Gautam Buddha University; Greater Noida

School of Engineering (Mechanical Engineering)

Degree	**Course Name**	**Course Code**	**Marks:100**
M. Tech. in Thermal Engg.	Cryogenic Technology	MET 515	SM+MT+ET 25+25+50
Semester	**Credits**	**L-T-P**	**Exam.**
I	3	3-0-0	3 Hours

Unit - I

Introduction to Cryogenic System: Introduction; Historical development; Mechanical properties; Thermal properties; Electric and magnetic properties; Properties of cryogenic fluids. **(06 Hours)**

Unit - II

Gas Liquefaction: Minimum work for liquefaction; Methods to produce low temperature; Liquefaction systems for neon, hydrogen and helium; Liquefaction of other gases like oxygen, nitrogen, argon, methane etc. **(06 Hours)**

Unit - III

Components of Liquefaction Systems: Heat Exchangers: Tubular; Giauque Hampson; Plate fin; Perforated plate; Compressors and Expanders; Expansion valve; Losses for real machines. **(08 Hours)**

Unit - IV

Gas Separation and Purification System: Properties of mixtures; Principles of mixtures; Principles of gas separation; Air separation systems; Cryogenic Refrigeration system; working media: Solids; Liquids and gases. **(08 Hours)**

Unit - V

Cryogenic Fluid Storage & Transfer: Cryogenic storage systems; Storage Vessel; Insulation Fluid transfer mechanics; Cryostat; Cryo-Coolers; Transportation and transfer of Cryogenic Fluids; Mechanical design of vessels; Safety and storage. **(09 Hours)**

Unit - VI

Applications: Space technology, Cryogenics propellants for rocket propulsions; Flight air separation and collection of LOX; Gas industry; Biology; Medicine; Electronics. **(08 Hours)**

Recommended Books:

1. Cryogenic Heat Transfer; Randall F. Barron; Gregory Nellis; John M. Pfotenhauer; Taylor and Francis; 1st Edition; 1999.
2. Fundamentals of Cryogenic Engineering; Mamata Mukhopadhyay; Prentice Hall India; 1st edition; 2010.
3. Cryogenic Engineering; Thomas M. Flynn; Taylor & Francis; 2nd Edition; 2005.
4. Cryogenic Engineering; B. A. Hands; Academic Press; 1st Edition; 1986.
5. Handbook of Cryogenic Engineering; J. G. Weisend; Taylor & Francis Group; 1st Edition; 1998.