

Syllabus of E&M Discipline

1. Fundamental of Electrical Engineering

(A) Basic Laws of Electrical Engineering (Ohm's Law, Kirchhoff's Law, Lenz's Law, Flemming's Rule and Faraday's Law of Electromagnetic Induction).

(B) Basic Unit of Electrical Engineering (Volt, Amp, Watt, Kwh, Ohm, Henry, Farad).

(C) Measurement of Voltage, Current, Power, Energy and Measuring Tools for the same.

(D) Class of Insulation and Types of Materials for the Same.

(E) Electrical Symbols and Plan Under Mines Act and BIS.

2. Transformers:

Basic Principle, Components, Types and Application, Parallel Operation, Transformer Losses, Cooling Types and Efficiency, FLP Transwithces, Transformer Protections.

3. Generators / Motors:

DC Motors: Different Types of DC Motors, Speed Control of DC Motors, Applications, Maintenance

Alternators: Alternator Components, Parallel Operation, Synchronization

Induction Motors: Squirrel Cage Induction Motor, Slip Ring Induction Motor, Motor Starters, Speed Control of Motors and Suitable Application of Motors, Advantage/Disadvantage of Slip Ring / Squirrel Cage Motor, Induction Motors, Troubleshooting and Maintenance of Motors.

4. **Cables:** Construction of Armoured / Pliable Armoured and Flexible Trailing Cables and Its Application in Underground and OC Mines, Cable Jointing.
5. **Braking of Motors:** Plugging, Dynamic Braking and Regenerative Braking.
6. **Transmission & Distributing (upto HT i.e. 33 KV):** Conductor Type, Support Type, Various Types of Poles, Earthing of Overhead Lines, Insulators, Lightning Arrestors, Voltage Regulation, Maintenance of Overhead Lines.
7. **Electrical Earthing:** Earthing System, Effect of Moisture, Chemical Treatment of Soil, Earth Electrodes, Earthing of Appliances, Measurement of Earth Resistance.
8. **Protective Device & Protection :** Fuses (Rewirable, HRC), Circuit Breakers (MCCB, MCB, ACB, VCB, SF6) and Relays, Underground Gate-End -Box, FLP Circuit Breaker, Field Switches, Unitized Substation For OCPs, Over Load, Earth Leakage, Short Circuit and Under Voltage Protection.
9. **Illumination System:** Type of Lamps, Level of Illumination Required For office, Domestic, Colliery Yard, Underground Lighting System.
10. **Power Supply :** Substation – Surface & Underground, Power Supply To Underground and OCP Mines, Maximum Demand, Demand Factor, Diversity Factor, Power Factor and Its Improvement, Power Tariff Structure.

11. FLP and Intrinsically Safe Apparatus, Cap Lamp, Battery Charger, Signaling Equipment
12. Treatment of Electric Shock and Artificial Respiration , Mines Safety and First Aid
13. **Energy Conservation:** Use of Energy Efficient Lamp , Renovation of Piping System, Strata Bunker, Use of Higher Voltage Nearer To Coal Face , Leakage Control of Ventilation Circuit, Installation of Capacitor Bank For PF Improvement, Re-organization of Transformer Load , Selection of Adequate Size of Motors, Haul Road Monitoring, Replacement of 'O' Ring, Seal Kit, Hydraulic Hoses to Arrest Leakage of Diesel, Periodical Maintenance of Engine – Filter, Hoses - Tyre Pressure, etc.
14. Basic Knowledge of Electronics.
15. Basic Computer Awareness and Its Applications.
16. IE Rules.
17. Measuring and Monitoring Instruments/Gauzes Used For Mechanical Items.
18. **Underground Face Machinery:** PSLW Packages With Shearer / Support / AFC Etc. Continuous Miner Packages With Shuttle Car, Roof Bolting Machine and Feeder Breakers, Load Haul Dumper/ Side Discharge Loader, Universal Drilling Machine, Man Riding System/ Coal Drill.
19. **Mine Transport:**
 - a. Belt Conveyer/Chain Conveyer/Haulages.
 - b. Winders – Winding Engine and Its Suspension Gear, Automatic Contrivances.
20. **Wire Ropes:** Construction/Sizes of Ropes For Winder and Haulage.
21. **Roof Support:** Hydraulic Props, Roof Bolting, Self-Advancing Powered Support – Its Construction, Operation and Maintenance.
22. **Mine Pumps:** Types of Pumps, its Application and Pipe Fitting, Maintenance.
23. **Ventilation Fan:** Types, Application and Maintenance.
24. Lubrication and Lubricants.
25. **Gear Boxes:** Types and Function of Gear Boxes, Daily/Periodical Maintenance of Gear Boxes.
26. **Coal Handling:** Coal Handling Plant, Weighing Machine and It Maintenance.
27. **Boiler and Steam Engine:** Types and Application In Coal Industry.
28. Foundry Works, Heat Treatment of Ferrous, Non-Ferrous Metals, Alloys and their use, Riveting.
29. **Conveyor Belting:** PVC / Rubber / Steel Chord Belting Basic Construction and Application.
30. **Welding:** Gas and Electrical Welding, Electrodes For Welding, Knowledge of Eutectic(Low Temperature).
31. **Coal Mines Regulation:** Regulation No.33, 38-57, 71-86, 87-97, 181-186.
32. Safety Aspects In Underground Mining Operation In Respect of DGMS Guidelines
33. Routine Maintenance and Breakdown Maintenance