RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Technology, VIII-Semester

AT801- Farm Power sources & Tractor Systems

Unit – 1

Study of sources of farm power –conventional & non-conventional energy sources. Energy requirement for crop production. Energy equivalents for direct and indirect source of energy. IC engines. Review of thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle. Study of mechanical, thermal and volumetric efficiencies. Study of engine components their construction, operating principles and functions. Study of engine strokes and comparison of 2-stroke and 4-stroke engine cycles and CI and SI engines. Study of Engine Valve systems, valve mechanism, Valve timing diagram, and valve clearance adjustment, valve lift and valve opening area.

Unit - 2

Study of types of air cleaners and performance characteristics of various air cleaners. Study of fuel supply system. Study of fuels, properties of fuels, calculation of air-fuel ratio. Study of tests on fuel for IC engines. Study of detonation and knocking in IC engines. Study of carburetion system, carburetors and their main functional components. Study of fuel injection system – Injection pump, their types, working principles. Fuel injector nozzles – their types.

Unit - 3

Engine governing – need of governors, governor types and governor characteristics. Study of ignition system of SI and CI engines. Study of electrical system including battery, starting motor, battery charging, cut-out, etc. Comparison of dynamo and alternator. Engine cooling system – need, cooling methods and main functional components. Study of need and type of thermostat valves. Additives in the coolant. Study of radiator efficiency. Study of lubrication system: need, types, functional components. Study of lubricants: physical properties, additives and their application. Familiarization with the basics of engine testing with reference to BIS code.

Unit - 4

Introduction about tractor: History Classification of tractors, Study of power transmission system: clutch, gear box, differential unit and final drive mechanism. Familiarization with Steering System: Ackerman and hydraulic steering, Brake mechanism, Hydraulic control system and Hitching. Tractor power outlets: PTO, belt, pulley, drawbar, etc.

Unit – 5

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.

LIST OF EXPERIMENTS:

FARM POWER SOURCES AND TRACTOR SYSTEM

1. To study about working principle of biogas plant and solar power plant.

2. To study about various functional components of an IC engine and identification of its.

3. To study about thermodynamics cycle of an IC engine with PV and TS diagram.

4. To study of functional components of valve mechanism and valve timing diagram.

5. To study about working principle of an IC engine (two stroke and four stroke).

6. To study about types of materials used for manufacturing of engine components.

7. To study about air cleaning system in IC engine and types of air cleaners.

8. To study about fuel supply system and properties of fuels.

9. To study about Working principle of carburetor and its functional components.

10. To study about working principle of governing system of an IC engine.

11. To study about working principle of injector nozzle and their types.

12. To study about different lubrication system and properties of lubricants.

13. To study about different cooling system and thermostats valve, types of coolants.

14. To study about electrical system including battery, dynamo, and alternator of tractor.

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New Scheme Based On AICTE Flexible Curricula

Agriculture Technology, VIII-Semester

Departmental Elective AT- 802 (A) 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.

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Agriculture Technology, VIII-Semester

Departmental Elective AT- 802 (B) 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.

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Agriculture Technology, VIII-Semester

Departmental Elective AT- 802 (C) 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)

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New Scheme Based On AICTE Flexible Curricula

Agriculture Technology, VIII-Semester

Departmental Elective AT- 802 (D) Food Plant Equipment Design

Theory

Raw food materials, harvesting, handling and packaging of food materials. Unit operations in processing plants, plant layout and its evaluation. Salient features of processing plants for cereals, horticultural crops, poultry and meat products. Guidelines for design and cost analysis of processing plants.

Suggested Reading:

- Ahmed, T. 1997. Dairy Plant Engineering and Management. 4th Ed. Kitab Mahal.
- Chakraverty, A. and De, D.S. 1981. Post-harvest Technology of Cereals, Pulses and Oilseeds. Oxford & IBH.
- Gary, Krutz, Lester Thompson and Paul Clear. 1984. Design of Agricultural Machinery. John Wiley & Sons.
- Hall, C.W. and Davis, D.C. 1979. Processing Equipment for Agricultural Products. AVI Publ.
- Henderson, S. and Perry, S.M. 1976. Agricultural Process Engineering. 5th Ed. AVI Publ.
- Johnson, A.J. 1986. Process Control Instrumentation Technology. 2nd Ed. Wiley International & ELBS.
- Romeo T. Toledo. 1997. Fundamentals of Food Process Engineering. CBS.
- Slade, F.H. 1967. Food Processing Plant. Vol. I. Leonard Hill Books.
- Phirke, P.S. 2009. Processing and conveying equipment design. Jain Brothers.
- Chakraborty, S.K. 2013. Fundamental Food Engineering, Narosa Publishing House Pvt. Ltd., New Delhi, ISBN:978-81-8487-334-4.
- Sahay, K.M., and Singh, K.K. 1994. Unit operations of Agricultural Processing. Vikas publishing house Pvt. Ltd., New Delhi.

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New Scheme Based On AICTE Flexible Curricula

Agriculture Technology, VIII-Semester

Open Elective AT- 803 (A) 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.

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Agriculture Technology, VIII-Semester

Open Elective AT- 803 (B) Farm Machinery Management

Importance and objectives of farm mechanization in Indian Agriculture, its impact, strategies, myths and future needs. Estimation of operating cost of tractors and farm machinery. Management and performance of power, operator, Labour. Economic performance of machinery, field capacity, field efficiency and factors affecting field efficiency. Tractor power performance in terms of PTO, drawbar and fuel consumption. Power requirement problems to PTO, DBHP. Selection of farm machinery, size selection, timeliness of operation, optimum width and problem related to its power selection; selecting proper power level and problems related to it. Reliability of agricultural machinery. Replacement of farm machinery and inventory control of spare parts. Systems approach to farm machinery management and application of programming techniques to farm machinery selection and scheduling. Network Analysis: Transportation, CPM & PERT, Dynamic programming, Markov chain.

Suggested Readings

- Hunt, D, Farm Power and Machinery Management, Iowas State University Press, USA, 1979
- Kapoor V.K. Operation Research: Concepts, Problems and Solutions by Sultan Chand & sons-2012
- Culpin, C, Profitable farm mechanization, Lock Wood & Sons, London, 1996
- Singh, S. and Verma, S.R. Farm Machinery Maintenance and Management. DIPA, ICAR, KAB-I, New Delhi.
- Carveille, L.A. (1980). Selecting farm machinery. Louisiana Cooperative Extn. Services publication
- FAO (1980). Agricultural Engineering in develop: selection of mechanization inputs, FAO, Agri service Bulletin

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Agriculture Technology, VIII-Semester

Open Elective AT- 803 (C) Remote sensing & GIS application

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.

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Agriculture Technology, VIII-Semester

Open Elective AT- 803 (D) Estimating and costing of structures

Unit:- 1

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. 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:- 2

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. Rural living and development, rural roads, their construction cost and repair and maintenance.

Unit:-3

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

Unit:- 4

Building Materials: Rocks, Stones, Bricks Properties and varieties of Tiles, Lime, Cement, Concrete, Sand. Glass, Rubber, Plastics, iron, Steel, Aluminium, Copper, Nickle. Timber. Building components: Lintels, Arches, stair cases, Different types of floors, Finishing: Design procedures, Technology, building construction Design procedures, Technology, building construction, Types of agricultural buildings and related needs, application of design theory and practice to the conservation, sloped and flat roof buildings.

Unit:- 5

construction economics: Preliminary estimates, Detailed Estimates of Buildings source of cost information, use of cost analyses for controlling design, Factors affecting building costs; cost evaluation of design and planning alternatives for building and estate development, Measurement and pricing, Economic methods for evaluating investments in buildings and building systems: cost-in-use, benefit-to-costs and savings-toinvestment ratios, rate of return, net benefits, payback.