Course Type	Course Code	Course Name	L	T	P	C
DC3	NMNC 503	Risk and workplace safety management	3	1	0	4

Course Objectives: The course is aimed at comprehensive understanding of philosophy of risk-based safety management at workplace. Essentially, nature of safety at workplace is more or less similar for different workplace including mining. Hence, the course is designed to cover the general aspects of risk-based safety management system and also different elements of SMP to give an overall idea about the process of safety management at workplace including accident investigation, emergency response system and safety audit.

Learning outcomes: Students will learn the latest and modern concept of risk-based safety management has been incorporated in the syllabus with focus on accident prevention, which is the primary requirement of any workplace. Systematic and risk-based emergency preparedness and response plan is also very critical for rescue and recovery after an accident or disasters. The curriculum will provide the entire spectrum of workplace safety management to build confidence in the students to handle safety issues at workplace efficiently. This course has covered new aspects such as accident investigation, emergency response plan, safety audit and impact of working conditions and ergonomics in workplace safety.

UNITS	Topics	Lecture Hours +Tutorials	Learning Outcomes
UNIT-1	**Occupational Health and Ergonomic Hazards:** Occupational health hazards – Dust, Noise, Diesel exhaust and Diesel Particulate Matter; Notified and occupational diseases; Ergonomics and its impact on health and safety at workplace Risk Management related terms and definitions; Basic concept of risk; Difference between hazards and risks; Need for risk based workplace safety management.	(4L + 1T)	Students will get an overview of different types of occupational hazards and understand the need for self-regulatory concept for safety management at workplace.
UNIT-2	**Risk Analysis Methods:** Hazard and Operative (HAZOP) Analysis; Failure Mode and Effect Analysis (FMEA); Failure Mode Effect and Critical Analysis (FMECA); Job Safety Analysis (JSA); Fault Tree Analysis (FTA); Bow Tie Analysis, Workplace Risk Assessment and Control process	(3L + 1T)	Students will learn about different methods of risk assessment
UNIT-3	**Risk Management:** Risk management objectives, Risk Management Principles, Probability, Exposure, Likelihood and Consequence of hazards, Qualitative, Quantitative and Semi-quantitative risk assessment techniques, Risk Management Options, Risk Control methods, Hierarchy of Controls	(7L + 1T)	Students will be able to identify workplace hazards, carryout risk assessment and identify appropriate controls against identified hazards
UNIT-4	**Workplace Safety Management:** Duty of Care, Due Diligence, Workplace Safety and Health Management System (SHMS) or Safety Management Plan (SMP), Features of risk-based SHMS / SMP, Elements of SHMS / SMP	(6L + 2T)	Students will get an idea how to develop safety management plan based on risk assessment of workplace hazards
UNIT-5	**System Safety Engineering Approach:** An overview of system safety engineering approaches; Domino model, Human Factors Analysis and Classification System (HFACS) using the "Swiss	(4L + 2T)	This unit will give an overview of different accident causation model

	Cheese" model; The Rasmussen Framework; Systems-Theoretic Accident Modelling and Process (STAMP); Multivariate Statistical Accident Causation Modelling.		and approaches of modern safety management.
UNIT-6	**Accident / Incident Management System:** Definition of Accident, Incident, High Potential Incident, Post accident immediate actions Objectives of Accident investigation, Accident investigation team, Steps in Accident investigation, Planning of accident investigation, Data collection, Data organization, Data analysis, Identification of causes and root causes of accident, Development of recommendations, Follow-up of accidents	(7L + 3T)	Students will get comprehensive understanding about importance of accident / incident investigation and step by step process of root cause analysis based accident investigation
UNIT-7	**Emergency Response Plan:** Importance of emergency response plan (ERP), Purpose of ERP, features of effective ERP, Development of Risk based ERP, Principles Emergency Management System and Structure of Emergency Management Organization, Emergency control rooms, rescue and recovery; procedure and responsibilities, safety of persons engaged in emergency response, safety measures for stability of tunnels/caverns, evacuation in emergency condition	(5L + 2T)	This unit will give an overall idea of criticality of emergency response at workplace and how to manage it effectively
UNIT-8	**Safety Audit:** Elements of Safety Audit, Steps in Safety audit	(6L + 2T)	Students will understand the importance of auditing of safety management system and different elements of safety audit.
	Total	42L + 14 T (56)	

Text Book:

1. Health and Safety: Risk Assessment by Tony Boyle, Routledge; 1 edition (July 24, 2015)

Reference Books:

1. Workplace Safety by Randall Ferris and Daniel Murphy, Elsevier
2. Mine Health and Safety Management – Edited by Michael Karmis
3. Safety Engineering by B. S. Dhillon, Springer
4. Mine Safety by B. S. Dhillon, Springer
5. Managing the Risk of Workplace Stress: Health and Safety Hazards by Sharon Clarke and Cary Cooper, Routledge; 1 edition (December 29, 2003)
6. Occupational Health and Safety of Construction Workers by Pratibha Joshi,
7. Industrial Safety Management: Hazard Identification and Risk Control by L. M. Deshmukh, available through Access Engineering Portal.