Course Outline for Written Exam – Assistant Professor (Agricultural Economics)

Chapter 1: Fundamentals of Microeconomics and Macroeconomics in Agriculture

- Concepts of Demand, Supply, and Market Equilibrium
- Consumer Behavior: Utility, Indifference Curve, Demand Function
- Production Functions, Cost Concepts, and Producer Behavior
- Market Structures: Perfect Competition, Monopoly, Monopolistic, Oligopoly
- National Income Accounting and GDP in Agriculture
- Inflation, Unemployment, and Economic Cycles in Agriculture

Chapter 2: Agricultural Production Economics and Farm Management

- Production Function and Input-Output Relationship in Agriculture
- Law of Diminishing Returns and Stages of Production
- Farm Planning and Budgeting Techniques
- Risk and Uncertainty in Farm Decision Making
- Farm Records, Accounts, and Financial Analysis
- Cost-Benefit Analysis, Break-even Analysis in Farm Management

Chapter 3: Agricultural Price Analysis and Policy

- Price Determination and Price Analysis in Agricultural Markets
- Price Stabilization and Government Interventions
- Agricultural Price Policy in Nepal and Its Evolution
- Minimum Support Price (MSP) and Procurement Systems
- Market Integration and Price Transmission

Chapter 4: Agricultural Marketing and International Agricultural Trade

- Agricultural Marketing System, Functions, and Channels
- Market Structure, Conduct, and Performance
- Role of Cooperatives and Contract Farming in Marketing
- Agricultural Trade Theories: Comparative and Absolute Advantage
- WTO, Agreement on Agriculture (AoA), and Nepal's Commitments
- Trade Barriers and Export Promotion Strategies in Agriculture

Chapter 5: Natural Resource Economics and Environmental Economics

- Concept, Importance, and Classification of Natural Resources
- Economics of Land, Water, Forest, and Biodiversity Use
- Property Rights, Tragedy of Commons, and Resource Degradation
- Climate Change Economics and Agriculture
- Payment for Ecosystem Services (PES) and Sustainable Resource Use
- Socioeconomic and Technical Aspects of Irrigation Management

Chapter 6: Project Appraisal, Evaluation, and Research Methods in Agriculture

- Identification, Formulation, and Appraisal of Agricultural Projects
- Financial and Economic Analysis of Agricultural Projects
- Monitoring and Evaluation Techniques (Logical Framework Approach)
- Research Process: Problem Identification, Hypothesis, Objectives
- Sampling Techniques, Questionnaire Design, Data Collection
- Data Analysis: Descriptive and Inferential Statistics
- Socioeconomic Research Methods and Participatory Rural Appraisal (PRA)

Chapter 7: Mathematical Economics and Econometrics in Agriculture

- Mathematical Tools: Functions, Differentiation, Optimization in Economics
- Cobb-Douglas Production Function and Elasticities
- Basics of Econometrics: OLS Method, Assumptions and Violations
- Time Series Analysis and Forecasting in Agricultural Economics
- Multicollinearity, Heteroscedasticity, and Autocorrelation
- Econometric Modeling in Agricultural Research

Chapter 8: Agricultural Finance, Agribusiness, and Management

- Role and Sources of Agricultural Credit (Formal & Informal)
- Classification of Agricultural Credit: Short, Medium, Long Term
- Credit Appraisal and Risk Management in Agriculture
- Concepts and Scope of Agribusiness
- Value Chain Development and Supply Chain Management in Agriculture
- Agricultural Cooperatives and Farmer Producer Organizations (FPOs)
- Public-Private Partnership (PPP) in Agribusiness

Chapter 9: Economic Growth, Development, and Public Economics in Agriculture

- Theories of Economic Growth and Development
- Role of Agriculture in Economic Development
- Dual Economy Models (Lewis Model, Fei-Ranis Model)
- Public Goods, Externalities, and Role of Government in Agriculture
- Agricultural Development Policies and Plans in Nepal
- Agriculture Development Strategy (ADS) and Local Governance in Agriculture

Chapter 10: Organization and Management of Agricultural Research and Development

- Role of Agricultural Research in Economic Growth
- Research-Extension-Farmer Linkage and Technology Transfer
- Major Agricultural Research Institutions in Nepal (NARC, DoA, MOALD)
- Role of Universities in Agricultural Research and Development
- Innovation Systems in Agriculture and Agri-startups
- Role of Private Sector in Agricultural Research and Extension

Chapter 11. सुदुरपश्चिम विश्वविद्यालय सम्वन्धी जानकारी (संरचना, पदाधिकारीहरु, पदिय जिम्मेवारी, ऐन र नियमावलीहरु)। **THE END**

Course Outline for Written Exam – Assistant Professor (Agricultural Engineering)

Chapter 1: Farm Power and Tractor Systems

- Sources of Farm Power: Human, Animal, Mechanical, Electrical, Renewable
- Classification and Components of Tractors
- IC Engine – Working Principles, Components, and Functions
- Power Transmission Systems in Tractors
- Performance Evaluation of Tractors – Drawbar Power, PTO Power, Fuel Efficiency
- Recent Advances in Farm Power and Renewable Energy Use in Agriculture

Chapter 2: Farm Machinery and Equipment

- Classification of Farm Implements
- Primary and Secondary Tillage Implements – Types and Functions
- Seed Drills, Planters, Transplanters – Mechanism and Calibration
- Intercultural Equipment – Weeders, Sprayers, Dusters
- Harvesting and Threshing Machinery – Principles and Types
- Mechanization Status and Challenges in Nepal

Chapter 3: Introductory Agrometeorology and Weather Observations

- Introduction to Agrometeorology and Importance in Agriculture
- Elements of Weather and Climate (Temperature, Rainfall, Humidity, Wind)
- Measurement of Weather Parameters – Instruments and Techniques
- Weather Forecasting and Advisory Services for Farmers
- Climate Change and Its Impact on Agriculture

Chapter 4: Principles and Practices of Irrigation Management

- Importance and Objectives of Irrigation
- Sources of Irrigation – Surface, Groundwater, Rainwater Harvesting
- Methods of Irrigation – Surface, Subsurface, Sprinkler, Drip
- Irrigation Scheduling and Water Requirement Calculations
- Conjunctive Use of Water and Irrigation Efficiency
- Irrigation Institutions and Policies in Nepal

Chapter 5: Soil and Water Conservation Engineering

- Introduction and Scope of Soil and Water Conservation
- Types and Causes of Soil Erosion – Water and Wind Erosion
- Erosion Control Measures – Mechanical, Agronomic, and Biological
- Gully and Ravine Control Structures
- Soil Conservation Planning at Watershed Level
- Case Studies of Soil Conservation Projects in Nepal

Chapter 6: Watershed Management and Planning

- Concept and Importance of Watershed Management
- Watershed Delineation and Characterization
- Hydrological Cycle and Water Balance in Watersheds
- Land Capability Classification and Land Use Planning
- Participatory Watershed Management Approaches
- Integrated Watershed Development Programs in Nepal

Chapter 7: Farm Structures and Rural Infrastructure

- Planning and Layout of Farmstead
- Structures for Storage – Grain Storage, Cold Storage
- Animal Housing – Design and Construction Principles
- Structures for Processing and Value Addition (Threshing Floors, Drying Yards)
- Rural Infrastructure – Roads, Drinking Water, Sanitation
- Greenhouse Technology and Polyhouses for Protected Cultivation

Chapter 8: Land Surveying and Leveling

- Basic Concepts of Surveying – Principles and Classification
- Chain Surveying – Equipment and Techniques
- Leveling – Methods, Instruments, and Computations
- Contour Survey and Map Preparation
- Use of Total Station and GPS in Agricultural Land Survey
- Field Layout for Irrigation and Drainage Systems
- Research methodology, research design, data analysis etc

Chapter 9: Drainage Engineering and Water Management

- Importance of Agricultural Drainage
- Surface and Subsurface Drainage Systems – Design and Installation
- Drainage Coefficient and Spacing Calculations
- Drainage Structures – Outlets, Drains, and Filters
- Waterlogging Problems and Reclamation Techniques
- Salinity and Water Quality Management in Irrigation Systems

Chapter 10: Renewable Energy Technologies for Agriculture

- Solar Energy Applications in Agriculture
- Biogas and Bioenergy – Design, Installation, and Utilization
- Micro-hydropower and Water Lifting Technologies
- Wind Energy for Water Pumping and Grain Processing

Chapter 11. सुदुरपश्चिम विश्वविद्यालय सम्वन्धी जानकारी (संरचना, पदाधिकारीहरु, पदिय जिम्मेवारी, ऐन र नियमावलीहरु) ।

THE END

Course Outline for Written Exam – Assistant Professor (Agri-ecology and Biochemistry)

Chapter 1: Fundamentals of Biochemistry

- Structure, properties, and functions of carbohydrates, proteins, lipids, nucleic acids
- Enzymes – Classification, Mechanism of Action, Enzyme Kinetics
- Vitamins and Minerals – Functions and Deficiency Symptoms in Plants
- Metabolism – Carbohydrate, Protein, Lipid and Nucleic Acid Metabolism
- Plant Secondary Metabolites – Phenolics, Alkaloids, Terpenes
- Role of Biochemistry in Soil, Plant, and Crop Health

Chapter 2: Crop Physiology – Growth and Development

- Plant Water Relations – Absorption, Transpiration, Water Potential
- Photosynthesis – Light and Dark Reactions, Factors Affecting Photosynthesis
- Respiration – Glycolysis, TCA Cycle, Electron Transport Chain
- Plant Hormones – Types, Functions, Role in Growth and Development
- Source-Sink Relationship and Dry Matter Partitioning
- Stress Physiology – Drought, Salinity, Temperature, and Biotic Stresses

Chapter 3: Agricultural Microbiology

- Soil Microflora – Bacteria, Fungi, Actinomycetes, Algae
- Role of Microbes in Nutrient Cycling – Nitrogen, Phosphorus, Carbon
- Biofertilizers – Types, Production and Application
- Rhizosphere Microbiology – Plant-Microbe Interactions
- Microbial Biocontrol Agents – Trichoderma, Bacillus, Pseudomonas
- Agricultural Waste Decomposition and Composting

Chapter 4: Agri-biodiversity and Its Conservation

- Concept and Importance of Agri-biodiversity
- Types of Biodiversity – Genetic, Species, Ecosystem Diversity
- Role of Traditional Knowledge in Agri-biodiversity Conservation
- On-farm, In-situ, and Ex-situ Conservation Approaches
- Biodiversity and Climate Resilience in Farming Systems
- Agrobiodiversity Policy Framework and Global Initiatives

Chapter 5: Principles of Ecology in Agricultural Systems

- Ecosystem Structure and Functions – Energy Flow, Food Chains
- Population and Community Ecology – Succession and Biodiversity
- Ecological Principles in Agroecosystems
- Nutrient Cycling and Agroecosystem Stability
- Agroecology and Sustainable Agricultural Practices
- Ecological Indicators and Biodiversity Monitoring

Chapter 6: Medicinal and Aromatic Plants – Importance and Cultivation

- Introduction and Classification of Medicinal and Aromatic Plants
- Important MAPs of Nepal – Distribution and Uses
- Propagation, Cultivation Practices and Post-harvest Handling
- Active Compounds and Extraction Techniques
- Role of MAPs in Traditional Medicine and Herbal Industries
- Conservation and Sustainable Utilization of MAPs

Chapter 7: Soil-Plant-Microbe Interactions in Agroecosystems

- Rhizosphere Processes – Root Exudates and Microbial Colonization
- Biological Nitrogen Fixation – Symbiotic and Non-symbiotic
- Mycorrhizal Associations and Nutrient Uptake
- Role of Microbes in Organic Matter Decomposition
- Soil Health and Role of Microbial Diversity
- Impact of Agrochemicals on Soil Microbial Population

Chapter 8: Climate Change and Agri-ecology

- Climate Change – Causes and Impacts on Agriculture
- Climate-resilient Agroecosystems and Agroecological Approaches
- Carbon Sequestration Potential in Agroecosystems
- Role of Agrobiodiversity in Climate Adaptation
- Climate-smart Agricultural Practices
- Case Studies of Traditional Agroecosystems Resilient to Climate Change

Chapter 9: Organic Farming and Ecological Agriculture

- Principles and Practices of Organic Farming
- Role of Natural Inputs and Ecological Balance
- Integrated Nutrient and Pest Management in Organic Systems
- Role of Biodiversity in Pest and Disease Management
- Certification, Marketing, and Export Potential of Organic Products
- Success Stories of Organic Farms in Nepal

Chapter 10: Policy and Institutional Framework for Agri-ecology and Biodiversity Conservation

- National Agrobiodiversity Policy and Action Plans
- Role of Research Institutions and Universities in Agri-ecology
- Farmer Participatory Research and Extension in Agrobiodiversity Conservation
- Role of Community Seed Banks and Local Initiatives
- Global Conventions – CBD, ITPGRFA, FAO Guidelines
- Institutional Linkages and Capacity Building for Agri-ecology

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