preparation of interview schedule - Field testing. Method of conducting survey. Exercise on coding, editing, tabulation and validation of data. Preparing for data entry into computer. Hypothesis testing – Parametric and Non-Parametric Tests. Exercises on format for Thesis / Report writing. Presentation of the results.

Suggested Readings:

1. Black TR. 1993. Evaluating Social Science Research - An Introduction .SAGE Publ.
2. Creswell JW. 1999. Research Design - Qualitative and Quantitative Approaches. SAGE Publ.
3. Dhondyal SP. 199J. Research Methodology in Social Sciences and Essentials of Thesis Writing. Amman Publ. House, New Delhi.
4. Kothari CR. 2004. Research Methodology - Methods and Techniques. Wishwa Prakashan, Chennai.
5. Rao KV. 1993. Research Methodology in Commerce and Management. Sterling Publ., New Delhi.
6. Singh AK. 1993. Tests, Measurements and Research Methods in Behavioral Sciences. Tata McGraw-Hi I I.
7. Verrkatasubramanian V. 1999. Introduction to Research Methodology in Agricultural and Biological Sciences. SAGE Publ.

Course No. : AG ECON 507

Course Title: Econometrics

Credit : 2+1= 3

Semester : II

Theory Syllabus :

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

UNIT V

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

Practical Syllabus:

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:

- a. Gujarati DN. 2003. Basic Econometrics. McGraw Hill.
 - b. Johnson AG Jr., Johnson MB and Buse RC. 1990. Econometrics - Basic and Applied. Macmillan.
 - c. Kelejan HH and Oates WE. 1994. Introduction to Econometrics Principles and Applications. Harper and Row Publ.
 - d. Koutsoyianis A. 1997. Theory of Econometrics. Barner and Noble.
 - e. Maddala GS. 1992. Introduction to Econometrics. Macmillan.
 - f. Maddala GS. 1997. Econometrics. McGraw Hill.
 - g. Pindyck RS and Rubinfeld DL. 1990. Econometrics Models and Econometric Forecasts. McGraw Hill.
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Course No. : AG ECON 508

Course Title: Linear Programming

Credit: 1+1= 2

Semester : III

Theory Syllabus :

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

Simple Method: Concept of simplex Method, solving profit maximization and cost minimizations problems. Formulation of farms and nonfarm problems as linear programming models and solutions.

UNIT III

Extension of Linear Programming models: Variable resource and price programme transportation problems, recursive programming, and 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 Syllabus:

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 and Economic Analysis. McGraw Hill.
- Loomba NP. 2006. Linear Programming. Tata McGraw Hill.
- Shenoy G. 1989. Linear Programming-Principles and Applications. Wiley Eastern Publ.
- Vaserstein. 2006. Introduction to Linear programming. Pearson Education Publication.

Course No. : AG ECON 509

Course Title : Agricultural Finance and Project Management

Credit : 2+1= 3

Semester : II

Theory Syllabus :

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 3 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 Syllabus:

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

Suggested Reading:

- Agrawal, R.R.and Earl, O. Heady. 1972. Operation Research Methods for Agricultural Decision. The Iowa state University Press, Ames.
- Chandra, Prasanna.1997..Project:Planning and Appraisal.Tata McGraw-Hill Publishing Co., New Delhi-110 002.
- Dhubashi,P.R.1986.Policy and Performance-Agricultural and Rural Development in Post Independent India. Sage Publ.
- Gittinger, J.P. 1984. Economic Analysis of Agricultural Projects. John Hopkins University Press.
- Gupta,S.C. 1987. Development Banking for Rural Development.Deep & Deep Pbl.
- Little, IMD & Mirlees J.A.1974. Project Appraisal and Planning for Developing Countries. Oxford & IBH Publ..
- Muniraj,R. 1987. Farm Finance for Development. Oxford & IBH Publ..
- Nelson, A. and W.G.Moore. Agricultural Finance.

B) Minor Subjects

Course No. : AG ECON 517

Course Title : Computer Application for Agricultural Economics

Credit : 2+1= 3

Semester : I

Theory Syllabus :

Unit I

Concept of Computers: Detailed Block Diagram as per today's configuration. Main areas of Computers and their applications. Advanced Storages: SCSI Hard Disks, Magnetic Tapes, DVD ROM, Pocket Drives, cache memory, Static and Dynamic RAM. Buses: ISA, PCI and others. Ports: Parallel and Serial. Networking Cards. Types of Computers- Analog, Digital, Hybrid, General Purpose and Special purpose Computers, Micro Computers, Mini Computers, Main-frame Computers, and Super Computers.

Unit II

Data and Information- Data Definition, Data Processing Systems, Data Type and various file formats- Numeric, Alphabetic, Audio, Graphic, and Video and their presentation. Data Processing- Introduction to Data Processing, Computer as a tool for Data Processing, Data Processing Cycle, Data Processing techniques, Data Analysis, Data Inputs and Outputs, Data Processing management, Data Security.

Unit III

Working on Operating Systems & Application Software: MS Windows and Linux Operating Systems. Working with word Processing, spreadsheet application, slides preparation for presentation and database application software.

Unit IV

Data Analysis Software: Use of various management software's like SPSS. Data analysis on packages like MS-Excel, Open Stat and Gnumeric.

Unit V

Networking fundamentals, types of networking, network topology. Introduction to Networking protocols: File Transfer Protocol(FTP), Telnet, simple mail transfer protocol (SMTP), Transmission Control Protocol/ Internet Protocol (TCP/IP), Hyper text mark up language (HTML). Introduction to LAN, WAN, MAN. Working with Internet: Web pages, Web sites, Web servers, Web applications.

Practical Syllabus:

Advanced Architecture of Modern Computer System, .word Processing Package and it's execution for preparing the slides, Execution of Statistical formulae on Spreadsheet packages, Preparing the relational database on MS-Access, Statistical Packages like SPSS, Numeric, Open Stat, Spar2, Networking Protocols: FTP, SMTP, TCP/IP etc.. Internet Fundaments: Web Pages, Web Sites, Web Servers, Web Applications.

Suggested Readings:

- Lucas. 2004. Information Technology for Management. McGraw Hill.
- Norton P. 1998. Introduction to Computers. 2nd Ed. Tata McGraw Hill.
- Rajaraman V. 2006. Introduction to Information Technology. Prentice Hall of India.
- Tanenbaum AS. 2003. Computer Networks. Prentice Hall of India.

Course No. : EXT 503

Course Title : DIFFUSION AND ADOPTION OF INNOVATIONS

Credit : 2+1= 3

Theory Syllabus :

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, mono morphic 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 adoption of an innovation
- Review of adoption studies
- Identification of opinion leaders
- Use of sources of information for farm technology
- Study of factors promoting 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.
- Jalihal 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.

Course No. : EXT 507

Course Title : HUMAN RESOURCE DEVELOPMENT

Credit : 2+1= 3

Theory Syllabus

UNIT I	Human Resource Development – Definition, Meaning, Importance, Scope and Need for HRD
	Conceptual frame work, inter disciplinary approach, function systems and case studies in HRD;
	HRD Interventions – Different Experiences; Selection, Development & Growth- Selection
	Recruitment, Induction Staff Training and Development, Career planning
	Social and Organizational Culture: Indian environment perspective on cultural process and social structure, society in transition
	Organizational and Managerial values and ethics, organizational commitment
	Motivation productivity - job description – analysis and evaluation;
	Performance Appraisal.
UNIT II	Human Resource management: Collective bargaining, Negotiation skills
	Human Resource Accounting (HRA): What is HRA? Why HRA? Information Management for HRA and Measurement in HRA
	Intra personal processes: Collective behaviour, learning, and perception ; Stress and coping mechanisms
	Inter-Personal Process, Helping Process – communication and Feedback and interpersonal styles
	Group processes : Inter and Intra
	Organizational communication, Team building Process and functioning, Conflict management, Collaboration and Competition
	HRD & Supervisors: Task Analysis
	Capacity Building – Counseling and Mentoring

	Role of a Professional Manager: Task of Professional Manager – Responsibility of Professional Manager; Managerial skills and Soft skills required for Extension workers
	Decision Making: Decision Making models
	Management by Objectives
UNIT III	Training – Meaning, determining training need and development strategies
	Training types, models, methods and evaluation
	Facilities for training – Trainers training – techniques for trainees participation
	Research studies in training extension personnel
	Main issues in HRD: HRD culture and climate – organizing for HRD – emerging trends and prospects.

Practical:

- Visit to different training organizations to review on going activities & facilities;
- Analysis of Training methods followed by training institutions for farmers and extension workers
- Studies on evaluation of training programmes;
- Study of HRD in organization in terms of performance, organizational development, employees welfare and improving quality of work life and Human resource information, Presentation of reports.

Suggested Readings:

- Agochiya D. 2002. Every Trainer's Handbook. Sage Publ.
- David Gross. 1997. Human Resource Management - The Basics. TR Publ.
- Davis Keth & Newston W John 1989. Human Behaviour at Work. 8th Ed. McGraw-Hill.
- Hersey Paul & Balanchard H Kenneth. 1992. Management of Organizational Behaviour Utilizing Human Resource. 5th Ed. Prentice-Hall of India.
- Knoontz Harold & Weihhrich Heinz 1990. Essentials of Management. 5th Ed. McGraw-Hill.
- Lynton RP & Pareek U. 1993. Training for Development. DB. Taraporewale Sons & Co.
- Punna Rao P & Sudarshan Reddy M. 2001. Human Resource Development Mechanisms for Extension Organization. Kalyani Publ.
- Rao TV. 2003. Readings in Human Resource Development. Oxford Publ. Co.
- Silberman Mel. 1995. Active Training. Press Johnston Publ. Co., New Delhi.
- Singh RP. 2000. Management of Training Programmes. Anmol Publ.
- Subba Rao P. 2005. Management & Organizational Behaviour. Himalaya Publ. House.
- Sundaram RM, Gupta V, George SS. 2006. Case Studies in Human Resource Management. ICFAI, Hyderabad.
- Tripati & Reddy. 2004. Principles of Management. Tata McGraw-Hill.
- Wayne MR & Robert MN. 2005. Human Resource Management. International Ed. Pearson Prentice Hall.

C) Supporting Subjects

Course No.: STAT-501

Course Title :Mathematical Methods for Applied Sciences

Credit: 3+0

Theory

Unit I

Variables and functions, Limit and continuity, specific functions. Differentiation, theorems of differentiation, differentiation of logarithmic, trigonometric, exponential and inverse functions, function of function, derivative of higher order, partial derivatives, Application of derivatives in agricultural research, determination of points of inflection, maxima – minima in optimization, etc.

Unit II

Integration as a reverse process of differentiation, methods of integration, reduction formula, definite integral; Application of integration in agriculture research with reference to economics and genetics, engineering etc.

Unit III

Vector and vector spaces, Matrices, notation and operations, law of matrix algebra, transpose and inverse of Matrix, Eigen value and Eigen vectors, determinants, evaluation and properties of determinants. Application of determinants and matrices in solution of equations for economic analysis.

Unit IV

Set theory- set operations, finite and infinite sets, operations of set, function defined in terms of sets.

Suggested Readings Books

1. Taro Yamano. Mathematics for Economics. Prentice- Hall of India Pvt. Limited New Delhi.
2. Harville D.A. 1997. Matrix Algebra from a Statisticians Perspective .Springer.Publ.
3. Stewart J. 2007. Calculas.Thompson Pub.
4. Thomas GB. Jr. & Finney RL. 1996. Calculas 9th Ed. Pearson Edu. chand and sons Pub., New Delhi.

Course No.: STAT-511

Course Title : Statistical Methods for Applied Sciences

Credits: 2+1

Theory

Unit I

Classification and tabulation of data. Descriptive Statistics, Exploratory data analysis, Theory of probability: random variable and mathematical expectation

Unit II

Discrete and Continuous probability distribution: Binomial, Poisson, Normal, and their application. Concept of sampling distribution: Chi-square, t, and F distribution. Test of significance based on Normal, Chi-square, t and F distribution. Large sample theory (Z-test).

Unit III

Correlation and regression: Simple and multiple linear regression model, Stepwise regression, Estimation of parameters, Correlation, Partial and multiple correlation, Rank correlation, Path analysis, Test of significance of correlation coefficients and regression coefficients, coefficient of multiple determination. Polynomial regression model and their fitting, Estimation of parameters.

Unit IV

Non-parametric tests: sign, Mann-Whitney U test, Run test, Median test.

Practical:

Calculation of mean, median, mode, variance and standard deviation etc. Fitting of Binomial, Poisson and Normal distributions, Large sample test, t, F and Chi-square test, Correlation, Partial and multiple correlation, Rank correlation and linear, multiple and non-linear regression, Path analysis, Non- parametric tests.

Suggested Readings:

1. Snedecor G.W. & W.G. Cochran, (1967) Statistical Methods Sixth Edition, Oxford & IBH Publishing Company, Bombay, W.
2. Ostle B , (1967) Statistics in Research Oxford & IBH Publishing Company, Bombay, W.
3. Robert G. D. Steel and James H. Torrie (1971). Principles and Procedures of Statistics. Biometrical Approach, McGraw Hill International Book Company, New York
4. Gupta S. C., V.K. Kapoor (1991). Fundamental of mathematical statistics, Sultan

D) Seminar

AG.ECON : 591

Course title; Seminar

Credit : 0+1

E) Masters' Research

AG.ECON : 599

Course title; Research work

Credit : 0+20

F) Compulsory Non Credit Courses

Course No. : PGS 501

Course Title : LIBRARY AND INFORMATION SERVICES

Course Credits : 0+1=1

Practical :

Exercise No.	Title of the exercise
1-2	Introduction to library and its services; types of library.
3	Role of libraries in education, research and technology transfer;
4	Classification systems and organization of library;
5-6	Sources of information- Primary sources, secondary sources and tertiary sources;
7-9	Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABs reference sources;
10	Literature survey;
11	Citation techniques/Preparation of bibliography;
12	Use of CD-ROM Databases,
13	Online Public Access Catalogue and other computerized library services;
14-15	Use of Internet including search engines and its resources;
16	e-resources access methods.

Course No. : PGS 502

Course Title : TECHNICAL WRITING AND COMMUNICATIONS SKILLS

Course Credits : 0+1=1

Practical :

Exercise No.	Title of the exercise
1	Various forms of scientific writings- theses, technical papers, reviews, manuals, etc
2	Various parts of thesis and research communications (title page, authorship, conten

	page, preface, introduction, review of literature, material and methods, experimental results and discussion);
3	Writing of abstracts, summaries, précis, citations etc.;
4	Commonly used abbreviations in the theses and research communications;
5	Illustrations, photographs and drawings with suitable captions;
6	Pagination, numbering of tables and illustrations;
7	Writing of numbers and dates in scientific write-ups;
8	Editing and proof-reading;
9	Writing of a review article.
10-11	Grammar (Tenses, parts of speech, clauses, punctuation marks);
12	Error analysis (Common errors);
13	Concord; Collocation; Phonetic symbols and transcription; Accentual pattern:
14	Weak forms in connected speech:
15	Participation in group discussion: Facing an interview;
16	Presentation of scientific papers.

Suggested Readings:

1. Chicago Manual of Style. 14th Ed. 1996. Prentice Hall of India.
2. Collins' Cobuild English Dictionary. 1995. Harper Collins.
3. Gordon HM & Walter JA. 1970. Technical Writing. 3rd Ed. Holt, Rinehart & Winston.
4. Hornby AS. 2000. Comp. Oxford Advanced Learner's Dictionary of Current English. 6th Ed. Oxford University Press.
5. James HS. 1994. Handbook for Technical Writing. NTC Business Books.
6. Joseph G. 2000. MLA Handbook for Writers of Research Papers. 5th Ed. Affiliated East-West Press.
7. Mohan K. 2005. Speaking English Effectively. MacMillan India.
8. Richard WS. 1969. Technical Writing. Barnes & Noble.
9. Robert C. (Ed.). 2005. Spoken English: Flourish Your Language. Abhishek.
10. Sethi J & Dhamija PV. 2004. Course in Phonetics and Spoken English. 2nd Ed. Prentice Hall of India.
11. Wren PC & Martin H. 2006. High School English Grammar and Composition. S. Chand & Co.

Course No. : PGS 503

**Course Title : INTELLECTUAL PROPERTY AND ITS MANAGEMENT
IN AGRICULTURE**

Course Credits : 1+0=1

Theory

Lecture No.	Topics to be covered
1-2	Historical perspectives and need for the introduction of Intellectual Property Right regime
3-4	TRIPs and various provisions in TRIPs Agreement
5	Intellectual Property and Intellectual Property Rights (IPR), benefits of securi IPRs
6	Indian Legislations for the protection of various types of Intellectual Properties
7-9	Fundamentals of patents, copyrights, geographical indications, designs and layo

	trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and bio-diversity protection	
10-11	Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection	
12	National biodiversity protection initiatives	
13	Convention on biological diversity	
14-15	International Treaty on Plant Genetic Resources for Food and Agriculture	
16	Licensing of technologies, Material transfer agreements, Research Collaboration Agreement, License Agreement	

Suggested Readings:

1. Erbisch FH & Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI.
2. Ganguli P. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill.
3. Intellectual Property Rights: Key to New Wealth Generation. 2001. NRDC & Aesthetic Technologies. Ministry of Agriculture, Government of India. 2004. State of Indian Farmer. Vol.
4. V. Technology Generation and IPR Issues. Academic Foundation. Rothschild M & Scott N. (Ed.). 2003. Intellectual Property Rights in Animal Breeding and Genetics. CABI.
- 5.Saha R. (Ed.). 2006. Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies. Daya Publ. House.
6. The Indian Acts - Patents Act, 1970 and amendments; Design Act, 2000; Trademarks Act, 1999; The Copyright Act, 1957 and amendments; Layout Design Act, 2000; PPV and FR Act 2001, and Rules 2003; National Biological Diversity Act, 2003.

Course No. : PGS 504

Course Title : BASIC CONCEPTS IN LABORATORY TECHNIQUES

Course Credits : 0+1=1

Practical :

Exercise No.	Title of the exercise
1	Safety measures while in Lab;
2	Handling of chemical substances;
3	Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condenser, micropipettes and vaccumets;
4	washing, drying and sterilization of glassware;
5	Drying of solvents/chemicals.
6	Weighing and preparation of solutions of different strengths and their dilution;
7	Handling techniques of solutions;
8	Preparation of different agro-chemical doses in field and pot applications;
9	Preparation of solutions of acids;
10	Neutralization of acid and bases;
11	Preparation of buffers of different strengths and pH values.
12	Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath, oilbath;

13	Electric wiring and earthing.	
14	Preparation of media and methods of sterilization;	
15	Seed viability testing, testing of pollen viability;	
16	Tissue culture of crop plants; Description of flowering plants in botanical terms in relation to taxonomy	

Suggested Readings:

1. Furr AK. 2000. CRC Hand Book of Laboratory Safety. CRC Press.
2. Gabb MH & Latchem WE. 1968. A Handbook of Laboratory Solutions. Chemical Publ. Co.

Course No. : PGS 505
Course Title : AGRICULTURAL RESEARCH, RESEARCH ETHICS AND RURAL DEVELOPMENT PROGRAMMES
Course Credits : 1+0=1

Theory

Lecture No.	Topics to be covered
1	History of agriculture in brief;
2	Global agricultural research system: need, scope, opportunities; Role in promoting food security, reducing poverty and protecting the environment;
3	National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions;
4	Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centres (IARC), partnership with NARS,
5	role as a partner in the global agricultural research system, strengthening capacities at national and regional levels;
6	International fellowships for scientific mobility.
7	Research ethics: research integrity, research safety in laboratories,
8	Welfare of animals used in research,
9	Computer ethics,
10	Standards and problems in research ethics.
11	Concept and connotations of rural development,
12-13	rural development policies and strategies.
14	Rural development programmes: Community Development Programme, Intensive Agricultural District Programme, Special group – Area Specific Programme, Integrated Rural Development Programme (IRDP), Panchayati Raj Institutions, Cooperatives, and Voluntary Agencies/Non Governmental Organizations.
15	Critical evaluation of rural development policies and programmes.
16	Constraints in implementation of rural policies and programmes.

Suggested Readings:

1. Bhalla GS & Singh G. 2001. Indian Agriculture - Four Decades of Development. Sage Publ.
2. Punia MS. Manual on International Research and Research Ethics. CCS, Haryana Agricultural University, Hisar.
3. Rao BSV. 2007. Rural Development Strategies and Role of Institutions -

- Issues, Innovations and Initiatives. Mittal Publ.
4. Singh K. 1998. Rural Development - Principles, Policies and Management. Sage Publ.
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Course No. : PGS 506
Course Title : DISASTER MANAGEMENT
Course Credits : 1+0=1

Theory

Lecture No.	Topics to be covered
1-3	To introduce learners to the key concepts and practices of natural disaster management; to equip them to conduct thorough assessment of hazards and risk vulnerability; and capacity building.
4-5	Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold waves
6-7	Climatic Change: Global warming, Sea level rise, Ozone depletion
8-10	Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, and sea accidents
11-12	Disaster Management- Efforts to mitigate natural disasters at national and global levels.
13-14	International Strategy for Disaster reduction.
15-16	Concept of disaster management, national disaster management framework, financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response. Disaster response: Police and other organizations.

Suggested Readings:

1. Gupta HK. 2003. Disaster Management. Indian National Science Academy. Orient Blackswan.
2. Hodgkinson PE & Stewart M. 1991. Coping with Catastrophe: A Handbook of Disaster Management. Routledge.
3. Sharma VK. 2001. Disaster Management. National Centre for Disaster Management, India.