RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Agriculture Technology, VIII-Semester

AT-8001 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.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Agriculture Technology, VIII-Semester

AT-8002 Ground Water Wells and Pumps

Unit I

Occurrence and movement of ground water; aquifer and its types; Classification of wells, fullypenetrating tubewells and open wells, familiarization of various types of bore wells; design of open wells.

Unit II

Groundwater exploration techniques; methods of drilling of wells: percussion,rotary, reverse rotary; design of tubewell and gravel pack, installation of well screen,completion and development of well; groundwater hydraulics-determination of aquiferparameters by different method such as Theis, Jacob and Chow's, Theis recovery method;

Unit III

Estimation of ground water potential, quality of groundwater; artificial groundwater recharge techniques.

Unit IV

Pumping systems: water lifting devices;different types of pumps, classification of pumps, component parts of centrifugal pumps,priming, pump selection, installation and trouble shooting, performance curves, effect of speedon capacity, head and power, effect of change of impeller dimensions on performancecharacteristics; hydraulic ram, propeller pumps, mixed flow pumps and their performancecharacteristics; deep well turbine pump and submersible pump.

Practical

Verification of Darcy's Law; study of different drilling equipment; sieve analysis for graveland wellscreens design; estimation of specific yield and specific retention; estimation of aquifer parameters by Theis method, Coopers-Jacob method, Chow method;Theis Recovery method; well design under confined and unconfined conditions; estimating ground water balance; study of artificial ground ater rechargestructures; study of radial flow and mixed flow centrifugal pumps, multistage centrifugal pumps; installation of centrifugal pump; testing of centrifugal pumpand study of cavitation; study of hydraulic ram; study and testing of submersible pump.

Learning Outcome:

On the completion of the subject, the students will understand the pumping systems, ground water recharging techniques and pumping systems characteristics for selecting appropriate pumping system

References:

Michael AM, Khepar SD. and SK Sondhi. 2008. Water Well and Pumps, 2nd Edition, Tata Mc-GrawHill.

Todd David Keith and Larry W. Mays. 2004. Groundwater Hydrology, 3rd Edition, John Wiley &Sons, New York (International Book Distributing Company Lucknow).

Michael AM. and Ojha TP. 2014. Principles of Agricultural Engineering Vol-II, 5th Edition. JainBrothers Publication, New Delhi.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Credit Based Grading System

Agriculture Technology, VII-Semester

Elective –V AT- 8003 (1) Testing of Farm Machinery

Importance and significance of testing and types of testing. Test equipment, usage and limitations. Test procedures and various test codes: National and International. Laboratory and field testing of tillage and sowing machinery: laser land leveler, m.b. Plough, disc plough, rotavator, cultivator, disc harrow, seed cum fertilizer drill & planter. Laboratory and field testing of manual & power operated intercultural machinery and plant protection machine. Laboratory and field testing of reaper, thresher and chaff cutter.Laboratory and field testing of tractor, straw combine & combine harvester. Review and interpretation of test reports. Importance and need of standardization of components of agricultural equipment.

Suggested Readings

- Barger EL, Liljedahl JB &McKibben EC. 1967. Tractors and their Power Units. Wiley Eastern.
- Indian Standard Codes for Agril. Implements. Published by BIS, New Delhi.
- Inns FM. 1986. Selection, Testing and Evaluation of Agricultural Machines and Equipment. FAO Service Bull. No. 115.
- Mehta ML, Verma SR, RajanPardeep and Singh S K. 2019. Testing and Evaluation of Agricultural Machinery.Daya Publishing House, Delhi.
- Nebraska Tractor Test Code for Testing Tractor, Nebraska, USA.
- Smith DW, Sims BG & O'Neill D H. 2001. Testing and Evaluation of Agricultural Machinery and Equipment - Principle and Practice. FAO Agricultural Services Bull. 110.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Credit Based Grading System

Agriculture Technology, VII-Semester

Elective –V AT- 8003 (2) Remote Sensing and GIS applications

Theory:

Basic component of remote sensing (RS), advantages and limitations of RS, possible use of RS techniques in assessment and monitoring of land and water resources; electromagnetic spectrum, energy interactions in the atmosphere and with the Earth's surface; major atmospheric windows; principal applications of different wavelength regions; typical spectral reflectance curve for vegetation, soil and water; spectral signatures; different types of sensors and platforms; contrast ratio and possible causes of low contrast; aerial photography; types of aerial photographs, scale of aerial photographs, planning aerial photography- end lap and side lap; stereoscopic vision, requirements of stereoscopic photographs; air-photo interpretation- interpretation elements; photogrammetry measurements on a single vertical aerial photograph, measurements on a stereo-pair- vertical measurements by the parallax method; ground control for aerial photography; satellite remote sensing, multispectral scanner- whiskbroom and push-broom scanner; different types of resolutions; analysis of digital data- image restoration; image enhancement; information extraction, image classification, unsupervised classification, supervised classification, important consideration in the identification of training areas, vegetation indices; microwave remote sensing. GI Sand basic components, different sources of spatial data, basic spatial entities, major components of spatial data, Basic classes of map projections and their properties, Methods of data input into GIS, Data editing, spatial data models and structures, Attribute data management, integrating data (map overlay) in GIS, Application of remote sensing and GIS for the management of land and water resources.

Suggested Reading:

- Reddy Anji, M. 2006. Textbook of Remote Sensing and Geographical Information Systems. BS Publications, Hyderabad.
- Elangovan, K. 2006. GIS Fundamentals Applications and Implementations. New India Publication Agency, New Delhi.
- George Joseph. 2005. Fundamentals of Remote Sensing. 2nd Edition. Universities Press (India) Private Limited, Hyderabad.
- Jensen, J.R. 2013. Remote Sensing of the Environment: An Earth Resource Perspective. Pearson Education Limited, UK.
- Lillesand, T., R.W. Kiefer and J. Chipman. 2015. Remote Sensing and Image Interpretation. 7th Edition, John Wiley and Sons Singapore Pvt. Ltd., Singapore.

  Sabins, F.F. 2007. Remote Sensing: Principles and Interpretation. Third Edition, Waveland Press Inc., Illinois, USA.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Credit Based Grading System

Agriculture Technology, VII-Semester

Elective –V AT- 8003 (3) Food Packaging

Theory

Functions of packaging; Type of packaging materials; Selection of packaging material for different foods; Selective properties of packaging film; Methods of packaging and packaging equipment. Mechanical strength of different packaging materials; Printing of packages; Barcodes & other marking; Interactions between packaging material and foods; Environmental and cost consideration in selecting packaging materials. Manufacture of packaging materials; Potential of biocomposite materials for food packaging; Packaging regulations; Packaging and food preservation; Disposal of packaging materials. Testing of packaging; Rigid and semi rigid containers; Flexible containers; Sealing equipment; Labelling; Asceptic and shrink packaging; Secondary and transport packaging.

Suggested Reading:

- Joseph H. Hotchkiss, 1988. Food and Packaging Interactions by (ACS symposium series -365, April 5-10, American chemical society, Washington DC,
- A.S Athlye Plastics in Packaging, TMGH, New Delhi.
- Stanley Sacharois& Roger C. Griffin. 1970. Food packaging. The AVI Publishing company Inc.
- Ahvenainen, R. (2003). Novel Food Packaging Techniques. Woodhead Publ. Ltd., Cambridge, England.
- Han, J. (2005). Innovations in Food Packaging. Elsevier Science & Technology Books.

Yam, K. L. (2009). Encyclopedia of Packaging Technology. 3rded. John Wiley and Sons, Inc. Publ., USA

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Credit Based Grading System

Agriculture Technology, VII-Semester

Elective –V AT- 8003 (4) 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"

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Credit Based Grading System

Agriculture Technology, VII-Semester

Elective –VI AT- 8004 (1) Ergonomics and Safety in Agriculture

Description of human-machine systems; ergonomics and its areas of application in the work system; history of ergonomics; modern ergonomics.Physiological parameters and their measurements; psychological and mental stresses and their measurement techniques; human energy expenditure; calibration of subjects; human workload and its assessment. Environmental heat stress and human physiology: heat stress index, skin temperature.Anthropometry and its role in daily life; application of anthropometry in equipment design; human postures, postural stress and its role in design of farm machinery. Anthropometric principles in workspace and equipment design; design of manual handling tasks.Human factors in tractor seat design, entry system, controls; shape, colour coding, dial and indicators; modern technology for comfort in driving places.Safety considerations and operators protective gadgets in farm operations; Standards/ codes for tractors and agricultural machinery safety.

Suggested Readings

- Bridger R S. Introduction to Ergonomics. CRC Press. 2009.
- Mark S Sanders and Ernest J McCormick. Human Factors in Engineering and Design. McGraw Hill. 2000.
- P Astrand, K Rodahl, H A Dahl and S B Stromme. Textbook of Work Physiology - Physiological Bases of Exercise. McGraw Hill. 2003.
- L P Gite. Anthropometric and Strength Data of Indian Agricultural Workers for Farm Equipment Design. Central Institute of Agricultural Engineering, Bhopal. 2009.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Credit Based Grading System

Agriculture Technology, VII-Semester

Elective –VI AT- 8004 (2) Drainage Engineering

Theory

Water logging- causes and impacts; drainage, objectives of drainage, familiarization with the drainage problems of the state; surface drainage coefficient, types of surface drainage, desig n of surface drains; sub-surface drainage: purpose and benefits, investigations of design parameters-hydraulic conductivity, drainable porosity, water table; derivation of Hooghoudt's and Ernst's drain spacing equations; design of subsurface drainage system; drainage materials, drainage pipes, drain envelope; layout, construction and installation of drains; drainage structures; vertical drainage; bio-drainage; mole drains; salt balance, reclamation of saline and alkaline soils, leaching requirements, conjunctive use of fresh and saline water.

Suggested Readings:

- Luthin. J.N. 1966, Drainage Engineering, John Wiley and Sons, New York.
- Michael, A.M and Ojha T.P. 2015. Principles of Agricultural Engineering, Volume II, Jain Brothers Publication New Delhi.
- Murthy, V.V.N. 1998, Land and water management, Kalyani publishing, New Delhi.
- Bhattacharya AK and Michael AM. 2013. Land Drainage, Principles , Methods and Applications. Vikas Publication House, Noida (UP)
- Ritzema H.P.1994 Drainage Principles and Applications, ILRI Publication 16, Second Edition (Completely Revised)

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Credit Based Grading System

Agriculture Technology, VII-Semester

Elective –VI AT- 8004 (3) Entrepreneurship in Agriculture

Theory

Entrepreneurship, management – Management functions – planning- Organizing -Directing – motivation – ordering – leading – supervision-Communication and control – Capital – Financial management – importance of financial statements – balance sheet – profit and loss statement, Analysis of financial statements – liquidity ratios – leverage ratios, Coverage ratios – turnover ratios – profitability ratios, Agro-based industries – Project – project cycle – Project appraisal and evaluation techniques – undiscounted measures – payback period – proceeds per rupee of outlay, Discounted measures – Net Present Value (NPV) – Benefit-Cost Ratio (BCR) – Internal Rate of Return (IRR) – Net benefit investment ratio (N / K ratio) – sensitivity analysis-Importance of agribusiness in Indian economy International trade-WTO agreements – Provisions related to agreements in agricultural and food commodities. Agreements on agriculture (AOA) – Domestic supply, market access, export subsidies agreements on sanitary and phyto-sanitary (SPS) measures, Trade related intellectual property rights (TRIPS). Concept of entrepreneur and entrepreneurship. Assessing overall business environment in Indian economy– Entrepreneurial and managerial characteristics. Entrepreneurship development Programmes (EDP)- Generation incubation and commercialization of ideas and innovations- Motivation and entrepreneurship development. Managing an enterprise: Importance of planning, budgeting, monitoring evaluation and follow-up managing competition. Role of ED in economic development of a country. Economic system and its implications for decision making by individual entrepreneurs- Social responsibility of business. Morals and ethics in enterprise management- SWOT analysis- Government schemes and incentives for promotion of entrepreneurship. Government policy on small and medium enterprises (SMEs)/SSIs/MSME sectors- Venture capital (VC), contract farming (CF) and joint ventures (JV), public-private partnerships (PPP)- Overview of agricultural industry and their characteristics

Suggested Reading

- Harsh, S.B., Conner, U.J. and Schwab, G.D. 1981. Management of the Farm Business. Prentice Hall Inc., New Jersey.
- Omri Rawlins, N. 1980. Introduction to Agribusiness. Prentice Hall Inc., New Jersey
- Gittenger Price, J. 1989. Economic Analysis of Agricultural Projects. John Hopkins University, Press, London.
- Thomas W Zimmer and Norman M Scarborough. 1996. Entrepreneurship. Prentice-Hall, New Jersey.
- Khanka S S. 1999. Entrepreneurial Development. S. Chand and Co. New Delhi.
- Mohanty S K. 2007. Fundamentals of Entrepreneurship. Prentice Hall India Ltd., New Delhi.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Credit Based Grading System

Agriculture Technology, VII-Semester

Elective –VI AT- 8004 (4) Computer Aided Design

Theory

Computer aided design principles of machines. Computer representation of models and drawings.Features of various solid modeling packages. Usage of packages for dynamic analysis of farm machines and its components.Design of inclined tillage tools. Development of plough surfaces.Solid and wire frame modeling of components of tractor, seed drills and threshers.Structural analysis and fatigue analysis of tractor and machinery systems Graphic analysis of cutter bar mechanism.

Suggested Readings

- Chris McMahon and Jimmie Browne. 2000. CAD /CAM/ Principles, Practice and ManufacturingManagement. Pearson Edu.
- Grover, Mikell P. 2003. Automation, Production Systems and Computer Integrated Manufacturing.Prentice-Hall of India.
- Radhakrishnan, P., Subramanyan, S. and Raju, V. 2003. CAD/CAM/CIM. New Age International.
- Rao, P.N. 2002. CAD/CAM Principles and Applications. Tata McGraw Hill.
- Zeid, Ibrahim.1998. CAD/CAM Theory and Practice. Tata McGraw Hill