

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Agriculture Technology, VI-Semester

AT-6001 Agriculture Structures

Unit I

Planning and layout of farmstead. Scope, importance and need for environmental control, physiological reaction of livestock environmental factors, environmental control systems and their design, control of temperature, humidity and other air constituents by ventilation and other methods, Livestock production facilities, BIS Standards for dairy, piggery, poultry and other farm structures.

Unit II

Design, construction and cost estimation of farm structures; animal shelters, compost pit, fodder silo, fencing and implement sheds, barn for cows, buffalo, poultry, etc.

Unit III:

Storage of grains, Causes of spoilage, Water activity for low and high moisture food and its limits for storage, Moisture and temperature changes in grain bins; Traditional storage structures and their improvements, Improved storage structures (CAP, hermetic storage, Pusa bin, RCC ring bins), Design consideration for grain storage godowns, Bag storage structures, Shallow and Deep bin, Calculation of pressure in bins, Storage of seeds.

Unit IV:

Rural living and development, rural roads, their construction cost and repair and maintenance. Sources of water supply, norms of water supply for human being and animals, drinking water standards and water treatment suitable to rural community. Site and orientation of building in regard to sanitation, community sanitation system; sewage system and its design, cost and maintenance, design of septic tank for small family.

Unit V:

Estimation of domestic power requirement, source of power supply and electrification of rural housing.

Practical

- Measurements for environmental parameters and cooling load of a farm building,
- Design and layout of a dairy farm,
- Design and layout of a poultry house,
- Design and layout of a goat house/ sheep house,
- Design of a farm fencing system,
- Design of a feed/fodder storage structures,
- Design of grain storage structures,
- Design and layout of commercial bag and bulk storage facilities,
- Study and performance evaluation of different domestic storage structure,
- Cost estimation of a Farm building.

Learning Outcome:

Understanding the requirements of different types of structures used at farm/ rural level. Knowledge about their standards and available literature/ sources for design.

Reference Books

- Pandey, P.H. Principles and practices of Agricultural Structures and Environmental Control, Kalyani Publishers, Ludhiana.
- Ojha, T.P and Michael, A.M. Principles of Agricultural Engineering, Vol. I, Jain Brothers, Karol Bag, New Delhi.
- Nathanson, J.A. Basic Environmental Technology, Prentice Hall of India, New Delhi.
- Venugopal Rao, P. Text Book of Environmental Engineering, Prentice Hall of India, New Delhi.
- Garg, S.K. Water Supply Engineering, Khanna Publishers, New Delhi-6.
- Dutta, B.N. Estimating and Costing in Civil Engineering, Duttta & CO, Lucknow. Khanna, P.N. Indian Practical Civil Engineer's Hand Book, Engineer's Publishers, New Delhi.
- Sahay, K.M. and Singh, K.K. Unit Operations of Agricultural Processing, Vikas publishing pvt. Ltd, Noida.
- Banerjee, G.C. A Text Book of Animal Husbandry, Oxford IBH Publishing Co, New Delhi.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Agriculture Technology, VI-Semester

AT-6002 Irrigation and Drainage Engineering

Unit I

Water Resources- River basins-Development and Utilization in India and Tamil Nadu-Irrigation - duty and delta - Rooting characteristics-Moisture use of crop, Evapotranspiration

Unit II

Effective rainfall - Scheduling - Irrigation requirement - Irrigation frequency, Irrigation efficiencies.

Unit -III

Methods of Irrigation - Hydraulics and design - Erodible and non-erodible, alluvial channels- Kennedy's and Lacey's theories, Materials for lining water courses and field channel, Water control and diversion structure - Underground pipeline irrigation system - Land grading - Land levelling methods .

Unit IV

Command area - Concept, Components of CADA – On Farm Development works, Execution - maintenance and economics of OFD WORKS, Farmer's committee and its role for water distribution and system operation, Strategic outlet command - stream size for efficient warabandhi and rotational irrigation system.

Unit V

Agricultural drainage - Drainage coefficient; principles of flow through soils, Darcy's law - infiltration theory, Surface drainage systems - Subsurface drainage - Design of subsurface drainage - Pipe materials - mole drains, drainage wells, Leaching requirements - irrigation and drainage water quality - recycling of drainage water for irrigation.

PRACTICAL:

River basins, irrigation projects, irrigation tanks and water resources in TN - Determination of soil moisture by different methods (gravimetric, tensiometer, gypsum block and neutron probe method) - Duty and delta relationship – Problems Estimation of water requirement by different methods - Estimation of Evapotranspiration - Land levelling - plane method from climatological data - Determination of irrigation efficiencies - Problems on Border irrigation and Design of Basin irrigation. - Design of Furrow irrigation - problems - Problems on Kennedy's and Lacey's theory - Design of under ground pipeline system - Problems on Irrigation scheduling - OFD works in command areas - Design of surface drainage system - Design of Sub-surface drainage system - Field visit to command areas and observation of OFD works.

Learning Outcome:

At the end of this Chapter the students will learn about the how to estimate the irrigation water requirement, different types of irrigation and drainage systems and associated terminology

References:

Luthin. J.N. 1966, Drainage Engineering, John Wiley and Sons, New York
Michael, A.M. 1990. Irrigation -Theory and Practice, Vikas publishing house, New Delhi.
Murthy, V.V.N. 1998, Land and water management, Kalyani publishing, New Delhi.
Israelsen O W. and Hansen V. E and Stringham G. E. 1980. Irrigation Principles and Practice, John Wiley & Sons, Inc. USA

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Agriculture Technology, VI-Semester

AT-6003 Theory of Machines & Machine Design

Unit I

Elements, links, pairs, kinematics chain, and mechanisms. Classification of pairs and mechanisms. Lower and higher pairs. Four bar chain, slider crank chain and their inversions. Determination of velocity and acceleration using graphical (relative velocity and acceleration) method. Instantaneous centers.

Unit II

Types of gears. Law of gearing, velocity of sliding between two teeth in mesh. Involute and cycloidal profile for gear teeth. Spur gear, nomenclature, interference and undercutting. Introduction to helical, spiral, bevel and worm gear. Simple, compound, reverted, and epicyclic trains. Design of gears. Design of screw motion mechanisms like screw jack, lead screw, etc.

Unit III

Determining velocity ratio by tabular method. Turning moment diagrams, coefficient of fluctuation of speed and energy, weight of flywheel, flywheel applications. Belt drives, types of drives, belt materials. Length of belt, power transmitted, velocity ratio, belt size for flat and V belts. Design of flat belt and V-belt drives and pulleys. Effect of centrifugal tension, creep and slip on power transmission, Chain drives. Types of friction, laws of dry friction. Friction of pivots and collars. Single disc, multiple disc, and cone clutches. Rolling friction, anti friction bearings. Types of governors. Constructional details and analysis of Watt, Porter, Proell governors. Effect of friction, controlling force curves. Sensitiveness, stability, hunting, iso-chronism, power and effort of a governor. Static and dynamic balancing. Balancing of rotating masses in one and different planes.

Unit IV

Meaning of design, Phases of design, design considerations. Common engineering materials and their mechanical properties. Types of loads and stresses, theories of failure, factor of safety, selection of allowable stress. Stress concentration. Elementary fatigue and creep aspects. Cotter joints, knuckle joint and pinned joints, turnbuckle. Design of welded subjected to static loads. Design of threaded fasteners subjected to direct static loads, bolted joints loaded in shear and bolted joints subjected to eccentric loading. Design of shafts under torsion and combined bending and torsion. Design of keys. Design of muff, sleeve, and rigid flange couplings. Design of helical and leaf springs. Selection of anti-friction bearings.

Practical

Find out gyroscopic couple, Find out velocity & acceleration of slider crank mechanism, Find out velocity ratio of various gear trains, Study various types of belt drives and find out the velocity ratio of the drive, Draw the cam profile, Draw involute profile of a gear by generating method

Learning Outcome:

Understanding principles involved in design of a functional machine to knowing about different standard mechanisms.

References:

- Bevan Thomas. 1984. Theory of Machines. CBS Publishers and Distributors, Delhi.
- Ballaney P L. 1985. Theory of Machines. Khanna Publishers, 2-B Nath Market, Nai Sarak, New Delhi.
- Rao J S and Dukkipatti R V. 1990. Mechanisms and Machine Theory. Wiley astern Ltd., New Delhi.
- Lal Jagdish. 1991. Theory of Mechanisms and Machines. Metropolitan Book Co. Pvt.Ltd., 1 Netaji Subash Marg, New Delhi..
- Rattan S B. 1993. Theory of Machines. Tata McGraw Hill Publishing Co. Ltd., 12/4 Asaf Ali Road, New Delhi.
- Khurmi R S and Gupta J K. 1994. Theory of Machines. Eurasia Publishing House Pvt. Ltd., Ram Nagar, New Delhi
- Jain R K. 2013. Machine Design. Khanna Publishers, 2-B Nath Market, Nai Sarak, New Delhi.
- Khurmi R S and Gupta J K. 2014. A Text Book of Machine Design. S. Chand & Company Ltd., New Delhi

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Agriculture Technology, VI-Semester

AT-6004 Fluid Mechanics

Unit I

Fundamental Fluid Properties: – Engineering units of measurement – Mass, density – specific weight, specific volume – specific surface tension – capillarity. Viscosity, bulk modulus of elasticity, pressure and vapour pressure. Fluid Statics: Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on Gravity Dams and Tainter Gates), buoyant force, stability of floating and submerged bodies, relative equilibrium.

Unit II

Kinematics and Dynamics of flow: Introduction to basic lines – Streamlines, Streak lines, pathlines various types of fluid flow. Velocity potential function, Stream function, Vorticity and Circulation Flow net. Basic equations of fluid flow like Energy equation, continuity equation and momentum equation. Bernoulli's equation and its applications.

Unit III

Laminar Flow and Turbulent Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number. Velocity distribution, Laminar and turbulent boundary layers and laminar sublayer, boundary layer concept, aging of pipes. Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes, concept of water Hammer transmission of power.

Unit IV

Open channels: Channel geometry and elements of channel selection, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow and its computations, uniform flow and its computations, Chezy's and Manning's formulae, determinations of normal depth and velocity, normal and critical slopes, economical sections. Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing.

Practical

Problems on properties of fluid - Pressure measurement - hydrostatic forces - kinematics of flow - continuity equation - tank emptying - Measurement of head loss in pipe lines and pipe fittings - Flow measurement in pipes with venturi meter & orifice meter - Flow measurement in channels - most economical channel section - Design of channel.

Learning Outcome

Knowledge of the basic concept and principles of fluid mechanics. Ability to analyze fluid flow problems with the application of momentum and energy equations. Ability to distinguish between various types of fluid flow. Ability to find solutions to typical pipe flow problems,

References

Bansal, R.K., 2002. A text book of fluid mechanics and hydraulic machinery, Laxmi publications (P) Ltd., New Delhi

Grade, R.J., 2002. Fluid mechanics through problems. Wiley eastern Ltd., Madras

Jagadish Lal, 2000. Hydraulic machines. Metropolitan book house, New Delhi.

Donald, Pritchard Fluid Mechanics-Wiley India, New Delhi.

John F. Douglas, J.M. Gasoriek, John Swaffield, Lynne Jack, Fluid Mechanics, Pearson Edu.

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Credit Based Grading System

Agriculture Technology, VI-Semester

Elective II -AT- 6005 (1) Precision Farming

Precision Agriculture – need and functional requirements. Familiarization with issues relating to natural resources. Familiarization with equipment for precision agriculture including sowing and planting machines, power sprayers, land clearing machines, laser guided land levellers, straw-chopper, straw-balers, grain combines, etc. Introduction to GIS based precision agriculture and its applications.

Introduction to sensors and application of sensors for data generation. Database management. System concept. GPS – Concept and its application in agriculture. Site- specific management of inputs, On the go systems, map based systems. Application of different type of system for detection, Spectrophotometry Image analysis- approach, methods, software. Yield monitoring system, Yield monitors.

System approach in farm machinery management, problems on machinery selection, maintenance and scheduling of operations. Application to PERT and CPM for machinery system management

Practical

Familiarization with precision agriculture problems and issues. Familiarization with various machines for resource conservation. Practical use of spectrophotometer, spad meter, green seeker, etc. for field variability analysis. Solving problems related to image analysis. Problems related to cost analysis and inflation and problems related to selection of equipment, replacement, break-even analysis, time value of money etc.

References:

- Kuhar J E. The Precision Farming Guide for Agriculturist.
- Dutta SK. Soil Conservation and land management.
- Sigma and Jagmohan. Earth Moving Machinery.
- Wood and Stuart. Earth Moving Machinery.
- DeMess MN. Fundamentals of Geographic Information System.
- Hunt Donnell. Farm Power and Machinery Management.
- Sharma DN and S Mukesh. Farm Power and Machinery Management Vol I.

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Credit Based Grading System

Agriculture Technology, VI-Semester

Elective II -AT- 6005 (2) Protected Cultivation Technology

Protected cultivation: Introduction, History, origin, development, National and International Scenario, plant environment interactions – principles of limiting factors, solar radiation and transpiration, light, temperature, relative humidity, carbondioxide enrichment, Components of green house , perspective, types of green houses, shade nets, Cladding materials, Design and construction of green house-site selection, orientation, 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. Planting techniques in green house cultivation. Root media – types – soil and soil less media, composition, estimation, preparation and disinfection, bed preparation. Irrigation in greenhouse and net house – water quality, types of irrigation system, components, design, installation and material requirement.

Practical

Estimation of material requirement for construction of greenhouse ; Estimation of material requirement for preparation of root media; Root media preparation, bed preparation and disinfections; Design and installation of irrigation system; Study of different greenhouse environment control instruments; Economic analysis of greenhouses and net houses; Visit to shadenet houses, greenhouses.

References:

Singh Brahma and Balraj Singh. 2014. Advances in protected cultivation, New India Publishing Company
Sharma P. 2007. Precision Farming. Daya Publishing House New Delhi.
Ramana Rao KV, Gangwar S, A Bajpai, Chourasia, L, Soni K 2016. Snrakshit Kheti ke Antargath Satat Phasal Prabandhan. Scientific Publishers, Jodhpur

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Credit Based Grading System

Agriculture Technology, VI-Semester

Elective II -AT- 6005 (3) 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, VI-Semester

Elective II -AT- 6005 (4) IPR (Intellectual Property Rights)

Course Objective

Acquaint the students with the basic concepts of Intellectual Property Rights; and sensitize the students with the emerging issues in IPR and the rationale for the protection of IPR.

UNIT I Introduction

Introduction and Justifications of IPR, Nature of IP, Major forms of IP- *Copyright, Patent, Trade Marks Designs, Geographic indication, layout design of Semi conductors, Plant varieties, Concept & Meaning of Intellectual Property.*

Major international documents relating to the protection of IP - *Berne Convention, Paris Convention, TRIPS.* The World Intellectual Property Organization (WIPO).

UNIT II Copyright

Meaning and historical development of copyright , Subject matter , Ownership of copyright, Term of copyright, Rights of owner, Economic Rights, Moral Rights. Assignment and licence of rights, Infringement of copyright, Exceptions of infringement, Remedies, *Civil, Criminal, Administrative*, Registration Procedure.

UNIT III Patents

Meaning and historical development,. Criteria for obtaining patents, Non patentable inventions, Procedure for registration, Term of patent, Rights of patentee, Compulsory licence, Revocation, Infringement of patents, Exceptions to infringement, Remedies, Patent office and Appellate Board.

UNIT IV – Trade Marks, Designs & GI

Trade Marks: Functions of marks, Procedure for registration, Rights of holder, Assignment and licensing of marks, Infringement, Trade Marks Registry and Appellate Board.

Designs: Meaning and evolution of design protection, Registration, Term of protection, Rights of holder, unregistered designs.

Geographical Indication: Meaning and evolution of GI, Difference between GI and Trade Marks, Registration, Rights, Authorised user.

UNIT V Contemporary Issues & Enforcement of IPR

IPR & sustainable development, The Impact of Internet on IPR. IPR Issues in biotechnology, E-Commerce and IPR issues, Licensing and enforcing IPR, Case studies in IPR

Course Outcome:

1. Students will be able to understand Primary forms of IPR

2. Students will be able to assess and critique some basic theoretical justification for major forms of IP Protection
3. Students will be able to compare and contrast the different forms of IPR in terms of key differences and similarities.
4. Students will be able to understand the registration procedures related to IPR.
5. Students will be exposed to contemporary issues and enforcement policies in IPR.

References:

1. P. Narayanan, Intellectual Property Law, Eastern Law House
2. . Neeraj Pandey and Khushdeep[Dharni, Intellectual Property Rights, PHI, 2014
3. N.S Gopalakrishnan and T.G. Agitha, Principles of Intellectual Property, Eastern Book Co. Lucknow, 2009.
4. Anand Padmanabhan, Enforcement of Intellectual Property, Lexis Nexis Butterworths, Nagpur, 2012.
5. Managing Intellectual Property The Strategic Imperative, Vinod V. Sople, PHI.
6. Prabuddha Ganguli, " Intellectual Property Rights" McGraw Hill Education, 2016.

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Agriculture Technology, VI-Semester

AT-6006 IC Engine Testing

Practical

Different types of IC Engines. Familiarization with IC Engine Components and Systems, Piston, cranking rod, cranking rod, valves, governors, flywheel, crankcase, different types of engine oil, firing interval, fuel storage and supply system, cooling system. Engine performance parameters. Constructional features and difference between 2-stroke and 4-stroke engines. Performance curves of engines. Test codes for engine testing. Engine testing as per BIS code. Test code for tractor engine testing, Drawbar performance in the lab; PTO test and measure the tractor power in the lab/field; Determining the turning space, turning radius and brake test, hydraulic pump performance test and air cleaner and noise measurement test; Visit to tractor testing centre/industry.

Learning Outcome:

Help the student to understand the systems of IC engine and factors affecting the performance of engine.

References:

Liljedahl J B & Others. Tractors and Their Power Units.
Raymond N, EA Yong and S Nicolas. Vehicle Traction Mechanics.
Maleev VL. Internal Combustion Engines.
Kirpal Singh. Automobile Engineering – Vol I and Vol II.
Richey C.B. Agricultural Engineering Handbook.
Mehta ML, SR Verma, SK Mishra, VK Sharma. Testing & Evaluation of Agricultural Machinery

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Credit Based Grading System

Agriculture Technology, VI-Semester

AT-6007 Creativity and Entrepreneurship Development

Course Objective:

- Understand and use tools for generating entrepreneurial ideas and problem solving.
- Understand and use tools for the selection of ideas.
- Understand and gain the skills that are needed to implement ideas in today's society
- Understand Entrepreneurship's part in process that includes idea generation and implementation.
- Understand the concept of Entrepreneurship and its place in today's society

Course Outcomes:

- Recognize an opportunity for a user group and frame an appropriate design challenge that addresses the need for the user.
- Practice observation, interview and empathy skills to evolve a thorough understanding of the needs of the user.
- Share and integrate team leanings.
- Generate, develop and describe creative ideas that address the design challenge.

Syllabus:

1. The concept of Entrepreneurship, its history and its place in society.
2. The concept of Entrepreneurship and its relation to concept of innovation.
3. Creative processes for idea generation and problem solving.
4. Business plan.
5. Role of creativity, innovation and business research.
6. Entrepreneurship opportunities in contemporary business environment.

Reference Books :

1. Dollinger M.J. "Entrepreneurship strategies and resources," 3rd edition Pearson Education New Delhi.
2. Panda, Shiba charan "Entrepreneurship development", Anmol publication New Delhi.
3. Richard Blundel & Nigel locket, "Exploring Entrepreneurship : practices & perspectives Oxford.
4. Charles E. Banford & Garry D. Bruton, "Entrepreneurship – A small business Approach, Mcgrawhill Education.
5. P. Narayana Reddy, "Entrepreneurship" : Text and cases, Cengage learning
6. Rajeev Roy, "Entrepreneurship" Oxford.