

MIPC3001 MINE VENTILATION (3-0-0)

Course Objectives

To equip students with fundamental knowledge of mine ventilation systems, including gas detection, airflow control, heat management, and mechanical ventilation. The course emphasizes safety standards, ventilation planning, and network analysis to ensure optimal air quality and working conditions in underground mines, integrating theoretical principles with practical applications.

Module-I: (09 Hours)

Mine Gases: Properties, physiological effects, occurrence, detection and monitoring, sampling and analysis of mine air; Methane: Methane content of coal seams, methane emission, methane layering, methane drainage, radon gas and its daughter products

Module-II: (07 Hours)

Heat and Humidity: Sources of heat and humidity in mines, physiological effects of heat and humidity, heat stresses, Psychrometry, air cooling power, air cooling systems

Module-III: (09 Hours)

Distribution and control of air flow through mine openings: Laws of fluid flow, resistance of mine airways, equivalent orifice, losses in airways, distribution of air, economic design of airways, flow control devices, standards of ventilation, regulation regarding air velocities in underground mines

Module-IV: (11 Hour)

Natural Ventilation: Causes of natural ventilation, methods of calculation of NVP Mechanical Ventilation: Mine fans, types of fans, theory, characteristics and selection of fans, reversal of flows, fan laws, installation of fans, series and parallel combination of fans, fan drift, diffuser and evasee, booster fan, auxiliary ventilation

Module-V: (09 Hours)

Ventilation Surveys and Ventilation Planning: Pressure and quality surveys, survey instruments, planning of ventilation systems, estimation of air quality requirement for mines, principle of ventilation network analysis

Course Outcomes:

- CO1: Identify and explain the properties, effects, and monitoring techniques of mine gases (e.g., methane, radon). (Remembering/Understanding)
- CO2: Apply psychrometric principles to assess heat and humidity stresses in mines and design air cooling systems. (Application)
- CO3: Analyze airflow distribution using fluid flow laws, airway resistance calculations, and economic design principles. (Analysis)
- CO4: Evaluate mechanical ventilation systems (fans, boosters) and natural ventilation methods for compliance with safety standards. (Evaluation)
- CO5: Design ventilation plans and conduct network analyses to meet air quality requirements in mining operations. (Creation)

Books:

1. Mine Environment and Ventilation, G. B. Mishra, Oxford University Press, 5th Impression, 1993.
2. Mine Ventilation, S. P. Banerjee, Lovely Prakashan, 1st Edition, 2003
3. Mine ventilation and Air Conditioning, H. L. Hartman, John Wiley, 1989
4. Subsurface Ventilation and Environmental Engineering, M. J. McPherson, Chapman & Hall, 1993