ISTITUTE OF AGRICULTURE AND NATURAL SCIENCES
DeenDayal Upadhyaya Gorakhpur University
Gorakhpur-273009

M. Sc (Ag) AGRICULTURAL ECONOMICS

COURSE CURRICULUM AND SYLLABUS

According to Restructured and Revised 5th Dean Committee

Nomenclature and Credit hour

Nomenclature	Credit hours
COURSE WORK	
Major Courses	**20**
Minor Courses	**08**
Supporting course	**06**
Common Courses	**05**
Credit Seminar	**01**
Research work or Research Methodology	**30**
Total	**70**

NOTE:

Major courses: From the Discipline in which a student takes admission.

Minor courses: From the subjects closely related to a student's major subject

a. It is suggested the student may choose at least two out of three courses listed below as part of minor courses as these are related to policy advocacy and aim to build larger understanding of the subject.

b. Further, it is suggested that the student may choose the remaining Courses from any other discipline including the disciplines of Agrl. Economics/ABM and are related to the research problem selected by the student.

c. The final choice of the minor courses should be mandatorily approved by the Student Advisory committee/HoD.

Supporting courses: The subject not related to the major subject. It could be any subject considered relevant for student's research work (such as Statistical Methods, Design of Experiments, etc.) or necessary for building his/ her overall competence.

Common Courses: The following courses (one credit each) will be offered to all students undergoing Master's degree programme:

1. Library and Information Services
2. Technical Writing and Communications Skills
3. Intellectual Property and its management in Agriculture
4. Basic Concepts in Laboratory Techniques
5. Agricultural Research, Research Ethics and Rural Development Programmes

Some of these courses are already in the form of e-courses/ MOOCs. The students may be allowed to register these courses/ similar courses on these aspects, if available online on SWAYAM or any other platform. If a student has already

completed any of these courses during UG, he/ she may be permitted to register for other related courses with the prior approval of the Head of Department (HoD)/ Board of Studies (BoS).

Courses offered in each semester

SEMESTER I		
MAJOR COURSES		
COURSE CODE	**COURSE TITLE**	**CREDIT HOURS**
AEC-501	Micro Economic Theory And Applications	3(3+0)
AEC-502	Agricultural Production Economics	2 (1+1)
AEC-510	Indian Economy: History and Contemporary Issues	2 (2+0)
TOTAL CREDIT OF MAJOR COURSES		**7**
MINOR COURSE		
AEC-512	Institutional Economics	1(1+0)
AEC-513	Natural Resource and Environmental Economics	2(1+1)
SUPPORTING COURSE		
STAT 502	Statistical Methods for applied/social sciences	3(2+1)
COMMON COURSE		
PGS 501	Technical Writing and Communications Skills	1(1+0)
PGS 502	Library and Information Services	1(+0)
TOTAL CREDIT		**15**

SEMESTER II		
MAJOR COURSES		
COURSE CODE	**COURSE TITLE**	**CREDIT HOURS**
AEC-503	Agricultural Marketing and Price Analysis	3(2+1)
AEC-504	Macro Economics And Policy	2 (2+0)
AEC- 506	Agricultural Development and Policy Analysis	2 (2+0)
TOTAL CREDIT OF MAJOR COURSES		**7**
MINOR COURSE		
AEC-514	Commodity Future Trading	2 (2+0)
SUPPORTING COURSE		
MCA 512	Computer Applications for Agricultural Extension Research	3(2+1)
COMMON COURSE		
PGS 503	Intellectual Property and its management in Agriculture	1(1+0)

PGS 504	Basic Concepts in Laboratory Techniques	1(1+0)
TOTAL CREDIT		**14**

SEMESTER III		
MAJOR COURSES		
COURSE CODE	**COURSE TITLE**	**CREDIT HOURS**
AEC-507	Agricultural Finance and Project Management	3 (2+1)
AEC-508	Linear Programming	2 (1+1)
AEC-509	Research Methodology for Social Sciences	2 (1+1)
TOTAL CREDIT OF MAJOR COURSES		**7**
MINOR COURSE		
AEC-515	Development Economics	2 (2+0)
AEC-516	Rural Marketing	2 (2+0)
AEC-517	Evolution of Economic Thought	1 (1+0)
COMMON COURSE		
PGS 505	Agricultural Research, Research Ethics and Rural Development Programmes	1(1+0)
TOTAL CREDIT		**13**

SEMESTER IV		
COURSE CODE	**COURSE TITLE**	**CREDIT HOURS**
EXT 591	Master's Seminar	1(1+0)
EXT599	Master's Research or Research methodology	30
TOTAL CREDIT		31

Syllabus

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+0**
IV. **Why this course?**

Markets form an integral part of the economy. They are governed by demand and supply mechanism with profit making its ultimate goal. Thus, it is imperative to expose the students towards how the markets function, their types and how the buyers and sellers behave. That will help them make correct decision when it comes to price setting and choice of product.

Aim of the course

The course envisages the concepts and principles embodying micro-economics. The economic problems, functioning of price mechanism, theory of household behaviour and consumer's demand function. Theory of firm, supply determinants, determination of price under different market structures and factor pricing (micro economic components).

Theory

Block 1: Introduction to micro-economics Unit 1: 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

Block 2- Insight of consumer, production and cost involved

Unit 1: 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 2: 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.

Block 3: Overview of market

Unit 1: Market Forms

Behaviourof 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 2: 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.

Teaching Methods/Activities

- Lectures
- Case studies
- Assignments(Group/individual)
- Group Discussions on practises done by firms.
- Power point presentations bystudents.
- Exploring the agricultural market and identification of industries and their type.

Learning outcome

- After completion of the course the student will be able to:
- Get acquainted with the basic concepts of market functions.
- Build up vision towards how consumers makes choices and market reaches the equilibrium.
- Develop decision making skill for firms about product selections and scale of production to ensure maximum profit.
- Understand about different types of markets existing in the real world, their principles and whereabouts.

I. **Course Title : Agricultural Production Economics**

II. **Course Code :AEC-502**

III. **Credit Hours :1+1**

IV. **Why this course?**

Production in agriculture is the outcome of the input factors involved. In this competitive and uncertain market, it is important that the farmers take the right decision about the combination of inputs that will result in higher income. Thus, as an economist it is a pre-requisite that the students understand the interaction between output and input and work out the most effective production plan.

Aim of the course

To expose the students to develop the concept, significance and uses of production economics. To understand the relationships between factors and output. To learn how to decide the combination of inputs to be used as per the resources available. Ensure that the production process works efficiently.

Organization of the course

Theory

Block 1: Introduction to Production Economics Unit 1: 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.

Block 2: Factors and costs

Unit 1: 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 2: 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.

Block 3: Assessment

Unit 1: 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.

V. 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.

VI. Teaching Methods/Activities

- Lectures
- Assignments(Group/individual)
- Group Discussions on working out
- Power point presentations by students
- Exploring the agricultural market and identification of industries and their type.

VII. Learning outcome

Afterthesuccessfulcompletionofthecoursethestudentwillbeableto—Understand how the factors and output interact with each other. - Work out whether the production system is working efficiently and point out the loop holes.- Apply the knowledge of costs and profits to work out the demand and supply functions. This will result in to more efficient decision making.

I. **Course Title : Agricultural Marketing and Price Analysis**

II. **Course Code : AEC503**

III. **Credit Hours :2+1**

IV. **Why this course?**

The ultimate aim of production process is to sell the produce in the market and generate income. Markets serves as platform where this exchange takes place. Agriculture markets are different from other markets due to the nature of the commodity. Thus, it is important to develop a strong foundation of agricultural marketing, its components and issues. The student needs to know about the multi- pronged ways of marketing the produce, agencies involved. In this modern era, it is important to understand how technology is transforming this sector.

Aim of the course

The course is designed to acquaint the students about the basics of dynamics of agricultural marketing. The content includes supply, demand and marketing of farm production, marketing functions and channels, marketing costs, margins and efficiency, agricultural prices, New marketing formats like e-marketing, e-NAM future trading, supply chain management, market intelligence etc.

Organization of the course

Theory

Block 1: Introduction to Agricultural Marketing

Unit 1: 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.

Block 2: Agricultural Markets

Unit 1: 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 2: 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.

Block 3: Advances in Agricultural Marketing

Unit 1: Use of Information Technology

RoleofInformationTechnologyandMarketIntelligenceinmarketingofagricultural commodities, -electronic auctions (e-bay), e-Chaupals, Agmarknet and Domestic and Export market Intelligence Cell (DEMIC).

Unit 2: Dynamics of price

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

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.
- MarketIntelligence–Characters,Accessibility,andAvailabilityPriceforecasting.
- 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.

V. Teaching Methods/Activities

- Lectures.
- Case studies.
- Assignments(Group/individual).
- Group Discussions on price volatility and control measures prevailing.
- Power point presentations by students on government schemes.
- Visit to eNAM mandies, Warehouses, etc.

Learning outcome

- **After the completion of this course the student will be able to–**
- Understand the whereabouts of agricultural marketing.
- The different forms of marketing existing in this sector.
- Gain expertise in market intelligence and price forecasting.

I. **Course Title : Macro Economics and Policy**

II. **Course Code :AEC-504**

III. **Credit Hours:2+0**

IV. **Why this course?**

The economy of the nation is governed by certain rules, regulation and principles. The students has to gain knowledge of the mechanism through which the large economies are controlled and ensure that welfare prevails. They are entitled to know the transactions between different markets and policies framed to keep value of money under control.

Aim of the course

The course envisages the concepts and principles of macroeconomics from classical to Keynesian theories. The other component deals with the monetary system- money, credit and banking system, value of money and economic activities, national income accounting and approaches to estimate national income theory of income and employment determination and inflation.

Theory

Block 1: Conceptualising Macro Economics

Unit 1: Introduction: Measurement and Concepts

BasicconceptsandscopeofMacro-economics,NationalIncomeAccounting:Methods of measurement of key macro-economic aggregates, relationship of national income and other aggregates (with numerical exercises),real and nominal income

Block 2: Theories of macroeconomics Unit 1: 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 2. 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).

Block 3- Money, Consumption and Inflation Unit 1: 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 2: Theories of Aggregarte Consumption and Investment

Absolute Income Hypothesis, Relative Income Hypothesis, Fisher's Inter-temporal ChoiceModel,Life-CycleandPermanentIncomeHypotheses;ProfitsandAccelerator Theory.

Unit 3: Inflation and Unemployment

Inflation: Nature, Effects and control; Types of inflation – demand pull, cost push- stagflation, core inflation, hyperinflation; Phillips curve.

Teaching Methods/Activities

- Lectures.
- Case studies.
- Assignments (Group/individual).
- Group Discussions on inflation.

Learning outcome

After the completion of the course the student will be able to-Understand the concepts of national income, theories build up to understand macroeconomics. Understand better about the policies and government steps taken to control the economic transaction of the nation. Workout how the investment acts as a catalyst in national development.

I. **Course Title :Econometrics**

II. **Course Code : AEC505**

III. **Credit Hours :2+1**

IV. **Why this course?**

Development of analytical skills is imperative to make students proficient in conducting quality research work. The knowledge of variables, their models, and problems encountered when dealing with variables will build up a compatibility with the analytical aspects.

Aim of the course

The course provides knowledge of the econometric methods like time series analysis, linear regression models and their application in economic analysis. The course provides aninsightin to the econometric problems in analyzing time series and cross section data.

Theory

Block 1: Introduction to Econometrics Unit 1: Introduction

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

Block 2: Classical Regression

Unit 1: 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 2: Breaking down of Classical assumptions

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

Block 3: Qualitative Variables

Unit 1: Qualitative variables and simultaneous equation models

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

VII. **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

Teaching Methods/Activities

- Lectures.
- Assignments(Group/individual).

Learning outcome

After the completion of the course, the student will be able to-Understand the variables and the properties of regression models. Identify the problems in variables and remove them before conducting the analysis and avoid biased results.

I. **Course Title : Agricultural Development and Policy Analysis**

II. **Course Code :AEC-506**

III. **Credit Hours :2+0**

IV. **Why this course?**

The ultimate aim of the economies is to attain a satisfactory level of development. Development ensures that there is not only increase in income but also the distribution is such that lesser inequalities exist. The students need to know what is development and its related concepts. All the policies framed are with one sole objective of increasing the welfare. Thus, once concept of development is build up, students can better understand policies and the irgenesis.

Aim of the course

Concept of economic development and policy, theories of development, performance of Indian agriculture. The process and implementation of policies over a period of time.

Theory

Block 1:Introduction

Unit 1: Introduction

Role of agriculture in economic/ rural development – Evolution of thinking on agriculture and development; Agricultural development – meaning, stages and determinants – Population and food supply – need for sound agricultural policies

Block 2: Theoretical Concepts

Unit 1: Theories of Agricultural Development

Resource exploitation model- Conservation model- Location (Urban impact) model- Diffusion model- High pay-off input model-Induced Innovation Model- Agricultural R&D and Linkages

Block 3: Performance and policies

Unit 1: Performance of Indian Agriculture

Agrarian structure and land relations; trends in performance and productivity; agrarian structure and technology; credit, commerce and technology; capital formation; subsidies; pricing and procurement; Post Green Revolution agriculture; Productionandproductivitycrisisinagriculture;Regionaldifferences;FoodSecurity, PDS system andMalnutrition.

Unit 2: Agricultural Policy: Process and Implementation

Instruments of Agricultural Policy; Process of agricultural policy formulation, implementation, Monitoring and Evaluation in India; Global experiences in participatory approach to Agricultural policy process; critical review of various elements of Indian agricultural policy-resource policies – credit policies – input and product marketing policies – price policies; WTO – Agreement on Agriculture; Planning models. Planning for utilization of resources and Indian Five Year Plans.

Teaching Methods/Activities

- Lectures.
- Assignments(Group/individual).
- Group Discussions on evolution of Indian Agriculture and Development indices.
- Power point presentation by students on policies and their relevance.

Learning outcome

After the completion of the course the student will be able to-Understand the concept of development and its preference over growth. Visualize how the agriculture sector is performing in this aspect. Understand the motive behind the policies and their implementation.

I. **Course Title : Agricultural Finance and Project Management**

II. **Course Code : AEC507**

III. **Credit Hours :2+1**

IV. **Why this course?**

Money is the fuel of driving all the economic activities. India is a land of small and marginal farmers. The financial conditions of the farmers is not so strong that they can finance themselves. They require credit to meet the requirements of inputs. Thus, the student should know the sources, principles involved and types of credit available. The institutions involved and on what grounds the finance is given to the farmer. What are the risks involved and how to overcome them.

Aim of the course

This course is designed with an objective to deliver knowledge of the principles, procedures, problems and policies relating to financing agricultural firms. In addition to this the students are also given knowledge about the research developments in the subject.The approachis analytic.

VII. **Theory**

Block 1: Introduction to Agricultural Finance Unit 1: 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,andSHG's.

Block 2: Credit and Financial Analysis

Unit 1: 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 2: Financial analysis

Financial Decisions – Investment, Financing, Liquidity and Solvency. Preparation of financial statements - Balance Sheet, Cash Flow Statement and Profit and Loss Account.RatioAnalysisandAssessingtheperformanceoffarm/firm.

Block 3- Project and Risk Management

Unit 1: 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 2: 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.

VIII. Practical

- Development of Rural InstitutionalLending;
- Branchexpansion,demandandsupplyofinstitutionalagriculturalcreditandOver dues and Loanwaiving;
- An overview, Rural Lending Programmes of Commercial Banks, Lead BankScheme;
- Preparation of District Credit Plan, Rural Lending Programmes of Co-operative LendingInstitutions;
- Preparation of financial statements using farm/firm level data, Farm credit appraisal techniques and farm financial analysis through financialstatements;
- Performance of Micro FinancingInstitutions;
- NGO'sandSelf-HelpGroups,Identificationandformulationofinvestmentprojects;
- Project appraisal techniques – Undiscounted Measures and theirlimitations;
- Project appraisal techniques – DiscountedMeasures;
- Network techniques – PERT and CPM for projectmanagement;
- Case Study Analysis of an Agriculturalproject;
- Financial Risk and risk management strategies – crop insuranceschemes;
- Financial instruments and methods – E banking, Kisan Cards and corebanking.

IX. Teaching Methods/Activities

- Lectures
- Casestudies
- Assignments(Group/individual)
- Group Discussions oninflation

X. Learningoutcome

After the completion of the course the student will be able to-Understand the key issues of finance in Agriculture. Learn the techniques of assessing the worth of a project.

XI. SuggestedReading

- E Die Sollem H and Heady EO. (Ed.). *Capital and Credit Needs in Changing Agriculture*, Bauman.
- Hopkins A Barry, Peter Jo and Baker CB. *Financial Management inAgriculture*.
- MurrayWGandNelsonAG.1960.*AgriculturalFinance*.IowaStateUniversity
- Chanona C. 1969. *Agricultural Finance in India: Role of Commercial Banks*. Marketing and Economics Research Bureau, NewDelhi.
- Gittinger JP. 1972. *Economic analysis of agricultural projects*, John Hopkins Univ. Press,

Baltimore.

- Little IMD and JA Mirrless. 1974, *Project appraisal and planning for developingcountries*, Oxford and IBH publishing Co. New Delhi.

- Arnold CH. 1972. *Project Evaluation, collected papers*,Macmillan.

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I. **CourseTitle : Linear Programming**

II. **Course Code :AEC-508**

III. **Credit Hours :1+1**

IV. **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.

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

ExtensionofLinearProgrammingmodels:Variableresourceandpriceprogramming, transportationproblems,recursiveprogramming,dynamicprogramming.

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.

V. **Practical**

- Graphical and algebraic formulation of linear programmingmodels.
- Solving of maximization and minimization problems by simplexmethod.
- Formulation of the simplex matrices for typical farmsituations.

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I. CourseTitle : Research Methodology for SocialSciences

II. Course Code : AEC509

III. Credit Hours :1+1

IV. Why thiscourse

Planning of research is very crucial to conduct a successful research. There is need to give an insight to the student about how to conduct a research, right from data collection to analysis and finally writing the references.

V. Aim of thecourse

The course deals with scientific methods of research, the initiation of an inquiry, formulationofresearchproblemsandhypotheses,theroleofinductionanddeduction inresearch,collectionandanalysisofdateandinterpretationofresults

VI. Theory

Block 1: Concepts of research methodology Unit 1: Concepts of research methodology

Importance and scope of research in agricultural economics. Types of research – Fundamental vs. Applied. Concept of researchable problem – research prioritization

– selectionofresearchproblem.Approachtoresearch–researchprocess.

Block 2- Building up hypothesis and sample selection Unit 1: Hypothesis: Framing and Testing

Hypothesis – meaning – characteristics – types of hypothesis – review of literature

– settingofCourseObjectiveandhypotheses–testingofhypothesis.

Unit 2: 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-offbetweenscopeandcostofthestudy.Researchdesignandtechniques

– Types of researchdesign.

Block 3- Data Collection and Analysis

Unit 1: 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 2: Data Analysis

Data coding, tabulation, cleaning. –Multivariate analysis –factor analysis' PCA' cluster analysis. Universal

procedures for preparation of bibliography – writing of research articles.

VII. Practical

- Exercises in problemidentification.
- Project proposals – contents andscope.
- Formulation of Objective andhypotheses.
- Assessment of data needs – sources of data – methods of collection ofdata.
- Methodsofsampling–criteriatochoose–discussiononsamplingunderdifferent situations.
- Scaling Techniques – measurement ofscales.
- Preparation of interviewschedule.
- Field testing. Method of conductingsurvey.
- Exercise on coding, editing, tabulation and validation ofdata.
- Preparing for data entry intocomputer.
- Hypothesis testing – Parametric and Non-ParametricTests.
- Exercises on format for Thesis/ Reportwriting.
- Presentation of theresults.

VIII. Teaching Methods/Activities

- Lectures.
- Casestudies.
- Assignments(Group/individual).
- GroupDiscussions

After the successful completion of this course, student will be able to-Understand fundamentals of research. How to carefully plan out the research work and conduct it.

XI. SuggestedReading

- Baker CB. *Research Methodology in AgriculturalEconomics*
- Cohen MR and Nagel R. *An Introduction to Logic and ScientificMethod*
- Devey J Logic. *The Theory ofEnquiry*
- Dhondhyal SP. *Social Science Research and ThesisWriting*
- Ezekiel M. *CorrelationAnalysis*
- Heady EO. *Linear ProgrammingMethods*
- Willson ER. *An Introduction to ScientificResearch*
- Kumar A. 2008. *Research Methodology: A Survey.* Alts, NewDelhi,

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I. CourseTitle : Indian Economy: History and Contemporary Issues Credit

II. Course Code :AEC-510

III. Credit Hours :2+0

IV. Why thiscourse?

India is a developing economy. The evolution of the Indian economy will enlighten the student with how an economy develops. Students will understand how the policies and measures taken shape up the economy of the country.

V. Aim of the course

To introduce the students to the economic history over a period of time. It also highlightsthecontemporaryissuesofIndianeconomy.

VI. Theory

Block 1- History of Indian Economy

Unit 1: India from Independence to Liberalization

An overview of the economic developments during the period 1947-1980; Objectives and strategies of planned economic development and the role of the State; Sectoral growth performance; savings and investment; Demographic trends and issues; education; health and malnutrition; Trends and policies in poverty; inequality and unemployment.

Policy Changes since 1980s. The 1990 Crisis. Causes and Effects of liberalization. Regional differences: infrastructure, primary, secondary and tertiary sector.

Unit 3: Macro Trends Since 1990

Growth; Savings and Investment, Employment; productivity; diversification; Agro- based industries; competition policy; foreign investment, Regional differences.

Block 2- Contemporary Issues

Unit 1: Contemporary Issues

Monetary and Financial trends- areas of government spending in India, Capital expenditure, revenue expenditure, plan expenditure, non plan expenditure, Deficits (fiscal, primary, revenue), impact of fiscal deficit on economy, Capital receipts, revenue receipts, tax and non tax revenue, direct and indirect taxes, need to rationalize tax structure. Goods and Services Tax (GST). Union Budget, Zero base budgeting, Gender budgeting, Fiscal devolution and centre state financial relations in India, WPI, CPI implicit deflators. Foreign Trade policy.

VII. Teaching Methods/Activities

- Lectures
- Power point presentation by students on monetary and fiscal policy in past and present.
- Assignments(Group/individual).
- Group Discussions on Tax and itsreforms.

VIII. Learningoutcome

After the completion of the course the student will be able to-Visualize how the Indian economy has evolved. Get acquainted with the basic steps involved in the working of the national economy.

IX. SuggestedReading

- Dutt and Sundaram. *IndianEconomy*

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I. CourseTitle : International Economics

II. Course Code : AEC511

III. Credit Hours :2+1

IV. Why thiscourse?

The era of Globalisation, liberalization and privatization has unified the whole world. There is trade across national boundaries and one economy has effect on the other. Getting familiar with national economy is not sufficient to understand the mechanism of trade and economic aspects. Thus, this course is designed to teach student about the trade as international level.

V. Aim of thecourse

The major objective of this course is to give an insight of the interactions between national economies. What are the theories governing the trade across national boundaries.Themethodsinvolvedtoregulatetheinternationaltradeandinstitutions involved.

VII. Theory

Block 1- Introduction

Unit 1: 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.

Block 2- Models, Rate and Terms of Trade

Unit 1: Barriers to trade

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

Unit 2: 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 3: Rates and Terms of trade

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

Block 3- Institutions

Unit 1: Trades Institutions

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

VIII. Practical

- Producer's Surplus, Consumer's Surplus, National Welfare under Autarky and Free Trade Equilibrium with small and large countryassumption.
- Estimation of TradeGains

- Estimation of competitive and comparative measures like NPC, EPC, ERP and DRC
- Estimation of Offer CurveElasticity
- Estimation of Effect of Tariff, Export Subsidy, Producer Subsidy, Import Quota and Export Voluntary Restraints on NationalWelfare
- Estimation of RicardianModel
- Estimation of Effect of Trade under Specific FactorModel
- Estimation of trade Equilibrium under Heckscher -Ohlinmodel

IX. Teaching Methods/Activities

- Lectures.
- Casestudies.
- Assignments(Group/individual).
- Power point presentation on International Trade in currentscenario.

X. Learningoutcome

After successful completion of the course the student will be able to –Understand how trade take place between nations. Be able to work out strategies to maintain a favourable trade balance. Understand how the institutions play role in regulating thecrosscountrytradeanddealwiththeissues.

XI. SuggestedReading

- Kindelberger and Joshi PK. 2016. *International Economics* AITBSDelhi-110051
- BrouwerF.*InternationalTradeandFoodSecurity*.LEI-WageningenUR,TheNetherlands.

I. CourseTitle : InstitutionalEconomics

II. Course Code : AEC512

III. Credit Hours :1+0

IV. Why thiscourse?

Institutions are involved in framing of economic development. The human behavior is governed by the institutions working in their environment. Thus, the student need to understand the institutions and their working.

V. Aim of thecourse

To develop critical and informed understanding about institutions, their role in the working of economy. Exposure of issues, policies & regulations and its application in agriculturalsystem

VI. Theory

Block 1:Introduction

Unit 1: Basics of Institutional Economics

Old and New Institutional Economics – Institutional Economics vs Neo-classical Economics. Definition of institutions – Distinction between institutions and organizations – Institutional evolution.

Block 2: Approaches

Unit 1: Institutional changes & Resource allocation

Institutionalchangeandeconomicperformance-nationalandinternationaleconomic institutions. Transaction cost economics – Transaction costs and the allocation of resources. Transaction costs and efficiency. Asymmetric information - Moral hazard and Principal-Agentproblem.

Unit 2: Group and collective Approach

Free rider problem – path dependency – Interlinked transactions. Collective action and the elimination of free-rider problem - The logic of collective action and its role in reducing free rider problem – theory of Groups. Rent seeking – interest groups and policy formulation.

Block 3: Law Protection and Institutions

Unit 1: Property rights

Economic analysis of property rights- property rights regimes – private property – State Property - Common property Resources (CPRs) – public goods and club goods.

Unit 2: Agrarian Institutions

Special features of institutional arrangements in agriculture – Transaction costs in agriculture - Case Studies - Theories of agrarian institutions - tenancy institutions.

VII. Teaching Methods/Activities

- Lectures.
- Casestudies.
- Assignments(Group/individual).
- Group Discussions on Propertyrights

VIII. Learningoutcome

After successful completion of this course the student will be able to-Understand institutions and their roles in economic development. Know about the policies and their issues in an institutions.

IX. SuggestedReading

- Pearce DW –*The dictionary of modernEconomics*

I. CourseTitle : Natural Resource and Environmental Economics

II. Course Code : AEC513

III. Credit Hours :1+1

IV. Why thiscourse?

Sustainable development is the need of the hour. The economic activities affect not only the society but also the environment. Every activity has its social cost. The students, hence will be taught about the economic aspect of environment.

V. Aim of thecourse

To understand about economics of environment and social costs incurred due to economicdevelopment.Workoutmethodstomaintainenvironmentqualityandreduce socialcosts

VII. Theory

Block 1- Introduction to natural resource and environmental economics

Unit 1: Basic Foundation

Concepts, Classification and Problems of Natural Resource Economics – Economy Environment interaction – The Material Balance principle, Entropy law-Resources Scarcity - Limits to Growth - Measuring and mitigating natural resource scarcity
– Malthusian and Recardian scarcity – scarcity indices - Resource Scarcity and Technical Change.

Block 2- Insights of the subject

Unit 1: Theories and economics of natural resources

Theoryofoptimalextractionrenewableresources–economicmodelsofoilextraction- efficiency - time path of prices and extraction - Hotelling's rule, Solow-Harwick's Rule. Theory of optimal extraction exhaustible resources – economic models of forestry andfishery.

Unit 2: Functioning of Market

Efficiency and markets – market failures - externalities – types - property rights
– transaction costs – Coase's theorem and its critique - public goods - common property and open access resource management - Collective action.

Block 3- Dealing with the issues and sustainability

Unit 1: Environmental Issues

Environmental perspectives - biocentrism, sustainability, anthropocentrism - Environmentalproblemsandqualityofenvironment-Sourcesandtypesofpollution
-air,water,solidwaste,landdegradation–environmentalandeconomicimpacts
- Economics of pollution control - efficient reduction in environmental pollution.

Unit 2: Regulations

Environmental regulation – economic instruments - pollution charges – Pigovian tax - tradable permits – indirect instruments – environmental legislations inIndia.

Unit 3: Sustainability aspects

Concept of sustainable development – Economic Perspective – Indicators of sustainabilityRelationbetweendevelopmentandenvironmentstress-Environmental Kuznet's curve Environmental Accounting – resource accounting methods– International Environmental Issues – climate change – likely impacts – mitigation efforts and international treaties.

VIII. Practical

- Exhaustible resource management – optimum rate of oilextraction.
- Renewable resource management – optimum harvest ofForestry/fishery.
- Exercise on pollutionabatement-I.
- Exercise on pollutionabatement-II.
- Concepts in valuing theenvironment.
- Taxonomy of valuationtechniques.
- Productivity change method – substitute cost method – Hedonic price method – Travel cost method – Contingent valuationmethods.
- Discount rate in natural resourcemanagement.
- Environment impactassessment
- Visit to Pollution ControlBoard.

IX. Teaching Methods/Activities

- Lectures.
- Casestudies.
- Assignments(Group/individual).

X. Learningoutcome

After successful completion of this course, the student will be able to-Work out the plan for extraction / use of natural resource in most economical way. Understand the environment and its pollution. Learn how markets are affected if environment is not taken into consideration. Gain proficiency in rules and regulation governing economic aspect ofenvironment.

XI. SuggestedReading

- Pearce DW and Turner RK. *Economics of Natural Resource andEnvironment*
- Kwak J. *Economism: Bad Economics and the Rise ofInequality*
- Tietenberg T and Lewis L. *Environmental and Natural ResourceEconomics*
- Schwarz PM. *EnergyEconomics*

I. CourseTitle : Commodity Future Trading Credits

II. Course Code : AEC514

III. Credit Hours :2+0

IV. Why thiscourse?

Risk is involved in marketing. Price fluctuation is a very common phenomenon in agriculture marketing. In such situation selling of commodity in future market serves as a resort to insulate from this uncertainty. Thus, knowledge of futures market is helpful in ...

V. Aim of thecourse

To disseminate the knowledge about risk mitigating measures especially future trading. The future trading in agricultural commodities is increasing day by day therefore the role of SEBI, functioning of commodity exchanges are discussed.

Theory

Block 1- Introduction to commodity market Unit 1: Concepts of commodity future trading

History and Evolution of commodity markets – Terms and concepts: spot, forward and futures Markets – factors influencing spot and future markets. Speculatory mechanism in commodity futures.

Block 2- Techniques and Risks in Commodity Market

Unit 1: Technical aspects

Transactionandsettlement–deliverymechanism-roleofdifferentagents-trading strategies -potential impact of interest rate, Foreign Exchange, FDI in Commodity Markets.

Unit 2: Risk and its Management

Risk in commodity trading, importance and need for risk management measures

- managing market price risk: hedging, speculation, arbitrage, swaps - pricing and their features.

Block 3- Commodity exchange and market analysis

Unit 1: Commodity Exchange – A review

Important global and Indian commodity exchanges - contracts traded – special features -Regulation of Indian commodity exchanges - FMC and its role.

Unit 2: Analysis of commodity market

Fundamental Vs Technical analysis – construction and interpretation of charts and chart patterns for analyzing the market trend – Market indicators – back testing. Introduction to technical analysis software – analyzing trading pattern of different commodity groups.

VII. Teaching Methods/Activities

- Lectures.
- Casestudies.
- Assignments(Group/individual).
- GroupDiscussions.
- Power point presentations bystudents.

VIII. Learningoutcome

After successful completion of this course, the student will be able to-The basic concepts of commodity markets. The national and international commodity markets.

I. **CourseTitle : Development Economics Credit**

II. **CourseCode :AEC-515**

III. **Credit Hours :2+0**

IV. **Why thiscourse?**

Development is more important than growth. The development of a nation ensures thatconditionofwelfareprevails.Thestudentshastounderstanddifferentmeasures ofdevelopment.Howtomeasurethemandrelevanttheories.

V. **Aim of thecourse**

To develop concept of growth and development. Methods and theories of measuring development. Study of different developed economies will give exposure towards measures to create economic upliftment.

VI. **Learningoutcome**

After successful completion of this course, the student will be able to-Measure the development using different methods. Understand the theories of development and relate it to real world.

VII. **Theory**

Block 1- Introduction to Development Economics Unit 1:

Conceptions of Development

Development Economics – Scope and Importance - Economic development and economicgrowth-divergenceinconceptandapproach-IndicatorsandMeasurement of Economic Development –GNP as a measure of economic growth – New Measures of Welfare – NEW and MEW – PQLI – HDI – Green GNP - Criteria for under development – Obstacles to economic development –Economic and Non-Economic factors of economic growth- Development issues, poverty, inequality, unemployment and environmentaldegradation.

Block 2- Theories and comparison

Unit 1: Theories of Economic growth and development

Classical theories- Adam smith - Ricardo- Malthus, Marx's theory of economicdevelopment; Schumpeter's theory, Approaches to development- low income equilibrium trap - critical minimum effort- The Strategy of economic development- Balanced vs. Unbalanced growth, choice of technique, investment criteria, big push theory, Rostow's stages of Economic Growth,

unlimited supply of labour; social and technological dualisms; roles of capital accumulation, human capital and technological change in economic development, Models of economic growth Harrod- Domar, Kaldor, Mahalanobis, Lewis, FeiRanis, Input-Output, multisectoral models.

Unit 2: Comparative Economic Development

Countries selected for case studies -USA, Japan, China and India; Overview of economic development is selected countries; agrarian surplus and the role of the peasantry in economic development; industrial revolution; division of labour, organization of work and industrial production, the role of the State in developmental transition

VIII. Teaching Methods/Activities

- Lectures.
- Casestudies.
- Assignments(Group/individual).
- Group Discussions oninflation

IX. SuggestedReading

- Blaug M. 1986. *Economic History and the History of EconomicThought*
- Chenery HB and TN Srinivasan. *Handbook of DevelopmentEconomics*
- Baldwin RE. *Economic Development and Growth*. John Willey, NewYork

CourseTitle : Mathematics for Agricultural Economics

I. **CourseCode :STAT/AEC**

II. **Credit Hours :3+0**

III. **Why thiscourse?**

Knowledge of calculus is basic requirement for carrying out simple calculations.

IV. **Aim of thecourse**

To solve various mathematical problems in economic research. Calculations are integral part of research analysis therefore it has wide application in economic studies

Theory

Block 1- Introduction

Unit 1: Preliminaries

Logic and proof techniques; sets and set operations; relations; functions and their properties; number systems

Block 2- Variables and functions

Unit 1: Variables and functions

Specific functions are economic theory. Elementary analytical, geometry-gradient and equation of straight line. Standard equations and simple properties of circle, parabola and rectangularhyperbola.

Unit 2: Differentiation of functions

Limit and continuity. Differentiation, theorems of differentiation, differentiation of logarithmic and exponential functions, function of a function, derivative of higher order, partial derivatives. Application of derivatives to determine average and marginal values in economic analysis; determination of elasticities; points of inflexion; linear homogenous production functions; derivation of average and marginal curves.

Block 3- Overview of Linear Algebra

Unit 1: Linear Algebra

Determinants,evaluationandpropertiesofdeterminants,Vectorsandvectorspaces, Matrices, notations and operations, laws of matrix algebra; transpose and inverse of matrix; Solution of linear and quadratic equations involving one variable, simultaneous equations, application of determinants and matrices in solution of equation for economicanalysis.

Unit2:Optimization of functions

Optimization- unconstrained, maxima and minima, constrained optimization, Lagrange multiplier and their economic applications for optimization problems of cost, production, demand and supply.

Unit 3: Integration of functions

Integration as a reverse process of differentiation, methods of integration, reduction formulae,definiteintegral,useofintegrationtodeterminerelationbetweenaverage and marginal value. Capitalization over time, estimation of returns from capital goodsovertime.Paretodistribution.

Syllabus for supporting courses

I. **CourseTitle : Statistical Methods for AppliedSciences**

II. **CourseCode : STAT502**

III. **CreditHours :3+1**

IV. **Aim of thecourse**

This course is meant for students who do not have sufficient background of Statistical Methods. The students would be exposed to concepts of statistical methods and statistical inference that would help them in understanding the importance of statistics. It would also help them in understanding the concepts involved in data presentation, analysis and interpretation. The students would get an exposure to presentation of data, probability distributions, parameter estimation, tests of significance, regression and multivariate analytical techniques.

V. **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,Normaldistribution,BetaandGammadistributionsandtheirapplications. 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.

VI. 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 andF.
- Confidence interval estimation and Correlation and regression analysis, fitting of Linear and QuadraticModel.
- Non-parametric tests. ANOVA: One way, Two Way,SRS.

I. **CourseTitle : Information Technology in Agriculture**

II. **CourseCode : MCA512**

III. **Credit Hours :2+0**

Aim of thecourse

This is a course on Introduction to Networking and Internet Applications that aims at exposing the students to understand analogy of computer, basic knowledge of MS Office. Also to understand Internet and WWW, use of IT application and differentITtoolsinAgriculture

I. **Theory**

Unit I

Introduction to Computers, Anatomy of computer, Operating Systems, definition and types, Applications of MS Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions,

Unit II

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. e-Agriculture, concepts and applications,

Unit III

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, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc.,

Unit IV

Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc. for supporting Farm decisions, Preparation of contingentcrop-planningusing IT tools.