Course Type	Course Code	Name of Course	L	T	P	Credit
DC	MNC 206	MINE VENTILATION	3	0	0	9

Course Objective

Several million tons of major minerals and coal are being extracted every year for sustaining the requirement of world population and as a result, the mining operations are shifting towards deeper horizons of the earth. These mines are required to be ventilated for providing the required quantity and quality of air for working men, operations of machines and maintaining comfortable workplace environment in mines. Therefore, this course draws the importance now and also will be of high demand in the future.
The course objective is to lay the foundation for the students to conceptualize and design mine ventilation systems for working both coal and metal, mechanized and semi-mechanized sub-surface mines.

Learning Outcomes

Upon successful completion of this course, students will learn:

- Different mine gases and their methods of monitoring in mines.
- The methods for measurement of various ventilation parameters, viz. psychrometric properties of air, air velocity and ventilation pressure.
- The economic design of the ventilation system, which will provide comfortable and safe working conditions in the mine.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	***Composition of mine atmosphere*:** Mine gases - production, properties, physiological effects and detection; Sampling and analysis of mine air; Methane content of coal seams; Methane emission; Methane layering; Methane drainage; Radon gas and its daughter products; Monitoring of mine gases.	8	Students will know the sources of different gases present in mine atmosphere, their physiological effects on human beings and detection techniques in underground coal and non-coal mines.
2	***Heat and humidity*:** Sources of heat in mines; Effects of heat and humidity; Psychrometry, Air cooling power, Kata thermometer; Air-conditioning.	7	Students will know the sources of heat and humidity, and methods of improving climatic conditions in underground mines.
3	***Air flow through mine openings:*** Laws of fluid flow, Resistance of mine airways, Equivalent orifice, Losses in airways, Splitting of air current, Economic design of airways; Ventilation flow control devices; Permissible air velocities in different types of workings/openings; Standards of ventilation.	7	Students will learn about the fundamentals of fluid flow in mine openings, calculation of pressure loss in mine airways, different ventilation control devices used in underground mines and standards of ventilation stipulated by CMR, 2017 and MMR, 1961.
4	***Natural ventilation:*** Causes, effect of seasonal variations, calculation of NVP from air densities, thermodynamic principles and other methods.	6	Students will learn about the causes of natural ventilation and how natural ventilation is affected by diurnal and seasonal variations. Also, they will know the methods of calculation of natural ventilation pressure based on density difference in air columns and other practical methods.
5	***Mechanical ventilation*:** Types of mine fans; Theory, characteristics and suitability of fans; Selection and output control of fan; Fans in	8	Students will learn the constructional features and working of different types of fans used in mine ventilation. Also, they will learn how to

	series and parallel; Forcing and exhaust configurations; Reversal of airflow; Fan drift, Diffuser, Evasee; Booster fan and auxiliary ventilation; Venturi blowers; Ventilation of deep mines, underground and open pit.		select a mine fan based on head-quantity requirement of the mine.
6	***Ventilation planning*:** Planning of ventilation systems and economic considerations; Ventilation layouts for underground coal and metal mines; Calculation of air quantity required for ventilating a mine; Calculation of total mine head; Ventilation network analysis principles and computer applications; Ventilation surveys.	6	Students will learn • calculation of ventilation pressure and quantity requirements on the basis of manpower, mine gas emission, production tonnage and air velocity statutory norms in underground mines • ventilation system design and economics using ventilation network analysis principles and software. • methods of pressure-quantity survey in underground mines.
	Total	42	

Text Books:

1. Mine Environment and Ventilation by G. B. Misra.
2. Mine Ventilation by S. P. Banerjee.
3. Mine Ventilation and Air Conditioning by H.L. Hartman, J. Mutmansky and Y.J. Wang.
4. Subsurface Ventilation and Environmental Engineering by M.J. McPherson.