

**Shri Rawatpura Sarkar University,
Raipur**



**Examination Scheme & Syllabus
for
Diploma in Mining Engineering
Semester-III**



Diploma in Mining Engineering Semester-III

Three Years Diploma Programme

Scheme of Teaching and Examination

Diploma Third Semester Mining Engineering

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2022-2023)

S. No	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			Sem End Exam Duration (Hrs)
			L	T	P		Continuou s Evaluation	Sem End Exam	Total	
1	DENMN301	Basic Mechanical Engineering	3	-	-	3	70	30	100	3
2	DENMN302	Basic Electrical Engineering	3	-	-	3	70	30	100	3
3	DENMN303	Elements of Mining Technology	3	1	-	4	70	30	100	3
4	DENMN304	Mine Environmental Engineering	3	-	-	3	70	30	100	3
5	DENMN305	Strata Control	3	-	-	3	70	30	100	3
6	DENMN301P	Basic Mechanical Engineering Lab	-	-	4	1	-	-	50	-
7	DENMN302P	Basic Electrical Engineering Lab	-	-	4	1	-	-	50	-
8	DENMN304P	Mine Environmental Engineering Lab	-	-	4	1	-	-	50	-
9	DENMN306P	Industrial Training/Mines /Visit	-	-	-	2	-	-	50	-
Total Contact hr per week: 28			Total Credit: 21			Grand Total Marks:			700	

L: Lecture T: Tutorial P: Practical



Diploma in Mining Engineering Semester-III

Course Title	BASIC MECHANICAL ENGINEERING				
Course Code	DENMN301				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	PHYSICS				
Course objectives	<ul style="list-style-type: none"> • To introduce concepts of general Mechanical Engineering to the students of Mining Engineering • To have knowledge of fundamental principles and mechanical properties. • To understand the basics of thermodynamic principles and hydraulics. • To study the materials deformation characteristics and IC engines. 				
Course Contents	<p>UNIT-I MECHANICAL PROPERTIES & SIMPLE STRESS & STRAIN Definition of different mechanical properties – elasticity, plasticity, ductility, toughness, brittleness, hardness, malleability., Tensile, Compressive & Shear Stress & Strain, Different Elastic Moduli. Design of Simple Component: Cotter joint, knuckle joint, Flange Coupling & Single row riveted joint.</p> <p>UNIT-II HYDROSTATICS & HYDRODYNAMICS Physical properties of a fluid, Pascal’s law, Calculation of total force & Center of Pressure for a rectangular plate, Continuity equation of flow. Bernoulli’s equation, Venturi meters & its uses Flow through pipes.</p> <p>UNIT-III BASICS OF THERMODYNAMICS Properties, Processes, Basic laws of thermodynamics, Thermodynamic cycles, I.H.P.,B.H.P.,M.M.P.,F.H.P., Simple calculations, Steam & Gas Power plants, Boilers: Basics, Classification and Construction, Boiler Mounting & Accessories, Ranking cycle, Working principles of Turbine, Compressor, and Condenser & Pumps.</p> <p>UNIT-IV I.C. ENGINES Auto, Diesel and Dual cycles, Working principles of two stroke & four stroke petrol engine, Working principles of two stroke & four stroke diesel engines, Mechanical drives, Fundamentals of Rope, Chain & Belt, Clutch, Gearbox, Working Principle & Related simple problems.</p>				



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	<p>UNIT-V</p> <p>MATERIAL HANDLING</p> <p>Types of handling equipment, Determination of handling equipment, Requirement, Factor affecting the choice of handling equipment, Maintenance: Maintenance method, Types of maintenance, Their importance and field of applications process.</p>
<p>Course Outcome</p>	<p>At the end of the course student will be able to:-</p> <ul style="list-style-type: none"> • Explain the different principle applies to solve engineering problems dealing with force, displacement, velocity and acceleration. • Analyze the forces in any structures. • Solve rigid body subjected to dynamic forces. • Application of the various principles of mechanical engineering.
<p>Text Books</p>	<ol style="list-style-type: none"> 1. Text book of hydraulics by R.S. Khurmi 2. Text book of thermodynamics by R.S. Khurmi 3. Text book of design & mechanics of machine by R.S. Khurmi 4. Text book of Basic Mechanical Engineering by R.K. Rajput. 5. Engineering thermodynamics by P.K. Nag
<p>Reference Books</p>	<ol style="list-style-type: none"> 1. Basic Mechanical Engineering by Pravin Kumar. 2. Basic Mechanical Engineering by BasantAgrawal and C M Agrawal. 3. Basics of Mechanical Engineering by R K Singal and MridualSingal. 4. Handbook of Mechanical Engineering by RPH Editorial Board. 5. Basic Mechanical Engineering by R K Rajput.



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Course Title	BASIC ELECTRICAL ENGINEERING				
Course Code	DENMN302				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	PHYSICS				
Course objectives	<ul style="list-style-type: none"> • To impart the knowledge and practice in DC and AC circuits, machines, measuring instruments and electrical safety. • To develop a solid foundation about various laws applied in electrical engineering. • To study the various electrical machine used and the electromagnetics forces involve. 				
Course Contents	<p>UNIT-I BASIC CONCEPTS</p> <p>Concept of unit of Electric Current and Voltage: Ohm's Law, Concept of Resistance, Inductance, Resistivity and Conductivity; Their units and dependence on temperature, Power & energy heating, Effect of electric current and conversion of units (Mechanical to Electrical), Kirchoff's Voltage and Current Laws & their application in simple D.C. Circuits, Series and Parallel combination of resistance and wattage considerations, Electro magnetism Concept of magnetic field production by flow of current, Concept of m.m.f., flux reluctance, Permeability, Analogy between electric & magnetic circuit, Faraday's Laws of Electromagnetic Induction, Self and mutually induced e.m.f.</p> <p>UNIT-II A.C. CIRCUIT</p> <p>Concept of alternating voltage and current, Difference between A.C. and D.C., Concept of Cycle, Frequency, Period, Amplitude, Instantaneous Value, Average Value, R.M.S. value and Peak value, Form factor (definitions only), Concept of impedance, Phase angle, RL, RC & RLC Series & Parallel circuits, Numerical problems, Poly phase circuits, Three phase A.C. waveform, Phase displacement, Three phase A.C. circuit with balanced load.</p> <p>UNIT-III TRANSFORMERS</p> <p>Principle of Transformer, Auto Transformer, Applications of Transformer and Auto Transformer, D.C. Machines, Working principle of D.C. Machines, Constructional features.</p>				



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	<p>UNIT-IV</p> <p>INTRODUCTION OF AC MOTORS</p> <p>Introduction of A.C. Motor, Classification of A.C. Motors, Induction motors, Construction and working principle of 3-phase, Introduction of Synchronous Motor, Single phase induction motor, Working principle of Single Phase Induction Motor, Types of Single Phase Induction Motor, Capacitor start, Capacitor start and Capacitor run, Shaded Pole type, Universal Motor.</p> <p>UNIT-V</p> <p>ELECTRICAL & ELECTRONIC MEASUREMENT</p> <p>General description of PMMC, Moving iron, Dynamometers type instruments, Working principle and Construction of Ammeters and Voltmeters, Extension of range and Simple numerical problems, Principle and working of Wattmeter (dynamometer type) and Energy meter(Induction type), Digital measuring instruments, Seven-segment display and its applications, Basic concepts of CRO, Safety Precaution Artificial Respiration, Circuit Protection: Fuses, Switches, relays of circuit, MCB, MCCB, Earthling.</p>
<p>Course Outcome</p>	<p>At the end of the course student will be able to:-</p> <ul style="list-style-type: none"> • Identify the electrical components. • Explain the characteristics of electrical machines. • Explain the different principle applies to solve engineering problems dealing with A.C. motors, D.C. machines. • Formulate and solve problems in thermodynamics.
<p>Text Books</p>	<ol style="list-style-type: none"> 1. Principles of Electrical Engineering by Bhattacharya, Tata -McGraw-Hill, New Delhi, 1997 2. Electrical Application Servicing Crouse, William H., McGraw Hill, New York, 1st . 1980 3. Preventing Electrical Fires & Failures Hattangadi, A.A., Tata -McGraw-Hill, New Delhi, 2001 4. Electrical Technology Hughes, Edward, Longman, 1st , 1990 5. Basic Electrical Engineering Mittle, V.N. Tata McGraw-Hill, New Delhi 1990. 6. Electrical Technology Vol.IThareja B.L., 7. Thareja A.K. S. Chand & Company Ltd., New Delhi, 23rd Edition
<p>Reference Books</p>	<ol style="list-style-type: none"> 1. Basic Electrical Engineering by C L Wadhwa 2. Basic Electrical Engineering by Mehta V K and Mehta Rohit 3. Basic Electrical Engineering by Nagrath, I and Kothari 4. Basic Electrical Engineering by Mittle, V and ArvindMittle 5. Basic Electrical Engineering by T K Nagsarkar and M S Sukhija



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Course Title	ELEMENTS OF MINING TECHNOLOGY				
Course Code	DENMN303				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	GENERAL SCIENCE				
Course objectives	<ul style="list-style-type: none"> • Discuss the various drilling machines are used for exploratory drilling. • Explain the drives of inclines, drifts and adits for the opening of the underground mines. • Explain the drilling, blasting, loading, transportation, ventilation, lightening and drainage operation used in shaft sinking in the underground mines. • Discuss the various methods of shaft sinking. • Explain the advantages and disadvantages of surface mining and underground mining. • Discuss the various types of machinery used in the underground mining and surface mining. 				
Course Contents	<p>UNIT-I INTRODUCTION History of mining Industry and mineral wealth of India, Specially related with Chhattisgarh, Selection of site for opening a mine.</p> <p>UNIT-II MODES OF ENTRY Different types of modes of entry, Inclined, Shaft, Adit, Condition suitable to selection of a suitable mode of entry, Factors governing shape, size and site of modes of entry, Compressions, Suitability and advantages of each type of mode of entry.</p> <p>UNIT-III SINKING OPERATION Sinking of shaft in normal coal strata, Marking of center of shaft, Temporary supports/lining permanent lining, Firing shots in sinking shaft, Introduction of special methods of shaft sinking.</p> <p>UNIT-IV DRIFTING AND TUNNELING Introduction about drifting and tunneling, Methods of drifting and tunneling, Manual methods of drifting and tunneling, Mechanized methods of drifting and tunneling, Ventilation drilling, Blasting and Mucking, Transportation systems in</p>				



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	<p>drifts and tunnels.</p> <p>UNIT-V</p> <p>INTRODUCTION TO METHODS OF WORKING</p> <p>Underground Mining:</p> <p>Definition of important terms, Mine development, Activities involved in development of a mine, Stages in the life of a mine, Introduction to unit operations in underground mining, Choice of method of mining, Introduction to various Underground Mining methods, Introduction to various types of machineries used in Underground mining.</p> <p>Surface Mining:</p> <p>Definition of important terms, Advantages and disadvantages of surface mining, Mineral deposits amenable to surface mining, Various surface mining methods, Introduction to unit operations in surface mining, Introduction to various types of machineries used in surface mining.</p>
<p>Course Outcome</p>	<p>At the end of the course student will be able to:-</p> <ul style="list-style-type: none"> • Enhance the technical knowledge on exploratory drilling, drivage of inclines, adits and shaft sinking • Formulate and solve engineering problems in drilling and shaft sinking. • Use the techniques, skills, and modern engineering tools necessary for mine development practice. • Work effectively as an individual and as a member of a multidisciplinary team.
<p>Text Books</p>	<ol style="list-style-type: none"> 1. Surface Mining : G.B. Mishra 2. Mining Engineer's Handbook Vol. 1&2, 2nd Edition : Edited by Harold Hartman 3. Elements of Mining Technology Vol. 1&3 : D.J. Deshmukh 4. Introduction to mining
<p>Reference Books</p>	<ol style="list-style-type: none"> 1. Mining of Mineral Deposits : Shevyakov 2. Modern Coal Mining : Samir Das 3. Coal Mining : R.D.Singh



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Course Title	MINE ENVIRONMENTAL ENGINEERING				
Course Code	DENMN304				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	CHEMISTRY AND ENVIRONMENTAL STUDIES				
Course objectives	<ul style="list-style-type: none"> • To study the various engineering and technology applied in mining field. • Underground coal mining practice involves careful planning with due regards to safety of men, material and mine, optimum production with consideration to conservation of mineral. • Underground mining methods are considered more hazardous due to its procedure of winning under extremely difficult conditions inviting chances of infringement of safety. 				
Course Contents	<p>UNIT-I MINE ATMOSPHERE Pollution of mine atmosphere, Mine gases, Origin and occurrence of mine gases, Effects and detection of mine gases, Methane drainage, Monitoring system of mine environment, Analysis of mine air.</p> <p>UNIT-II HEAT AND HUMIDITY Heat and humidity, Types in mine atmosphere and their effects, Cooling power of mine air, Assessment of comfort conditions, Air conditioning of mines, Surface, Underground and divided installations, Spot coolers.</p> <p>UNIT-III MINE VENTILATION SYSTEM Object and standard of ventilation, Degree of gassiness of mines, Composition of mine air, Measurement of air quantity, Pressure and velocity, Law of air flow in mines, Flow of air in ducts and mine roadways, Resistance of air ways, Chezy's and Atkinson's equations, Equivalent resistance and Equivalent orifice of mine, Regulations related with above topics, Ecological and Environmental laws related to mines, Dust monitoring, Mechanical ventilation, Different types of fans used in mines, Theoretical characteristics of centrifugal and axial flow fans, Forcing and Exhaust fans, Relations between pressure quantity and power of fan, Numerical calculation, Fan drift, Their constructional feature, Auxiliary and Booster fans, Constructional feature, Splitting of air current, Advantage of splitting, Reversal of air current</p>				



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	<p>UNIT-IV NATURAL VENTILATION</p> <p>Natural ventilation and its measurements, Thermodynamics of natural ventilation, Distribution and control of air current, Accessories of ventilation used in mines – Door, regulator, stopping's, air lock, air crossing, brattice</p> <p>UNIT-V MINE LIGHTING</p> <p>Lighting sources in mines, Cap lamps, Constructional feature of lamps, Underground lighting, Flameproof and intrinsically safe lighting, Lamp room layout, Lamp room organization, Care and maintenance of cap lamps.</p>
<p>Course Outcome</p>	<p>At the end of the course student will be able to:-</p> <ul style="list-style-type: none"> • Enhance the technical knowledge on origin, occurrence, effects, and detection of various mine gases, air conditioning of surface and underground mining. • Formulate and solve engineering problems in ventilation and mine lighting. • Use the techniques, skills, and modern engineering tools necessary for mine development. • Work effectively as an individual and as a member of a multidisciplinary team.
<p>Text Books</p>	<ol style="list-style-type: none"> 1. Elements of Mining Technology Vol.2 by D.J. Deshmukh 2. Mine ventilation by G.B. Mishra 3. Mine Ventilation and Air Conditioning by Hartman H L
<p>Reference Books</p>	<ol style="list-style-type: none"> 1. Mine Ventilation Engineering by Hall C J 2. Subsurface Ventilation and Environmental Engineering by McPherson M J 3. Advanced Mine Environmental Engineering by R.D. Singh



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Course Title	STRATA CONTROL				
Course Code	DENMN305				
Course Credits	L	T	P	TC	
	3	1	-	4	
Prerequisites	BASIC SCIENCE				
Course objectives	<ul style="list-style-type: none"> • To be fully aware of different strata control techniques adopted in different situations in the field. • To understand the basic concept of strata control mechanism and principle of supports in mining. • To comprehend the essential requirements in this area to function effectively. 				
Course Contents	<p>UNIT-I SUPPORTS</p> <p>Timber & Steel supports, Examination of Roof Bolting, Roof stitching, Cable Bolting, Method of supporting Roadways, Supporting under different Conditions, Pit bottom, Crossing, Junctions, Faulted area, Longwall faces, Depillaring areas and Stopping areas, Support loads, Systematic Support Rules, Support plan, Support withdrawal.</p> <p>UNIT-II POWERED SUPPORTS</p> <p>Powered supports, Principle of Operation of Power supports, Classification of Power supports, Designation of Power Supports, Major Application of Power supports, Hydraulic fluids</p> <p>UNIT-III STOWING</p> <p>Principal methods of stowing, Their relative merits and applicability, Hydraulic stowing, Pneumatic Stowing, Mechanical Stowing , Hand Packing, Face arrangements, Pipe wear, Pipe Jams.</p> <p>UNIT-IV STRATA CONTROL</p> <p>Basic concepts of ground movement, Rock Pressure due to narrow and wide excavation, Failure of roof and floor, Measurement of Strata movement, Definition of Rock burst, Bumps, Gas outbursts, Pot holes.</p> <p>UNIT-V SUBSIDENCE</p> <p>Basic concept of Subsidence, Damage and loss due to Subsidence, Vertical and</p>				



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	lateral movements and their estimation, Angle of fracture and Angle of draw, Factors affecting subsidence, Subsidence Control , Protection of surface Structures, Introduction of Protection Pillars including shaft pillars.
Course Outcome	At the end of the course student will be able to:- <ol style="list-style-type: none">1. Acknowledge of strata control for understanding, formulating and solving strata control problem in any underground mine.2. Identify, analyze and solve strata movement problems.3. Acquire knowledge and hands-on competence in applying the concepts in the development of strata control.4. Use the techniques, skills, and modern engineering tools necessary for mine strata.5. Work effectively as an individual and as a member of a multidisciplinary team.
Text Books	<ol style="list-style-type: none">1. Strata Control in Mines Chang and Peng2. Winning and Working of Coal R.T. Deshmukh and D.J. Deshmukh
Reference Books	<ol style="list-style-type: none">1. Modern Coal Mining Practices R.D. Singh2. D.G.M.S. Circulars (Tech.) 1995 Onwards3. Longwall Mining Syed. S. Chang and Peng



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Course Title	BASIC MECHANICAL ENGINEERING LAB				
Course Code	DENMN301P				
Course Credits	L	T	P	TC	
	-	-	4	2	
Prerequisites	PHYSICS				
Course objectives	<ul style="list-style-type: none"> • To introduce concepts of general Mechanical Engineering to the students of Mining Engineering • To have knowledge of boiler mountings and accessories. • To understand the basics of thermodynamic principles and hydraulics. • To study of Cutter joint, knuckle joint and different types of Couplings. 				
Course Contents	<p>LIST OF EXPERIMENTS</p> <ol style="list-style-type: none"> 1. Study of boiler mountings and accessories. 2. Study of Simple & Compound gear trains and calculation of speed ratio. 3. Study of Flat and V belts. 4. Study of different type of industrial chains and ropes. 5. Study of Cutter joint, knuckle joint and different types of Couplings. 6. Study of different types of Bolted & Riveted joints. 7. Study of different type of boilers. 8. Study of types of lathe operations. 9. Study of law of triangle of forces. 10. Study of the Lami's theorem. 11. Study of the law of polygon of forces. 12. Study of the law of lever. 				



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Course Title	BASIC ELECTRICAL ENGINEERING LAB				
Course Code	DENMN302P				
Course Credits	L	T	P	TC	
	-	-	4	2	
Prerequisites	PHYSICS				
Course objectives	<ul style="list-style-type: none"> • To enhance the technical knowledge of Electrical equipment's. • To impart the knowledge and practice in DC and AC circuits, machines, measuring instruments and electrical safety. • To develop a solid foundation about various laws applied in electrical engineering. • To study the various electrical machine used and the electromagnetics forces involve. 				
Course Contents	<p>LIST OF EXPERIMENTS</p> <ol style="list-style-type: none"> 1. Follow Electrical engineering laboratory practices - Supply system & safety. 2. Introduction to various measuring instruments. A). Verify Ohm's Law. B).Verify KCL & KVL. 3. Measure voltage & current in RLC series circuit, Calculate impedance, inductance, capacitance, & power factor. 4. Measure voltage & current in RLC parallel circuit. Also calculate impedance, power factor. 5. Use rheostat as Regulator and Potential divider. 6. Identify the different parts of a dismantled motor. 7. Identify the different parts of 3-point starter and use it for starting single-phase induction motor. 8. Measure current & voltage in balanced star connection. Also verify the relation of phase and line value of voltage and current. 9. Measure current & voltage in balanced Delta connection. Also verify the relation of phase and line value of voltage and current. 10. Measure the electrical power and energy in a given circuit. 11. Use analog and digital multimeter for testing voltage, current and resistance. 12. Calculate fusing current of a fuse wire. 				



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Course Title	MINE ENVIROMENTAL ENGINEERING LAB				
Course Code	DENMN304P				
Course Credits	L	T	P	TC	
	-	-	4	2	
Prerequisites	ENVIRONMENT STUDIES				
Course objectives	<ul style="list-style-type: none"> • To enhance the technical knowledge on origin, occurrence, effects, and detection of various mine gases, air conditioning of surface and underground mining. • To have knowledge of fundamental principles and underground mining atmosphere. • To understand the basics and principles of flame safety lamp. • To work effectively as an individual and as a member of a multidisciplinary team. 				
Course Contents	<p>LIST OF EXPERIMENT</p> <ol style="list-style-type: none"> 1. Detection of presence and accumulation of firedamp in mine atmosphere. 2. Detection of presence and accumulation of CO in mine atmosphere 3. Study of various techniques of methane drainage. 4. Study of Installation of Axial Flow Fan. 5. Study of Installation and positioning of Booster Fan. 6. Study of different types of ventilation devices. 7. Study of cap lamp used in underground mine. 8. Study of Profilometer. 9. Study the air distribution system in Board and Pillar System of mining. 10. Study of Flame safety lamps used in underground mine. 11. Study of thermal precipitator dust sampler. 12. Study of Flame safety lamps used in underground mine. 				



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Course Title	Industrial Training/Mines/Visit				
Course Code	DENMN306P				
Course Credits	L	T	P	TC	
	-	-	-	2	
Prerequisites	BASICS OF MINING ENGINEERING				
Course objectives	<ul style="list-style-type: none"> • Industrial Training is one of the most essential components for a diploma graduate in Mining. • The sole purpose of industrial training is to expose the students to “real life” situations. Different aspect of mining such as geology, exploration, selection of method of working. • Students will cover different coal and metal mines both underground and opencast in such a way that at the end of the completion of diploma programme, they are conversant with different mining conditions. • Industrial training also opens avenues of new learning to the students and apply them during their project and industrial training presentations. 				
Course Contents	<p>The students should follow the following procedures:-</p> <ol style="list-style-type: none"> 1. Before going for training, the students will prepare various formats for data collection based on the topic of training assigned to them. 2. The students will be given specific assignments for the period of training. 3. During the course of training students will complete weekly report, assignments and keep weekly attendance updated. 4. On completion of training each student will submit a report of training and make a presentation before the group of students. Teacher assessment will be done during the training, on presentation of training and at the end of semester examination. 5. A seminar will be organized on specific topics identified by the teacher and the students will present their experiences earned during the training on the specific tasks. 6. End of the semester examination will be an external exam. <p>Place for choosing Industrial Training:</p> <p>Underground and Opencast</p> <ol style="list-style-type: none"> 1. Underground Coal Mines 2. Opencast Coal Mines 3. Underground Metal Mines 4. Opencast Metal Mines <p>List of Industry/Mines choosing for training:</p>				



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	<ol style="list-style-type: none">1. MOIL (U/G Metal Mine)2. SECL3. NMDC4. SAIL5. NALCO6. HCL7. ADANI
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