Higher order differential equations: Methods of finding complementary functions and particular integrals, methods of variation of parameters, Cauchy's and Legendre's linear equations, simultaneous linear differential equations with constant coefficients.

Differential calculus: Functions of two or more variables, Taylor's and Maclaurin's expansions, Maxima and minima.

Partial differential equations: Partial derivative and total derivative, homogeneous functions and Euler's theorem. Formation of PDE, higher order linear PDE with constant coefficients, solution of non-linear PDE, Charpit's method.

Integral calculus: Double integrals, change of order of integration, triple integrals, application of double and triple integrals to find area and volume.

Matrices: Elementary transformations, Gauss elimination, Gauss-Jordan method to find the inverse of a matrix. rank of a matrix, solution of linear equations, Eigen values and Eigen vectors, Cayley-Hamilton Theorem- its use to find inverse of the matrix, linear transformation, diagonalization of matrices.

Suggested Readings

1. Grewal, B. S. 2004. *Higher Engineering Mathematics*. Khanna Publishers Delhi.
2. Narayan, S. 2004. *A Text Book of Vector*. S. Chand and Co. Ltd. New Delhi.
3. Narayan, S. 2004. *Differential Calculus*. S. Chand and Co. Ltd. New Delhi.
4. Narayan, S. 2004. *Integral Calculus*. S. Chand and Co. Ltd. New Delhi.

Engineering Physics   3 (2+1)

Objective

To make the students acquainted with applications of physics in engineering and different physical processes in agricultural engineering

Theory

Magnetism: Dia, para and ferro-magnetism- classification; Langrevin theory of dia, and para magnetism, adiabatic demagnetization, Weiss molecular field theory; Introduction to quantum mechanics: wave particles duality, deBroglie concept uncertainty principle, time dependent and time independent Schrodinger equation.

Spectroscopy: Qualitative explanation of Zeeman effect, Stark effect and Paschen back effect, Raman spectroscopy; Solid state physics: statement of Bloch function, bands in solids, effective mass, distinction between metals, insulators and semi-conductors.

Semiconductors: Intrinsic and extrinsic semi-conductors, law of mass action, determination of energy gap in semi-conductors, donors and acceptor levels; Superconductivity: super conductivity, critical magnetic field, Meissner effect, isotope effect, Type I and II superconductors, Josephsons effect, DC and AC squids, introduction to high T_c superconductors.

LASERS and MASERS: Spontaneous and stimulated emission, Einstein A and B coefficients, population inversion, He, Ne and Ruby lasers, Ammonia and Ruby masers; Holography and optical

fibre: optical fibre- physical structure, basic theory, type of modes, characteristics of optical fibre and applications; Illumination: laws of illumination, luminous flux, luminous intensity, candle power, brightness.

Practical

To verify law of transverse vibrations along a string using electrical tuning fork; To determine e/m of electron using magnetron valve method; Determine dielectric constant of material using De Sautys bridge; Study the variation of magnetic field with distance along the axis of a current carrying circular coil and to determine the radius of the coil; Determine the energy band gap in a semi-conductor using a p-n junction diode; Study the LCR circuit; Find the wave length of light by using prism and spectrometer; Determine the low resistance using Carey Foster bridge without calibrating the bridge wire.

Suggested Readings

1. Avadhanulu, M. N. 2013. *An Introduction to Lasers theory and applications*. S. Chand Publication.

2. Chattopadhyay, D. and Rakshit, P. C. 2011. *Electricity and Magnetism*. S. Chand Publication.

3. Ghatak, A. K. and Lokanathan, S. 2022. *Quantum Mechanics*, *Theory and Application*. Trinity Press.

4. Griffiths, D. J. and Schroeter. 2018. *Introduction to Quantum Mechanics*. Cambridge University Press.

5. Khandelwal, D. P. 1985. *A Laboratory Manual of Physics*. Vani Publications.

6. Kittel, C. 2005. *Introduction to Solid State Physics*. Wiley Eastern Pvt. Ltd.

7. Laud, B. B. 2011. *Lasers and Non-linear Optics*. New Age International Publishers.

8. Mani, H. S. and Mehta, G. K. 2022. *Modern Physics*. Affiliated East-West Press.

9. Omar, M. A. 2002. *Elementary Solid State Physics*. Pearson.

10. Prakash, S. 2011. Optics. *Pragati Prakashan*, Meerut.

11. Saraf, B. and Khandelwal, D. P. 1982. *Physics through Experiments.* Vol. I & II. Vikas Publication, New Delhi.

12. Subramanyam, N., Lal, B. and Avadhanulu, M. N. 2012. *A Textbook of Optics*. S. Chand.

13. White, H. E. 2019. *Introduction to Atomic Spectra*. Mc-Graw Hill Publication.

14. Worsnop, B. L. and Flint, H. C. 1951. *Advanced Practical Physics*. Littlehampton Book Services Ltd.

Engineering Chemistry   3 (2+1)Objective

To make the students acquainted with applications of chemistry in engineering and different chemical processes in agricultural and food engineering

Theory

Phase rule: Phase, component, degree of freedom, application to one component system, viz. water system, sulphur system, two component system, viz. pb-Ag system, desilverisation of Pb.