

Course Curriculum of Fifth Semester
as per the ICAR - Sixth Deans' Committee Report for
the Academic Programmes in
AGRI. BUSINESS MANAGEMENT

- ❖ **UG-Certificate in Agri. Business Management**
- ❖ **UG-Diploma in Agri. Business Management**
- ❖ **UG-Degree: B.Sc. (Hons.) Agri. Business Management**



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Submitted to the

Directors of Instruction Coordination Committee

~ w.e.f. AY, 2026-27 ~

Course Curriculum of Fifth Semester as per the
ICAR-Sixth Deans' Committee Report for Academic Programmes in
AGRI-BUSINESS MANAGEMENT

Course Layout

B.Sc. (Hons.) Agri-Business Management

Semester: V (New)

w.e.f. Academic Year: 2026-27

Sr. No.	Course No.	Course Title	Credit Hrs.	Remark
1.	MKT-354	Grading, Standardization and Quality Management in Agri-food Products	2(1+1)	-
2.	MKT-355	Market Information and Intelligence	3(2+1)	-
3.	MKT-356	Capital and Commodity Markets	2(1+1)	-
4.	ABM-356	Business Research Methods	3(2+1)	-
5.	ECON-355	Cooperatives and Producers' Organizations	3(2+1)	-
6.	GPB-352	Intellectual Property Rights	1(1+0)	-
7.	BT-351	Fundamentals of Plant Biotechnology	2(2+0)	-
8.	AGRO-352	Sustainable Farming Systems and Precision Agriculture	2(1+1)	-
9.	STAT-351	Applied Business Statistics	2(1+1)	-
10.	EXTN-351	Social Entrepreneurship	1(1+0)	-
11.	EDT-351	Educational Tour	2(0+2)	NG
12.	OC-1/OC-2/...	Online Course(s) / MOOCs [†]	As opted by student	NG
Total Credits Hrs.=			21(14+7)	G
OC: Online Course, G: Gradual, NG: Non-gradual				
[†] Note: It is mandatory for each Student to complete total 10 credits (Non-gradual) of Online Courses from available resources across III to VIII semesters under the guidance of assigned Faculty/ Advisor.				

B.Sc.(Hons.) Agri-Business Management-Fifth Semester**Course-wise Syllabus with Teaching Schedules**

Semester	: V	
Course No.	: MKT-354	Credit Hrs. : 2(1+1)
Course Title	: Grading, Standardization and Quality Management in Agri-food Products	

SYLLABUS

- Objectives :**
- (i) To understand the principles and methods of grading and standardization for agri-food products.
 - (ii) To learn techniques to ensure product quality and consistency in the agricultural supply chain.
 - (iii) To explore quality management systems and certifications applicable to agri-food products.
 - (iv) To develop skills to implement grading, standardization, and quality management practices to meet market requirements and consumer expectations.

THEORY

Evolution of markets- Meaning of market, Marketing, Agril. Marketing. Concept of marketing -Old concept, New concept and Modern concept. Significance / Need of Agril. Marketing, Creation of utilities. Classification of markets. Marketing functions- Physical functions, Exchange functions and Facilitative functions. Grading and Standardization Meaning- Significance of Grading and Standardization. Types of grading- Fixed grading/Mandatory grading, Permissive/Variable grading, Centralized grading/Decentralized grading and Grading at producers' level. Criteria for grade standards and advantages of grading. Role of grading in Agril. Products. The Agricultural Produce (Grading and Marketing) Act, 1937. Quality control of Agril. Products, AGMARK standards, The role of DMI in grading of Agril. Produce, Inspection and Quality control, Labelling in Agril. Products. Grading of food grains- Grading of Rice Commercial classification, Based on physical characteristics, Cooking quality of rice, Rice grading by AGMARK. Special characteristics, General characteristics, Safety parameters, Determination of quality of rice. Impurities refractions of food grains foreign matter- Organic and Inorganic, Admixtures, Damaged and Discolored grains, Slightly damaged grains and Immature and Shriveled grains, Chalky, Weevils, Broken, Fragments, Other food grains, Non-food grains, Smutty grains, Whole grains. **Inherent and acquired characteristics of food grains.** Wheat- Quality characteristics of wheat varieties, Wheat- Strong wheat flour, Medium and medium flour, Kinds of wheat. AGMARK quality specifications for wheat, Safety parameters

and Determination of quality of wheat. FAQ standards for Rice, Wheat, Ragi, Maize. Grading of Pulses, AGMARK standards for Green gram (Moong), Red gram (Tur dal), Bengal gram, Black gram (Urad dal), Rajma, Peas, Masoor (Lentils), Matki (Math). Grading of oil seeds: Groundnut, Sunflower. AGMARK standards of oil seeds. Commercial classification of Groundnut- **Coramandal, Bold, Red natal and Peanuts.** Grading of pods and Kernels of groundnut. AGMARK grade designation of quality of edible oil. Grading of commercial crops- Special and General characteristics of Areca nut, Copra, Tobacco and Cotton, Chilli. Classification and Grading of vegetables: Cole, Tuber, Pod, Salad, Root and Bulb vegetables. Grading of fruits- Tropical fruits, Mango, Banana, Citrus, Grapes, Sapota and Pomegranate. Temperate fruits: Apple, Pears, Plums, Apricots and Peaches. Quality control of manufactured products Indian Standards Institution (ISI): aims and objectives of ISI, granting licenses for ISI, Bureau of Indian Standards (BIS), management systems certification. Spot exchange grade requirements, Mark to identify vegetarian/non vegetarian food, Eco mark. Mark of FPO and ISO standards. Quality control in food- Food hygiene, Food adulteration and Food poisoning. Good Agril. Practices, good manufacturing practices. EUREPGAP Quality management in food: FSS Act 2006, Hazard Analysis and Critical Control Point (HACCP), Codex Alimentarius commission (CODEX), Fair Average Quality (FAQ), General Characteristics and Grade designations of processed food- Jaggery, Instant food, Fruits and Vegetables products.

PRACTICAL

Study of laboratory equipments, Sampling equipments, Scientific grading, Instruments and other apparatus, Visit to vegetable and fruit markets and other food processing units. Visit to Bureau of Indian Standards. Presentations and Group discussions for the above topics.

Suggested Readings [MKT-354]:

1. **Acharya, S.S. and Agarwal, N.L.** 2000. Agricultural Marketing in India
2. **Chakravarty, A. and De, D.S.** 1981. Post Harvest Technology of Cereals and Pulses
3. **Jambunathan, L.R.** 1984. Grading of Cotton for Quality
4. **Mamoria, C.B.** 1976. Agricultural Problems of India
5. Manual on Grading and Standardization – Directorate of Marketing and Inspection (DMI), Nagpur
6. Manual on Standards – Bureau of Indian Standards (BIS), New Delhi
7. **Wader, L.K. and Murthy, C.** 2003. Textbook of Agricultural Marketing and Cooperation, ICAR, New Delhi

THEORY [MKT-354]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Introduction to Markets and Agricultural Marketing	Evolution of markets: Meaning of market, Marketing and Agricultural Marketing; Concepts of Marketing: Old, New and Modern concepts; Significance and Need of Agricultural Marketing; Creation of utilities	6
2	Classification of Markets and Marketing Functions	Classification of markets; Marketing functions: Physical functions; Exchange functions; Facilitative functions;	5
3	Introduction to Grading and Standardization	Meaning and Concept of Grading and Standardization; Significance and Need; Role in agricultural marketing; Advantages of grading;	7
4	Types of Grading and Grade Standards	Fixed (Mandatory) grading; Permissive grading; Centralized and Decentralized grading; Grading at producers' level; Criteria for grade standards; Advantages of grading in Agriculture	6
5	Agricultural Produce (Grading and Marking) Act, 1937 and AGMARK	Provisions of AGMARK Act; Objectives; AGMARK standards; Functions of DMI; Role of AGMARK in agricultural marketing	7
6	Quality Control and Inspection of Agricultural Products	Quality control concepts; Inspection procedures; Quality assessment; Sampling and testing; Labeling of agricultural products	6
7	Grading of Food Grains - Rice	Commercial classification of rice; Physical characteristics; Cooking quality; AGMARK grading of rice; General characteristics; Safety parameters; Quality determination of rice	7
8	Rice Quality Defects and FAQ Standards	Foreign matter; Organic and Inorganic impurities; Admixtures; Damaged grains; Chalky grains; Weevils; Broken grains; Smutty grains; FAQ standards for rice	6
9	Grading of Wheat and Coarse Cereals	Quality characteristics of Wheat; Types of Wheat flour; AGMARK specifications; Safety parameters; FAQ standards for Wheat, Ragi and Maize	7

Continued...

10	Grading of Pulses	AGMARK standards of Green gram, Red gram, Black gram, Bengal gram, Rajma, Peas, Lentils and Moth bean; Quality evaluation parameters	6
11	Grading of Oilseeds and Commercial Crops	Groundnut and Sunflower grading; AGMARK standards; Commercial classification of groundnut; Grading of pods and kernels; Quality of edible oil; Grading of Arecanut, Tobacco, Cotton and Chilli	8
12	Grading of Vegetables and Fruits	Classification and grading of vegetables; Cole, Tuber, Pod, Salad, Root and Bulb vegetables; Grading of tropical fruits (Mango, Banana, Citrus, Grapes, Sapota, Pomegranate); Temperate fruits (Apple, Pear, Plum, Apricot, Peach)	8
13	Quality Control of Manufactured Products and BIS Standards	ISI standards; Objectives of ISI; BIS certification; Licensing procedures; Management system certification; Spot exchange grade requirements; Vegetarian and Non-vegetarian logo; Eco Mark; FPO mark; ISO standards	6
14	Food Quality and Safety Management	Food hygiene; Food adulteration; Food poisoning; Good Agricultural Practices (GAP); Good Manufacturing Practices (GMP); Food Safety and Standards Act (FSS Act), 2006	5
15	HACCP, EUREPGAP and CODEX	Hazard Analysis and Critical Control Point (HACCP); EUREPGAP; Codex Alimentarius Commission (CODEX); International quality standards and food safety systems	5
16	Fair Average Quality and Grading of Processed Foods	Fair Average Quality (FAQ); General characteristics and grade designation of processed foods; Jaggery; Instant foods; Fruit and vegetable products.	5
Total =			100

PRACTICAL [MKT-354]

Exercise No.	Exercise Title	Content
1	Study of Laboratory Equipment	Introduction to laboratory layout; identification and use of balances, moisture meters, sieves, magnifiers, sample dividers, measuring cylinders and other quality testing equipment.
2	Study of Sampling Equipment	Study and handling of sampling probes, triers, sample dividers and sample collection procedures for agricultural commodities.
3	Study of Scientific Grading Instruments	Demonstration and use of grain grader, seed blower, moisture meter, color comparator, purity analysis equipment and grading instruments.
4	Study of Quality Evaluation Parameters	Observation and identification of quality parameters such as size, shape, colour, texture, moisture content, purity and defects in agricultural commodities.
5	Grading of Rice According to AGMARK Standards	Identification of impurities, broken grains, chalky grains, damaged grains and foreign matter; determination of rice grade.
6	Grading of Wheat and Coarse Cereals	Evaluation of wheat quality characteristics; identification of shrivelled grains, damaged grains and determination of AGMARK grades.
7	Grading of Pulses	Grading of green gram, black gram, red gram, Bengal gram and lentils according to AGMARK specifications.
8	Grading of Oilseeds and Groundnut	Assessment of quality parameters of groundnut and oilseeds; grading of pods and kernels; identification of defects.
9	Visit to Vegetable Market	Observation of grading, packaging, handling, transportation and marketing practices of vegetables. Preparation of market visit report.
10	Visit to Fruit Market	Study of grading standards, maturity indices, quality characteristics and packaging methods used in fruit marketing.
11	Visit to Jaggery Market	Study of quality parameters, grade designations, packaging and marketing practices of jaggery.
12	Visit to Food Processing Unit	Observation of quality control measures, food safety practices, hygiene standards, GMP implementation and processing operations.
13	Study of BIS Standards and Certification Systems	Familiarization with BIS, ISI mark, Eco Mark, FPO mark, vegetarian/non-vegetarian logo, ISO certification and management system certification.
14	Study of AGMARK and DMI Standards	Study of AGMARK grading procedures, grade designation system and role of Directorate of Marketing and Inspection (DMI).
15	Seminar Presentation	Student presentations on grading, standardization, AGMARK, BIS, HACCP, GAP, GMP, EUREPGAP, CODEX or quality control systems.
16	Group Discussion and Practical Review	Group discussion on market visits, quality management systems, grading standards and practical learning outcomes.

Semester : V		Join-@AgroMind Channel
Course No. : MKT-355	Credit Hrs. : 3(2+1)	
Course Title : Market Information and Intelligence		

SYLLABUS

Objectives:

- (i) To understand the importance of market information and intelligence in making informed business decisions,
- (ii) To learn methods for collecting, analyzing and interpreting market data and trends,
- (iii) To explore strategies to use market information to identify opportunities, mitigate risks and gain competitive advantage,
- (iv) To develop skills to effectively utilize market intelligence to optimize marketing strategies, pricing and product positioning in Agribusiness.

THEORY

Market Information - Meaning, Need for market information, Merits of Market Information, Importance of market information - Types of Market Information- Market Intelligence, Market News and Market Outlook - Essential Characteristics of Good Market Information and Means of data collection. Compilation, Analysis and Dissemination of Market information and Intelligence in India. Sources of Compilation and Dissemination of market information - Institutional and Non-institutional. Deficiencies, Problems and Reliability of market information. Simple forecasting tools for Price and Demand estimation: Time Series Analysis (Trend, Seasonal indices), Consumer surveys, Expert opinion survey methods, Market experiments methods, Graphical methods, Smoothing techniques and Regression methods. Evaluation of forecasts.

PRACTICAL

Price and Demand analysis of selected Agricultural commodities using Time Series Analysis, Consumers' surveys, Experts' opinion survey methods, Market experiments methods, Graphical methods, Smoothing techniques, Delphi method and Regression methods. Developing market intelligence and information reports.

THEORY [MKT-355]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Introduction to Market Information	Meaning and Concept of market information; Role in Agricultural Marketing; Scope and Significance	3
2	Need and Importance of Market Information	Need for market information; Importance in Business and Agricultural decision making; Benefits to farmers, Traders and Policymakers	3
3	Merits of Market Information	Advantages in Pricing, Marketing, Planning, Procurement and Policy formulation	3
4	Types of Market Information	Market Intelligence, Market News and Market Outlook	3
5	Market Intelligence	Meaning, Objectives, Scope and Applications of market intelligence in agribusiness	3
6	Market News	Collection and Reporting of daily prices, Arrivals, Market arrivals and Commodity trends	3
7	Market Outlook	Concept of market outlook; Forecast reports; Demand and Supply outlook studies	3
8	Characteristics of Good Market Information	Accuracy, Adequacy, Timeliness, Relevance, Reliability, Accessibility and Comparability	3
9	Data Collection for Market Information	Meaning and Methods of data collection; Primary and Secondary data sources	3
10	Primary Data Collection Methods	Personal interviews, Schedules, Questionnaires, Observations and Surveys	3
11	Secondary Data Sources	Government reports, Market bulletins, Journals, Publications and Online databases	3
12	Compilation of Market Information	Classification, Tabulation and Organization of market data	3
13	Analysis of Market Information	Data interpretation, Trend analysis and Market intelligence generation	3
14	Dissemination of Market Information	Importance and Methods of dissemination; Communication channels	3
15	Market Information Systems in India	Structure and Functioning of market information systems in India	3
16	Institutional Sources of Market Information	Government agencies, Directorate of Marketing and Inspection (DMI), State Marketing Boards and related institutions	3
17	Non-Institutional Sources of Market Information	Private agencies, Traders, Cooperatives, NGOs and Agribusiness firms	3

Continued...

18	Sources of Compilation and Dissemination	Institutional and Non-institutional mechanisms for collection and dissemination	3
19	Reliability of Market Information	Reliability, Validity and Quality of market information	3
20	Deficiencies and Problems of Market Information	Data gaps, Delays, Inaccuracies, Accessibility issues and Limitations	3
21	Introduction to Forecasting	Meaning, Objectives and Importance of forecasting in Agricultural Marketing	3
22	Forecasting for Price and Demand Estimation	Role of forecasting in Price analysis and Demand prediction	3
23	Time Series Analysis - Trend Analysis	Concept and Estimation of trend values; Uses in Agricultural markets	4
24	Time Series Analysis – Seasonal Indices	Seasonal variations; Computation and Interpretation of seasonal indices	4
25	Consumer Survey Method	Concept, Methodology, Advantages and Limitations of consumer surveys	3
26	Expert Opinion Survey Methods	Jury of expert opinion and Delphi approach; Applications in market forecasting	3
27	Market Experiment Methods	Controlled and Field market experiments; Uses in demand estimation	3
28	Graphical Methods of Forecasting	Graphical presentation and Interpretation of market trends and Forecasts	3
29	Smoothing Techniques	Moving averages and Exponential smoothing methods for forecasting	3
30	Regression Methods	Simple Regression Analysis; Applications in Agricultural forecasting	3
31	Evaluation of Forecasts	Criteria for forecast evaluation; Forecast errors and Accuracy measures	3
32	Integration of Market Intelligence for Decision Making	Application of market intelligence in agribusiness decisions.	5
Total =			100

PRACTICAL [MKT-355]

Exercise No.	Exercise Title	Content
1	Introduction to Market Information and Data Sources	Familiarization with market information systems; Collection of commodity data from government publications, Agmarknet, e-NAM, Statistical reports and Market bulletins.
2	Compilation of Price Data of Agricultural Commodities	Collection and Tabulation of monthly/annual price data for selected Agricultural commodities.
3	Compilation of Demand and Arrival Data	Collection and Organization of Demand, Supply and Market arrival data of selected commodities.
4	Graphical Representation of Market Data	Preparation of Line graphs, Bar diagrams and Trend charts for commodity prices and arrivals.
5	Time Series Analysis - Trend Estimation	Calculation of trend values using Moving averages and Trend line methods for selected commodity prices.
6	Time Series Analysis - Seasonal Indices	Estimation and Interpretation of seasonal indices for selected agricultural commodities.
7	Price Analysis of Agricultural Commodities	Analysis of historical price behavior and Identification of cyclical and Seasonal fluctuations.
8	Demand Analysis of Agricultural Commodities	Study of Demand trends using market data and Consumption patterns.
9	Consumer Survey Method	Preparation of Questionnaire, Collection of consumer responses and Analysis of consumer preferences.
10	Expert Opinion Survey Method	Collection and interpretation of expert opinions for commodity demand and price forecasting.
11	Delphi Method	Conducting Delphi survey exercise for forecasting agricultural commodity prices and demand.
12	Market Experiment Method	Designing and Analyzing simple market experiment studies for demand estimation and market response.
13	Smoothing Techniques for Forecasting	Application of Moving averages and Simple exponential smoothing techniques to market data.
14	Regression Method for Forecasting	Estimation of Simple regression equations and Forecasting commodity prices/demand.
15	Development of Market Intelligence Report	Preparation of commodity-wise market intelligence report including Prices, Arrivals, Trends and Forecasts.
16	Presentation and Discussion of Market Information Reports	Student presentations, Interpretation of findings, Group discussion.

Suggested Readings [MKT-355]:

1. **Acharya, S.S.** 1988. Agricultural Production, Marketing and price policy- A study of Pulses, Mittal Publications, Delhi.
 2. **Acharya, S.S. and Agarwal, N.L.** 1994. Agricultural prices- Analysis and policy, Oxford and IBH, New Delhi.
 3. **Alexander.** Market Intelligence.
 4. **Fox.** Market Information system.
 5. **Gupta, A.P.** 1975. Marketing of agricultural production in India, Voro and Co-Publishers Pvt. Limited, Bombay.
 6. **Jagdish Prasad.** 1966. Encyclopedia of Agricultural Marketing, Mittal Publishers Pvt. Limited, Bombay.
 7. **Kahlon, A.S. and George, M.V.** 1965. Agricultural marketing and Price Policies, Allied Publishers Private Limited, New Delhi.
 8. **Nayyar, H. and Ramaswamy, P.** 1995. Globalization and Agricultural Marketing, Rawat Publications, Jaipur.
 9. **Prasad, A. Shivarama.** Agricultural Marketing in India, Mittal Publications, Delhi.
 10. **Singhal, A.K.** 1989. Agricultural Marketing in India, Anmol Publications, New Delhi.
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Semester	:	V
Course No.	:	MKT-356
Credit Hrs.	:	2 (1+1)
Course Title	:	Capital and Commodity Markets

SYLLABUS

- Objectives :**
- To understand the functioning and dynamics of commodity markets in agriculture,
 - To learn about price discovery mechanisms, trading strategies and risk management techniques,
 - To explore the factors influencing supply and demand dynamics in commodity markets,
 - To develop skills to analyse commodity market trends, assess market opportunities and make informed trading decisions in agricultural commodities.

THEORY

Capital market instruments - Corporate stock and Corporate bonds - Capital market instruments - Commercial paper, Certificate of deposits - Equities - Common Stocks, Restricted Shares - Preferred Stocks - Fixed income capital market instruments - Bonds, Debentures, Swap and Mortgage - Backed securities - Managing Interest Rate Risk - The Yield Curve - Process and Procedures of raising equity capital - Types of investors in capital market - Depository services - Meaning and Functions - Insider trading - Transaction procedures and settlement - Stock Valuation.

History and Evolution of commodity markets. Marketing of food grains - Cereals and Pulses, Production, Consumption, Marketable surplus. Marketing of commercial crops: Coffee, Tea, Rubber, Tobacco, Arecanut, Coconut, Cotton, Oilseeds, Spices, Jute - Supply and Demand. Marketing practices, Market structure, Marketing channels and Price spread, Organizations and Institutions, Commodity Boards and their activities. Marketing of Horticultural crops - Fruits, Vegetables and Flowers - Demand, Supply and Utilization, Marketing practices, NHB, NHM, APEDA. Role of commodity exchanges - Difference between National and Regional exchanges. Meaning and Types of market participants - Hedgers, Speculators, Arbitrators. Derivatives market - Meaning, Functions and Limitations. Types of Derivatives - Options, Forward, Futures and Swaps. Factors influencing Spot and Futures markets. Trading strategies, Pricing of futures. Operational mechanism of commodity markets. Settlement process and Delivery mechanisms. Strategies using options to hedge risks, Long and Short positions. Role of Banks and Warehousing in commodity markets - Global Commodity Exchanges dealing with Agricultural Commodities.

PRACTICAL

Compilation of basic statistics on Area, Production, Productivity, Consumption, Export and Import of selected crops. Estimating growth. Graphical representation. Visit to Grain Market, Fruit, Vegetable and Flowers markets. Futures pay-offs calculation. Pricing of derivatives.

THEORY [MKT-356]

Lecture No.	Topic	Sub-topics / Key Points	Weightage (%)
1	Introduction to Capital Markets	Meaning and Importance of capital markets Structure and Functions of capital market Role in Economic Development Overview of Indian Capital Market	5
2	Capital Market Instruments - I	Corporate stocks and Corporate bonds Commercial papers Certificates of deposits features and functions of instruments	6
3	Capital Market Instruments - II	Equities and common stocks Restricted shares Preferred stocks Rights and Obligations of shareholders	6
4	Fixed Income Securities	Bonds and Debentures Swaps Mortgage-backed securities Managing interest rate risk Yield curve concepts	6
5	Raising Equity Capital and Investors	Process and Procedures of raising equity capital IPO and FPO basics Types of investors in capital market Institutional and Retail investors	6
6	Depository Services and Stock Valuation	Meaning and Functions of depository services Insider trading Transaction procedures and Settlement Basics of stock valuation	6
7	Introduction to Commodity Markets	Meaning and Features of commodity markets History and Evolution of commodity markets Importance in agriculture and trade	6
8	Marketing of Food Grains	Marketing of Cereals and Pulses Production and consumption trends Marketable Surplus Supply and Demand factors	6
9	Marketing of Commercial Crops	Marketing of Coffee, Tea, Rubber and Tobacco Marketing of Arecanut, Coconut, Cotton, Oilseeds, Spices and Jute Supply and Demand dynamics	6
10	Marketing Structure and Commodity Boards	Marketing practices and Market structure Marketing channels and Price spread Commodity boards and their activities Role of institutions in commodity marketing	6
11	Marketing of Horticultural Crops	Marketing of fruits, Vegetables and Flowers Demand, Supply and Utilization NHB, NHM and APEDA functions	6
12	Commodity Exchanges and Market Participants	Role of commodity exchanges National vs Regional exchanges Hedgers, Speculators and Arbitraders Functions of market participants	7

Continued...

13	Derivatives Market	Meaning and Functions of derivatives Limitations of derivatives markets Types: Options, Forwards, Futures and Swaps	7
14	Futures and Spot Markets	Factors influencing Spot and Futures markets Trading strategies Pricing of futures Long and Short positions	7
15	Operational Mechanism of Commodity Markets	Trading procedures in commodity markets Settlement process and Delivery mechanisms Strategies using options to hedge risks	7
16	Banks, Warehousing and Global Commodity Exchanges	Role of Banks and Warehousing in commodity markets Warehousing receipts Global commodity exchanges dealing with agricultural commodities	7
Total =			100

PRACTICAL [MKT-356]

Practical No.	Title	Hands-on Activity
1	Introduction to Agricultural Commodity Data	Introduction to Agricultural Statistics Sources of Secondary data Collection of data from Government publications and Websites
2	Compilation of Area Statistics	Collection and Compilation of area data for selected crops Preparation of tabular statements
3	Compilation of Production Statistics	Collection and Organization of production data Crop-wise comparison of production trends
4	Compilation of Productivity Statistics	Calculation of Productivity/ Yield of selected crops Interpretation of productivity variations
5	Compilation of Consumption Data	Collection of consumption statistics Analysis of domestic demand patterns
6	Compilation of Export and Import Data	Collection of export and import statistics for agricultural commodities Trade trend analysis
7	Estimation of Growth Rates	Methods of estimating growth Linear and Compound growth rate calculation
8	Graphical Representation of Data-I	Construction of bar diagrams Pie charts and Line graphs for agricultural statistics
9	Graphical Representation of Data - II	Trend graphs and Comparative charts Interpretation of graphical data
10	Visit to Grain Market	Observation of grain marketing practices Price quotation and arrivals Interaction with traders and commission agents
11	Visit to Fruit and Vegetable Market	Study of marketing channels Price spread and Handling practices Market intelligence collection
12	Visit to Flower Market	Observation of flower auction systems Price determination and Grading practices Market demand analysis
13	Futures Pay-off Calculations - I	Meaning of futures contracts Calculation of long and short futures pay-offs
14	Futures Pay-off Calculations - II	Hedging examples Profit and Loss estimation in futures trading
15	Pricing of Derivatives	Basics of derivative pricing Futures and options pricing concepts Spot and Futures price comparison
16	Presentation, Case Studies and Practical Review	Presentation of market visit reports Case studies on commodity markets

1. **Niti Nandini Chatnani.** *Commodity Markets*. Tata McGraw Hill Education Private Limited, New Delhi – 110008.
2. **Bharat Kulkarni.** *Commodity Markets and Derivatives*. Excel Books, A-45, Naraina, Phase I, New Delhi – 110028.
3. **Carter, Colin A.** 2003. *Futures and Options Markets: An Introduction*. Prentice-Hall, Upper Saddle River, NJ.
4. **Hull, John C.** 2005. *Fundamentals of Futures and Options Markets* (5th Edition). Prentice Hall, Upper Saddle River, NJ.
5. **McDonald, Robert L.** 2006. *Derivatives Markets* (2nd Edition). Addison Wesley, Boston.
6. **Wayne Purcell and Stephen Koontz** 1999. *Agricultural Futures and Options: Principles and Strategies* (2nd Edition). Prentice-Hall. ISBN: 0-13-779943-8.

Semester	:	V
Course No.	:	ABM-356
Credit Hrs.	:	3(2+1)
Course Title	:	Business Research Methods

SYLLABUS

- Objectives :**
- (i) To understand various research methodologies and their application in business settings,
 - (ii) To learn how to formulate research questions, design studies and collect data for business analysis,
 - (iii) To develop skills to critically evaluate research findings and apply them to business decision-making,
 - (iv) To gain proficiency in using statistical tools and software for data analysis in business research.

THEORY

Business Research – Meaning, types, importance and characteristics of good research. Ethics in business research. Research proposal - purpose, types and its Importance. Research process – Problem identification. Developing an Approach to the problem. Research design - definition, classification and types. Sampling design - meaning, steps in sampling design and process. Types of sampling: Probability and Non-probability sampling. Determining sample size. Meaning and types of Sampling error. Data sources – primary and secondary data types. Data Collection Methods: Observations, survey and interview. Focus group discussion and panel data. Measurement and scaling techniques – basic scales of measurement, scaling techniques. Attitude measurement – Likert scale. Data editing, coding, classification, tabulation. Data Analysis – qualitative and quantitative methods. – Use of parametric and nonparametric tests: T -test, Z-test, F-test, Chi- square test and ANOVA and its applications – Correlation, simple and multiple regression techniques. Steps in report writing.

PRACTICAL

Preparing business research proposal – Problem identification and research questions formulation of research design, sampling framework and hypothesis. Data mining - Collection of primary and secondary data – Sources. Preparation of interview schedule and questionnaire for primary data collection - Administration of mailed questionnaire and on-line survey. Conducting field level enquiry and data collection. Organizing other methods of data collection - Focus group discussion/panel data collection / observation / case study. Application of scaling techniques in business research. Data editing - coding and tabulation - Application of statistical tools (Descriptive statistics) in business research. Understanding cause and effect and functional relationships among the variables.

THEORY [ABM-356]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1 - 2	Introduction to Business Research	Meaning, Scope and Various types of research	8
3		Significance in industry; Importance and Characteristics of good research	4
4	Ethics in Business Research	Ethical considerations and Researcher responsibilities	8
5 - 7	Research Proposal	Purpose, Importance and Types of proposals	8
8 - 9	Problem Identification	Defining the problem and Formulating research questions	8
10	Developing an Approach	Theoretical framework and Analytical models	8
11 - 13	Research Design	Definition, Classification and Specific design types	6
14 - 15	Sampling Design	Meaning, Steps in design and Sampling process	6
16 - 18	Sampling Techniques	Probability vs. Non-probability sampling methods	5
19	Sample Size and Error	Determining size and Understanding sampling errors	5
20	Data Sources	Primary vs. Secondary data types and Data mining	4
21 - 23	Data Collection Methods	Observations, Survey, Interview, Focus group discussion and Panel data	4
24 - 25	Measurement and Scaling techniques	Basic scales of measurement and Attitude measurement - Likert scale	6
26	Data Processing	Data Editing, Coding, Classification and Tabulation	6
27	Data Analysis Overview	Qualitative and Quantitative methods	4
28 - 31	Parametric and Nonparametric Tests	T -test, Z-test, F-test, Chi- square test and ANOVA and its applications - Correlation, Simple and Multiple regression techniques	8
32	Report Writing	Steps in Report Writing	2
Total =			100

TEACHING SCHEDULE**PRACTICAL [ABM-356]**

Exercise No.	Exercise Title
1	Preparing business research proposal - Problem Identification and Research questions
2 - 3	Formulation of Research design, Sampling framework
4	Formulation of Hypothesis
5	Data mining - Collection of primary and secondary data sources
6 - 7	Preparation of interview schedule and questionnaire for primary data collection
8	Administration of mailed questionnaire and on-line survey
9	Conduct of field level enquiry and data collection
10 - 11	Organizing other methods of data collection; Focus group discussion / Panel data collection / Observation / Case study
12	Application of scaling techniques in business research
13 - 14	Data editing - Coding and Tabulation
15	Application of statistical tools (Descriptive statistics) in business research
16	Understanding cause and effect and functional relationships among the variables

Suggested Readings [ABM-356]:

1. **Cooper D.R. and P.S. Schindler** 2007. Business Research Methods, Tata McGraw Hill Company Ltd.
2. **Kothari C.R.** 2007. Research Methodology, New Age International Publishers.
3. **Andrea Ahlemeyer-Stubbe and Shirley Coleman.** A Practical Guide to Data Mining for Business and Industry, John Wiley and Sons Limited, United Kingdom (*e-book*).
4. **Ledolter, Johannes.** Data Mining and Business Analytics with R. John Wiley and Sons, New Jersey (*e-Book*).

Semester	:	V
Course No.	:	ECON-355
Credit Hrs.	:	3(2+1)
Course Title	:	Cooperatives and Producers Organizations

SYLLABUS

- Objectives :**
- (i) To understand the principles and structures of cooperatives and producers' organizations in agriculture.
 - (ii) To learn about the benefits and challenges of cooperative business models for small holder farmers and producers.
 - (iii) To explore strategies for organizing, managing and governing agricultural cooperatives and producers' organizations effectively.
 - (iv) To develop skills to foster collaboration, collective marketing and value addition through cooperative and producer-led initiatives in agriculture.

THEORY

Management of cooperative enterprises: Concept, Meaning, Definition, Unique features- Issues in cooperative management-Cooperative governance-Human resource development in cooperatives- Professionalization of cooperatives. Co-operative management structure: Role and responsibilities of General Body, Board of Directors, President and Chief Executive Officer. Decision making in cooperatives-Performance evaluation parameters for co-operatives. Capital and cooperatives-Meaning-Purpose of Equity-Equity Management and cooperatives -The Importance of Financial Planning -Equity Types -Equity Management Considerations. Producer Organizations: concept, meaning, types, characteristics and scope. Process guidelines for promotion of FPOS. Steps in Registration of PCs. Management of Producer Companies: Membership, Powers of General Body, Powers of Executive Committee, Funds, Accounts and Audit, Appropriation of net profit. Role of central and state governments in supporting FPOs, Role of NABARD in promoting Producer Organizations.

PRACTICAL

Case studies on evaluation of the performance of co-operative organizations. Case studies on democratic decisions and ethical dilemma. Assessing capital requirements of a Producer Company, Assessment of financial viability of the business of Producer Companies, Assessing institutional performance of Producer Company.

THEORY [ECON-355]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage
1 - 2	Management of cooperative enterprises	Concept, Meaning, Definition, Unique features	8
3 - 6		Issues in cooperative management, Cooperative governance, Human resource development in cooperatives, Professionalization of cooperatives	12
7 - 9	Co-operative management structure	Role and responsibilities of General Body, Board of Directors, President and Chief Executive Officer	10
10 - 12		Decision making in cooperatives, Performance evaluation parameters for co-operatives	8
13	Capital and cooperatives	Meaning - Purpose of Equity - Equity Management and Cooperatives The Importance of Financial Planning, Equity Types, Equity Management Considerations	10
14 - 18	Producer Organizations	Concept, Meaning, Types, Characteristics and Scope	8
19 - 23	Process guidelines for FPO	Process guidelines for promotion of FPOS Steps in Registration of PCs.	10
24	Management of Producer Companies	Membership, Powers of General Body, Powers of Executive Committee	10
25 - 27	Funds of FPO	Funds, Accounts and Audit, Appropriation of net profit	6
28 - 31	Role of Central and State governments	Role of Central and State governments in supporting FPOs	10
32	Role of NABARD	Role of NABARD in promoting Producer Organizations.	8
Total =			100

TEACHING SCHEDULE**PRACTICAL [ECON-355]**

Exercise No.	Exercise Title	Content
1	Institutional Preference - I	Performance Index (PI) calculation for Producer Company - I
2	Institutional Preference - II	Comparative report on Governance Producer Company - II
3	Institutional Preference - III	Participatory Assessment report for Producer Company - III
4	Case Study - I	Analysis of a successful Dairy Co-operative
5	Case Study - II	Analysis of a failing Marketing Co-operative
6	Case Study - III	Best practices report for Co-operative Credit
7	Ethical Dilemma - I	Role play: Resolving board-member conflicts
8	Ethical Dilemma - II	Debate: Profit-sharing vs. Capital Reserves
9	Ethical Dilemma - III	Resolution of a Whistle blowing scenario
10	Capital requirements - I	Initial Authorized Capital plan for a new PC
11	Capital requirements - II	Working Capital forecast for seasonal crops
12	Capital requirements - III	Debt-Equity structuring for infrastructure expansion
13	Financial Viability - I	Break-even Analysis for a processing unit
14	Financial Viability - II	3-year Cash Flow Projection
15	Financial Viability - III	NPV and IRR calculation for a cold chain project
16	Financial Viability - IV	Final Sensitivity Analysis under market fluctuations

Suggested Readings [ECON-355]:

1. **Prabir Datta.** 2018. A Guide book for Producer Organization (PO) and Producer Group (PG).
2. **Farmer Producer Organisations.** 2015. National Bank for Agriculture and Rural Development.
3. **Sanjiv Phansalkar and Avinash Paranjape.** 2021. Making Farmer Producer Organizations achieve viability: A Practical Guide.
4. **Sanjiv Phansalkar, Vedprakash, Aneesha Bali and Anish Kumar.** 2021. State of Sector Report - Farmer Producer Organizations in India.

Semester :	V	
Course No. :	GPB-352	Credit Hrs. : 1(1+0)
Course Title :	Intellectual Property Rights	

SYLLABUS

- Objectives** :
- (i) To understand the principles and significance of intellectual property rights (IPRs) in Agriculture,
 - (ii) To learn about different types of IPRs such as patents, trademarks and plant breeders' rights,
 - (iii) To explore the legal and ethical implications of IPRs in agricultural innovation, research, and commercialization,
 - (iv) To develop skills to protect, manage, and utilize intellectual property assets effectively in agricultural enterprises.

THEORY

Introduction and Meaning of Intellectual Property, Brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc. Types of intellectual Property and Legislations covering IPR in India- Patents, Copyrights, Trademark, Industrial design, Geographical indications, Appellations of origin, Integrated circuits, Trade secrets. Patents Act, 1970 and Patent system in India, Patentability, Process and Product patent, Filing of patent, Patent specification, Patent claims, Patent opposition and Revocation, Infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and Patent database. Origin and History including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV and FR Act of India, Plant Breeder's Rights, Registration of plant varieties under PPV and FR Act 2001, Breeders, Researcher and Farmer's rights. Traditional knowledge - Meaning and Rights of TK holders. Convention of Biological Diversity, International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

THEORY [GPB-352]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Introduction and Meaning of Intellectual property	Definition, Meaning, Concept, Nature, Significance of IPRs in Agriculture; Role in innovation, Research and Commercialization	6
2	Brief introduction to GATT, WTO, TRIPs and WIPO	Historical background, Objectives, Abbreviations, Functions, Global IPR Framework, Relevance to Agriculture	10
3	Treaties for IPR protection: Madrid Protocol, Berne Convention, Budapest Treaty, etc.	Overview, Objectives, Scope, International Protection Mechanisms, Significance	6
4	Types of intellectual Property and legislations covering IPR in India	Patents, Copyrights, Trademark, Industrial Design, Geographical Indications, Appellations of Origin, Integrated Circuits, Trade Secrets; Comparative overview	10
5	Patents Act 1970 and Patent system in India	History, Salient features, Legal framework, Patentability criteria, Process and Product patents	6
6	Filing of patent, patent specification, patent claims	Filing procedure, Documentation, drafting of patent specification, Claims, Examination stages	6
7	Patent opposition and revocation, infringement, Compulsory licensing	Grounds, Legal procedures, Remedies, Rights, Limitations, Case illustrations	6
8	Patent Cooperation Treaty, Patent search and patent database	International patent filing route, Patent databases, Search tools, Prior art search, Practical applications	6
9	Origin and History including a brief introduction to UPOV for protection of plant varieties	Historical background, Objectives, Conventions, Significance in plant variety protection	6
10	Protection of plant varieties under UPOV and PPV & FR Act of India	Comparative legal framework, Scope, Protection criteria, Registration requirements	6
11	Plant breeder's rights, Registration of plant varieties under PPV & FR Act 2001	Breeders' rights, Eligibility, Registration process, Required documents, Examples	6
12	Breeders, researcher and Farmer's rights	Rights, Privileges, Legal safeguards, Benefit-sharing provisions, Limitations	6

Continued...

13	Traditional knowledge - meaning and rights of TK holders	Concept, Significance, Misappropriation concerns, Protection mechanisms, Examples	5
14	Convention of Biological Diversity, International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)	Objectives, Principles, Conservation, access to resources, International cooperation	5
15	Indian Biological Diversity Act, 2002 and its salient features	Legal provisions, Institutional framework, Biodiversity management, Approvals, Compliance	5
16	Access and Benefit sharing	Definition, Mechanisms, Stakeholders, Benefit-sharing models, Challenges, Practical applications	5
Total =			100

Suggested Readings [GPB-352]:

1. **Ganguly, P. and Tata McGraw Hill.** 2001. Intellectual Property Rights - Unleashing the knowledge economy.
2. **Erbisch, F.H. and Maredia, K., CABI.** 1998. Intellectual Property Rights in Agricultural Biotechnology.
3. **Rothschild, M. and Scott, N. (Ed.), CABI.** 2003. Intellectual Property Rights in Animal Breeding and Genetics.
4. **Saha, R.** 2006. Intellectual Property Rights in NAM and other Developing Countries: A Compendium on Law and Policies, (Ed.) Daya Publ. House.
5. **Ministry of Agriculture, Government of India.** 2004. State of Indian Farmer. Vol V. Technology Generation and IPR issues. Academic Foundation.
6. The Indian Acts - Patents Act, 1970 and amendments; Design Act, 2000; Trademarks Act, 1999; The Copyright Act, 1957 and amendments; Layout Design Act, 2000; PPV and FR Act 2001, and Rules 2003; National Biological Diversity Act, 2003.
7. WIPO Intellectual Property Handbook: Policy Law and Use. Fields of Intellectual Property Protection, WIPO, 2008.

Semester	:	V
Course No.	:	BT-351
	Credit Hrs.	: 2(2+0)
Course Title	:	Fundamentals of Plant Biotechnology

SYLLABUS

- Objectives :**
- (i) To understand the principles and techniques of plant biotechnology,
 - (ii) To learn about genetic engineering, gene editing, and other biotechnological methods used in plant breeding,
 - (iii) To explore the applications of plant biotechnology in crop improvement, pest resistance, and stress tolerance,
 - (iv) To develop skills to critically evaluate the ethical, environmental and regulatory aspects of plant biotechnology.

THEORY

Introduction, History, Concepts and Applications of Plant Biotechnology, Cell, DNA Structure and Function, Introduction to Recombinant DNA Technology, Gene cloning steps, Common enzymes used as molecular tools, Vectors, Construction of genomic libraries, Isolation and Cloning of coding parts of eukaryotic genes-cDNA cloning. Gene transfer methods, Transgenic and its importance, Gene editing, Biosafety measures and Intellectual Property Rights. Molecular markers, RAPD, RFLP, SSR, SNP etc., and their applications. Concept of Tissue culture, Organogenesis and Embryogenesis, Embryo rescue and its significance, Micropropagation, Somaclonal variation and its use in crop improvement, Synthetic seeds and their significance, Somatic hybridization and Cybrids and Cryopreservation. Use of tissue culture in Biotechnology (Transgenic and Gene editing).

Suggested Readings [BT-351]:

1. **Brown, T.A.**, 2006, Gene cloning and DNA analysis: An introduction, Blackwell Publishing, Oxford, UK.
2. **Chawla, H.S.**, 2002, Introduction to Plant Biotechnology, Science Publishers.
3. **Gardener, E.J., Simmons, M.J. and Snustad, D.P.** 1991, Principles of Genetics.
4. **John Singh, B.D.** 2013, Biotechnology, Kalyani Publishers.
5. **Wiley and Sons, Inc.**, New York, USA.

TEACHING SCHEDULE**THEORY [BT-351]**

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Plant Biotechnology	Definition, Introduction, History, Scope and Applications of Plant Biotechnology	4
2	Cell and DNA	Cell, Cell organelles, its structure and Functions; DNA its structure and functions	4
3	Recombinant DNA technology	Definition, Introduction, Objectives and Applications of RDT	4
4	PCR	Techniques of PCR and its applications	4
5	Isolation and Gene cloning	Definition, Introduction, Principles and Methods of DNA/Gene Isolation, Concept and Steps of Gene Cloning, Applications of Gene Cloning in Plant Biotechnology and Agriculture	4
6	Restriction enzymes	Introduction to common enzymes used as molecular tools	4
7	Vectors	The carriers of DNA molecules, Properties, Types, Categories of vectors.	4
8 - 9	Genomic libraries and Gene cloning	Introduction Genomic and cDNA library, its construction, applications	4
10	Genetic Engineering	Application of Genetic Engineering in crop Improvement	4
11 - 12	Gene transfer methods	Introduction to different Indirect and Direct methods of gene transfer	6
13 - 14	Transgenics and its Biosafety	Definition, Importance of transgenics in crop improvement, Examples. Biosafety Issues, Regulations and Guidelines for transgenics	6
15	Intellectual Property Rights	Concept, Importance and Types of IPR, IPR Protection in Plant Biotechnology, Role and Applications of IPR in Biotechnology	
16	Marker- Assisted Breeding	Introduction, definition, advantages, disadvantages in crop improvement, steps, types.	4
17	Molecular Markers	Different types of molecular markers - RAPD, RFLP, SSR, SNP etc. and its applications	4
18	Plant tissue culture	Concept, history, steps in plant tissue culture. Applications of plant tissue culture in crop improvement	6
19	Organogenesis	Definitions, Introduction to organogenesis.	4
20 - 21	Embryogenesis and Embryo rescue	Definitions, Introduction to and embryogenesis, embryo rescue	4

Continued...

22 - 23	Micropropagation	Pathways of regenerations, Problems associated with Micropropagation advantages of Micropropagation	6
24 - 25	Somaclonal variation	Definition, Applications and Achievements	4
26 - 27	Synthetic seed	Applications of synthetic seed, Steps for production of synthetic seeds	4
28 - 29	Somatic hybridization and Cybrids	Techniques of Somatic hybridization, Advantages, Problem and Limitations.	4
30	Cryopreservation	Meaning, Importance of cryopreservation of plants and advantages over other methods.	4
31	Use of tissue culture in Biotechnology	Applications of Tissue culture in crop improvement	4
32	Transgenics and Gene editing.	Introduction to Transgenics and Gene editing.	4
Total =			100

Semester	:	V	Join-@AgroMind Channel
Course No.	:	AGRO-352	Credits Hrs. : 2(1+1)
Course Title	:	Sustainable Farming Systems and Precision Agriculture	

SYLLABUS

- Objectives :**
- (i) To understand the principles and practices of sustainable farming systems aimed at environmental stewardship and resource conservation,
 - (ii) To learn about precision agriculture technologies and their applications for optimizing inputs, minimizing waste and increasing farm efficiency,
 - (iii) To explore strategies to integrate sustainable practices and precision agriculture techniques for improved crop productivity, profitability and environmental sustainability,
 - (iv) To develop skills to implement and manage sustainable farming systems and precision agriculture technologies to address challenges such as climate change, soil degradation, and water scarcity in Agriculture.

THEORY

Farming System-Scope, Importance, Concept and Types. Farming systems components, Indicators of Sustainability, Adaptation and Mitigation, Determining production and Efficiencies in Cropping and Farming systems; Sustainable Agriculture- Problems and its impact on agriculture. Evaluation indices for cropping system. Integrated Farming System- Historical background, Objectives and Characteristics, Components of IFS and its advantages, Resource use efficiency and Optimization techniques. Operational structure of NPOP. Organic certification process and Economic considerations. Marketing export potential of organic products. Precision agriculture: Components, Concepts and principles, Techniques, their issues and concern for Indian agriculture. Global Positioning System (GPS) and Geographical Information System (GIS), Site Specific Nutrient Management (SSNM) for nutrient and Irrigation management practices. Comparative yield, Quality and Farm profits under SSNM practices v/s Variable Rate Technology (VRT) practices. Yield monitoring and Mapping.

PRACTICAL

Tools for determining production and efficiencies in cropping and farming system, Visit cropping systems and IFS models. Evaluation indices for cropping system. Organic farming guidelines and Alternative philosophies. Organic nutrient resources and their fortification, Restrictions on nutrient use, Enriched compost, Vermi-compost, Liquid organic manures, Green manuring, Crop residue management, Bio fertilizers/ Bio inoculants and their quality. ITKs inorganic farming. NPOP: Certification process and Standards of organic farming; Processing, Labeling, Marketing and Export of organic products. Economics of Organic production systems. Visit to organic farmer's fields. Use of GPS for agricultural survey and Recording the observations with GPS. Area estimation, Navigation and Recording elevation points. Conversion of GPS readings, Study of maps, Top sheets, Cartography, GPS software's, Spatial data creation and Editing. Introduction to image processing software. Visual and Digital interpretation of remote sensing images. VRT, Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation. Use of UAV in agriculture.

THEORY [AGRO-352]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Farming System	Farming System - Scope, Importance and Concept	6
2		Types and Systems of farming system.	8
3		Farming system components and their maintenance	6
4		Indicators of Sustainability, Adaptation and Mitigation.	4
5		Determining production and Efficiencies in cropping and farming systems	6
6	Sustainable agriculture	Sustainable agriculture-Problems and its impact on Agriculture.	6
7	Cropping system	Evaluation indices for cropping system	8
8	Integrated farming system	Integrated farming system-Historical background, Objectives and Characteristics, Components of IFS and its advantages, Resource use efficiency and Optimization techniques.	10
9	NPOP	Operational structure of NPOP	8
10	Organic certification	Organic certification process and Economic considerations	8
11	Marketing of organic products	Marketing export potential of organic products	4
12	Precision agriculture	Precision agriculture: Concepts and Techniques; their issues and concerns for Indian agriculture.	10
13	Global Positioning System	Global Positioning System (GPS) uses in precision farming.	4
14	Geographic Information System	Geographic Information System (GIS) uses in precision farming.	4
15	Site Specific Nutrient Management	Site Specific Nutrient Management (SSNM) for nutrient and irrigation management practices.	4
16	VRT and SSNM	Components and Uses of variable technology SSNM practices v/s Variable Rate Technology (VRT) practices. Yield monitoring and Mapping.	4
Total =			100

PRACTICAL [AGRO-352]

Exercise No.	Exercise Title
1	Tools for determining production and Efficiencies in cropping and farming system
2	Visit of Cropping systems/ IFS models, Organic farming guidelines and alternative philosophies, NGOs and other organizations for promotion of organic Agriculture
3	Organic nutrient resources and its fortification.
4	Restrictions to nutrient use, Enriched compost, Vermi-compost, Liquid organic manures, Green manuring, Crop residue management.
5	Bio-fertilizers/ bio-inoculants and their quality analysis
6	ITK in organic farming
7	NPOP; Certification process and standards of organic farming
8	Processing, Labeling, Marketing and Export of organic products
9	Economics of organic production system
10	Visit to organic farmers fields
11	Use of GPS for agricultural survey and Recording observations with GPS
12	Area estimation, Navigation and Recording elevation points
13	Conversion of GPS readings, Study of Maps, Topo sheets, Cartography
14	Introduction to GIS software, spatial data creation and editing
15	Introduction to image processing software, Visual and digital interpretation of remote sensing images
16	VRT, Generation of spectral profiles of different objects, Supervised and unsupervised classification and acreage estimation. Use of UAV in Agriculture.

Suggested Readings [AGRO-352]:

1. **Joshi, M. and Prabhakarashetty, T.K.** 2005. Sustainability through Organic Farming, Kalyani Publishers.
2. **Palaniappan, S.P. and Anandurai, K.** 1999. Organic Farming - Theory and Practice, Scientific Publishers.
3. **Panda, S.C.** 2014, Cropping and Farming System. Agrobios (India) Publishers.
4. **Reddy, S.R.** 2017. Geo informatics and Nanotechnology for Precision Farming. Kalyani Publishers. pp.140.
5. **Thomas Lilles, Ralph W. Kiefer and Jonathan Chipman.** 2015. Remote Sensing and Image Interpretation, 7th Edition, Wiley Publications. Pp 736.
6. **Wright, Richard, T. and Bernard, J. Nebel.** Environmental science: toward a sustainable agriculture.

Semester		: V
Course No.	: STAT-351	Credits Hrs. : 2(1+1)
Course Title		: Applied Business Statistics

SYLLABUS

- Objectives :**
- (i) To understand the fundamental concepts and techniques of statistical analysis in business contexts,
 - (ii) To learn how to collect, organize, and interpret data to make informed business decisions,
 - (iii) To explore the application of statistical tools and methods in various business functions such as marketing, finance, and operations,
 - (iv) To develop skills to use statistical software packages effectively for data analysis and visualization in business settings.

THEORY

Introduction to Sampling Theory, Sampling versus Complete Enumeration, Methods of Sampling: Probability sampling design - Simple Random Sampling (WR and WOR), Use of Random Number Tables for selection of Simple Random Sample. Concept of Stratified Sampling, Determining sample size for Simple Random and Stratified Sampling under Equal, Proportional, Neyman's and Optimal allocations. Concept of Systematic sampling, Cluster, Multistage and Probability Proportional to Size (PPS) sampling along with their advantages and disadvantages. Non-probability sampling scheme: Judgment, convenience, quota and accident sampling scheme. Time series analysis: Introduction, Spatial, temporal and conditional series, Objectives of time series, components of time series: Trend, Seasonal, Cyclical and Irregular components. Measurement of trend: Graphical, Semi-Average, Moving Averages and Central Moving Averages, Isolation of trend by moving averages, Ordinary Least Squares (OLS) and Fitting of trend. Index Numbers: Concept and Definition, Objectives of index numbers, Advantages and Limitations. Prerequisites of Index Numbers, Types of Index Numbers: Price Index Number (Retail and Wholesale), Quantity Index Numbers, Value Index Numbers. Construction of Simple Index Numbers under Simple aggregative and Simple average of relatives (Fixed and Chain based) method. Construction of Weighted Index Numbers under Weighted Aggregative Method. Chain Index Number, Conversion of Chain Base Index Number to Fixed Base Index Number, Fixed Base Index Number to Chain Base Index Number. Statistical Quality Control: Definition of Control charts, uses of Control charts, Chance and Assignable causes, Parts of control charts (Central line and Control limits). Control charts for variables $\bar{X}$ -bar and R-charts, Control charts for fraction defective (p) and Control charts for number of defects per unit. Operating characteristic curves for Control charts.

PRACTICAL

Use of Random Number Tables for selection of Simple Random Sample (WR/WOR). Computing Mean and Variance for Simple random samples. Determining sample size for Simple Random samples. Determining sample size for Stratified Sampling under Equal, Proportional, Neyman's and Optimal allocation. Graphical presentation of various time-series components. Presenting trend line using Graphical and Semi-Average methods. Computation of Moving Average and Central Moving Average, Isolation of trend by Moving averages. Fitting of trend line using Ordinary Least Squares (OLS). Construction of Price Index Number: Retail and Wholesale. Construction of Quantity Index Numbers and Value Index Numbers. Construction of Simple Index Numbers under Simple aggregative and Simple average of relatives (fixed and chain based) method. Construction of Weighted Index Numbers under Weighted Aggregative Method. Construction of Chain Index Number, conversion of Chain Base Index Number to Fixed Base Index Number, Fixed Base Index Number to Chain Base Index Number. Construction of $\bar{X}$ bar and R charts for variables. Construction of fraction defective (p) and number of defects per unit. Construction of Operating characteristic curves for control charts.

THEORY [STAT-351]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Introduction to Sampling Theory	Introduction to Sampling Theory, Sampling versus Complete Enumeration.	6
2	Methods of Sampling: Probability sampling design	Simple Random Sampling (WR and WOR), Use of Random Number Tables for selection of Simple Random Sample. Concept of Stratified Sampling, Systematic sampling, Cluster, Multistage and Probability Proportional to Size (PPS) sampling along with their advantage and disadvantages.	15
3	Determining sample size	Simple Random Sampling and Stratified Sampling under Equal, Proportional, Neyman's and Optimal allocations.	5
4	Methods of Sampling: Non-probability sampling	Judgment, Convenience, Quota and Accident sampling scheme.	7
5 - 6	Time series analysis	Introduction, Spatial, Temporal and Conditional series, Objectives of time series, Components of time series: Trend, Seasonal, Cyclical and Irregular components.	7
7 - 8	Measurement of trend	Graphical, Semi-Average, Moving Averages and Central Moving Averages, Isolation of trend by Moving Averages, Ordinary Least Squares (OLS), and Fitting of trend.	10
9	Index Numbers	Concept and Definition, Objectives of Index Numbers, advantages and limitations. Prerequisites of index numbers.	10
10	Types of Index numbers	Price index number (Retail and Wholesale), Quantity index numbers, Value index numbers.	8
11 - 12	Construction of Index number	Construction of Simple index numbers under simple aggregative and simple average of relatives (Fixed and Chain based) method. Construction of weighted index numbers under weighted aggregative method.	10
13	Chain index number	Conversion of chain base index number to Fixed base index number, fixed base index number to chain base index number.	5
14	Statistical Quality Control	Definition of control charts, uses of Control charts, chance and assignable causes, parts of control charts (central line and control limits).	7
15 - 16	Types of Control charts	Control charts for variables X-bar and R charts, control charts for fraction defective (p) and control charts for number of defects per unit. Operating characteristic curves for control charts.	10
Total =			100

PRACTICAL [STAT-351]

Exercise No.	Exercise Title
1	Use of Random Number Tables for selection of Simple Random Sample (WR/WOR). Computing Mean and Variance for Simple random samples
2	Determining sample size for Simple random samples
3	Determining sample size for Stratified Sampling under Equal, Proportional, Neyman's and Optimal allocation
4	Graphical presentation of various time-series components Presenting trend line using Graphical and Semi-Average methods
5 - 6	Computation of Moving Average and Central Moving Average, Isolation of trend by moving averages
7	Fitting of trend line using Ordinary Least Squares (OLS)
8	Construction of Price Index Number: Retail and Wholesale
9	Construction of Quantity Index numbers and Value Index Numbers
10	Construction of Simple Index Numbers under Simple aggregative and Simple average of relatives (Fixed and Chain based) method
11	Construction of Weighted Index Numbers under Weighted Aggregative Method
12 - 13	Construction of Chain Index Number. Conversion of Chain Base Index Number to Fixed Base Index Number, Fixed Base Index Number to Chain Base Index Number
14	Construction of X-bar and R-charts for variables
15	Construction of fraction defective (p) and number of defects per unit
16	Construction of Operating characteristic curves for control charts.

Suggested Readings [STAT-351]:

1. **Rangaswamy, R..** A Textbook of Agril. Statistics.
2. **Gupta, S.P.** Advanced Practical Statistics.
3. **Gupta, S.C. and Kapoor, V.K.** Fundamentals of Mathematical Statistics.
4. **Brockwell, P.J, and Davis, R,A,** Introduction to Time Series and Forecasting.
5. **John Wiley, Duncan, A.J** Quality Control and Industrial Statistics.
6. **Dodge, H.F. and Romig, H.G.** Sampling Inspection Tables.
7. **Cochran, W.G.** Sampling Techniques.
8. **Cowden D.J.** Statistical Methods in Quality Control.
9. **Grant, E.L. and Leavenworth, R.S.** Statistical Quality Control.
10. **Chaudhari, A. and Stenger, H.** Survey Sampling Theory and Methods.
11. **Box G.E.P., Jenkins G.M. and Reinsel G.C.** Time Series Analysis: Forecasting and Control.

Semester : V			Join-@AgroMind Channel
Course No. :	EXTN-351	Credit Hrs. :	1(1+0)
Course Title :	Social Entrepreneurship		

SYLLABUS

- Objectives :**
- (i) To understand the concept and principles of social entrepreneurship,
 - (ii) To learn about innovative business models that address social and environmental challenges,
 - (iii) To explore strategies for creating sustainable social impact while ensuring financial viability,
 - (iv) To develop skills to identify social problems, design solutions and implement projects that benefit communities.

THEORY

Social Entrepreneurship: Concept, Meaning, Historical perspective of social entrepreneurship. Factors impacting transformation into social entrepreneurship. Characteristics of social entrepreneurs. Differences between business and social enterprise. Forms of social enterprises, Profit and Non-profit Proprietorships, Partnership and Company; Non-Governmental organisation, Trust and Company. Third Sector Organizations (TSOs) and Social enterprises. Similarities and Differences with other forms of enterprises. Organisation of social enterprise. Financing of social enterprise. Legal compliance and management of resistance. Management: Strategy, Finance, HRM and Marketing. Governance challenges - Accountability, Transparency and Democracy. Measurement of social outcomes and impact, Social accounting, Social return on investment. Innovations in social enterprises. Successful social enterprises in India.

Suggested Readings [EXTN-351]:

1. **Bornstein, David and Susan Davis.** 2010. Social Entrepreneurship: What Everyone Needs to Know? Oxford University Press, New York.
2. **Bornstein, David.** 2007. How to Change the World: Social Entrepreneurs and the Power of New Ideas. Oxford University Press, New York.
3. **Doherty, Bob, George Foster and Chris Mason.** 2009. Management for Social Enterprise. Sage Publications, USA.
4. International Journal of Social Entrepreneurship and Innovation, Inder science.
5. **Taylor and Francis.** Journal of Social Entrepreneurship.
6. **Praszkier, Ryszard and Andrzej Nowak.** 2011. Social Entrepreneurship: Theory and Practice. Cambridge University Press, Cambridge.
7. **Yunus, Muhammad.** 2010. Building Social Business: The New Kind of Capitalism that Serves Humanity's Most Pressing Needs. Public Affairs, New York.

THEORY [EXTN-351]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Social Entrepreneurship	Meaning, Definition, Concept and Historical perspective of social entrepreneurship	10
2	Factors affecting social entrepreneurs	Personal, Psychological, Environmental, Social, Organizational, Financial factors etc.	05
3	Characteristics of social entrepreneurs	Leadership, Innovation, Ethics, Empathy, Risk-taking, Influencer, Motivated, Passionate, Collaboration etc.	05
4	Social enterprise	Meaning, Definition of social enterprise, Differences between Business and Social enterprise	10
5	Profit and Non-profit Proprietorships	Forms of social enterprise: Profit and Non-profit proprietorships, Partnership, Non-governmental organisation, Trust and Company.	05
6	Third Sector Organizations	Meaning, Definition, Objectives and Features of Third Sector Organizations (TSOs).	05
7	Similarities with other forms of enterprises	Similarities: Use of management practices, Business activities, Revenue generation, Innovation, Customer satisfaction, Sustainability etc.	05
8	Differences with other forms of enterprises	Objectives, Profit distribution, Decision making, Funding, Target etc.	05
9	Organisation of Social enterprise	Characteristics and Types of social enterprise organisations	05
10	Financing of social enterprise	Objectives and Sources of financing of social enterprise, Challenges in financing social enterprises	05
11	Legal compliance and management of resistance	Importance and Areas of legal compliance in social enterprise. Resistance—causes, types and Techniques of managing resistance	10
12	Management in social enterprises	Meaning, Definition and Functions of management, Strategy, Finance, HRM and Marketing	05
13	Governance challenges	Accountability, Transparency and Democracy	05
14	Measurement of social outcomes	Measurement of social outcomes and impact of it. Concept and Meaning of Social accounting, Social return on investment	05
15	Innovations in social enterprises	Meaning, Definition, Characteristics and Types of innovations in social enterprises. Importance of innovation in social enterprises	10
16	Successful social enterprises in India	Successful social enterprises in India like Livelihood and Agriculture (Amul), Healthcare (Aravind Eye Care System), Bollant Industries, Jaipur Rugs, Lijjat papad, Goonj, SELCO foundation etc.	05
Total =			100

Semester : V	
Course No. : EDT-351	Credit Hrs. : 2(0+2) NG
Course Title : Study Tour	

The study/ educational tour shall be of 10 - 14 days duration within the V semester.

The students shall visit Industries/ Institutions, preferably outside the State, so that, in addition to visiting the Organizations/ Industries (related to the profession).

They will also be exposed to the geographical, social, socio-economic and cultural diversity of different places/ states.

After the visit, the students shall submit a 'Report'/ make a 'Presentation'.