# IIPM SCHOOL OF ENGINEERING & TECHNOLOGY

**LESSON PLAN: 2023-24**

# Sub: Th.2- Mine Hazard and Safety (MHS)

**Branch : Mining**

**Faculty name : Soumya Ranjan Dash**

**Duration : 60 hours**

**SYLLABUS**

**Semester : 5TH**

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| **UNIT I** | 1. ***MINE GASES & GAS TESTING***    * Composition of atmospheric air. Different mine gases, their properties and physical effects .    * State fire damps, black damp, stink damp, white damp and after damp in mines.    * Describe flame safety lamp & its working principle.    * Explain gas testing by flame safety lamp by accumulation test & percentage test.    * State precaution for gas testing.    * Describe various parts of flame safety lamp, special features.    * State limitations of flame safety lamp. |
| **UNIT II** | 1. ***EMISSION OF FIREDAMP IN U/G WORKINGS***    * Describe gradual exudation, blower & outbursts of firedamp in U/g workings. |
| **UNIT III** | 1. ***DEFINE FIRES & SPONTANEOUS HEATING***    * Define incubation period    * Define spontaneous heating and its causes and effects.    * State preventive measures against spontaneous heating.    * Explain CO/O2 ratio & CO2/O2 ratio. |
| **UNIT IV** | 1. ***MINE EXPLOSION***    * Describe coal dust explosion & fire damp explosion with their causes & prevention.    * State inflammability of coal dust & fire damp.    * Explain Coward’s diagram.    * State prevention, suppression & treatment of dust.    * Describe sampling of dust in Mines.    * Stone dust barrier. |
| **UNIT V** | 1. ***MINE INUNDATION***    * State sources of water in mines & its danger.    * State precaution against inundation.    * Describe burnside safety boring apparatus.    * State precaution while approaching water logged area.    * Describe water dams- its construction & design. (Without derivation of formula)    * Explain water danger plan.    * Statutory provision for working near water body. |
| **UNIT VI** | 1. ***MINE LIGHTING & ILLUMINATION***    * Define illumination and its units.    * Standards of lighting at different parts of mine as per mine regulation. |

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| **UNIT VII** | 1. ***NOISE AND VIBRATION .***    * Explain the effect of noise & vibration on miners & mine structures & other surface structure with respect to statutory provision. |
| **UNIT VIII** | 1. ***MINE RESCUE AND RECOVERY***    * Proto-IV, Proto-V, Drager BG-174, Self rescuer, Smoke helmet, Gas mask.    * Construction of Rescue brigade and their role in rescue and recovery operation.    * Mine Rescue rules 1985 Annexure I,II,III. |

## Books Suggested:

* Mine Ventilation G B Mishra
* Mine Rescue M A Ramlu

**Objective :**

* Testing of different mine gases. Physiological effect on miners, detection of fire damp by flame safety lamp, explains the method of gas testing by CO-detectors & methanometer.
* Explain how firedamp is emitted in mines.
* Explain causes of mine fires & spontaneous heating.
* Define explosion, explain causes & elaborate necessary steps required for prevention of coal dust & firedamp explosion.
* Define mine inundation, explain causes & elaborate necessary preventive measures required.
* Describe lighting arrangement, lighting standards explain glare & its effect
* Explain the effect of noise & vibration on miners & mine structures & other surface structure.
* Explain rescue and recovery work when mine hazard occurs.

**Learning Outcome:** As a Mining Engineer, one must be thoroughly conversant with various sources of mining hazards as also the remedial measures needed to be undertaken to avoid any mishap and able to understand total operation of rescue and recovery.

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| **Sl. No** | **Chapter** | **Proposed Week for Teaching** | **Lecture No.** | **Sub. Topic** | **Important Teaching Points** | **Content Source** |
| 01 | **I** | 1ST | 01 | Mine gases & gas testing | Different Hazards in Mines and summary of general safety measures in underground mine | G B Mishra M A Ramlu |
| 02 | 02 | Mine gases & gas testing | Mine atmosphere, Properties & Physical effects different type of Mine Gases | G B Mishra M A Ramlu |
| 03 | 03 | Mine gases & gas testing | Fire damp, black damp,  stink damp, white damp & after damp | G B Mishra M A Ramlu |

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| 04 |  |  | 04 | Mine gases & gas testing | Working principle of Flame Safety lamp | G B Mishra M A Ramlu |
| 05 | 2ND | 01 | Mine gases & gas testing | Accumulation &  percentage test by Flame safety lamp | G B Mishra M A Ramlu |
| 06 | 02 | Mine gases & gas testing | Precaution for gas testing | G B Mishra M A Ramlu |
| 07 | 03 | Mine gases & gas testing | Various parts of Flame safety lamp | G B Mishra M A Ramlu |
| 08 | 04 | Mine gases & gas testing | Limitation of Flame safety lamp | G B Mishra M A Ramlu |
| 09 | **II** | 3RD | 01 | Emission of firedamp in U/g workings | Gradual exudation, blower and outbursts of  firedamp in underground mine | G B Mishra M A Ramlu |
| 10 | **I & II** | 02 | Mine gases & gas testing and Emission of  firedamp in U/g workings | Revision Class and Group discussion (Chapter 1&2) | ---------- |
| 11 | 03 | Mine gases & gas testing and Emission of firedamp in U/g workings | Unit Test I-II | -------------- |
| 12 | 04 | Mine gases & gas testing and Emission of  firedamp in U/g workings | Doubt Clearing Class (Chapter 1&2) | ------------- |
| 13 | **III** | 4TH | 01 | Mine fires & spontaneous heating | Formation of Fire, triangle of fire | G B Mishra M A Ramlu |
| 14 | 02 | Mine fires & spontaneous  heating | Incubation period | G B Mishra M A Ramlu |
| 15 | 03 | Mine fires &  spontaneous heating | Spontaneous heating and its causes | G B Mishra M A Ramlu |
| 16 | 04 | Mine fires &  spontaneous heating | Effects of spontaneous heating | G B Mishra M A Ramlu |
| 17 | 5TH | 01 | Mine fires &  spontaneous heating | Preventive measures  against spontaneous heating | G B Mishra M A Ramlu |
| 18 | 02 | Mine fires &  spontaneous heating | CO/O2 ratio | G B Mishra M A Ramlu |
| 19 | 03 | Mine fires & spontaneous  heating | CO2/O2 ratio | G B Mishra M A Ramlu |
| 20 | 04 | Mine fires & spontaneous heating | Revision Class and Group discussion (Chapter 3) | ------------- |

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| 21 |  | 6TH | 01 | Mine fires & spontaneous  heating | Unit Test- III | -------------- |
| 22 | 02 | Mine fires &  spontaneous heating | Doubt Clearing Class (Chapter 3) | ------------- |
| 23 | **IV** | 03 | Mine Explosion | Coal dust explosion, causes & prevention | G B Mishra M A Ramlu |
| 24 | 04 | Mine Explosion | Fire damp explosion, causes & prevention | G B Mishra M A Ramlu |
| 25 | 7TH | 01 | Mine Explosion | Inflammability of coal dust & fire damp | G B Mishra M A Ramlu |
| 26 | 02 | Mine Explosion | Coward’s diagram | G B Mishra M A Ramlu |
| 27 | 03 | Mine Explosion | Prevention, suppression & treatment of dust | G B Mishra M A Ramlu |
| 28 | 04 | Mine Explosion | Sampling of dust | G B Mishra M A Ramlu |
| 29 | 8TH | 01 | Mine Explosion | Stone dust barrier | G B Mishra M A Ramlu |
| 30 | 02 | Mine Explosion | Revision Class and  Group discussion (Chapter 4) | ------------ |
| 31 | 03 | Mine Explosion | Unit Test- IV | -------------- |
| 32 | 04 | Mine Explosion | Doubt Clearing Class (Chapter 4) | ------------- |
| 33 | **V** | 9TH | 01 | Mine Inundation | Surface water sources & Underground water sources in mines and its danger | G B Mishra M A Ramlu |
| 34 | 02 | Mine Inundation | Precaution against Inundation | G B Mishra M A Ramlu |
| 35 | 03 | Mine Inundation | Burnside safety boring  apparatus. VOLSAFE- 500 | G B Mishra M A Ramlu |
| 36 | 04 | Mine Inundation | Precaution while approaching water logged area and provision for working near water body. | G B Mishra M A Ramlu |
| 37 | 10TH | 01 | Mine Inundation | Water dams- its  construction & design and water danger plan. | G B Mishra M A Ramlu |
| 38 | 02 | Mine Inundation | Revision Class and  Group discussion (Chapter 5) | ----------- |
| 39 | 03 | Mine Inundation | Unit Test- V | ----------- |

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| 40 |  |  | 04 | Mine Inundation | Doubt Clearing Class (Chapter 5) | ---------- |
| 41 | **VI** | 11TH | 01 | Mine lighting & Illumination | Illumination and its units. | G B Mishra M A Ramlu |
| 42 | 02 | Mine lighting & Illumination | Intensity of light, Luminous efficiency, Reflection, MHCP, MSCP | G B Mishra M A Ramlu |
| 43 | 03 | Mine lighting & Illumination | Lighting in Mines (On  surface & bellow ground) | G B Mishra M A Ramlu |
| 44 | 04 | Mine lighting & Illumination | Standard of lighting according to DGMS circular | G B Mishra M A Ramlu |
| 45 | **VII** | 12TH | 01 | Noises & Vibration | Sources of noise | G B Mishra M A Ramlu |
| 46 | 02 | Noises & Vibration | Vibration effect | G B Mishra M A Ramlu |
| 47 | 03 | Noises & Vibration | effect of noise &  vibration on miners & mine structures | G B Mishra M A Ramlu |
| 48 | **VI & VII** | 04 | Mine lighting & Illumination and Noises & Vibration | Revision Class and Group discussion (Chapter 6-7) | ------------ |
| 49 | 13TH | 01 | Mine lighting & Illumination and Noises & Vibration | Unit Test- VI & VII | ------------ |
| 50 | 02 | Mine lighting & Illumination and Noises & Vibration | Doubt Clearing Class (Chapter 6-7) | ------------- |
| 51 | **VII** | 03 | Mine Rescue and Recovery | Proto-IV | G B Mishra M A Ramlu |
| 52 | 04 | Mine Rescue and Recovery | Proto-V | G B Mishra M A Ramlu |
| 53 | 14TH | 01 | Mine Rescue and Recovery | Drager BG-174, special features of the Drager  BG-174 | G B Mishra M A Ramlu |
| 54 | 02 | Mine Rescue and Recovery | Self rescuer, Smoke helmet, Gas mask | G B Mishra M A Ramlu |
| 55 | 03 | Mine Rescue and Recovery | Construction of Rescue brigade and their role in rescue and recovery  operation | G B Mishra M A Ramlu |
| 56 | 04 | Mine Rescue and Recovery | Mine Rescue rules 1985 | DGMS |
| 57 | 15TH | 01 | Mine Rescue and Recovery | Mine Rescue rules 1985 Continue. | DGMS |

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| 58 |  |  | 02 | Mine Rescue and Recovery | Revision Class and Group discussion  (Chapter 8) | ------ |
| 59 | 03 | Mine Rescue and Recovery | Unit Test- VIII | ------- |
| 60 | 04 | Mine Rescue and Recovery | Doubt Clearing Class (Chapter 8) | -------- |

Signature of

**Faculty Member HOD Principal/ Director**