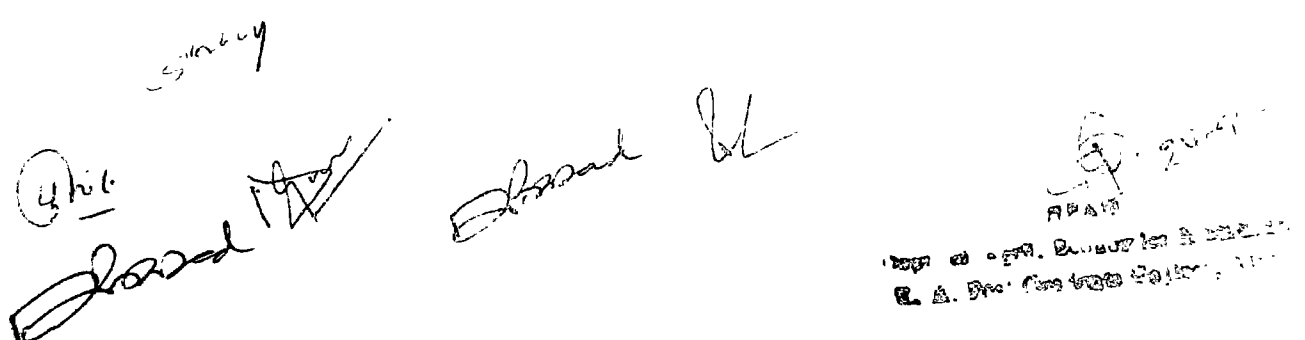# Department of Agricultural Economics and Statistics
Programme Structure
M.Sc. (Ag.) Agricultural Economics
Semester wise allocation of course with credit load

First Semester

Course Code	Course Title	Course Type	Credits	T/P	Evaluation (MM=100)		
					Internal		External
					CIE	Pract.	ETE
AEC-501	Micro Economics theory & Applications	Major	3 (2+1)	T+P	30	20	50
AEC-502	Agricultural Production Economics	Major	2 (1+1)	T+P	30	20	50
AEC-509	Research Methodology for Social Sciences	Major	2 (1+1)	T+P	30	20	50
AEC-508	Linear Programming	Major	2 (1+1)	T+P	30	20	50
AEC-516	Rural Marketing	Minor	2 (1+1)	T+P	30	20	50
PGS-501	Technical writing & communication skills	Common	1 (0+1)	P	40+10*	50	00
PGS-502	Library and Information Services	Common	1 (0+1)	P	40+10*	50	00

Second Semester

Course Code	Course Title	Course Type	Credits	T/P	Evaluation (MM=100)		
					Internal		External
					CIE	Pract.	ETE
AEC-504	Macro Economics and Policy	Major	2 (1+1)	T+P	30	20	50
AEC-507	Agricultural Finance and Project Management	Major	3 (2+1)	T+P	30	20	50
AEC-511	International Economics	Minor	3 (2+1)	T+P	30	20	50
STAT-502	Statistical methods for Applied Sciences	Supporting	3 (2+1)	T+P	30	20	50
PGS-503	Intellectual Property and Its Management in Agriculture	Common	1 (1+0)	T	40+10*	00	50
PGS-504	Basic concepts in Laboratory techniques	Common	1 (0+1)	P	40+10*	50	00

Third Semester

Course Code	Course Title	Course Type	Credits	T/P	Evaluation (MM=100)		
					Internal		External
					CIE	Pract.	ETE
AEC-505	Econometrics	Major	3 (2+1)	T+P	30	20	50
COMP-501	Computer Applications in Agriculture	Supporting	3 (2+1)	T+P	30	20	50
AEC-503	Agriculture Marketing and Price Analysis	Major	3 (2+1)	T+P	30	20	50
AEC-517	Evolution of Economic Thoughts	Minor	3 (2+1)	T+P	30	20	50
PGS-505	Agricultural Research, Research Ethics and Rural Development Programme	Common	1 (1+0)	T	40+10*	0	50

Fourth Semester

Course Code	Course Title	Course Type	Credits	T/P	Evaluation (MM=100)	
					Internal	External
AECMS-591	Master Seminar	Compulsory	1 (0+1)	P	100	-
AECMR-599	Master Research (Thesis)	Compulsory	30 (0+30)	P	-	100

*Assignment/PPT Presentation/GD

Course Contents

M.Sc. (Ag) in Agricultural Economics

I. Course Title	:	Micro Economic Theory and Applications
II. Course Code	:	AEC-501
III. Credit Hours	:	3 (2+1)

I. Theory

Unit I : Basic Concepts : A review

Scarcity and Choice; Production possibility frontier, Positive and normative economics; concepts of opportunity cost, Demand and Supply: determinants of individual demand/supply; demand/ supply schedule and demand/ supply curve; market versus individual demand/ supply; shifts in the demand/ supply curve

Unit II : Consumer Choice

Cardinal Utility Approach – Ordinal Utility Approach -Budget sets and Preferences under different situations – Hicks and Slutsky income and substitution effects Applications of Indifference curve approach – Revealed Preference Hypothesis – Consumer surplus – Derivation of Demand curve – Elasticity of demand – Demand and supply together; how prices allocate resources; controls on prices – price floor and price ceiling – applications in agriculture.

Unit III : Production and Cost

Production functions: single variable - average and marginal product, variable proportions, stages of production. Two variables - isoquants, returns to scale and to a factor; factor prices; Technical progress; cost minimization and output maximization; Elasticity of substitution. Expansion path and the cost function Concept of economic cost; Short run and long run cost curves; increasing and decreasing cost industries; envelope curve; L-shaped cost curves; economies of scale; revenue and expenditure, elasticity and marginal revenue; Firm equilibrium and profit.

Unit IV : Market Forms

Behaviour of profit maximizing firms and the production process- Perfect competition: Equilibrium of the market. Long run industry supply, applications: effects of taxes and subsidies; Monopoly: Equilibrium; supply; multiplant firm; monopoly power; deadweight loss; price discrimination; Monopolistic Competition: Product differentiation; equilibrium of the firm in the industry-with entry of new firms and with price competition. Comparison with pure competition. Duoploy: Cournot model and reaction curves; Stackelberg's model, Bertrand model; Oligopoly.

Unit V : Factor Markets

Labour and land markets - basic concepts (derived demand, productivity of an input, marginal productivity of labour, marginal revenue product); demand for labour; input demand curves; shifts in input demand curves; competitive labour markets; Economic rent and quasi rent.

II. Suggested Reading

- Koutsoyiannis A. *Modern Micro Economics*. Macmillan Press Ltd.

- S. Subba Reddy Agricultural Economics Oxford and IBH Publishing company Pvt. Ltd. New Delhi.

- आधुनिक कृषि अर्थशास्त्र, रामा पब्लिशिंग हाऊस, मेरठ-250002

I. Course Title   : **Agricultural Production Economics**
II. Course Code   : **AEC-502**
III. Credit Hours   : **2 (1+1)**

I. Theory

Unit I : Concepts of production economics

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 and theory of production

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 : Concepts of cost

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 : Dynamics of economic assessment

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.

II. 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 analysis.

III. Suggested Reading

- EO Heady. *Economics of Agricultural Production and resources use*. Oxford and IBH Publishing company Pvt. Ltd. New Delhi.
- S.P. Dhondyal. Farm Management and Production Economics. Rama Publishing House, Meerut.
- आधुनिक कृषि अर्थशास्त्र, रामा पब्लिशिंग हाऊस, मेरठ-250002

I. Course Title   :   **Research Methodology for Social Sciences**
II. Course Code   :   **AEC 509**
III. Credit Hours   :   **2 (1+1)**

I. Theory

Unit I : Concepts of research methodology

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: Framing and Testing

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

Unit III : Sampling

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

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 : Data Analysis

Data coding, tabulation, cleaning. –Multivariate analysis –factor analysis' PCA' cluster analysis. Universal procedures for preparation of bibliography – writing of research articles.

II. Practical

- 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.

III. Suggested Reading

- Dhondhyal SP. *Social Science Research and Thesis Writing*
- आधुनिक कृषि अर्थशास्त्र, रामा पब्लिशिंग हाऊस, मेरठ-250002

I. Course Title   :   **Linear Programming**
II. Course Code   : · AEC-508
III. Credit Hours   :   2 (1+1)

I. 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 Programming.

II. 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.

III. Suggested Reading

- A.S. Narag Linear Programming and Decision making, Sultan Chanrd & Sons. New Delhi.
- P.K. Gupta Linear Programming and Theory of Games, Sultan Chand & Sons
- उच्चतर कृषि अर्थशास्त्र, रामा पब्लिशिंग हाऊस, मेरठ-250002

RURAL MARKETING

OBJECTIVE

To provide understanding regarding issues in rural markets like marketing environment, consumer behaviour, distribution channels, marketing strategies, etc.

THEORY

UNIT-I

Concept and scope of rural marketing, nature and characteristics of rural markets, potential of rural markets in India.

UNIT-II

Environmental factors-socio-cultural, economic and other environmental factors affecting rural marketing.

UNIT-III

Rural consumer's behaviour-behavior of rural consumers and farmers; buyer characteristics and buying behaviour, Rural v/s urban markets.

UNIT-IV

Rural marketing strategy-Marketing of consumer durable and non-durable goods and services in the rural markets with special reference to product planning; product mix, pricing course objective, pricing policy and pricing strategy.

UNIT-V

Product promotion-Media planning, planning of distributuion channels, and organizing personal selling in rural market in India.

PRACTICAL

Survey of Rural market both Primary and Secondary case study of marketing of a minor and major commodity with respect to rural marketing channels. Casts, margin and market price spread, market performance and Rural market efficiency. On line searches for Rural market information sources and interpretation of market intelligence report, submission of a report on above all aspects.

SUGGESTED READING

- उच्चतर कृषि अर्थशास्त्र, रामा पब्लिशिंग हाऊस, मेरठ-250002

PGS 501

PGS - 501 TECHNICAL WRITING AND COMMUNICATIONS SKILLS (0+1)

Objective

To equip the students/ scholars with skills to write dissertations, research papers, etc. To equip the students/ scholars with skills to communicate and articulate in English (verbal as well as writing).

Practical (Technical Writing)

• Various forms of scientific writings- theses, technical papers, reviews, manuals, etc.;

• Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion);

• Writing of abstracts, summaries, précis, citations, etc.;

• Commonly used abbreviations in the theses and research communications;

• Illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations;

• Writing of numbers and dates in scientific write-ups;

• Editing and proof-reading;

• Writing of a review article;

• Communication Skills - Grammar (Tenses, parts of speech, clauses, punctuation marks);

• Error analysis (Common errors), Concord, Collocation, Phonetic symbols and transcription;

• Accentual pattern: Weak forms in connected speech;

• Participation in group discussion;

• Facing an interview;

• Presentation of scientific papers.

Suggested Readings

1. Barnes and Noble. Robert C. (Ed.). 2005. *Spoken English: Flourish Your Language.*

2. *Chicago Manual of Style.* 14th Ed. 1996. Prentice Hall of India.

3. *Collins' Cobuild English Dictionary.* 1995.

4. Harper Collins. Gordon HM and Walter JA. 1970. *Technical Writing.* 3rd Ed.

5. Holt, Rinehart and Winston. Hornby AS. 2000. *Comp. Oxford Advanced Learner's Dictionary of Current English.* 6th Ed. Oxford University Press.

6. James HS. 1994. *Handbook for Technical Writing.* NTC Business Books.

7. Joseph G. 2000. *MLA Handbook for Writers of Research Papers.* 5th Ed. Affiliated East-West Press.

8. Mohan K. 2005. *Speaking English Effectively.* MacMillan India.

9. Richard WS. 1969. *Technical Writing.*

10. Sethi J and Dhamija PV. 2004. *Course in Phonetics and Spoken English.* 2nd Ed. Prentice Hall of India.

11. Wren PC and Martin H. 2006. *High School English Grammar and Composition.* S. Chand & Co.

PGS - 502

PGS - 502 LIBRARY AND INFORMATION SERVICES (0+1)

Objective

To equip the library users with skills to trace information from libraries efficiently, to apprise them of information and knowledge resources, to carry out literature survey, to formulate information search strategies, and to use modern tools (Internet, OPAC, search engines, etc.) of information search.

Practical

Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/ Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; eresources access methods.

I. Course Title	:	Macro Economics and Policy
II. Course Code	:	AEC-504
III. Credit Hours	:	2 (1+1)

I. Theory

Unit I : Introduction: Measurement and Concepts

Basic concepts and scope of Macro-economics, National Income Accounting: Methods of measurement of key macro-economic aggregates, relationship of national income and other aggregates (with numerical exercises), real and nominal income

Unit II : Classical Macroeconomics

Say's Law, Quantity Theory of Money, aggregate labour supply and demand of labour, Classical theory of determining output, wages and prices.

Unit III. Income And Spending: Keynesian Framework

Simple Keynesian model of income determination; Keynesian Multiplier- aggregate spending, taxation, transfer payments, foreign spending, balanced budget; budget surplus (with numerical exercises).

Unit IV : Money, Interest and Income

Goods market equilibrium-IS curve; Demand for Money, the Liquidity Preference Theory – Liquidity Trap; asset market equilibrium- LM curve; simultaneous equilibrium in goods and asset market- effect of fiscal and monetary policy

Unit V : Theories of Aggregarte Consumption and Investment

Absolute Income Hypothesis, Relative Income Hypothesis, Fisher's Inter-temporal Choice Model, Life-Cycle and Permanent Income Hypotheses; Profits and Accelerator Theory.

Unit VI : Inflation and Unemployment

Inflation: Nature, Effects and control; Types of inflation – demand pull, cost pushstagflation,

core inflation, hyperinflation; Phillips curve

II. Suggested Reading

- Stonier & Hegue. *A Text Book of Economic Theory*
- MC Vaish. *Macro–Economics Theory*
- नवीन कृषि अर्थशास्त्र, रामा पब्लिशिंग हाऊस, मेरठ-250002

I. Course Title   :   **Agricultural Finance and Project Management**
II. Course Code   :   **AEC 507**
III. Credit Hours   :   **3 (2+1)**

I. Theory

Unit I : Basic concepts: A Review

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 : Credit and its aspects

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 analysis

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 Overview

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 : Risk and its Management

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.

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

III. Suggested Reading

- S. Subba Reddy Agricultural Economics Oxford and IBH Publishing company Pvt. Ltd. New Delhi.
- नवीन कृषि अर्थशास्त्र, रामा पब्लिशिंग हाऊस, मेरठ-250002

I.Course Title   : International Economics
II.Course Code : AEC 511
III.Credit Hours : 2+1

I.Theory

Unit I: Concepts of International Economics

Scope and Significance of International Economics – The role of trade- General Equilibrium in a Closed Economy (Autarky Equilibrium) – Equilibrium in a Simple Open Economy - Possibility of World Trade - Trade gains and Trade Equilibrium.

Unit II: Barriers to trade

Tariff, Producer Subsidy, Export Subsidy, Import Quota and Export Voluntary Restraints- The Case of Small Country and Large Country Case.

Unit III: Models of trade

Ricardian Model of Trade- Specific Factors Model- Heckscher - Ohlin Model - Trade Creation and Trade Diversion – Offer Curve - Export Supply Elasticity and Import Demand Elasticity – Comparative Advantage and Absolute Advantage.

Unit IV: Rates and Terms of trade

Official Exchange Rate and Shadow Exchange Rate - Walra's Law and Terms of Trade – Trade Blocks.

Unit V: Trades Institutions

IMF, World Bank, IDA, IFC, ADB – International Trade agreements – UruguayRound – GATT – WTO.

II.Practical

- Producer's Surplus, Consumer's Surplus, National Welfare under Autarky andFree Trade Equilibrium with small and large country assumption.
- Estimation of Trade Gains
- Estimation of competitive and comparative measures like NPC, EPC, ERP andDRC
- Estimation of Offer Curve Elasticity
- Estimation of Effect of Tariff, Export Subsidy, Producer Subsidy, Import Quotaand Export Voluntary Restraints on National Welfare
- Estimation of Ricardian Model
- Estimation of Effect of Trade under Specific Factor Model
- Estimation of trade Equilibrium under Heckscher -Ohlin model

III.Suggested Reading

- Kindelberger and Joshi PK. 2016. *International Economics* AITBS Delhi-110051
- Brouwer F. *International Trade and Food Security*. LEI - Wageningen UR, The Netherlands.

I. Course Title	:	**Statistical Methods for Applied Sciences**
II. Course Code	:	**STAT 502**
III. Credit Hours	:	**3 (2+1)**

Theory

Unit I

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.

Unit III

Introduction to theory of estimation and confidence-intervals, Simple and multiple correlation coefficient, partial correlation, rank correlation, Simple and multiple linear regression model, test of significance of correlation coefficient and regression coefficients, Coefficient of determination, Fitting of quadratic models.

Unit IV

Non-parametric tests – sign, Wilcoxon, Mann-Whitney U-test, Run test for the randomness of a sequence. Median test.

Unit V

Introduction to ANOVA: One way and Two Way, Introduction to Sampling Techniques, Introduction to Multivariate Analysis, Transformation of Data.

Practical

- Exploratory data analysis, 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 Correlation and regression analysis, fitting of Linear and Quadratic Model.
- Non-parametric tests. ANOVA: One way, Two Way, SRS.

Suggested Reading

- Goon A.M, Gupta M.K and Dasgupta B. 1977. *An Outline of Statistical Theory*. Vol. I. The World Press.
- Goon A.M, Gupta M.K. and Dasgupta B. 1983. *Fundamentals of Statistics*. Vol. I. The World Press.

Common Paper

PGS - 503 INTELLECTUAL PROPERTY AND ITS MANAGEMENT IN AGRICULTURE (1+0)

Objective

The main objective of this course is to equip students and stakeholders with knowledge of Intellectual Property Rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledgebased economy.

Theory

Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

Suggested Readings

1. Erbisch FH and 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 and Aesthetic Technologies.
4. Ministry of Agriculture, Government of India. 2004. *State of Indian Farmer*. Vol. V. Technology Generation and IPR Issues. Academic Foundation.
5. Rothschild M and Scott N. (Ed.). 2003. *Intellectual Property Rights in Animal Breeding and Genetics*. CABI.
6. Saha R. (Ed.). 2006. *Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies*. Daya Publ. House. 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; The Biological Diversity Act, 2002.

Common Paper

PGS - 504 BASIC CONCEPTS IN LABORATORY TECHNIQUES (0+1)

Objective

To acquaint the students about the basics of commonly used techniques in laboratory.

Practical

• Safety measures while in Lab;

• Handling of chemical substances;

• Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccupets;

• Washing, drying and sterilization of glassware;

• Drying of solvents/ chemicals;

• Weighing and preparation of solutions of different strengths and their dilution;

• Handling techniques of solutions;

• Preparation of different agro-chemical doses in field and pot applications;

• Preparation of solutions of acids;

• Neutralisation of acid and bases;

• Preparation of buffers of different strengths and pH values;

• Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath, oilbath;

• Electric wiring and earthing;

• Preparation of media and methods of sterilization;

• Seed viability testing, testing of pollen viability;

• 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 and Latchem WE. 1968. *A Handbook of Laboratory Solutions*. Chemical Publ. Co.

I. Course Title : Econometrics
II. Course Code : AEC 505
III. Credit Hours : 3 (2+1)

I. Theory

Unit I : Introduction

Relationship between economic theory, mathematical economics, models and econometrics, methodology of econometrics-regression analysis.

Unit II : Classical Linear Regression

Basic two variable regression – assumptions estimation and interpretation approaches to estimation – OLS and their properties – extensions to multi-variable models-multiple regression estimation and interpretation.

Unit III : Breaking down of Classical assumptions

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

Unit IV : Qualitative variables and simultaneous equation models

Use of dummy variables- Introduction to simultaneous equations- identification problem

II. Practical

- Single equation two variable model specification and estimation
- Hypothesis testing transformations of functional forms and OLS application
- Estimation of multiple regression model
- Testing and correcting specification errors
- Testing and managing Multicollinearity
- Estimation of regressions with dummy variables

III. Suggested Reading

- Koutseyianis, A. 1997. *Theory of Econometrics*. Barner & Noble.
- उच्चतर कृषि अर्थशास्त्र, रामा पब्लिशिंग हाऊस, मेरठ-250002

COMPUTER APPLICATION IN AGRICULTURE 3(2+1)

Theory

Introduction to Computers, Operating Systems, definition and types, Applications of MS- Office for document creation & Editing. Data presentation, Interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (WWW): Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations.

c-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smart phone Apps in Agriculture for farm advises, market price, post harvest management etc; Geospatial technology for generating valuable agri-Information. Decision support systems, concepts, components and applications in Agriculture, Agricultura Expert System, Soil Information Systems etc for supporting Farm decisions. Preperation of contingent crop-planning using IT tools.

Practical

Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as windows, Unix/ Linux, Creating. Files & Folders, File Management. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document, MS-EXCEL.- Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri- Information system. Introduction to World Wide Web (WWW). Introduction of programming languages. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/ Wofost; Computation of water and nutrient requirements of crop using CSM and IT tools. Introduction of Geospatial Technology for generating valuable information for Agriculture. Hands on Decision Support System. Preparation of contingent crop planning.

I. Course Title : **Agricultural Marketing and Price Analysis**
II. Course Code : **AEC 503**
III. Credit Hours : **3 (2+1)**

I. Theory

Unit I: Introduction to agricultural marketing

New 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 : Aspects of agricultural marketing

Different Forms of marketing: Co-operatives Marketing – APMC Regulated Marketing - Direct marketing, Farmer Producer Companies, e-NAM and marketing under e-NAM, e-marketing Contract farming and Retailing, Organized 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 : Future marketing and government

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/SEBI in promoting commodity trading and regulatory measures.

Unit IV : Use of Information Technology

Role of Information Technology and Market Intelligence in marketing of agricultural commodities, -electronic auctions (e-bay), e-Chaupals, Agmarknet and Domestic and Export market Intelligence Cell (DEMIC).

Unit V : Dynamics of price

Price forecasting – time series analysis – time series models – spectral analysis. Price policy and economic development – non-price instruments.

II. Practical

- 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.
- Supply 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.

III. Suggested Reading

- Acharya SS & Agarawal NL. 2004. *Agricultural Marketing in India*. Oxford and IBH Publishing company Pvt. Ltd. New Delhi.
- Acharya SS & Agarawal NL. 1994. *Agricultural Prices-Analysis and Policy*. Oxford and IBH Publishing company Pvt. Ltd. New Delhi.
- नवीन कृषि अर्थशास्त्र, रामा पब्लिशिंग हाऊस, मेरठ-250002

EVOLUTION OF ECONOMIC THOUGHTS   3(2+1)

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 economic thought- mercantilism 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 philosopy

Experiences of the Structural adjustment programmes of the post liberalization era.

SUGGESTED READING

- उच्चतर कृषि अर्थशास्त्र, रामा पब्लिशिंग हाऊस, मेरठ-250002

Common Paper

PGS - 505 AGRICULTURAL RESEARCH, RESEARCH ETHICS AND RURAL DEVELOPMENT PROGRAMMES (1+0)

Objective

To enlighten the students about the organization and functioning of agricultural research systems at national and international levels, research ethics, and rural development programmes and policies of Government.

Theory

UNIT I History of agriculture in brief; Global agricultural research system: need, scope, opportunities; Role in promoting food security, reducing poverty and protecting the environment; National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions; Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centres (IARC), partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels; International fellowships for scientific mobility.

UNIT II Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics.

UNIT III Concept and connotations of rural development, rural development policies and strategies. Rural development programmes: Community Development Programme, Intensive Agricultural District Programme, Special group – Area Specific Programme, Integrated Rural Development Programme (IRDP) Panchayati Raj Institutions, Co-operatives, Voluntary Agencies/ Non-Governmental Organisations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

Suggested Readings

1. Bhalla GS and 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.