DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE-6)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
CONDUCTING POLYMERS	4	2	0	2	Class 12th with Physics, Chemistry	---

Learning objectives

The Learning Objectives of this course are as follows:

- To impart knowledge of structure and electrical properties of conducting polymers.
- To learn about applications of conducting polymers.

Learning outcomes

The Learning Outcomes of this course are as follows:

After studying this paper, students will be able to

- Perform the synthesis and doping in conducting polymers.
- Analyze and demonstrate the properties of conducting polymers

SYLLABUS OF DSE-6

THEORY COMPONENT-

UNIT 1 (8 Hours)

BASIC ASPECTS OF CONDUCTING POLYMERS

Historical background, band structure, band alignment, conduction mechanism, theory of electrical conduction in conducting polymers

UNIT 2 (10 Hours)

SYNTHESIS OF CONDUCTING POLYMERS

Chemical, electrochemical and mechanical synthesis of polyaniline, polypyrrole, polythiophene. Doping and its effects on properties of conducting polymers

UNIT 3 (12 Hours)

PROPERTIES & APPLICATIONS OF CONDUCTING POLYMERS

Electrical properties, resistance, impedance, capacitance, magnetic properties and optical properties of different conducting polymers. Applications of conducting polymers in electronic devices, sensors, rechargeable batteries, solar cells, light emitting devices, biomedical devices, organ transplant, artificial mussels and EMI shielding etc.

PRACTICAL COMPONENT (60 Hours)

- Synthesis of polyaniline, polypyrrole and polythiophene by chemical polymerizations.
- Synthesis of conducting polymers by electro chemical polymerizations.
- To improve electrical conductivity of PANI by chemical doping.
- Evaluation of mechanical properties of conducting polymer films/sheets.
- Determination of the thermal properties of conducting polymers.
- To prepare a molded sheet of conducting polymers.
- To manufacture molded conducting device
- To study the effect of doping of Polypyrrole
- To measure the electrical conductivity and resistivity of conducting polymer films/sheets.
- To design and demonstrate the conducting polymer based devices i.e light emitting devices, chemical sensor and solar cell.

ESSENTIAL/RECOMMENDED READINGS

- Chandrasekhar P., (1999) Conducting Polymers, fundamentals and applications: A practical approach, Springer.
- Nalwa H.S., (1997) Handbook of Organic Conductive Molecules and Polymers: Conductive polymers: synthesis and electrical properties, Vol. 2, Wiley.
- Skotheim T.A., Elsenbaumer R.L., Reynolds J.R., (2007) Handbook of Conducting Polymers, CRC Press.
- Batrinescu, G., Constantin, L. A., Cuciureanu, A., & Constantin, M. A. (2016). Conductive polymer-based membranes. Conducting Polymers.
- Fernandez O.T., (2015) Conducting Polymers, Royal Society of Chemistry.

- Almeida L.C., (2013) Conducting Polymers: Synthesis, Properties & Applications, Nova Publishers.
- Gupta, R. K. (Ed.). (2022). Conducting Polymers: Chemistries, Properties and Biomedical Applications. CRC Press.

SUGGESTIVE READINGS

- Dyson, R. W., (1982) Speciality polymers Chapman and Hall publications.
- Brydson J.A., (2016) Plastics Materials, Butterworth Heinemann, 8th Edition.
- Sołoducho, J., & Cabaj, J. (2016). Conducting polymers in sensor design. Conducting Polymers. Rijeka: Intech, 27-48.
- Otero, T. F. (2016). Conducting Polymers: Bioinspired Intelligent Materials and Devices. Royal Society of Chemistry.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.