SUBJECT NO-IM60045, SUBJECT NAME- ENGINEERING SYSTEMS SAFETY DESIGN AND CONTROL

LTP- 3-1-0,CRD- 4

SYLLABUS :-

Introduction: Key concepts and terminologies: Engineering systems safety and management, system safety, accident prevention, loss control, risk assessment, energy control model, hazard control hierarchy; Know your worksystem: Identify the elements of a worksystem, divide the worksystem into sub-systems, sub-sub-systems to component levels based on hardware approach and functional approach. Represent a worksystem through process flow diagram and P & I diagram; Possible safety issues in process plants, repetitive manufacturing, and job shops; Safety issues in material handling, machine tools, and operations.

Safety mathematics: Basic probability and statistics, Boolean algebra, probability distributions, reliability tools – FTA, ETA, decision making tools – AHP and PROMETHE, Monte Carlo Simulation, Bayesian decision models, numerical problems, and case examples.

Hazard Analysis: HAZAN, HAZOP, PHA, FMEA, and Root cause analysis, numerical problems, and case examples.

Risk assessment: Qualitative and quantitative risk, risk assessment process, loss calculation, probabilistic risk assessment (PRA), uncertainty modeling in risk assessment, numerical problems, and case examples.

Safety function deployment: Link to quality, QFD, design for safety, prevention through design, Haddon's energy model, and integrated approach for safety functions deployment (SFD), numerical problems, and case examples.

Standards, rules and regulations for safety: OSHAS 18001, industrial safety rules and regulations in India.

Books

- **Industrial Accident Prevention, Heinrich et al., McGraw Hill, 1980 (text).**
- **Safety management techniques, Petersen, 2003 (text).**
- **Probabilistic Risk Assessment for Engineering and Scientists, Komamoto and Henby, 1995 (text).**
- **Lee's Loss Prevention in the Process Industries, Sam Mannan, Elsevier, 2005 (text).**
- **Productive Safety Management, Tania Mol, Butterworth Heinemann, 2003.**
- **Human Error, James Reason, Cambridge University Press, 2007.**
- **Normal Accidents, Charles Perrow, Princeton University Press, 1999.**
- **Managing Risk and Reliability of Process Plants, Mark Tweeddale, Gulf Professional Publishing, Singapore, 2003.**