RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Technology, VII-Semester

AT701- Post-Harvest Management & Processing

Unit I: Food grains (other than rice, wheat, pulses, oilseeds) processing
Structure and composition of cereals, legumes and oilseeds. Milling technology of maize, wet milling of corn, Milling technology of barley, malting of barley and its utilization in manufacture of value added food products including malted milk foods. Bakery and Snack technology: Technology of bread, biscuits, crackers and cakes, Technology of manufacturing process of Pasta foods- Macaroni, Noodles and Spaghetti, Technology of breakfast cereals: corn flakes, puffed, extruded snacks, Potato chips.

Unit II: Horticultural crops (fruits, vegetables, flowers) processing
Washing, grading sorting of fruits and vegetables, primary packaging and handling techniques and tools. Activities in the fruit and vegetable pack-houses. Special storage and packaging requirements. Pre-cooling, Cold storage, Modified atmosphere storage/ packaging. Processed products from fruits and vegetables – peeled, diced, sliced, dried, juices, pulp, puree, sauces, marmalade, jam, ketchup, traditional products, etc. Handling and processing of flowers – tools and techniques.

Unit –III: Milk processing
Market milk industry in India and abroad: Distinctive features of tropical dairying as compared to those of the tropical climate of developed countries. Collection and transportation of milk. Different unit operations during milk handling and processing. Status and significance of traditional Indian milk products in India. Processing of milk into frozen, condensed, dried, fermented, fat rich and other products. By-product utilization. Packaging of dairy products.

Unit IV: Meat & Egg Processing
Development of meat, poultry, egg and fish industry in India, Pre-slaughter care, handling and ante-mortem inspection of animal, Stunning and slaughtering techniques, Postmortem inspection, rigor mortis and conversion of muscle to meat Slaughterhouse sanitation, meat hygiene and zoonotic diseases, Processing of poultry meat, Egg and egg products – quality assessment of egg, Types, handling, transportation and marketing of fish, Preservation of fish., Manufacturing process of dehydrated fish and fish pickles. Cleaning and sanitation, Waste management of food processing plants.

Unit V: **Spices and other cash crops (sugarcane, cotton, tobacco, etc.) processing**
Post-harvest technology, composition; processed products of spices: Ginger, chilli, turmeric, onion and garlic, pepper, cardamom. Minor spices: Herbs, leaves and spartan seasonings and their processing and utilization; Post harvest technology and processing of areca nut, cashew nut, oil palm; Spice oil and oleoresins: Extraction techniques; Different types of equipment for Crushing of sugarcane for juice extraction, jiggery making, etc. Unit operations in cotton processing, baling, ginning, cleaning, etc. Curing and drying of tobacco.

PRACTICAL:

- Visit to wholesale grain mandi
- Visit to Rice mill/ Dal mill/ Roller flour mill/ Oil mill/ Solvent extraction plant
- Visit to fruit & vegetable wholesale market
- Visit to milk collection center

- Visit to milk processing plant
- Visit to traditional milk product processing facility
- Visit to abattoir/ Fish market/ other commodity mandi

Learning Outcome:

Inculcating importance of different types of agricultural products, their food and industrial value. Understanding the processing requirements and techniques suitable for different types of agricultural products.

References:

- Ojha, T.P and Michael, A.M. Principles of Agricultural Engineering, Vol. I, Jain Brothers, Karol Bag, New Delhi.
- Sahay, K.M. and Singh, K.K. Unit Operations of Agricultural Processing, Vikas publishing pvt. Ltd, Noida.
- Chakraverty, A.2000.Third Edition, Post-harvest technology for Cereals, Pulses and oilseeds. Oxford &IBH publication Pvt Ltd, New Delhi
- Pande, P.H. 1994. Principles of Agriculture Processing. Kalyani Publishers, Ludhiana
- Sharma BD. 1999. Meat and Meat Products Technology: Including Poultry Products Technology. Jaypee Bros. Medical Publishers.
- Varnam A & Jane P. 1994. Milk and Milk Products: Technology, Chemistry and Microbiology. Sutherland Springer Science & Business Media.
- Sukumar De. 2001.Outlines of Dairy Technology. Oxford University Press
- Chakraborty, S.K.2013. Fundamental Food Engineering, Narosa Publishing House Pvt. Ltd., New Delhi, ISBN:978-81-8487-334-4.

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New Scheme Based On AICTE Flexible Curricula

Agriculture Technology, VII-Semester

Departmental Elective AT- 702 (A) Irrigation Theory & Practices

UNIT-I (Water resources utilisation and irrigation)

Water Resource of India and it's demand in various sector, Irrigation development, Irrigation projects, Environmental Impact assessment and inter basin water transfer.

UNIT -II (Measurement of irrigation water)

Methods of water measurements in open channels, weirs, Flumes, Orifice, Water meter and propeller meter.

UNIT-III (irrigation water conveyance system)

Open channel flow, Design of open channel, On farm structure of water conveyance, structure for diversions and channel crossing, Underground pipe line system, Design and Operation of underground pipeline system.

UNIT-IV (Land grading survey and design)

Land grading survey and design, land levelling methods, contour bench levelling and earth work quantities computation, Equipments for land grading.

UNIT-V (Soil Water Atmosphere and plant interaction)

Soil water, infiltration, ,soil water movement, soil water constraints, Evapotranspiration, crop water requirement, irrigation scheduling, irrigation efficiency.

PRACTICALS

surface irrigation methods, furrow irrigation system, border irrigation system, basin irrigation system, sprinkler irrigation, Drip irrigation, surface irrigation, Open channel flow, water flow measurement in pipes, contour bench levelling, land levelling.

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Agriculture Technology, VII-Semester

Departmental Elective AT- 702 (B) Farm Machinery Design

Theory

Farm machinery design - modern trends - tasks and requirements - economic considerations - durability, reliability and rigidity. Physico mechanical properties of soils - technological process of ploughing - wedge theory - working process of mould board plough - determination of basic parameters - Design of coulters - shares - mould boards. Machines and implements for surface and inter row tillage - peg toothed harrow - disk harrows - rotary hoes - graders - rollers - cultivators - design of V shaped sweeps - rigidity of working tools. Rotary machines - trajectory of motion of rotary tiller tynes - forces acting - power requirement. Machines with working tools executing an oscillatory motion. Design considerations for Grain hoppers – seed metering mechanism – furrow openers and seed tubes. Machines for fertilizer application – discs type broadcasters. Organic fertilizer application - Properties of organic manure – spreading machines. Liquid fertilizer distributors. Planting and transplanting – paddy transplanters – potato planters. Hydraulic nozzles. Power operated hydraulic sprayer design principles. Controlled droplet application. Spray drift and its mitigation. Use of drones for spraying – design of spray generation and application issues. Crop harvesting- plant properties- physical and mechanical properties of plant stem-plant bending modeling.Harvesters, basic principles of design and its sub-systems. Cereal threshing and separation-design of tangential and axial threshing units. Performance indicesof threshing units. Factors influencing the threshing process and power requirement. Separation process and design of straw walker. Cleaning unit process and operation. Grain pan- chaffer and bottom sieve.

Suggested Readings

- Bosoi, E.S., O.V.Verniaev, I.I. Smirnov and E.G. Sultan-Shakh. (1990). Theory, construction and calculations of Agricultural Machinery - Vol.I. Oxonian Press Pvt. Ltd. No.56, Connaught Circle, New Delhi.
- William. R.Gill and Glen E.Vanden Berg.. Soil dynamics in tillage and traction. Supdt. of documents, U.S. Govt. Printing Office, Washington, D.C. 20402.
- Bernacki, C., J.Haman and Cz.Kanafajski (1972). Agricultural Machines, Theory and Construction. Vol - I. U.S. Dept. of Commerce, National Technical Information Service, Springfield, Virginia.22151.
- Yatsuk, E.P. (1981). Rotary soil working machines construction, calculation and design. American Publishing Co. Pvt.Ltd, New Delhi.
- Varshney AC et al. 2004. Data book for Agricultural Machinery Design. ICAR- Central Institute of Agricultural Engineering, Berasia Road, Bhopal.

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New Scheme Based On AICTE Flexible Curricula

Agriculture Technology, VII-Semester

Departmental Elective AT- 702 (C) Dairy Technology

Unit I

Market milk industry: Distinctive features of tropical dairying. Collection and transportation of milk; a) Organization of milk collection routes b) Practices for collection of milk, preservation at farm, refrigeration, natural microbial inhibitors, lactoperoxidase system. Reception and treatment (pre-processing steps) of milk in the dairy plant. Pasteurization, homogenization, Sterillisation, cooling and storage of milk.

Unit II

Status and significance of traditional Indian milk products in India. *Khoa, Khoa based sweets:* Burfi, Peda, Milkcake, Kalakhand, Gulabjaman etc., *Rabri and Basundi, Channa, Chhana-based sweets:* Rasogolla, Sandesh, Rasomalai etc., *Paneer, Chakka/Maska and Shrikhand,* Misti *Dahi*, *Kheer and Payasam*. Mechanization of manufacturing process, advances in preservation and packaging.

Status of fat-rich dairy products in India and abroad. Manufacture, storage and characteristics of different types for fat-rich products viz. cream, butter, ghee, butter-oil, etc. Legal standards related to these products.

History, development and status of ice cream industry, Definition, classification and composition and standards of ice cream and other frozen desserts, Stabilizers and emulsifiers-their classification, properties and role in quality of ice cream, Technological aspects of ice cream manufacture.

Unit III

Introduction, Importance of Packaging, History of Package Development, Packaging materials, a) Characteristics of basic packaging materials: Paper (paper board, corrugated paper, fibre board), Glass, Metal, Plastics, Foils and laminates, retort pouches, Package forms, Legal requirements of packaging materials and product information. Packaging of milk and dairy products such as pasteurized milk, UHT-sterilized milk, aseptic packaging, fat rich products ghee and butter, coagulated and desiccated indigenous dairy products and their sweetmeades, concentrated and dried milks including baby foods.

Unit IV

Production Management: Definition, Function and structure of Production Management, Production planning & Control, Work study and measurement motion and time study. Efficiency of plant operation: product accounting, setting up norms for operational and processing losses for quantity, fat and SNF, monitoring efficiency.

References:

- Kanekanian. 2014. Milk and Dairy Products as Functional Foods. John Wiley & Sons, Ltd., UK.
- Adnan Y. Tamime. 2009. Milk Processing and Quality Management. Blackwell Publishing Ltd., UK.
- Pieter Walstra, Jan T.M. Wouters, Tom J. Geurts. 2006. Dairy Science and Technology, 2nd Ed. CRC Press, Boca Raton, FL, USA.
- Sukumar De. 2005. Outlines of Dairy Technology. Oxford University Press, New Delhi.

- H.G. Kessler. 1981. Food Engineering and Dairy Technology. Verlag A. Kessler, Fraising (F.R. Germany).
- Y.H. Hui. 1993. Dairy Science and Technology Handbook, Vol. I, II and III. Wiley-VCH, USA.
- Varnam A & Jane P. 1994. Milk and Milk Products: Technology, Chemistry and Microbiology. Sutherland Springer Science & Business Media.

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Agriculture Technology, VII-Semester

Departmental Elective AT- 702 (D) Experimental design & statistical methods in Agriculture

Theory:

Need for designing of experiments, characteristics of a good design. Basic principles of designs- randomization, replication and local control. Uniformity trials, size and shape of plots and blocks; Analysis of variance; Completely randomized design, randomized block design and Latin square design. Factorial experiments, (symmetrical as well as asymmetrical). orthogonality and partitioning of degrees of freedom, Confounding in symmetrical factorial experiments, Factorial experiments with control treatment. Split plot and strip plot designs; Analysis of covariance and missing plot techniques in randomized block and Latin square designs; Transformations, crossover designs, balanced incomplete block design, resolvable designs and their applications ~ Lattice design, alpha design - concepts, randomisation procedure, analysis and interpretation of results. Response surfaces. Experiments with mixtures. Bioassays- direct and indirect, indirect assays based on quantal dose response, parallel line and slope ratio assays potency estimation.

Suggested Reading:

- Cochran WG & Cox GM. 1957. Experimental Designs. 2nd Ed. John Wiley.
- Dean AM & Voss D. 1999. Design and Analysis of Experiments. Springer.
- Federer WT. 1985. Experimental Designs. MacMillan.
- Fisher RA. 1953. Design and Analysis of Experiments.
- Oliver & Boyd. Nigam AK & Gupta VK. 1979. Handbook on Analysis of Agricultural Experiments. IASRI Publ. Pearce SC. 1983. The Agricultural Field Experiment: A Statistical Examination of Theory & Practice. John Wiley.

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Agriculture Technology, VII-Semester

Open Elective AT- 703 (A) ICT in Agriculture

Introduction & scope of ICT in Agriculture, Need for ICT in Agricultural Extension. National Policies on ICT in Agricultural Extension. Role of communications in ICT: Concept, elements & their characteristics. Message: meaning, dimensions of a message characteristics of a good message, message treatment and effectiveness, distortion of message. Methods of communication: meaning and function. Forms of communication. Role of Mass Media in dissemination of farm technology. Modern communication media: electronic video, tele text, tele conference, computer assisted instruction. Telephone/Mobile Technology: Farmer Call Centre, SMS Broadcast Service, m-krishi. ICT initiatives of NGOs and Private Companies. ICT initiatives by ICAR and SAUs, Value Added Services, Fisher Friend Project, SMS Services to farmers by Department of Agriculture. Practices of ICT for Agricultural Extension: aAQUA, Digital Green, e-Agrik (e-Agriculture), e- Sagu (e-cultivation), KISSAN (Karshaka Information Systems Service and Networking), Solutions through Information, VASAT-Virtual Academy for the Semi-Arid Tropics, Touch Screen Kiosk, e-Extension (e-Soil Health Card Program) Village. Village Knowledge Centre (VRC/VRC/CIC): Introduction, concept, process for setting VRC. Warana Wired Village Project, Web Portals: AGRISNET, DACNET, In DG, DEAL, i-KISAN, e-Krishi, ASHA, IFFCO- Agri-Portal, Agriwatch Portal, i-Shakti. ICTs for market information and Agri-Business: AGMARKNET, e-KRISHI VIPNAN, ICT-e-CHOPAL, EID GarryIndiagriline.

Suggested Reading:

- G.L. Ray, 2006. Extension communication and management. Kalyani Publ.
- A.S. Sandhu, 2004. Text book on Agricultural communication process and methods. Oxford & TBH.
- R Saravanan, C Kathiresan & T Indra Devi, 2011. Information & communication technology for agriculture and rural development. New India Publ. Agency

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Agriculture Technology, VII-Semester

Open Elective AT- 703 (B) AI & IOT applications in agriculture

Theory

Foundation and history of artificial intelligent, problems and techniques – AI programming languages, introduction to LISP and PROLOG- problem spaces and searches, blind search strategies, Breadth first- Depth first- heuristic search techniques Hill climbing: best first-A* algorithm AO* algorithm- game tree, Min max algorithms, game playing- alpha beta pruning. Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Baye's probabilistic interferences and Dempstershafer theory, Heuristic methods, symbolic reasoning under uncertainty, Statistical reasoning, Fuzzy reasoning, Temporal reasoning, Non monotonic reasoning. Planning and planning in situational calculus, representation for planning, partial order planning algorithm, learning from examples, discovery as learning, learning by analogy, explanation based learning, neural nets, genetic algorithms. Principles of Natural language processing, rule based systems architecture, Expert systems, knowledge acquisition concepts, AI application to robotics, and current trends in intelligent systems. Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models &APIs .Machine to Machine, Difference between IoT and M2M, Software define Network. Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation &disseminationIoT applications in managing crop and environmental parameters.

Suggested Reading

- Russell, S. and P. Norvig. 1998. Artificial Intelligence: A Modern Approach. Prentice Hall.
- Rich, Elain and Kevin Knight. 1991. Artificial Intelligence. TMH.
- Patrick Henry Winston. 1992. Artificial intelligence. Addition Wesley 3 rd Ed.
- Nilson Nils J. Principles of Artificial Intelligence. Norsa Publishing House.
- Vijay Madisetti, ArshdeepBahga, "Internet of Things: A Hands-On Approach"
- WaltenegusDargie,ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

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Agriculture Technology, VII-Semester

Open Elective AT- 703 (C) Instrumentation

Unit I

Semiconductors. p—n junction. V—I characteristics of p—n junction. diode as a circuit element. rectifier. clipper. damper, voltage multiplier, capacitive filter. diode circuits for OR &AND (both positive and negative logic), bipolar junction transistor: operating point. classification (A.B & C) of amplifier. various biasing methods (fixed. self potential divider). h-parameter model of a transistor. analysis of small signal. CE amplifier. phase shift oscillator, analysis of differential amplifier using transistor. ideal OP-AMP characteristics. linear and non-linear applications of OP-AMP (adder. subtractor. integrator, active rectifier. comparator. differentiator. differential, instrumentation amplifier and oscillator). zener diode voltage regulator. transistor series regulator. current limiting. OP-AMP voltage regulators.

Unit II

Basic theorem of Boolean algebra. Combinational logic circuits(basic gates. SOP rule and Kmap). binary ladder D/A converter, successive approximation A/D converter, generalized instrumentation,

Unit III

Measurement of displacement, temperature, velocity, force and pressure using potentiometer. resistance thennometer, thermocouples. Bourclean tube, pressure gauges. LVDT, strain gauge circuits, wheatstone bridge and other bridges and tacho-generator, load cells.

Practical

- To study V-I characteristics of p-n junction diode: To study half wave. full wave and bridge rectifier: To study transistor characteristics in CE configurations: To design and study fixed and self bias transistor: To design and study potential divider bias transistor: To study a diode as clipper and clamper: To study a OP-AMP IC 741 as inverting and non- inverting amplifier: To study a OP-AMP IC 741 as differentiator and integrator to study a differential amplifier using two transistor: To study a OP-AMP IC 741 as differential amplifier: To study a zener regulator circuit: To study a OP-AMP IC 741 as a active rectifier: To study a OP-AMP IC 741 as a comparator:

- To familiarize with various types of transducers. Straingauge bridges, thermocouple, pressure gauges measurement of load (load cell), torque, power and energy, etc. and its calibration

References

- Mehta V K. Principles of Electronics. S. Chand and Co., New Delhi.
- Shaney A K. Measurement of Electronics and Electronic Instrumentation. Khanna Publications.
- Roy Chowdary. Integrated Electronics. John Wiley International.
- Kumar Anand. Digital Electronics. A. PHI.
- Gupta Sanjeev, Sonthosh Gupta. Electronic Devices and Circuits. Danapath Rai Publications

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Agriculture Technology, VII-Semester

Open Elective AT- 703 (D) Chemical Engineering & Thermodynamics

UNIT-I Measured Thermodynamic properties and other basic concepts

Thermodynamics properties volume, temperature, pressure , Equilibirium Fundamental Definitions, Independent and dependent thermodynamic properties, phases.

UNIT -II The first law of thermodynamics

Definition, fundamental, work, Hypothetical paths, Reversible and irreversible processes, closed system, integral balance, Differential balance, isolated system, open system, open system energy balance on processing Equipment (introduction, Nozzle and diffusers, turbine and pumps, Heat exchanger, throtteling devices, thermodynamic data for U and H, calculating First law quantities in closed systems

UNIT -III (entropy and the Second law of thermodynamics)

Definition, second law of thermodynamics for closed system, second law of thermodynamics for closed systems, second law of thermodynamics for open system, mechanical energy balance. Vapour compression power and refrigeration cycles, molecular view of entropy.

UNIT -IV Equation Of state and intermolecular Forces

Ideal gas law, Equations of state, compressibility equation, Van der Waals equation

UNIT-V The thermodynamic Web

Mathematical Relations, derived thermodynamic quantities, Fundamental property Relations, Maxwell relations, Dependent of state Function on T, P, and V, thermodynamic web.