

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Mechanical Engineering (Cryogenic Engineering)

Subject Name ELEMENTS OF CRYOGENIC ENGINEERING

Sr.No	Course content
1.	Introduction: Meaning & definition of cryogenics, Importance of cryogenics studies, properties of engineering materials at cryogenic temperatures, mechanical properties ,thermal properties, electric & magnetic properties, super conducting materials ,thermo electric materials, composite materials, properties of cryogenic fluids, super fluidity of He 3 &He4.
2.	Cryogenic Measurement systems: Temperature measurements, pressure measurements, flow measurements, liquid level measurements, fluid quality measurements.
3.	Importance of Cryogenic insulations: -Various factors for selection of insulations, various types such as expanded foams, gas filled& fibrous insulation, vacuum insulation, evacuated powder& fibrous insulation, opacified powder insulation, multi layer insulation, comparison of performance of various insulations.
4.	Salient Applications of cryogenic systems: Super conductive devices such as bearings, motors, cryotrons, magnets, space technology, space simulation chamber, cryogenics in biology and medicine, food preservation and industrial applications, nuclear propulsions ,chemical propulsions.
5.	Hazards:-Physical hazards, Chemical hazards, Physiological hazards,
6.	Combustion hazards, oxygen hazards, , accidents in cryogenic plants & prevention
7.	Safety in handling of cryogens, care for storage of gaseous cylinders, familiarization with regulations of department of explosives.

List of Experiments:

1. Study of cryogenic properties of hydrogen and helium.
2. Study of low temperature measurement instrument.
3. Study of flow measurement and quality measurement instrument.
4. Study of liquid level measurement.
5. Study of insulation used in cryogenic equipment.
6. Study of cryogenic application (superconductivity)
7. Study of cryogenic application in space technology.
8. Study of cryogenic application in bio medical and food preservation
9. Study of safety while handling fluid.
10. To find the thermal conductivity of powder insulation by boil off calorimeter method.

Reference Books:

1. Cryogenic systems-Baron, McGraw-Hill book
2. Cryogenic fundamentals-Haselden, Academic press New York
3. Cryogenic technology –Vance
4. Advance cryogenic –bailey, plenum press
5. Cryogenic engineering -Scott
6. Cryogenic Engineering & Gas Applications – By Dr. P.K.Bose.