

Workshop Technology and Practice**2 (0+2)****Objective**

To expose the students to basic manufacturing processes involved for production of different machine elements and to facilitate hands-on experience of using these machines.

Practical

Introduction about different shops in the workshop; Safety and precautions to be taken in the workshop; Study of different tools used for fitting and different fitting operations; Study of various measuring instruments used for fitting; Exercise in fitting: sawing, filing and right angle fitting of MS flat; Working with complex fitting jobs: operations of drilling, reaming, and threading and with tap dies; Preparation of a paper weight; Study of various carpentry tools, types of wood and their characteristics and working with carpentry tools; Preparation of simple joints in carpentry: cross half lap joint or T-half joint, Mortise and Tenon joint in carpentry; Preparation of dovetail joint in carpentry; Study of welding, types of welding, oxyacetylene gas welding, types of flames, welding techniques and equipment used for gas welding, working with welding equipment; Working with electric arc welding; Equipment and tools, safety and precautions taken in arc welding; Preparation of Butt joint and lap joint with ARC welding; Preparation of Lap and butt joints using gas welding; Working on a lathe machine and study of different tools used in lathe machine; Exercise on simple turning, step turning in lathe machine; Preparation of job on taper turning, drilling, knurling and threading in lathe machine; Working with different machines in machine shop such as shaper, milling machine, etc. and with different tools used in machine shop; Exercise on bending, shaping etc.; Exercise on Drawing, Punching, Riveting; Making different types of sheet metal joints using G.I. sheets; Practice job on shaper; changing a round MS rod into square section with a shaper; Exercise on a milling machine such as making a slot, gear tooth forming and indexing

Suggested Readings

1. Chapman W A J. 2018. *Workshop Technology* (Vol. I and II). Arnold Publishers (India) Pvt. Ltd., AB/9, Safdarjung Enclave, New Delhi.
2. Hajra Choudhury S K, Roy N, Hajra Choudhury A K. 2017. *Elements of Workshop Technology* (Vol. I and II). Media Promoters and Publishers Pvt. Ltd, Mumbai.
3. Khurmi R S and Gupta J K. 2018. *A Text Book of Workshop Technology*. S. Chand & Company Ltd, New Delhi.
4. Raghuwansi B S. 2016. *A Course in Workshop Technology* (Vol. I and II). Dhanpat Rai and Sons, 1682, Nai Sarak, New Delhi.

Basic Electrical Gadgets and Instruments**3 (2+1)****Objective**

To enable the students to take up repair and maintenance of different common electrical gadgets and instruments.

Theory

Introduction to different electrical appliances used in agricultural buildings, structures and farm .0operations; Difference between AC and DC supply system; Introduction to AC fundamentals; AC

through series RL, RC, and RLC circuits, parallel AC circuit, series and parallel resonance; Q-factor and bandwidth.

Three- phase AC circuit: Concept of balanced three-phase AC circuits, line and phase quantity in star and delta network, power in three-phase circuit, various methods of three phase power measurement like (one wattmeter and two –wattmeter method).

Diode and its applications: Rectifier, Clipper, Clamper, voltage multiplier and capacitive filter zener diode as voltage regulator.

Transistor and its applications: Bipolar junction transistor, operating point. Various biasing methods, fixed, self biasing and potential divider biasing method; OP-AMP, Ideal OP-AMP characteristics, Linear and non-linear applications of OP-AMP (adder, subtractor, integrator, active rectifier, comparator).

Introduction to digital electronics and logic gates: Basic theorem of boolean algebra, combinational logic circuits (basic gates, SOP rule and K-map), binary adder.

Principles of general instruments, measurement of displacement, temperature, velocity, force and pressure using different instruments like strain gauges, load cell, thermistors, thermocouples, pyrometer, linear variable differential transformer (LVDT), capacitive transducers, RTD, instruments for measurement of speed, wind velocity, solar radiation, anemometer, multimeter, etc.

Practical

Basic Electrical and Electronics Gadgets

To prepare an electrical switch board to control two light points, one plug point, one fan point and fuse (House wiring); To prepare an electrical switch board to control two light points using two two-way switch (staircase wiring); To connect and test a fluorescent lamp; To find faults and repair home appliances such as heater, electric iron, fans and mixer-grinder, etc.; To find faults and repair UPS; To measure the power requirement and power factor in a AC single phase series RLC circuit; To measure energy of a single phase AC circuit with the help of ammeter, voltmeter and power factor meter and energy meter; To measure the power consumption in a three-phase circuit using two-wattmeter method.

Instrumentation

To prepare a DC power supply unit using diode and filter circuit; To study the Zener diode as voltage regulator circuit; To study transistor characteristics in CE configurations; To verify different logic gates; To measure unknown resistance using Wheatstone bridge; To measure the displacement and to determine the characteristics of LVDT; To measure the displacement using LVDT and potentiometer; To measure the pressure using strain gauge and Bourdentube; To measure the temperature using RTD, thermistors and thermocouple and study their characteristics; To measure the speed, wind velocity, solar radiation etc, using different measuring tools like tachometer, anemometer, pyranometer, multimeter, etc.; To acquaint with different other types of instruments used in agriculture and food processing applications.

Suggested Readings

1. Boylestad R L and Nashelsky L N. 2011. *Electronic Device and Circuit Theory*. Pearson.

2. Ghosh S. 2007. *Fundamentals of Electrical and Electronics Engineering*. Second edition. PHI Learning, New Delhi.
3. Metha V K and Metha R. 2012. *Basic Electrical Engineering*. Fifth edition. S Chand & Co., New Delhi.
4. Metha V K and Metha R. 2012. *Principle of Electronics*. Fifth edition. S Chand & Co., New Delhi.
5. Rajput R K. 2007. *Basic Electrical and Electronics Engineering*. Laxmi Publications, New Delhi.
6. Theraja B L and Theraja A K. 2005. *A Text Book of Electrical Technology*. Vol. I & II. S Chand & Co., New Delhi.

Agricultural Informatics and Artificial Intelligence

3 (2+1)

Objective

To acquaint students with the basics of computer applications in agriculture, multimedia, database management, application of mobile app and decision- making processes, etc.

To provide basic knowledge of computer with applications in Agriculture and to make the students familiar with Agricultural-Informatics, its components and applications in agriculture

Theory

Introduction to Computers, Anatomy of Computers, Memory Concepts, Units of Memory, Operating System: Definition and types, Applications of MS-Office for creating, Editing and Formatting a document, Data presentation, Tabulation and graph creation, Statistical analysis, Mathematical expressions, Database, concepts and types, creating database, Uses of DBMS in Agriculture, Internet and World Wide Web (www): Concepts and components.

Computer programming: General concepts, Introduction to Visual Basic, Java, Fortran, C/C++, etc. concepts and standard input/output operations.

e-Agriculture, Concepts, design and development; Application of innovative ways to use information and communication technologies (IT) in Agriculture; Computer Models in Agriculture: Statistical, weather analysis and crop simulation models, concepts, structure, inputs-outputs files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation; IT applications for computation of water and nutrient requirement of crops; Computer-controlled devices (automated systems) for Agri-input management; Smartphone mobile apps in agriculture for farm advice: Market price, postharvest management etc.; Geospatial technology: Concepts, techniques, components and uses for generating valuable agri-information; Decision support systems: Concepts components and applications in agriculture; Agriculture Expert System; Soil Information Systems etc. for supporting farm decisions. Preparation of contingent crop-planning and crop calendars using IT tools; Digital India and schemes to promote digitalization of agriculture in India.

Introduction to artificial intelligence, background and applications, Turing test. Control strategies, Breadth-first search, Depth-first search; Heuristics search techniques: Best-first search, A* algorithm, IoT and Big Data; Use of AI in agriculture for autonomous crop management, and health, monitoring livestock health, intelligent pesticide application, yield mapping and predictive analysis,