RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, V-Semester

AN601 Post-Harvest Management & Processing

Course Objectives: Describe the processing requirements and techniques suitable for different types of agricultural products.

Unit I: Food grains (other than rice, wheat, pulses, oilseeds) processing

Structure and composition of cereals, legumes and oil seeds. 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. Differ ent unit operations during milk handling and processing. Status and significance of traditional Indian m ilk 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.

Practicals:

1. Visit to wholesale grain mandi
2. Visit to Rice mill/ Dal mill/ Roller flour mill/ Oil mill/ Solvent extraction plant
3. Visit to fruit & vegetable wholesale market
4. Visit to milk collection center
5. Visit to milk processing plant
6. Visit to traditional milk product processing fa cility
7. Visit to abattoir / Fish market/ other commodity mandi

Course Outcomes:

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:

1. Ojha, T.P and Michael, A.M. Principles of Agricultural Engineering, Vol. I, Jain Brothers, Karol Bag, New Delhi.
2. Sahay, K.M. and Singh, K.K. Unit Operations of Agricultural Processing, Vikas publishing pvt . Ltd, Noida.
3. Chakraverty, A.2000.Third Edition, Post-harvest technology for Cereals, Pulses and oilseeds. Oxford &IBH publication Pvt Ltd, New Delhi
4. Pande, P.H. 1994. Principles of Agriculture Processing. Kalyani Publishers, Ludhiana
5. Sharma BD. 1999. Meat and Meat Products Technology: Including Poultry Products Technology. Jaypee Bros. Medical Publishers.
6. Varnam A & Jane P. 1994. Milk and Milk Products: Technology, Chemistry and Microbiology. Sutherland Springer Science & Business Media.
7. Sukumar De. 2001.Outlines of Dairy Technology. Oxford University Press
8. 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

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, V-Semester

AN602- Bio-Energy Systems: Design and Applications

Course Objectives: To provide in depth knowledge on basic principles of Bio-energy systems and to provide skills in design and operation of major bio-energy systems like, improved biomass stoves, biomass furnaces, biogas plants, biomass gasifiers etc. and related appliances

Unit I

Environmental aspects of bio-energy, assessment of greenhouse gas mitigation potential. Energy and biomass availability in Indian farms – Introduction to Bio energy - Biomass – Photosynthesis - Energetics of photosynthesis - Energy farms, energy plantation- Processing of biomass for energy production- Physical and chemical properties of biomass relevant in energy conversion- proximate and ultimate analysis-HHV and LHV- estimation of calorific value- Briquetting of biomass. Classification of bioenergy processes- Thermo-chemical and Bio-chemical energy conversion processes.

Unit II

An overview of anaerobic processes for energy production – Biomethanation process – Biogas plant design, operation, fault checking, maintenance. Biogas appliances, engines - Clean-up of biogas - Developments in anaerobic waste management - Design of commercial biogas plants., Principles of high rate biogas systems- Different types of high rate bio-reactors like UASB, Anaerobic filter, fluidised bed and hybrid bioreactors. Energy production from MSW and landfills.

Unit III

Use of vegetable oils as fuel - Bio-diesel - general principles of the technology- production and use. Alcohol for fuel purpose- production processes and technology. Hydrogen as fuel – Hydrogen production by bio-photolysis – Biogas Fuel cells.

Unit IV

Combustion, gasification and pyrolysis of biomass - Basic principles. Technology and equipment for biomass combustion- Chemistry of gasification- Different types of gasifiers– Thermal applications of producer gas- Use of producer gas in engines.

Practicals:

1. Study of biomass characteristics like TS, VS, Proximate analysis and their estimation
2. Design of biogas system for a dairy unit
3. Assessment of portable biogas plants
4. Estimation of efficiency of biogas stove
5. Study of biogas engine
6. Study of anaerobic waste water treatment systems
7. Study of operation parameters of anaerobic high rate bioreactor
8. Design of biomass gasifier
9. Study of biomass gasifier system used for energy production
10. Production procedure for biodiesel
11. Study and operation of a briquetting machine
12. Estimation of BOD of an organic waste water sample

Course Outcomes: Students understand the principles of Bio-energy systems and become skilled in design and operation of major bio-energy systems like, improved biomass stoves, biomass furnaces, etc.

Suggested References:

1. FAO 1983. Biomass Energy profiles. Food and Agrl. Organisation of the U.N. Rome.
2. FAO 1992. Biogas processes for sustainable development. Food and Agrl. Organisation of the U.N. Rome.
3. FAO 1997.Renewable biological systems for alternative sustainable energy production. Food and Agrl.Organisation of the U.N. Rome.
4. Chakraverty, A. 1989. Bio-technology and other alternative technologies for utilization of Biomass/Agrl. Wastes. Oxford & IBH Pub. Co. Pvt. Ltd., New Delhi.
5. Chawla, O.P. 1986. Advances in biogas Technology, IARI, New Delhi.
6. Mathur, A.N. and Rathore N.S. 1992. Biogas production, management and utilization. Himanshu Publication. Delhi.
7. Mital, K.M., 1996, Biogas systems; Principles and applications, New Age International (P) ltd. Publishers, New Delhi.
8. Rai G.D. 1989. Non-conventional Sources of energy. Khanna Publishers. Delhi.
9. Sims, Ralph. 2002. The Brilliance of Bioenergy - In Business and In Practice, James &James (SciencePublishers) Ltd., Euston.
10. Sims, Ralph. 2002.The Brilliance of Bioenergy - In Business and In Practice, James & James (Science Publishers) Ltd, EustonRai, G.D. 2013. Non-Conventional Energy Sources, Khanna Publishers, Delhi.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, V-Semester

Departmental Elective AN603 (A) Watershed Management

Watershed - introduction and characteristics. Watershed development - problems and prospects, investigation, topographical survey, soil characteristics, vegetative cover, present land use practic es and socio-economic factors. Watershed management - concept, objectives, factors affecting, watershed planning based on land capability classes, hydrologi c data for watershed planning, watershed codification, delineation and prioritization of watersheds – sediment yield index. Water budgeting in a watershed. Management measures - rainwater conservation technologies - in-situ and ex-situ storage, water harvesting and recycling. Dry farming techniques - inter-terrace and inter- bund land management. Integrated watershed management - concept, components, arable lands - agriculture and horticulture, non -arable lands - forestry, fishery and animal husbandry. Effec t of cropping systems, land management and cultural practices on watershed hydrology. Watershed programme - execution, follow-up practices, maintenance, monitoring and evaluation. Participatory watershed management - role of watershed associations, user gr oups and self-help groups. Planning and formulation of project proposal for watershed management programme including cost - benefit analysis.

References:

1. Ghanshyam Das. 2008. Hydrology and Soil Conservation Engineering: Including Watershed Management. 2nd Edition, Prentice-Hall of India Learning Pvt. Ltd., New Delhi.
2. Katyal, J.C., R.P. Singh, Shriniwas Sharma, S.K. Das, M.V. Padmanabhan and P.K. Mishra. 1995. Field Manual on Watershed Management. CRIDA, Hyderabad.
3. Mahnot, S.C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service. New Delhi.
4. Sharda, V.N., A.K. Sikka and G.P. Juyal. 2006. Participatory Integrated Watershed Management: A Field Manual. Central Soil and Water Conservation Resea rch and Training Institute, Dehradun.
5. Singh, G.D. and T.C. Poonia. 2003. Fundamentals of Watershed Management Technology. Yash Publishing House, Bikaner.
6. Singh, P.K. 2000. Watershed Management: Design and Practices. E -media Publications, Udaipur. Singh, R.V. 2000. Watershed Planning and Management. Yash Publishing House, Bikaner.
7. Tideman, E.M. 1999. Watershed Management: Guidelines for Indian Conditions. Omega Scientific Publishers, New Delhi

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, V-Semester

Departmental Elective AN 603 (B) Design and Maintenance of Greenhouse

Course Objective: The agricultural production must be increased to guarantee the food demand of the fast growing population. Students will get acquainted with greenhouse technology and the cultivation aspects which will help them to adopt the technology for increasing production.

Unit I

History and types of greenhouses; importance, function and features of green house; scope and development of green house technology. Location, Planning and various component of greenhouse; design criteria and calculation; constructional material and methods of construction; covering materials and its characteristics

Unit II

Solar heat transfer, steady state analysis of green house, Greenhouse heating, cooling, shedding and ventilation systems; Carbon Dioxide generation and monitoring and lighting systems, instrumentation & computerized environmental Control Systems.

Unit III

Green house irrigation system designs. Types of valves and accessories, fertilization, root substrata and its pasteurization, containers and benches, plant nutrition. Alternative cropping systems; plant tissue culture, chemical growth regulation;

Unit IV

Disease control; integrated pest management; postproduction quality and handling – Cost analysis of greenhouse production; Applications of green house & its repair & maintenance.

Course Outcome: Students understand the greenhouse technology and the cultivation aspects that help them to adopt the technology for increasing production.

References:

1. Manohar, K.R. and Iga Thinathane. C. Greenhouse technology and management. B.S.Publications, Hyderabad.
2. Nelson, P.V. Greenhouse operation and maintenance. Publisher: Prentice Hall, 2011. ISBN 10: 0132439360 ISBN 13: 9780132439367.
3. Prasad and Kumar. 2012. Greenhouse management for horticulture crops. Agrobios (India), Jodhpur
4. Salokhe, V.M. and Sharma, A.K. 2012.Greenhouse technology and applications. GeetaSomani Agrotech publishing Academy, Udaipur.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, V-Semester

Departmental Elective AN 603 (C) Refrigeration and Air Conditioning

Course Objectives: To impart the concept of the basic principles, working, scientific analysis and system components of different types of refrigeration and air conditioning systems.

Unit I

Laws of thermodynamics. Carnot cycle and reversed Carnot cycle. Principles of refrigeration, units, terminology, production of low temperatures, air refrigerators working on reverse Carnot cycle and Bell Coleman cycle. Vapour refrigeration-mechanism, P-V, P-S, P-H diagrams.

Unit II

Vapour compression cycles, dry and wet compression, super cooling and sub cooling. Types of refrigeration systems- Electrolux and steam jet refrigeration systems. Components of mechanical refrigerator. Study of compressors, condensers, expansion devices and evaporators. Vapour absorption refrigeration system.

Unit III

Methods of refrigeration. Common refrigerants and their properties. Design calculations for refrigeration system. Cold storage plants. Thermodynamic properties of moist air, perfect gas relationship for approximate calculation, adiabatic saturation process, wet bulb temperature and its measurement, psychometric chart and its use, elementary psychometric process.

Unit IV

Air conditioning – principles –Type and functions of air conditioning, physiological principles in air conditioning, air distribution and duct design methods, fundamentals of design of complete air conditioning systems – humidifiers and dehumidifiers – cooling load calculations, types of air conditioners – applications.

Course Outcomes: Students understand the concept of the basic principles, working and system components of various types of refrigeration and air conditioning systems and also have knowledge of various refrigerants, their properties, selection criteria and environmental aspects.

References:

1. Ballney P. L. 1994. Thermal Engineering. Khanna Publishers, New Delhi.
2. Khurmi R S. 1992. Engineering Thermodynamics. S Chand and Co. Ltd., Ram Nagar, New Delhi.
3. Kothandaraman C P Khajuria P R and Arora S C. 1992. A Course in Thermodynamics and Heat Engines. DhanpetRai and Sons, NaiSarak, New Delhi.
4. Mathur M L and Mehta F S. 1992. Thermodynamics and Heat Power Engineering. DhanpatRai and Sons,NaiSarak, New Delhi.
5. Nag P K.1995. Engineering Thermodynamics. Tata McGraw Hill Publishing Co.Ltd., 12/4 Asaf Ali Raod, New Delhi.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, V-Semester

Departmental Elective AN 603 (D) Soil & Water Conservation Engineering

Course Objective: Describe Soil and Water conservation processes including agronomical and engineering measures.

Unit I

Soil erosion - Introduction, causes and types - geological and accelerated erosion, agents, factors affecting and effects of erosion. Water erosion - Mechanics and forms - splash, sheet, rill, gully, ravine and stream bank erosion. Gullies - Classification, stages of development.

Unit II

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.

Unit III

Measurement of soil erosion - Runoff 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. Terraces - level and graded broad base terraces, bench terraces - planning, design and layout procedure, contour stonewall and trenching.

Unit IV

Gully and ravine reclamation - principles of gully control - vegetative measures, temporary structures and diversion drains. Grassed waterways and design.

Unit V

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.

Course Outcome: Students have knowledge about soil erosion and measurements, soil loss estimation, and conservation processes including agronomical and engineering measures.

References:

1. Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. 1996. Manual of Soil and Water Conservation Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Mahnot, S.C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service, New Delhi.
3. Mal, B.C. 2014. Introduction to Soil and Water Conservation Engineering. 2014. Kalyani Publishers.
4. Michael, A.M. and T.P. Ojha. 2003. Principles of Agricultural Engineering. Volume II. 4th Edition, Jain Brothers, New Delhi.
5. Murthy, V.V.N. 2002. Land and Water Management Engineering. 4th Edition, Kalyani Publishers, New Delhi.
6. Norman Hudson. 1985. Soil Conservation. Cornell University Press, Ithaka, New York, USA.
7. Frevert, R.K., G.O. Schwab, T.W. Edminster and K.K. Barnes. 2009. Soil and Water Conservation Engineering, 4th Edition, John Wiley and Sons, New York. Suresh, R. 2014. Soil and Water Conservation Engineering. Standard Publisher Distributors, New Delhi.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, V-Semester

Open Elective AN604 (A) Agriculture Structures

Course Objective: Describe requirements of different types of structures and their standards used at farm/ rural level.

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, P usa 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.

Course Outcome: Students understand the requirements of different types of structures used at farm/ rural level and have knowledge about their standards and available literature/ sources for design.

References:

1. Pandey, P.H. Principles and practices of Agricultural Structures and Environmental Control, Kalyani Publishers, Ludhiana.
2. Ojha, T.P and Michael, A.M. Principles of Agricultural Engineering, Vol. I, Jain Brothers, Karol Bag, New Delhi.
3. Nathonson, 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.
4. Garg, S.K. Water Supply Engineering, Khanna Publishers, New Delhi-6.
5. 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.
6. Sahay, K.M. and Singh, K.K. Unit Operations of Agricultural Processing, Vikas publishing pvt. Ltd, Noida.
7. Banerjee, G.C. A Text Book of Animal Husbandry, Oxford IBH Publishing Co, New Delhi.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, V-Semester

Open Elective AN604 (B) 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 Boar. 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: Students understand Primary forms of IPR, able to asses and critique some basic theoretical justification for major forms of IP Protection, compare and contrast the different forms of IPR in terms of key differences and similarities and understand the registration procedures related to 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.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, V-Semester

Open Elective AN604 (C) Photovoltaic Technology and Systems

Course Objective: To impart basic knowledge in Solar PV Technology, its effective use, commercial installation, components and improve the related problem solving skills.

Unit I

Solar PV Technology: Advantages, Limitations, Current Status of PV technology, SWOT analysis of PV technology. Types of Solar Cell, Wafer based Silicon Cell, Thin film amorphous silicon cell Thin Cadmium Telluride (CdTe) Cell, Copper Indium Gallium Selenide (CiGS) Cell, Thin film crystalline silicon solar cell.

Unit II

Solar Photo Voltaic Module: Solar cell, solar module, solar array, series & parallel connections of cell, mismatch in cell, fill factor, effect of solar radiation and temperature on power output of module, I-V and power curve of module.

Unit III

Balance of Solar PV system: Introduction to batteries, battery classification, lead acid battery, Nickel Cadmium battery, comparison of batteries, battery parameters, and Charge controller: types of charge controllers, function of charge controller, PWM type, MPPT type charge controller, Converters: DC to DC converter and DC to AC converter.

Unit IV

Application of Solar PV system. Solar home lighting system, solar lantern, solar fencing, solar street light, solar water pumping system, Roof top solar photovoltaic power plant and smart grid.

Course Outcome: Students have knowledge in Solar PV module, balance of solar PV system, its applications, use, commercial installation, and the related problem solving skills.

References:

1. Buresch, Mathew. 1983. Photo-voltaic energy systems : Design and Installation. McGraw-Hill Book Company, New York.
2. Derrick, Francis and Bokalders, Solar Photo-voltaic Products. Meinel & Meinel. Applied Solar Energy.
3. Rai GD. 1998. Non-conventional Sources of Energy. Khanna Pub.
4. Rathore N.S., Kurchania A.K., Panwar N.L. 2006. Renewable Energy: Theory & Practice, Himanshu Publications.
5. Solanki C.S. 2011. Solar Photovoltaic: Fundamentals, Technologies and Applications, PHI Learning Private Ltd.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, V-Semester

Open Elective AN604 (D) Instrumentation and Control System

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 limit ing. OP-AMP voltage regulators. 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 II

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

Unit III

Introduction to Control system: Terminology and classification of control system, examples of control system, mathematical modeling of mechanical and electrical systems, differential equations, transfer function, block diagram representation and reduction, signal flow graph techniques. Feedback characteristics of control systems Open loop and closed loop systems, effect of feedback on control system and on external disturbances, linearization effect of feedback, regenerative feedback

Unit IV

Time response analysis Standard test signals, time response of 1st order system, time response of 2nd order system, steady-state errors and error constants, effects of additions of poles and zeros to open loop and closed loop system. Time domain stability analysis Concept of stability of linear systems, effects of location of poles on stability, necessary conditions for stability, Routh-Hurwitz stability criteria, relative stability analysis, Root Locus concept, guidelines for sketching Root-Locus.

Unit V

Frequency response analysis Correlation between time and frequency response, Polar plots, Bode Plots, all-pass and minimum-phase systems, log-magnitude versus Phase-Plots, closed-loop frequency response. Frequency domain stability analysis : Nyquist stability criterion, assessment of relative stability using Nyquist plot and Bode plot (phase margin, gain margin and stability).

References:

1. Mehta V K. Principles of Electronics. S. Chand and Co., New Delhi.
2. Shaney A K. Measurement of Electronics and Electronic Instrumentation. Khanna Publications.
3. Roy Chowdary. Integrated Electronics. John Wiley International.
4. Kumar Anand. Digital Electronics. A. PHI.
5. Gupta Sanjeev, Sonthosh Gupta. Electronic Devices and Circuits. Danapath Rai Publications
6. Albert D. Helfrick, William David Cooper, "Modern electronic instrumentation and measurement techniques", TMH 2008.
7. Oliver Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
8. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Buterworth Heinmann), 2008.
9. David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI, New Delhi 2008.
10. H.S. Kalsi, "Electronics Instrumentation", TMH Ed. 2004
11. A.K.Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai.
12. MMS Anand, "Electronic Instruments & Instrumentation Technology", PHI Pvt .Ltd., New Delhi Ed.2005

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, V-Semester

AN605 Tractor and Farm Machinery Operation-II

Practicals:

Familiarization with different makes and models of agricultural tractors and Power Tillers. Identification of functional systems and controls of tractors. Safety rules and precautions. Maintenance and trouble shooting. Driving practice of tractor and Power tiller. Familiarization with tools for general and special maintenance.

1. Hitching & De-hitching of mounted type implement.
2. Hitching & De-hitching of trailed type implement.
3. Study of field patterns while operating a tillage implement.
4. Practice of operating tillage tool (mould-board plough/ disc plough) and their adjustment in the field.
5. Driving practice with a trail type trolley – forward and in reverse direction.
6. Care and maintenance procedure of agricultural machinery during operation and off-season.
7. Repair and maintenance of implements – adjustment of functional parameters in tillage implements.
8. Replacement of broken components in tillage implements.
9. Replacement of furrow openers and change of blades of rotavators.
10. Maintenance of cutter bar in a reaper.
11. Adjustments in a thresher for different crops.
12. Replacement of V-belts on implements.
13. Setting of agricultural machinery workshop.

References:

1. Ghosh, R. K., Swan, S. 1993. Practical Agricultural Engineering. Kolkata NayaPrakosh.
2. Jain, S. C., and Rai, C. R. 2013.Farm Tractor Maintenance and Repair. Standard Publishers Distributors., New Delhi.
3. Operators Manuals of Tractors.
4. Service manuals provided by manufacturers.
5. Surendra Singh, Verma, S. R. 2009. Farm Machinery Maintenance and Management. India Council of Agricultural Research, New Delhi.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, V-Semester

AN606 CAD Lab

Practicals:

1. Layout and sketching of different geometries
2. Drawing environment in AUTOCAD
3. Elements of drawing and draw commands
4. 3D functions in AUTOCAD
5. 2D: Figures for practice using AutoCAD
6. ISOMETRIC drawing for practice using AutoCAD
7. 3-D solid figures using AUTOCAD
8. Introduction to CREO 3.0
9. Learning different Operations like Threading, Sweep, Swept-blend.
10. Modeling & Assembling

References:

1. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishers.
2. Beginning AutoCAD 2019 Exercise Workbook by Cheryl R. Shrock, Steve Heather.
3. CAD Exercises by Sachidanand Jha.