Course Type	Course Code	Name of Course		Т	Р	Credit
DE	NCYD507	Bio-inorganic Chemistry		0	0	3

## **Course Objective**

• The course is intended to impart knowledge and understanding about the role of various metal ions in biology, either as part of enzymes or as a participant in various biological processes. They provide information about the structure and mechanistic aspect of various metallo-enzymes.

## **Learning Outcomes**

- At the end of the course students should be able to-
- Develop understanding about how metal ions are transported and stored in biological systems
- Explain how the active site structure of the enzyme and protein folding influence the activity of the enzymes
- Develop understanding about the interaction of metal with proteins/nucleic acids and their implication in biological processes.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Essential and trace elements in biological processes, Metal Storage and Transport: Ferritin, transferrin, and siderophores, ionophores. Biological role of alkali and alkaline earth metal ions, transport and regulation, cellular transport of Fe, Ca, Na and K, ionophores and ions channels, molecular aspects of intracellular processes. Metalloenzymes, Iron enzymes, Mn, Ni, Zn and Cu containing Enzymes, SODs, Molybdenum/Tungsten containing enzymes, Coenzyme vitamin B <sub>12</sub> , Zinc in transcription and regulation.	18L	Develop understanding about the various methods and process for transport and storage of metal ions such as iron in biological systems Learns the role of alkaline and alkaline earth metals, their transport and regulation. Develop understanding about various aspects of metalloenzymes Understand role of zinc in transcription and regulation
2	Photosynthesis, Oxygen Evolution Complex (OEC), Oxygen Binding and transport: Biological Dioxygen carriers: Hemoglobin, hemerythrin, hemocyanin, allosteric regulation, artificial dioxygen carriers, metallo-porphyrins, Electron- transfer proteins, long distance electron transfer.	12L	DevelopunderstandingaboutPhotosynthesis and OEC.Acquire knowledge about various biologicaldioxygen carriers.Develop understanding about the chemistryof dioxygen binding and transport bydioxygen carriers.Able to design synthetic models ofdioxygen carriers.
3	Metal-Nucleic Acid Interactions: Metals in Medicine, Metal deficiency and disease, toxic effects of metals, metals used for diagnosis and chemotherapy with particular reference to anticancer drugs	12L	Acquire knowledge about various metal excess and metal deficient diseases Develop understanding about metal and nucleic acid interactions

			Learns various metal used in diagnosis and therapeutics
Total		42	

**Text Books:** 

- Bioinorganic chemistry: Ivano Bertini, Harry B. Gray, Stephen J. Lippard, Joan Silverstone Valentine, University Science Books, 1994.
- S. J. Lippard, J. M. Berg, Principles of Bioinorganic Chemistry. 1st Ed, University Science Books, California, 1994

## **Reference Books:**

- 1. Bioinorganic Chemistry: A Survey, Ei-Ichiro Ochiai, academic press, 2008.
- 2. Bio-inorganic Chemistry: A short course, Rossette M. Roat –Malone, 2nd edition, Wiley, NY, 2007.