

6. Sivanappan, R. K. 1992. *Sprinkler Irrigation*. Oxford & IBH Publishing House, New Delhi.
7. Suresh, R. 2010. *Micro Irrigation - Theory and Practices*. Standard Publishers Distributors, Delhi.

Machine Design

2 (2+0)

Objective

To make the students acquainted with design considerations for various machine components so as to enable them to take up the work of new design

Theory

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; Design of shafts under torsion and combined bending and torsion; Design of keys; Design of muff, sleeve, and rigid flange couplings; Cotter joints, design of socket and spigot cotter joint; knuckle joint; Design of welded subjected to static loads; Design of helical and leaf springs; Design of threaded fasteners subjected to direct static loads, bolted joints loaded in shear and bolted joints subjected to eccentric loading; Design of flat belt and V-belt drives and pulleys; Design of gears; Selection of anti-friction bearings.

Suggested Readings

1. Bhandari, V. B. 2007. *Introduction to Machine Design*. Tata Mc. Graw Hill Publishing House, New Delhi.
2. Jain, R. K. 2013. *Machine Design*. Khanna Publishers, 2-B Nath Market, Nai Sarak, New Delhi.
3. Khurmi, R. S. and Gupta, J. K. 2014. *A Text Book of Machine Design*. S. Chand & Company Ltd., New Delhi.
4. Sharma, P. C. and Agarwal, D. K. 2010. *Machine Design*. S. K. Kataria & Sons, New Delhi.

Electrical Machines

3 (2+1)

Objective

1. To make the students acquainted with operating principles of various electrical motors and other machines
2. To help them gain practical exposure of different electrical devices and their controls

Theory

Introduction to electrical machines; Basic principles of operation of electrical machines used in agricultural engineering such as DC generator, DC motor, 1-phase induction motor, 3-phase induction motor, and BLDC motor; Magnetic circuit: concept of magnetic flux production, magneto motive force, reluctance, laws of magnetic circuits, determination of ampere-turns for series and parallel magnetic circuits, hysteresis and eddy current losses.

Transformer: principle of working, construction of single phase transformer, EMF equation, phasor diagram on load/ load, leakage reactance, voltage regulation, power and energy efficiency, open circuit and short circuit tests; D.C. machines: principles operation and performance of DC