CURRICULUM ADDRESSING NATIONAL AND GLOBAL ISSUES

GLOBAL NUTRITIONAL PROBLEMS

Theory

Unit I: Food consumption
Food consumption pattern of underdeveloped, developing and developed countries.
Unit II: Nutritional deficiency diseases
An overview of world nutrition situation and assessment of problems of developing and developed countries in light of prevalence, aetiology, indicators and preventive measures.
Unit III: Health programmes
Nutrition and health programmes to alleviate malnutrition, role of national and international organizations.
Unit IV: Health care polices
Impact of health care polices and delivery systems; Micronutrients, food fortification and supplementation.

GLOBALIZATION AND CONSUMER ECONOMICAL

Theory

Unit I: The ontology of consumer economics

Consumer motivation- Concept, components of motivation; Maslow's motivational theory and consumer behaviour; Consumer decision process- Problem or need recognition, information search, evaluation of alternatives, purchase decision, postpurchase decision; Models of buyer decision making -Economic model, psychological models, consumer behaviour models; Influence of purchase decision- external and internal; Consumer decision styles; Risk in consumer behavior -functional risk, physical risk, financial risk, social risk, psychological risk, time risk; Adoption and diffusion of innovations; Impulse buying- definition and types; Factors influencing impulse buying behavior -consumer related factors, Situational characteristics, product characteristics, store related factors, consumer behaviour.

Unit II: Global markets

Definition and importance; Features of global marketing; Forces affecting global marketing; Objectives of global marketing; Global marketing environment; Global marketing strategies;

Difference between global and international market; Advantages and disadvantages of global marketing.

Unit III: New economic policies

Introduction to new economic policies- Liberalization, privatization, globalization; Privatization-introduction, objectives; Types of privatization; Problems of privatization; Privatization in India; Privatization and global impact; Globalization meaning, trends, factors influencing globalization; Impact of globalization on Indian economy; Positive and negative impact of globalization in India; World Trade Organization(WTO) –objectives and functions; WTO agreement; Benefits of WTO; WTO and developing countries; WTO agreement on agriculture and subsidies; General Agreement on Tariff and Trade (GATT)-Purpose, implications of GATT agreement in various areas. Citizen Charter- Vision, mission objectives, importance in public administration; Goods and Service Tax (GST)- Components of GST, benefits of GST, impact of GST on consumers.

Unit V: Agriculture and Indian economy

Indian agriculture policy; Agriculture credit in India; National agricultural insurance schemes; Agriculture marketing in India; Sustainable agriculture and food security in India; Government programmes for increasing family food security and financial security of consumers.

VII. Practicals

1. Project work: Study on impulse buying behaviour among teenage consumers collection of review
2. Formulation of objectives for the study
3. Finalization of method of research
4. Designing a data collection tool
5. Data collection on impulse buying behaviour among teenage consumers
6. Data analysis and report writing
7. Presentation of report on impulse buying behaviour among teenage consumers
8. Presentation of the report on impulse buying behaviour among teenage consumers
9. Critical analysis of citizen charter of electricity department
10. Study the crop insurance scheme
11. Conduct farmer awareness camp on crop insurance scheme
12. Study the implementation of any one government programme for increasing family food security and financial security
13. Identify structural and functional aspects of any one agriculture market
14. Observe the functioning of selected agriculture market
15. Group discussion on functional aspects of agriculture market
16. End term assessment

COMMUNITY NUTRITION AND EDUCATION

Theory:

Malnutrition- Definition and causes, PEM, Marasmus, Kwasiorkor, vicious cycle of malnutrition. Assessment of nutritional status. Clinical signs and symptoms, nutritional anthropometry, biochemical tests, biophysical tests, diet survey methods. Major nutritional problems prevalent in India and the state of Protein energy malnutrition, anaemia, vitamin A deficiency, iodine deficiency disorders, obesity, hypertension, atherosclerosis, diabetes mellitus. National programmes and role of national and international agencies. In improving nutritional status of the community. Integrated Child Development Service (ICDS), supplementary Nutrition Program (SNP), Applied Nutrition Program (ANP), Mid-Day Meal Program (MDMP), Vitamin A Prophylaxis Program, Anaemia Prophylaxis Programme. Food and Agricultural Organization (FAO), World Health Organization (WHO), United Nations Children's Fund (UNICEF), UNDP, CARE and other Voluntary and Government Agencies. Nutrition education- Objectives and methods, principles.

Practical Assessment of nutritional status of an individual/community using anthropometry and dietary survey. A) Preparation of schedule B) Survey work C) Analysis of data D) Writing of report. Visit to local health centre to identify clinical signs and symptoms of nutritional problems. Identification of adulterants in common foods. Visit to an ICDS Block. Development of audio-visual aids, radio script; popular article; chart/posters leaflets etc. Planning, implementation and evaluation of nutrition education for a target group.

INTERNATIONIAL TRADE AND SUSTAINABILITY GOVERNANCE

UNIT I

International trade - basic concepts, WTO and its implications for Indian economy in general and agriculture sector in particular.

UNIT II

TRIPS, TRIMS quotas, anti-dumping duties, quantitative and qualitative restrictions, tariff and non-tariff measures, trade liberalization, subsidies, green and red boxes, issues for negotiations in future in WTO; CDMs and carbon trade.

UNIT III

Importance of foreign trade for developing economy; absolute and comparative advantage, foreign trade of India.

UNIT IV

Composition of India's foreign trade policy; India's balance of payments; inter regional Vs international trade; tariffs and trade control; exchange rate; the foreign trade multiplier.

UNIT V

Foreign demand, supply side analysis, opportunity cost, trade and factor prices, implications for developing countries, market entry methods, export procedures & documentations.

ENTREPRENEURSHIP DEVELOPMENT AND BUSINESS COMMUNICATION

Theory

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises, Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management, Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agrientrepreneurship and rural enterprise.

Practical

Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs.

GEO-INFORMATICS, NANO-TECHNOLOGY AND PRECISION FARMING

Theory

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical

Introduction to GIS software, spatial data creation and editing. Introduction to image processing software. Visual and digital interpretation of remote sensing images. Generation of spectral

PESTS OF CROPS AND STORED GRAINS AND THEIR MANAGEMENT

Theory

General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments. Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI godowns

INTELLECTUAL PROPERTY RIGHTS

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, 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&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders. Convention on 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.

AGRI-BUSINESS MANAGEMENT

Theory

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries. Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries. Agri-value chain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control. Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behavior analysis, Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Practical

Study of agri-input markets: Seed, fertilizers, pesticides. Study of output markets: grains, fruits, vegetables, flowers. Study of product markets, retails trade commodity trading, and value added products. Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD. Preparations of projects and Feasibility reports for agribusiness entrepreneur. Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques. Case study of agro-based industries. Trend and growth rate of prices of agricultural commodities. Net present worth technique for selection of viable project. Internal rate of return.

AGRIBUSINESS ENVIRONMENT AND POLICY

UNIT I

Role of agriculture in Indian economy: problems and policy changes relating to farm supplies, farm production, agro processing, agricultural marketing. Agricultural finance etc. in the country.

UNIT II

Structure of Agriculture - Linkages among sub-sectors of the Agribusiness sector; economic reforms and Indian agriculture; impact of liberalization, privatization and globalization on Agri business sector.

UNIT III

Emerging trends in production, processing, marketing and exports; policy controls and regulations relating to the industrial sector with specific reference to agro industries.

UNIT IV

Agribusiness policies- concept and formulation; and new dimensions in Agribusiness environment and policy.

UNIT V

Agricultural price and marketing policies; public distribution system and other policies

BUSINESS LAWS AND ETHICS

UNIT I

Introduction to Indian legal system, The Indian Contract Act-1872: Contract meaning, nature, significance, types of contract, essentials of a valid contract, offer and acceptance, capacity to contract, free consent, performance of contract.

UNIT II

Companies Act-1956: incorporation, commencement of business, types of companies, management, winding of companies, Negotiable Instruments Act.

UNIT III

Essential Commodities Act, APMC Act, Consumer Protection Act, RTI MRTP Act-major provisions and implications.

UNIT IV

Factory Act, Labor laws, Industrial dispute Act.

UNIT V

Nature and importance of ethics and moral standards; corporations and social responsibilities, scope and purpose of business ethics; Ethics in business functional areas; industrial espionage; solving ethical problems; governance mechanism.

PRODUCTION AND OPERATIONS MANAGEMENT

UNIT 1

Nature and Scope of Production and Operations Management; Its relationship with Other Systems in the Organization; Factors Affecting System and Concept of Production and Operation Management; Facility location, Types of Manufacturing Systems and Layouts, Layout Planning and Analysis.

UNIT II

Productivity Variables and Productivity Measurement, Production Planning and Control, Mass Production, Batch Production, Job Order Manufacturing, Product Selection, Product Design and Development, Process Selection, Capacity planning.

UNIT III

Scheduling, Maintenance Management Concepts, Work Study, Method Study, Work Measurement, Work Sampling, Work Environment, Industrial Safety,

UNIT IV

An Overview of Material Management, Determination of Material Requirement. Purchase Management, Store Management, Logistics management, Material Planning and Inventory management, JIT, Safety Management.

UNIT V

Quality Assurance, Accepting Sampling, Statistical Process Control, Total Quality Management, ISO standards and their Importance, Introduction to re-engineering, value engineering.

LIVESTOCK PRODUCTION AND MANAGEMENT

UNIT-4 (ZOO ANIMALS PRODUCTION MANAGEMENT)

Taxonomy of important wild zoo animals. Status and conservation practices of wild life in India. Basic principles of habitat and housing of various classes of wild zoo animals. Size and space requirement (dimension) of cubicles, enclosures of important wild zoo animals. Management of livestock in fringe areas, in and surrounding the breeding areas. Feeding habits, feeds and feeding schedules of captive animals. Restraining, capture, handling, physical examination of captive animals. Classification of zoos, management of sanctuaries, national parks etc. Acts and Rules related to captive animals. National and international organization and institutions interlinked to captive animals role and functioning.

UNIT-5 (ANIMAL WELFARE)

Definition of animal welfare and ethics. Human and animal welfare in relation to ecosystem and environmental factors. Role of veterinarians in animal welfare. Animal welfare

organizations, Animal Welfare Board of India - their role, functions and current status. Rules, regulations, laws on animal welfare. Prevention of Cruelty to Animals (PCA) Act, 1960 {59 of 1960). Role and function of Committee for the Purpose of Controlling and Supervising Experiments in Animals (CPCSEA). Protection of wild life in nature and captivity. Protection and welfare of performing animals. Welfare of animals during transportation. Animal welfare in commercial livestock farming practices. Protection and welfare of working animals. Pet and companion animal welfare. Animal welfare during natural calamities and disaster management. Legal duties of veterinarians, Common offences against animals and laws related to these offences. Provincial and Central Acts relating to animals. Laws relating to offences affecting Public Health. Livestock Importation Act Evidence, liability and insurance. Code of Conduct and Ethics for veterinarians - the Regulations made under the Act.

VETERINARY PUBLIC HEALTH

UNIT-1 (VETERINARY PUBLIC HEALTH AND FOOD SAFETY)

Aims and scope of Veterinary Public Health. Role of veterinarians in public health. One Health concept and initiatives. Veterinary Public Health administration. Sources of contamination. Principles and concepts of food hygiene and safety. Milk hygiene in relation to public health. Hygienic and safe milk production practices including steps for prevention and control of milk contamination, adulterants, antimicrobial residues, agrochemicals, subclinical mastitis or udder infections etc. Microbial flora of milk and milk products. Milk plant and dairy equipment hygiene. Quality control of milk and milk products. Milk hygiene practices in India and other countries. Elements of meat inspection and meat hygiene practices. Pathological conditions associated with the transport of food animals. Hygiene in abattoirs and meat plants. Detection of conditions or diseases and judgements during ante mortem and post mortem inspection. Examination of lymph nodes. Meat as a source of disease transmission. Sources of contamination of meat and methods of carcass decontamination. Speciation of meat. Animal welfare and public health issues. Classification of low risk and high risk material generated in an abattoir and its hygienic disposal. Inspection of poultry for human consumption. Occupational health hazards in abattoir and meat plants. Foodborne infections and intoxications associated with foods of animal origin. Toxic residues (pesticides, antibiotics, metals and hormones) in foods and associated health hazards. Types of biohazards. Hazard analysis and critical control points (HACCP) system. Importance of ISO 9000 and 14000 series in meat industry. Risk analysis, assessment and management. International food safety standards: World Organisation for Animal Health (OIE), World Trade Organization (WTO) agreements and Codex Alimentarius Commission. Sanitary and phytosanitary measures in relation to foods of animal origin. Food Safety and Standards Act and Regulations. Role of Food Safety and Standards Authority of India (FSSAI), Bureau of Indian Standards (BIS) and other national agencies.

UNIT-2 (VETERINARY EPIDEMIOLOGY)

Definitions, components and aims of epidemiology. Factors influencing occurrence of livestock diseases and animal production. Determinants of disease. Transmission and maintenance of infections. Ecology of disease. Measures and patterns of disease occurrence. Survey and surveillance of animal diseases and related parameters. Epidemiological methods- Descriptive, analytical, experimental, theoretical, serological and molecular. Animal disease forecasting. Strategies of disease management: prevention, control and biosecurity. Economics of animal diseases. National and international regulations on livestock diseases. Role of OIE and laws on international trade of animals and animal products.

UNIT-4 (ENVIRONMENTAL HYGIENE)

Scope and importance. Ecosystem: Components structure and functions. Biodiversity: uses, threats and conservation. Natural resources: types, uses and abuses. Environmental contaminants in food chain-bioaccumulation, biomagnification and persistent organic pollutants. Environmental pollution: Sources, nature of pollutants, effects on animal and human health. Rural and urban pollution. Air pollution, sources and hazard. Air pollution in animal houses, effect on health and productivity. Airborne diseases – Classification, health hazard, prevention and control. Water-Sources, contamination & their prevention. Water qualities- Physical, chemical, bacteriological and radiological. Water purification methods for community water supplies. Waterborne diseases – Classification, health hazard, prevention and control. Soil, marine and thermal pollution- Classification, sources, hazard, prevention and control. Noise pollution – Sources, hazards, prevention and control. Nuclear hazards or radiological hazard-Types, hazards and radiation protection. National rules and legislations related to environmental pollution and role of pollution control board in India. Biosafety: Importance, classification and biosafety measures for prevention of risk hazards. Disaster management and mitigation. Solid and liquid waste management at farms and biomedical waste management. Sanitation and disinfection of farm and hospital environment in veterinary public practice for infection control. Global warming and greenhouse effect- Definition, greenhouse gases, impact of climate change and international treaties or protocols. Management of waste from animal industries. Stray and fallen animal management and carcass disposal. Vector and reservoir control.

LIVESTOCK PRODUCTS TECHNOLOGY

UNIT-3 (ABATTOIR PRACTICES AND ANIMAL BYPRODUCTS TECHNOLOGY)

Layout and management of rural, urban and modern abattoirs. HACCP concepts in abattoir management. FSSA standards on organization and layout of abattoirs. Animal welfare and pre-slaughter care, handling and transport of meat animals including poultry. Procedures of Ante-mortem and post mortem examination of meat animals. Slaughtering and dressing of meat animals and birds. Emergency and casualty slaughter. Evaluation, grading and fabrication of dressed carcasses including poultry. Abattoir by-products; rendering, meat, bone, glue, gelatin, fat and byproducts of pharmaceutical value. Skin and hides; methods of flaying, defects, preservation and tanning. Treatment of condemned meat and carcasses. Management of effluent emanating from abattoir.

UNIT-4 (MEAT SCIENCE)

Prospect of meat industry in India. Structure and composition of muscle (including poultry muscle). Conversion of muscle to meat. Nutritive value of meat. Fraudulent substitution of meat. Preservation of meat and poultry; drying, salting, curing, smoking, chilling, freezing, canning, irradiation and chemicals. Ageing of meat. Modern processing technologies of meat and meat products. Packaging of meat and meat products. Formulation and development of meat; kabab, sausages, meat balls or patties, tandoori chicken, soup, pickles. Fermentation of meat products. Physico-chemical and microbiological quality of meat and their products. Basics of sensory evaluation of meat products. Nutritive value, preservation, packaging of egg and egg products. Laws governing national or international trade in meat and meat products. Organic and genetically modified meat and poultry products.

UNIT-4 (TRANSFER OF TECHNOLOGY FOR LIVESTOCK DEVELOPMENT)

Technology- Concept, generation process, application, merits and de-merits. Adoption and diffusion of innovations, stages of adoption, adopter categories, innovation decision process, attributes of innovations, diffusion process, factors affecting adoption and diffusion processes. Programme planning- principles, objectives and steps. Evaluation of extension programme, constraints in the adoption of scientific animal husbandry practices. Role of extension agents in diffusion of livestock innovations. Cattle and buffalo improvement programmes: Key Village Scheme, Intensive Cattle Development Project, Gosadan and Gaushala. Dairy development programmes: concept of cooperation, Rochdale principles of cooperation, objectives of cooperative, Amul pattern of dairy cooperative system and Operation Flood. Transfer of technology projects of Indian Council of Agricultural Research (ICAR): Krishi Vigyan Kendra (KVK), Agricultural Technology Information Centre (ATIC), Agricultural Technology Management Agency (ATMA), National Agricultural Innovation Project (NAIP), Rashtriya Krishi Vikas Yojana (RKVY) etc. Different ongoing central and state government animal husbandry development programmes being run related to sheep, goat, poultry, piggery, fodder production etc.

UNIT-9 (CONTEMPORARY ISSUES IN LIVESTOCK ENTERPRISES)

Gender and animal husbandry- definition, difference between gender and sex, role of women in animal husbandry, gender sensitization, importance of gender sensitization in animal husbandry, need for gender analysis, gender budgeting and mainstreaming. Salient features of recent livestock census, livestock insurance scheme, national livestock mission. Sustainability- concept of sustainability of livestock production system (social, environmental and economic challenges faced). Introduction to environmental consequences of livestock rearing. Animal welfare: Introduction to animal welfare, ethics and rights. Importance of animal welfare in the contemporary society. Expectations from veterinary professionals.

VETERINARY MEDICINE

UNIT-4 (ZOO AND WILD ANIMAL MEDICINE)

Principles of zoo hygiene, public health problems arising from zoos. Prevention, control and treatment of infectious, parasitic, nutritional and metabolic diseases in zoo and wild animals including exotic birds. Acts and Rules related to Zoo and wild animals. National and international organizations and institutions interlinked to wild and zoo animals – role and functioning.

PLANTATION CROPS

Theory: History and development, scope and importance, area and production, export and import potential, role in national and state economy, uses, industrial importance, by products utilization, soil and climate, varieties, propagation: principles and practices of seed, vegetative and micropropagation, planting systems and method, gap filling, systems of cultivation, mulching, shade regulation, weed and water management, training, pruning and handling, nutrition, foliar feeding, role of growth regulators, soil management, liming practices, tipping practices, top working, physiological disorders, harvesting, post-harvest handling and processing, packaging and marketing, yield and economics of coconut, arecanut, oil palm, palmyrah palm, cacao, cashew nut, coffee, tea, Date palm and rubber.

Practical: Description and identification of coconut varieties, selection of coconut and arecanut mother palm and seed nut, planting of seed nuts in nursery, layout and planting of coconut, arecanut, oil palm, cashew nut, cacao gardens, manuring, irrigation; mulching, raising masonry nursery for palm, nursery management in cacao. Description and identification of species and varieties in coffee, harvesting, grading, pulping, fermenting, washing, drying and packing of coffee, seed berry collection, seed extraction, treatment and sowing of coffee, epicotyle, softwood, grafting and top working in cashew, working out the economics and project preparation for coconut, arecanut, oil palm, cashew nut, cacao, etc. Mother plant selection, preparation of cuttings and rooting of tea under specialized structure, training, centering, pruning, tipping and harvesting of tea.

TEMPERATE VEGETABLE CROPS

Theory: Importance of cool season vegetable crops in nutrition and national economy. Area, production, export potential, description of varieties and hybrids, origin, climate and soil, production technologies, post-harvest technology and Marketing of cabbage, cauliflower, knolkhol, sprouting broccoli, Brussels' sprout, lettuce, palak, Chinese cabbage, spinach, garlic, onion, leek, radish, carrot, turnip, beet root, peas, broad beans, rhubarb, asparagus, globe artichoke, Vegetable kale.

Practical: Identification and description of varieties/hybrids; propagation methods, nursery management; preparation of field, sowing/transplanting; identification of physiological and nutritional disorders and their corrections; post-harvest handling; cost of cultivation and field visits to commercial farms.

MEDICINAL AND AROMATIC CROPS

Theory: History, scope, opportunities and constraints in the cultivation and maintenance of medicinal and aromatic plants in India. Importance, origin, distribution, area, production, climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirements. Plant protection, harvesting and processing of under mentioned important medicinal and aromatic plants. Study of chemical composition of a few important medicinal and aromatic plants, extraction, use and economics of 16 drugs and essential oils in medicinal and aromatic plants. Therapeutic and pharmaceutical uses of important species. Storage techniques of essential oils. Medicinal Plants: Withania, periwinkle, Rauvolfia, Dioscorea, Isabgol, opium poppy Ammi majus, Belladonna, Cinchona, Pyrethrum and other species relevant to local conditions. Aromatic Plants: Citronella grass, khus grass, flag (baje), lavender, geranium, patchouli, bursera, menthe, musk, occimum and other species relevant to the local conditions. Marketing.

Practical: Collection of medicinal and aromatic plants from their natural habitat and study their morphological description, nursery techniques, harvesting, curing and processing techniques and extraction of essential oil.

ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

Theory: Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources. Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Ecosystems, Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem:- a. Forest ecosystem, b. Grassland ecosystem, c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity and its conservation:- Introduction, definition, genetic, species & ecosystem diversity and bio geographical classification of India. Biodiversity at global, National and local levels, Threats to biodiversity - habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environmental Pollution: definition, cause, effects and control measures of - Air, Water, Soil, Marine, Noise

and Thermal pollution and Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust dies. Wasteland reclamation, Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Role of Information Technology in Environment and human health. Field work: Visit to a local area to document environmental assets river/forest/grassland/hill/mountain, visit to a local polluted site-Urban/Rural/Industrial/Agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc. Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community – based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Practical: Visit to local areas - river/forest/ grassland/catchment etc. to document components of ecosystem. Study of common plants, insects, birds and animals. Visit to industries to study pollution abatement techniques and case studies - solid waste management, Human population and the Environment.

DEVELOPMENTAL ASSESSMENT OF YOUNG CHILDREN

Practical:

Orientation on Screening and developmental assessment of young children for various developments through different tools and techniques. Exploring existing areas, approaches and tools in developmental screening; Orientation on formal and informal measures in assessment, special considerations and ethical issues in assessing various areas of developments of Toddlers, Infants, Pre-schoolers and Pre-Primary school children. Conducting tests for Neonatal assessment – APGAR and Gestational age, Neonatal Behavioural Assessment Scale (BNBAS), Conducting tests for Infant and Toddler hood assessment - Anthropometry, Developmental Screening Test, Bayley's Scale of Infant Development (BSID), Vineland social Maturity scale etc. Screening and assessment of preschool and Pre-primary school children- Stanford Binet Intelligence Scale, Weschler Scale of Intelligence for Preschool and Primary School Children, Vineland Social Maturity Scale, Adaptive Behaviour Scale; DAS II; Thematic Apperception Test (TAT), Children's

Apperception Test (CAT), Raven's Coloured Progressive Matrices (RCPM); Pea body Picture Vocabulary test, Pramila Pathak's Mental and Motor Growth of Indian babies; Ecological assessment of Preschool and Pre-primary school children- HOME Inventory; Informal measures like Time sampling, event sampling, sociogram, Anecdotal records, Case studies etc; Assessment of readiness skills of pre-primary school children- Auditory perception, Visual perception skills, Writing skills, reading skills, arithmetic skills, discriminatory skills, tests for preschool children; Presentation of reports; Conducting education programmes for parents on the developmental status of their children. Identifying the intervention needs of developmentally delayed child; Planning and implementation of intervention programmes and preparation of material; Evaluation of effectiveness of intervention program planned for developmentally delayed child. Presentation of reports.

PROGRAMME DEVELOPMENT FOR RURAL FAMILIES

Theory:

Planning: nature of planning. Extension programme planning: concept, definition, objectives, principles relevant terms used in programme planning: situation, aims, objectives, problem, solution, project, plan, plan of work, calendar of work etc. Steps in extension programme planning: elaborate discussion. Critical analysis of few major development programmes under five-year plans. Leader and leadership: meaning, definition, identification of leader execution of programme: Environment and rapport building, role of local leader, involvement of local leaders, involvement of local bodies, organizations and extension agencies. Implementation of programme and constraints associated with it. Monitoring and evaluation: concept, meaning, definition.

Practical:

Establishing rapport with rural families and identification of leader. Conducting baseline survey of village and household and analysis of information. Different PRA tools, its applications in programme development and exercises. Triangulation of information from conventional and PRA method. Preparation of detailed plan of work for small need-based programme. Implementation of programme Evaluation of programme Documentation Presentation of findings of programme

PROJECT MANAGEMENT

Theory

Project management: Overview. Project - meaning, concept, types, elements of management. Project proposal- concept, designing, project initiation, resource allocation framework. Market and demand analysis. Environmental appraisal of projects, Environmental impact analysis, technical analysis, financial analysis. Budgeting Terminology of networks. Project management techniques.

Practical:

Collection and screening of case studies on project management and report writing, Visit to project - Technology generation project. Visit to Project - Transfer of Technology (ToT). Visit to Project- Women entrepreneurship. Visit to state level and international level funding agencies. Visit to International funded projects. Visit to women and child development project. Visit to agriculture development project, Visit to rural development projects. Designing, planning and preparation of a mini project proposal. Working on project management techniques: PERT. Working on project management: CPM. Working on project management techniques: WBS. Report writing.

NUTRACEUTICALS AND HEALTH FOODS

Practical:

Market survey for dietetic foods. Planning, preparation, nutrient calculation and acceptability of dietetic foods with preference to locally available food stuff. High/low energy, high/low protein high/low fibre low sodium low cholesterol low dycemic index low fluid, high fibre and low fat. RUTF (Ready to use therapeutic foods) for under nutrition in preschool and school age children. Food for sports person in intensive activities and endurance activities. celiac disease, Food for lactose intolerance. Food for senior citizens (with dental problem, with flatulence, digestive disorders, physical and nervous diseases.

ENTREPRENEURSHIP DEVELOPMENT AND BUSINESS MANAGEMENT

Theory:

Development of entrepreneurship, motivational factors, social factors, environmental factors, characteristics of entrepreneurs, entrepreneurial attributes / competencies. Concept, need and importance of entrepreneurial development. Evolution of entrepreneurship, objectives of entrepreneurial activities, types of entrepreneurs, functions of entrepreneurs, importance of entrepreneurial development, and process of entrepreneurship development. Environment scanning and opportunity identification need for scanning – spotting of opportunity-scanning of environment – identification of product / service – starting a project; factors influencing sensing the opportunities. Infrastructure and support systems- Good policies, schemes for entrepreneurship development; role of financial institutions, and other agencies in entrepreneurship development. Steps involved in functioning of an enterprise. Selection of the product / services, selection of form of ownership; registration, selection of site, capital sources, acquisition of manufacturing know how, packaging and distribution. Planning of an enterprise, project identification, selection and formulation of project; project report preparation, Enterprise Management. Production management – product, levels of products, product mix, quality control, cost of production, production controls, Material management. Production management – raw material costing, inventory control. Personal management – manpower planning, labour turn over, wages / salaries. Financial management / accounting – funds, fixed capital and working capital, costing and pricing, long term planning and short-

term planning, book keeping, journal, ledger, subsidiary books, annual financial statement, taxation. Marketing management- market, types, marketing assistance, market strategies. Crisis management- raw material, production, leadership, market, finance, natural etc.

Practical: Visit to small scale industries. Interaction with successful entrepreneurs. Visit to financial institutions and support agencies. Preparation of project proposal for funding by different agencies.

EDUCATION AND COUNSELING OF PARENTS AND COMMUNITY

Practicals Orientation on need and importance of parent and community education. Understanding recent issues and challenges. Parent-Child Relationships and its impact on children. Studying various methods of parent and community education. Visit of local community to identify parents of normal and exceptional children, rapport building, identifying families with problems and conducting case studies, acquiring familiarization with the tests and techniques used for the assessment of troubled families, identification of areas and issues for parent education, developing parent education programmes, Planning, conducting and evaluating parenting education programmes, wisconsin model of community education, study on communication barriersdifferences between men and women, conducting sessions in the community on communication skills and effective human communication, studying on various approaches and techniques of counselling, organising counseling sessions for individuals,couples, parents and families of normal and exceptional children by using appropriate therapies – cognitive behavioural therapy (CBT), rational emotive behavioural therapy (REBT), client centered and existential therapies etc, establishing and managing the resource centre for parents and local community, implementing and evaluating the programmmes developed.

INTRODUCTION TO RURAL SOCIOLOGY

Theory:

Rural sociology- Meaning, scope and significance. Structural differentiation in terms of difference and characteristics of rural and urban societies. Planned social change - Approaches to rural planning, improvement and transformation and their shortcomings. Indian rural development programs (IRDPs). Indian rural social stratification: Castes- Basic notions, changes and its role in economy and policy, difference between caste and class, backward classes and implementations of constitutional provisions. Indian rural institutions: Social- Family and marriage (Nature, forms and changes), Economic-political: Land relations and changes; rural poverty: its manifestations and causes. Socio-religious: Functional significance of beliefs, traditions and customs. Rural social changes - Processes and factors of transformation. Status of women in rural India and their role in rural and agricultural development.

NUTRITION IN CALAMITIES

Theory

Unit I: Calamities and undernutrition

Starvation in emergencies arising out of drought, floods, earth quakes, locust, war. wrong policies and poverty and climatic changes, conflict and global economic volatility, historical perspectives.

Unit II: Food needs during emergencies

Effect of inanition, short, medium and long-term emergencies on food and nutrient intake, precautions against food shortage; Population groups most vulnerable to under nutrition; Food needs at national level during normal emergencies.

Unit III: Nutritional deficiency diseases

Major nutritional deficiency diseases in emergencies, mobilization of local resources, general fund distribution, mass and supplementary feeding, therapeutic feeding. social funds, Nutritional Indices and reference standards, Preventing and handling donations in emergencies.

Unit IV: Hygiene and sanitation

Control of communicable diseases, public health and hygiene problems during emergencies.

GENDER ISSUES IN HUMAN DEVELOPMENT AND RELATIONSHIPS

Unit I: Gender perspectives and theories

Concept of gender- biological and socio-cultural connotations. Historical perspectives. Gender differences in human development. Gender theories- Gender Orientation theory of Sandra Bem. Gender Schema theory, theory of Ego Development and Gender. Gender Stratification theory by Blumberg. Gender Identity Formation theory.

Unit II: Gender discrimination, gap and parity

Gender equality and development. Gender inequalities in human development–dimensions, causes and consequences. Gender discrimination indicators- global gender gaps. Gender Development Index, Global Gender Gap Index and Gender Parity Index. Demographic challenges to family ecology- gender role socialization.

Unit III: Gender violence and empowerment

Gender violence- dowry harassment and deaths, suicides, prostitution, sexual harassment and exploitation and prevention. Family violence, amniocentesis, female feticide, infanticide, eve

teasing. Gender empowerment strategies- working towards family solidarity and social well-being. Gender main streaming- concept, policy of

United Nations, objectives, requirements and principles. Empowering lives of women by controlling – patriarchy system, women's sexuality, fertility, labour, lack of visibility. Gender budgeting.

Unit IV: Changing trends in status of women

Status of women in India. Various plans and policies designed for achieving gender equality. Changing trends in gender role orientation- early civilization, pre-independence, post independent India, contemporary times, socio economic impact on the family and society, cultural impact on the family. Gender role portrayal in mass media. Gender stereotyping in schools. Gender issues at workplace.

VII. Practical

1. Gender analysis of mass media: Print media and E-media

2. Report writing

3. Study of adopted socialization practices for children of both genders

4. Report writing

5. Case studies of three generations on dynamics of gender orientation

6. Report presentation and discussion

7. Case studies of three generations on dynamics of Gender roles and responsibilities.

8. Report presentation and discussion

9. Views of adolescents on their gender role orientation- designing questions .

10. Survey through questionnaire

11. Report presentation and discussion

12. Case studies on changing trends of roles and responsibilities of women and men

13. Report writing

14. Visits to women welfare Govt. organizations/ agencies/ NGOs

15. Presentation of report and class discussion.

16. End term assessment

GLOBAL EXTENSION SYSTEMS

Theory

Unit I: Orientation to extension systems

Early extension efforts; Indian extension systems - reforms, challenges of extension management in India; Paradigm shift in extension systems; Extension approaches in view of globalization and market liberalization; Privatization of extension services – introduction, scope, advantages, limitations and experiences; Decentralization of extension systems; Revolution in extension systems.

Unit II: Governance and extension systems

Indian governance and role of extension systems - retrospection on Indian governance; Role of extension system; Ministries - rural development, agriculture, science and technology, human resource development, health, industries, education and women and child development; NGO collaboration; Review of five year plans.

Unit III: ICAR extension system

History; Extension system; Organisational structure; Policy issues; Existing extension systems and challenges; National and regional institutions - vision, objectives, activities, innovations, programmes; Extension systems in SAUs -organisational structure, personnel, roles, innovations, SWOT analysis.

Unit IV: Extension management and training organisations and institutions

FAO, IFAD, IFRI, WFO, WHO, *Biodiversity international*, MANAGE, NIRD, National Institute of Agricultural Marketing (NIAM), NAARM, EEI, SAMETI, FTC.

FAMILY AND CULTURAL DIVERSITIES

Theory

Unit I: Culture and family

Culture- definition, components and characteristics of culture. Agents of cultural influences- school, family, community and other social groups. Cultural factors and impact on families. Western versus Eastern family culture. Cultural diversities in India. Elements of India's diverse culture – religion, philosophy, cuisine, language, fine arts, dance, music.

Unit II: Families in India and abroad

Families in India and abroad - communal, nuclear, joint, extended, polyamorous, polyandrous, polygynous, single parent families, unrelated families. Indian family culture-values and issues concerning families and its stability. Factors determining social status of

families. Families in rural and tribal agrarian community – status of women, children, elderly and men in the families.

Unit III: Cross-cultural variations in family functioning

Cross-cultural variations in different aspects of family functioning across different West and East countries/ cultures *vis-à-vis* – marriage, parenthood, relationships, care of elderly and status of women. Cross cultural variations in family functioning, roles and responsibilities, cohesion, interpersonal communication patterns, conflict resolution. Parenting across cultures – child rearing, socialization and socialization practices. Family crisis and adaptations across cultures. Unique family experiences across cultures, some classic examples like Kibbutz in Israel.

Unit IV: Diversities in family life and challenges

Diversities in family life – ethnic, linguistic, regional, etc. Effect of urbanization, secularization, westernization, technological advancement, globalization and other such developments on families in general and agrarian in particular. Challenges before families across cultures. Legal provisions – emerging cultural trends. Research trends in cross-cultural family studies, methodological issues.

FAMILY STUDIES

Theory

Unit I: Theoretical frameworks and perspectives

Different frameworks to understand families-conceptual framework, institutional, developmemtal and interactional framework. Family theories- Family Systems theory, human ecology theory, life course perspectives, social-cognitive-behavioral theory, biosocial theory and family communication theories. Family perspectives- Parson's sociological perspective, Marxist perspective, feminist perspectives, modern perspective.

Unit II: Family assessment

Different approaches to Family research- demographic, psychological, psychiatric, ethnographic and inter disciplinary approach. Measurement of family roles and relationships. Ethics in family research. Current issues for research in Indian families in different communities- rural and urban.

Unit III: Family under transition

Indian family system and changing patterns. Fatherhood- changing role of parents. Global migration- demographics, nature, contemporary migration patterns and effects. Cultural identity, family change and transnational mothering. Influence of globalization on children, youth, aged and families. Work and family interface - changing nature of work, feminization of the labour force and changing nature of family life and family roles. Diverse families -

single parent families, female headed households, dual career families, one child family, adoptive families. Marital distress, family disorganisation.

Unit IV: Family therapy

Evolution of family therapy. Early models and basic techniques of family therapy group process and communications analysis. Classic schools of family therapy- Bowenian family systems therapy, strategic, structured and experiential therapies, solution focused therapy, narrative therapy, psychodynamic therapy and integrative models. Cognitive behaviour family therapy. Application of family therapy in mental disorders. Family resilience- concept, developmental systems perspective, advances and challenges in family resilience research.

ADULTHOOD AND AGING

Theory

Unit I: Ageing perspectives and developmental changes

Socio demographic profile of the aged in Indian context. Biological theories of aging, programmed ageing theories, random damage theories. Stochastic theories, evolutionary theories . The Ageing body - physical, sensory, cardiovascular, brain and central nervous system changes. Changes in bodily systems - muscular and skeletal system, respiratory system, immune system. Cognition during adulthood fluid and crystallized intelligence, decline/ stability in intelligence, dialectic

operations, memory, multidimensional changes. Cognitive neuroscience and aging. Healthy aging.

Unit II: Ageing personality

Personality changes during late adulthood. Personality types among the elderly. The Five-factor Model of dispositional traits by Tupes and Christal. Neugarten's Personality Styles. Levinson's theory of Social development, Carl Jung's theories personality, psyche & dreams. Peck's theory of personality adjustment in late adulthood. Erikson's theory. Disengagement theory. Information-processing in old age- attention, memory, pathological changes in memory. Cognitive disorders dementia, Parkinson's disease and Alzheimer's disease. Ageing and sexuality, illness and sexuality.

Unit III: Ageing in the family context

Aged in the family milieu- family relationships, problems, prospects and support systems. Attachment and relationships in late adulthood. Ageing and mental health, Mental health risks and disorders. Loneliness, depression and sociability in old age. Indicators of successful and positive aging. Ageing and financial status. Elderly abuse. Stress among the aged and

coping strategies. Grief and bereavement- patterns of bereavement and stages of grief. Dying with dignity.

Unit IV: Ageing in the current scenario

Contemporary socio-cultural changes and aging. Ageing in the current scenario impact of urbanisation, globalisation and migration. Dual career families and aging, stress among caretakers and sandwich generation. International scenario of the aged. Critical issues around global aging. Reconceptualising aging. Researchable issues related on aging. Welfare of the aged- policies and programmes. Research trends in gerontology and methodological issues.

ENVIRONMENTAL ISSUES AND CHALLENGES

Theory

Unit I: Technology and environment

Technology, environment and sustainable development; Positive and negative effect of technological advancement; Effect of technology on organisms and their habitat; Impact of industrialization on environment; Environmental consequences of agricultural development; Environmental effects of information and communication technologies.

Unit II: Global environmental issues

Global environmental issues; Challenges in building governance mechanism; Efforts at international forums; Climate change and global warming; Conservation of biodiversity and wildlife; Over population and land degradation; Exploitation of natural resources and energy crisis; Depletion of ozone layer; Acid rain; Nuclear

power; Oil spill pollution; Dumping of hazardous waste.

Unit III: Environmental management system

Environmental management system; Carbon credits a market based instrument for environmental benefit; Objectives and functioning of national and international organizations in environment conservation; Environmental standards in India; Environmental management approaches; Environment audit; Methodology for environment impact assessment; Environment education.

Unit IV: Environment and human health

The effect of global environmental change on vector-borne diseases and parasites; Health effects of particulate matter in environment; Human health implications of exposure to chemical residues in the environment; Neuro toxic effects of environmental contaminants on human health; Environmental factors influencing puberty onset; Cancer risk correlated to environment, diet and genetic factors, food and fertility; Climate change and Infectious diseases; Environmental health hazards in various occupations.

Principles of Horticultural Crops and Plant Protection

Theory

Scope of horticultural. Soil and climatic requirements for fruits, vegetables and floriculture crops in India, improved varieties, Criteria for site selection, layout and planting methods, nursery raising, commercial varieties/hybrids, sowing and planting times and methods, seed rate and seed treatment for vegetable crops; macro and micro propagation methods, plant growing structures, pruning and training, crop coefficients, water requirements and critical stages, fertilizer application, fertigation, irrigation methods, harvesting, grading and packaging, post-harvest practices followed in agricultural engineering in India, Garden tools, management of orchard, Extraction and storage of vegetables seeds. Major pests and diseases and their management in horticulture crops.

Practical

Judging maturity time for harvesting of crop; Study of seed viability and germination test; Identification and description of important fruits, flowers and vegetable crops; Study of different garden tools; Preparation of nursery bed; Practices of pruning and training in some important fruit crops, visit to commercial greenhouse/ polyhouse; cultural operations for vegetable crops (sowing, fertilizer application, mulching, irrigation and weed control); seed extraction techniques; identification of important pests and diseases and their control.

Principles of Agronomy

Theory

Introduction and scope of agronomy. Classification of crops, Effect of different weather parameters on crop growth and development. Principles of tillage, tilth and its characteristics. Crop seasons. Methods, time and depth of sowing of major field crops. Methods and time of application of manures and fertilizers. Organic farming-Sustainable agriculture in India. Soil water plant relationship, crop coefficients, water requirement of crops and critical stages for irrigation, weeds and their control, crop rotation, cropping systems, Relay cropping.

Practical

Identification of crops and their varieties, seeds, manures, fertilizers and weeds; Fertilizer application methods; Different weed control methods; Practice of ploughing, Practice of Puddling, Practice of sowing.

Watershed Hydrology

Theory

Hydrologic cycle, precipitation and its forms, rainfall measurement and estimation of mean rainfall in local areas, frequency analysis of point rainfall. Mass curve, hyetograph, depth-area-duration curves and intensity-duration-frequency relationship. Hydrologic processes-Interception, infiltration-factors influencing, measurement and indices. Evaporation - Estimation and measurement. Runoff -Factors affecting, measurement, stage - discharge rating curve, estimation of peak runoff rate and volume, Rational method, Cook's method and SCS curve number method. Geomorphology of watersheds – Linear, aerial and relief aspects of watersheds- stream order, drainage density and stream frequency. Hydrograph - Components, base flow separation, unit hydrograph theory, S-curve, synthetic hydrograph,

applications and limitations. Stream gauging – discharge rating curves, flood peak, design flood and computation of probable flood. Flood routing – channel and reservoir routing. Drought – classification, causes and impacts, drought management strategy.

Practical

Visit to meteorological observatory and study of different instruments. Design of rain gauge network. Exercise on intensity - frequency - duration curves. Exercise on depth - area – duration and double mass curves. Analysis of rainfall data and estimation of mean rainfall by different methods. Exercise on frequency analysis of hydrologic data and estimation of missing data, test for consistency of rainfall records. Exercise on computation of infiltration indices. Computation of peak runoff and runoff volume by Cook's method and rational formula. Computation of runoff volume by SCS curve number method. Study of stream gauging instruments - current meter and stage level recorder. Exercise on geomorphic parameters of watersheds. Exercise on runoff hydrograph. Exercise on unit hydrograph. Exercise on synthetic hydrograph. Exercise on flood routing.

Fundamentals of Renewable Energy Sources

Theory

Concept and limitation of Renewable Energy Sources (RES), Criteria for assessing the potential of RES, Classification of RES, Solar, Wind, Geothermal, Biomass, Ocean energy sources, Comparison of renewable energy sources with non-renewable sources available around the world. Solar Energy: Energy available from Sun, Solar radiation data, solar energy conversion into heat through, Flat plate and Concentrating collectors, different solar thermal devices, Principle of natural and forced convection drying system, Solar Photo voltaic: p-n junctions. Solar cells, PV systems, stand alone, Grid connected solar power station, Calculation of energy through photovoltaic power generation and cost economics. Wind Energy: Energy available from wind, General formula, Lift and drag. Basis of Wind energy conversion, Effect of density, Frequency variances, Angle of attack, Wind speed, Types of Windmill rotors, Determination of torque coefficient, Induction type generators, Working principle of wind power plant. Bio-energy: Pyrolysis of Biomass to produce solid, liquid and gaseous fuels. Biomass gasification, Types of gasifier, various types of biomass cook stoves for rural energy needs. Biogas: types of biogas plants, biogas generation, factors affecting biogas generation and usages, design consideration, advantages and disadvantages of biogas spent slurry.

Practical

Study of different types of solar cookers, solar water heating system, natural convection solar dryer, forced convection solar dryer, solar desalination unit, solar greenhouse for agriculture production, biogas plants, biomass gasifiers, biomass improved cook-stoves, solar photovoltaic system.

Farm Machinery and Equipment-I

Theory

Introduction to farm mechanization. Classification of farm machines. Unit operations in crop production. Identification and selection of machines used in global agricultural practices for

various operations on the farm. Hitching systems and controls of farm machinery. Calculation of field capacities and field efficiency. Calculations for economics of machinery usage, comparison of ownership with hiring of machines. Introduction to seed-bed preparation and its classification. Familiarization with land reclamation and earth moving equipment. Introduction to machines used for primary tillage, secondary tillage, rotary tillage, deep tillage and minimum tillage. Measurement of draft of tillage tools and calculations for power requirement for the tillage machines. Introduction to tillage machines like mould-board plough, disc plough, chisel plough, sub-soiler, harrows, cultivators, Identification of major functional components. Attachments with tillage machinery. Introduction to sowing, planting & transplanting equipment. Introduction to seed drills, no-till drills, and striptill drills. Introduction to planters, bed-planters and other planting equipment. Study of types of furrow openers and metering systems in drills and planters. Calibration of seed-drills/ planters. Adjustments during operation. Introduction to materials used in construction of farm machines. Heat treatment processes and their requirement in farm machines. Properties of materials used for critical and functional components of agricultural machines. Introduction to steels and alloys for agricultural application. Identification of heat treatment processes specially for the agricultural machinery components.

Practical

Familiarization with different farm implements and tools. Study of hitching systems, Problems on machinery management. Study of primary and secondary tillage machinery – construction, operation, adjustments and calculations of power and draft requirements. Study of sowing and planting equipment – construction, types, calculation for calibration and adjustments. Study of transplanters – paddy, vegetable, etc. Identification of materials of construction in agricultural machinery and study of material properties. Study of heat treatment processes subjected to critical components of agricultural machinery.

Soil and Water Conservation Engineering

Theory

Soil erosion - Introduction, causes and types - geological and accelerated erosion, agents, factors affecting and effects of erosion in local areas. Water erosion - Mechanics and forms - splash, sheet, rill, gully, ravine and stream bank erosion. Gullies - Classification, stages of development. Soil loss estimation – Universal soil loss equation (USLE) and modified USLE. Rainfall erosivity estimation by KE>25 and EI30 methods. Soil erodibility - topography, crop management and conservation practice factors applicable to local agricultural areas. Measurement of soil erosion –unoff plots, soil samplers. Water erosion control measures - agronomical measures - contour farming, strip cropping, conservation tillage and mulching. Engineering measures– Bunds and terraces. Bunds - contour and graded bunds - design and surplussing arrangements. Terraces - level and graded broad base terraces, bench terraces - planning, design and layout procedure, contour stonewall and trenching. Gully and ravine reclamation - principles of gully control - vegetative measures, temporary structures and diversion drains. Grassed waterways and design. Wind erosion- Factors affecting, mechanics, soil loss estimation and control measures - vegetative, mechanical measures, wind breaks and

shelter belts and stabilization of sand dunes. Land capability classification. Rate of sedimentation, silt monitoring and storage loss in tanks.

Practical

Study of different types and forms of water erosion. Exercises on computation of rainfall erosivity index. Computation of soil erodibility index in soil loss estimation. Determination of length of slope (LS) and cropping practice (CP) factors for soil loss estimation by USLE and MUSLE. Exercises on soil loss estimation/measuring techniques. Study of rainfall simulator for erosion assessment. Estimation of sediment rate using Coshocton wheel sampler and multislot devisor. Determination of sediment concentration through oven dry method. Design and layout of contour bunds. Design and layout of graded bunds. Design and layout of broad base terraces. Design and layout of bench terraces. Design of vegetative waterways. Exercises on rate of sedimentation and storage loss in tanks. Computation of soil loss by wind erosion. Design of shelterbelts and wind breaks for wind erosion control. Visit to soil erosion sites and watershed project areas for studying erosion control and water conservation measures.

Water Harvesting and Soil Conservation Structures

Theory

Water harvesting -principles, importance and issues. Water harvesting techniques – classification based on source, storage and use. Runoff harvesting – short-term and long-term techniques. Short-term harvesting techniques - terracing and bunding, rock and ground catchments. Long term harvesting techniques - purpose and design criteria. Structures - arm ponds - dug-out and embankment reservoir types, tanks and subsurface dykes. Farm pond - components, site selection, design criteria, capacity, embankment in local areas, mechanical and emergency spillways, cost estimation and construction. Percolation pond -site selection, design and construction details. Design considerations of *nala* bunds. Soil erosion control structures - introduction, classification and functional requirements. Permanent structures for soil conservation and gully control – check dams, drop, chute and drop inlet spillways - design requirements, planning for design, design procedures - hydrologic, hydraulic and structural design and stability analysis. Hydraulic jump and its application. Drop spillway - applicability, types - straight drop, box-type inlet spillways - description, functional use, advantages and disadvantages, straight apron and stilling basin outlet, structural components and functions. Loads on head wall, variables affecting equivalent fluid pressure, triangular load diagram for various flow conditions, creep line theory, uplift pressure estimation, safety against sliding, overturning, crushing and tension. Chute spillway - description, components, energy dissipaters, design criteria of Saint Antony Falls (SAF) stilling basin and its limitations. Drop inlet spillway - description, functional use and design criteria.

Practical

Study of different types of farm ponds. Computation of storage capacity of embankment type of farm ponds. Design of dugout farm ponds. Design of percolation pond and *nala* bunds. Runoff measurement using H-flume. Exercise on hydraulic jump. Exercise on energy dissipation in water flow. Hydrologic, hydraulic and structural design of drop

spillway and stability analysis. Design of SAF stilling basins in chute spillway. Hydrologic, hydraulic and structural design of drop inlet spillway. Design of small earthen embankment structures. Practice on software for design of soil and water conservation structures. Field visit to watershed project areas treated with soil and water conservation measures / structures.

Bio-Energy Systems: Design and Applications

Theory

Fermentation processes and its general requirements, An overview of aerobic and anaerobic fermentation processes and their industrial application across India. Heat transfer processes in anaerobic digestion systems, land fill gas technology and potential. Biomass Production: Wastelands, classification and their use through energy plantation, selection of species, methods of field preparation and transplanting. Harvesting of biomass and coppicing characteristics. Biomass preparation techniques for harnessing (size reduction, densification and drying). Thermochemical degradation. History of small gas producer engine system. Chemistry of gasification. Gas producer – type, operating principle. Gasifier fuels, properties, preparation, conditioning of producer gas. Application, shaft power generation, thermal application and economics. Trans esterification for biodiesel production. A range of bio-hydrogen production routes. Environmental aspect of bio-energy, assessment of greenhouse gas mitigation potential.

Practical

Study of anaerobic fermentation system for industrial application, Study of gasification for industrial process heat, Study of biodiesel production unit, Study of biomass densification technique (briquetting, pelletization, and cubing), Integral bio energy system for industrial application, Study of bio energy efficiency in industry and commercial buildings, Study and demonstration of energy efficiency in building, Measuring efficiency of different insulation technique, Study of Brayton, Striling and Rankine cycles, Study of modern greenhouse technologies.

Precision Farming Techniques for Protected Cultivation

Theory

Protected cultivation: Introduction, History, origin, development, National and International Scenario, components of green house, perspective, Types of green houses, polyhouses /shed nets, Cladding materials, Plant environment interactions – principles of limiting factors, solar radiation and transpiration, greenhouse effect, light, temperature, relative humidity, carbon dioxide enrichment, Design and construction of greenhouses – site selection, orientation, design, construction, design for ventilation requirement using exhaust fan system, selection of equipment, Greenhouse cooling system – necessity, methods – ventilation with roof and side ventilators, evaporative cooling, different shading material fogging, combined fogging and fanpad cooling system, design of cooling system, maintenance of cooling and ventilation systems, pad care etc. Greenhouse heating – necessity, components, methods, design of heating system. Root media – types – soil and soil less media, composition, estimation, preparation and disinfection bed preparation. Planting techniques in green house cultivation. Irrigation in greenhouse and net house – Water quality, types of irrigation system, components, design,

installation and material requirement. Fogging system for greenhouses and net houses – introduction, benefits, design, installation and material requirement. Maintenance of irrigation and fogging systems. Fertilization – nutrient deficiency symptoms and functions of essential nutrient elements, principles of selection of proper application of fertilizers, fertilizer scheduling, rate of application of fertilizers, methods, automated fertilizer application. Greenhouse climate measurement, control and management. Insect and disease management in greenhouse and net houses Selection of crops for greenhouse cultivation, major crops in greenhouse – irrigation requirement, fertilizer management, cultivation, harvesting and post-harvest techniques used globally; Economic analysis.

Practical

Estimation of material requirement for construction of greenhouse ; Determination of fertilization schedule and rate of application for various crops; Estimation of material requirement for preparation of root media; Root media preparation, bed preparation and disinfections; Study of different planting techniques ; Design and installation of irrigation system; Design and installation of fogging system ; Greenhouse heating; Study of different greenhouse environment control instruments; Study of operation maintenance and fault detection in irrigation system; Study of operation maintenance and fault detection in fogging system; Economic analysis of greenhouses and net houses; Visit to greenhouses.

NSS

Practical

Orientation of students towards national problems; Study of the philosophy of N.S.S., fundamental rights, directive principles of state policy, socio-economic structure of Indian society, population and five year plans; Functional literacy: Non-formal education of rural youth, eradication of social evil, awareness programmes, consumer awareness, highlights of the Consumer Act, environment enrichment and conservation, health, family welfare and nutrition; Right to information act.