O. P. JINDAL UNIVERSITY
O. P. Jindal Knowledge Park, Punjipathra, Raigarh-496109

O. P. Jindal University

Raigarh–Chhattisgarh

Scheme and Syllabus
of
B.Tech

School of Engineering
Session- 2025-29

O. P. JINDAL UNIVERSITY

O. P. Jindal Knowledge Park, Punjipathra, Raigarh-496109

PROGRAM OUTCOMES (POS): At graduation, students will be able to: (From AY: 24-25)

(refer next page for WK1 – WK9 (Knowledge and Attitude Profile)

PO-1	**Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO-2	**Problem Analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO-3	**Design/Development of Solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO-4	**Conduct Investigations**

O. P. JINDAL UNIVERSITY

O. P. Jindal Knowledge Park, Punjipathra, Raigarh-496109

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

PROGRAM SPECIFIC OUTCOMES - At graduation, students will be able to provide:

PSO1: Applying Mechanical Engineering to Global Challenges

Develop an attitude to meet global challenges and apply the knowledge of mechanical engineering to solve problems related to thermal, design, manufacturing, and interdisciplinary fields.

PSO2: Technology-Driven Solutions for Industry & Society

Demonstrate knowledge and skill for solving social, real industrial problems using modern software and hardware tools.

PSO3: Utilizing Mechanical Engineering for Emerging Technologies

Utilizing the knowledge of Mechanical Engineering to work effectively in cutting edge technologies such as Robotics, Artificial Intelligence, Mechatronics, and Automation.

O. P. JINDAL UNIVERSITY

O. P. Jindal Knowledge Park, Punjipathra, Raigarh-496109

Curriculum and Credit Framework for Undergraduate Programme (CCFUP)									
Semester	MAJOR		MINOR	AEC	SEC	Internship/ Apprentice-ship/Project/ Community outreach	VAC	MDC	Total Credits
	DSC	DSE							
I	16			2	2		2		22
II	13			2	2		2	3	22

** Students on exit shall be Awarded Undergraduate Certificate (in the Field of Study/ Discipline) after securing the requisite 44 credits in Semesters I and II and complete one vocational course of 4 credits during the summer*

O. P. JINDAL UNIVERSITY

O. P. Jindal Knowledge Park, Punjipathra, Raigarh-496109

AEC: Ability Enhancement Course **SEC: Skill Enhancement Course**

VAC: Value addition Course **MDC: Multidisciplinary Course**

Level of courses: There will be 5 level of courses on the basis of learning outcome and difficulty levels distributed across semesters in ascending order.

Level-1 (0-99), Level-2 (100-199), Level-3 (200-299), Level-4 (300-399), Level-5 (400-499) courses shall be pre-requisite, introductory, intermediate, higher level, and advanced courses respectively.

DEGREE	MAJOR		MINOR	AEC	SEC	INTERNSHIP/ PROJECT	VAC	MDC	TOTAL CREDIT
	CORE	ELECTIVE							
Honors	106	12	24	8	9	8	6	9	182
Honors with Research	94	12	24	8	9	20	6	9	182

O. P. JINDAL UNIVERSITY

O. P. Jindal Knowledge Park, Punjipathra, Raigarh-496109

Course Structure for B. Tech Program (1st & 2nd Semester)-2025-29 batch

(School of Engineering, Common to all departments)

Year	FIRST SEMESTER (NHEQF Level: 4.5)											
	Sem	Course Code	Course Category	Name of the Course	Hours per week			Scheme of Examination and Marks				Credits : L+ T+ (P/2)
					L	T	P	PRE		ESE	Total	
								MID	TA			
First Year	I st	MAT24-B-MJ111	MAJOR	Engineering Mathematics-I	3	0	0	15	15	70	100	3
		PHY24-B-MJ111	MAJOR	Applied Physics	2	0	0	7.5	7.5	35	50	2
		EE24-B-MJ101	MAJOR	Basic Electrical and Electronics	3	0	0	15	15	70	100	3
		ME24-B-MJ101	MAJOR	Engineering Graphics	2	0	2	15	15	70	100	3
		MME24-B-MJ101	MAJOR	Introduction to Engineering Materials	3	0	0	15	15	70	100	3
			AEC	Choose from the Pool	2	0	0	7.5	7.5	35	50	2
			SEC	Choose from the Pool	2	0	0	7.5	7.5	35	50	2
					0	0	4	-	15	35	50	
			VAC	Choose from the Pool	2	0	0	7.5	7.5	35	50	2
		EE24-B-MJ102	MAJOR	Basic Electrical and Electronics Lab	0	0	2	-	15	35	50	1
		ME24-B-MJ102	MAJOR	Innovation and Skill Development	0	0	2	-	15	35	50	1
												22

O. P. JINDAL UNIVERSITY

O. P. Jindal Knowledge Park, Punjipathra, Raigarh-496109

Course Structure for B. Tech Program (1st & 2nd Semester)-2025-29 batch

(School of Engineering, Common to all departments)

Year	SECOND SEMESTER (NHEQF Level: 4.5)											
	SEM	Course Code	Course Category	Name of the Course	Hours per week			Scheme of Examination and Marks				Credits: L+ T+ (P/2)
					L	T	P	PRE		ESE	Total	
								MID	TA			
First Year	IInd	MAT24-B-MJ112	MAJOR	Engineering Mathematics-II	3	0	0	15	15	70	100	3
		CHE24-B-MJ111	MAJOR	Applied Chemistry	2	0	0	7.5	7.5	35	50	2
		ME24-B-MJ103	MAJOR	Fundamentals of Mechanics	3	0	0	15	15	70	100	3
		CSE24-B-MJ101	MAJOR	Python Programming	3	0	0	15	15	70	100	3
			AEC	Choose from the pool	2	0	0	7.5	7.5	35	50	2
			SEC	Choose from the pool	2	0	0	7.5	7.5	35	50	2
					0	0	4	-	15	35		
			VAC	Choose from the pool	2	0	0	7.5	7.5	35	50	2
			MDC	Choose from the pool	3	0	0	15	15	70	100	3
		ME24-B-MJ104	MAJOR	Mechanics Lab	0	0	2	-	15	35	50	1
		CHE24-B-MJ112	MAJOR	Applied Science Lab	0	0	2	-	15	35	50	1
												22

O. P. JINDAL UNIVERSITY

O. P. Jindal Knowledge Park, Punjipathra, Raigarh-496109

Exit option to qualify for Undergraduate Certificate (after completion of 1st year)

1. An exit option is available for students those who have earned the total 44 credits at the End of Second Semester.
2. Student who wants to avail the exit option after first year have to earn additional 4 credits from the list of courses shown below.
3. These courses student have to complete within summer vacation after 1st Year.
4. After fulfillment as mentioned in 1 to 3 above, Students can earn U.G Certificate and same will be issued by the University.

List of Exit Courses (Choose Any *TWO* Skill-based Courses)

S. N.	Courses Code	Name of the Courses	L	T	P	Credit	Scheme of Examination and Marks			
							PRE		ESE	Total
							MID	TA		
1	CE24-B-EC101	Computer-Aided Drawing with AutoCAD	0	0	4	2	-	15	35	50
2	CSE24-B-EC101	Basic Computer Skills	0	0	4	2	-	15	35	50
3	CSE24-B-EC102	Computer Hardware Skills	0	0	4	2	-	15	35	50
4	EE24-B-EC101	Electrical Wiring & Testing	0	0	4	2	-	15	35	50
5	ME24-B-EC101	Advanced Mechanical Workshop	0	0	4	2	-	15	35	50

O. P. JINDAL UNIVERSITY

O. P. Jindal Knowledge Park, Punjipathra, Raigarh-496109

Program:	B. Tech.	**Semester:**	After 1st Year
Name of the Course:	Advanced Mechanical Workshop	**Course Code:**	ME24-B-EC101
Credits:	2	**No of Hours:**	4 hrs. / week
Max Marks:	50		

Course Descriptions:

This course provides hands-on training and practical exposure to basic manufacturing processes and advanced mechanical workshop practices essential for mechanical and production engineering students. The course is designed to familiarize students with the operation of hand tools, machines, and manufacturing techniques used in fitting, carpentry, welding, foundry, and machining shops. Students will perform a series of structured practical tasks to understand the material properties, working principles, and safety procedures of various fabrication and machining processes. The course aims to build foundational technical skills and promote confidence in handling real-world engineering problems related to fabrication, assembly, and component production.

Course Outcomes:

After Completion of the course, Students will be able to:

CO Number	Course Outcome
CO1	Create wooden components and joints (like mortise and tenon) and develop simple wooden products using carpentry tools.
CO2	Create wooden components and joints (like mortise and tenon) and develop simple wooden products using carpentry tools.
CO3	Perform basic welding operations including butt-joint, lap-joint, and fabrication of components using arc welding and spot-welding techniques.
CO4	Apply the foundry process by preparing molds using patterns and casting non-ferrous metals and complex shapes.
CO5	Operate basic machine tools like lathe, shaper, and milling machines to produce parts with eccentric, dovetail, and pocketing operations.

Experiments to be performed (Minimum Ten experiments)

Fitting Shop

1. Making a V- groove job using fitting tools.
2. Making a step cutting job using fitting tools.
3. Making a male-female joint using fitting tools.

Carpentry Shop

1. Making a two-piece pattern using carpentry tool.
2. Making a mortise and tenon joint using carpentry tools.
3. Making a laptop stand using carpentry tools (Combined job).

Welding Shop

1. Making a Butt-Joint using virtual welding 2.O.
2. Making a Lap-joint using spot welding.
3. Fabricating a steel chair using electric arc welding (Combined Job).

Foundry Shop

1. Preparing a mold using a two-piece pattern.
2. Casting of a non-ferrous metals using two-piece pattern.
3. Casting of a sculpture using metal pattern (Combined job).

Machine Shop

1. Preparing an eccentric job on a lathe machine.
2. Performing dovetail cutting operation on a shaper machine.
3. Performing circular pocketing operation on a milling machine.

List of Tools/Equipment/Machines Required:

1. Fitting tools.
2. Carpentry tools
3. Welding machines (MMAW/Virtual 2.0/Spot) and equipment.
4. Muffle furnace.
5. Lathe Machine.
6. Shaper Machine.
7. Milling Machine.

CO, PO, & PSO Correlation

CO Number	Program Outcome											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	3	1	2	1	1	2	2	1	2	3	2	-
CO2	3	2	3	1	2	1	1	2	2	1	2	3	2	-
CO3	3	2	3	2	3	2	1	2	2	2	2	3	3	-
CO4	3	2	3	3	3	2	2	2	2	2	2	3	3	-
CO5	3	3	3	3	3	2	2	2	2	2	2	3	3	-

Note: 1: Low 2: Moderate 3: High

O.P. Jindal University
School of Engineering
Department of Mining Engineering

Board of Studies (BoS)

Minutes of Meeting

- **Meeting Title:** Board of Studies Meeting
- **Date:** April 24, 2025
- **Time:** 3:00 PM – 4:00 PM
- **Location / Platform:** Online – Zoom Platform
- **Facilitator:** Dr. M. Kalyan Phani
- **Minute Taker:** Dr. Gagan Gupta and Dr. M. Kalyan Phani

The Department of Mining Engineering at O. P. Jindal University proposed the revision and approval of the scheme and syllabus for the following programs for the academic year 2025–26: Diploma 5th and 6th Semesters (Batch 2023–26), Diploma 3rd and 4th Semesters (Batch 2024–27), Diploma 2nd Semester (Batch 2025–28), and B.Tech. 3rd and 4th Semesters (Batch 2024–28).

To deliberate on these revisions, a virtual meeting of the Board of Studies (BoS) was convened on **24th April 2025 at 3:00 PM**, hosted by the department through Zoom platform. The primary agenda of the meeting was to discuss and finalize the scheme and syllabus of the aforementioned semesters.

The following members were present:

1. Dr. B. K. Pal
   Professor, Mining, NIT-Rourkela
2. Dr. M. K. Pradhan
   Professor (HAG), Mining, NIT-Raipur
3. Mr. Om Prakash
   President and CEO, Mining, Jindal Power Limited
4. Dr. M. Kalyan Phani
   Head – Metallurgical and Mining Engineering, O.P. Jindal University
5. Dr. Gagan Gupta
   Assistant Professor, Mining, O.P. Jindal University

6. Dr. Aashish Sahu

   Assistant Professor, Mining, O.P. Jindal University

At the outset, the Chairman of the Board of Studies (BoS), **Dr. M. Kalyan Phani**, extended a warm welcome to all members and formally commenced the meeting by presenting the department's **vision and mission**. He highlighted the recent strategic initiatives and significant achievements of the department, reflecting its continuous efforts toward academic excellence and industry relevance. Dr. Phani informed the committee that the **syllabus revision process** has been actively pursued over the past six months and has undergone several iterations. These revisions were meticulously carried out based on comprehensive feedback collected from industry experts, faculty members, students, and other key stakeholders via the university's structured feedback portal.

The revised curriculum has already been reviewed and endorsed by the departmental academic committee and is now being placed before the BoS for its critical review and formal approval. Dr. Phani also presented the agenda items for the current meeting and encouraged all members to engage in thoughtful deliberations and contribute their expert insights to enrich the academic framework.

The agenda of the BoS meeting was:

1. To review the proposed scheme and syllabus of Diploma 5th and 6th Semesters (Batch 2023–26).
2. To review the proposed scheme and syllabus of Diploma 3rd and 4th Semesters (Batch 2024–27).
3. To review the proposed scheme and syllabus of Diploma 2nd Semester (Batch 2025–28).
4. To review the proposed scheme and syllabus of B.Tech. 3rd and 4th Semesters (Batch 2024–28).

Dr. Gagan Gupta was invited by the Chairman, Board of Studies (BoS) to present the departmental curriculum proposals. He presented the proposed teaching scheme and syllabus for the Diploma 5th and 6th Semesters (Batch 2023–2026). During the ensuing discussion, the committee recommended the inclusion of the Rock Mechanics Laboratory (Course Code: SOE-D-MN505) in the 5th semester. The remaining proposed courses were reviewed and found appropriate, with no further modifications suggested. The proposed scheme and syllabus for the Diploma 3rd and 4th Semesters (Batch 2024–2027) were also reviewed. The committee

members expressed satisfaction and recommended no changes. Subsequently, the proposed teaching scheme for the Diploma 2nd Semester (Batch 2025–2028) was examined. The inclusion of courses such as Communicative English – II (HUM-25-D-201) and Yoga and Meditation (HUM-25-D-202) was well appreciated by the committee. The overall structure was deemed appropriate, with no additional modifications required. In the case of the B.Tech. 3rd and 4th Semesters (Batch 2024–2028), the committee commended the department's efforts to align the curriculum with the National Education Policy (NEP) 2020. Members particularly appreciated the range of pool subjects offered under the Ability Enhancement Courses, Skill Enhancement Courses, Value Addition Courses, and Multidisciplinary Courses. During the review of the Skill Enhancement Course pool for the 3rd semester, the committee recommended renaming the course titled "Civil Engineering Drawing (AutoCAD)" to "Engineering Drawing using AutoCAD". It was clarified that the course is offered by the Department of Civil Engineering, and thus the title could not be modified at the departmental level.

A query was raised regarding the certification awarded to students exiting the B.Tech. program after two years. It was clarified that such students would receive an Undergraduate Diploma Certificate, in accordance with NEP 2020 guidelines. This provision was acknowledged and appreciated by the committee. In conclusion, the committee approved all proposed teaching schemes and syllabi across various program levels, finding them satisfactory with no further revisions necessary. The meeting concluded with a vote of thanks extended by the Chairperson to all members for their insightful suggestions and active participation.

Approved online

Dr. B. K. Pal
Professor, Mining, NIT-Rourkela

Approved online

Dr. M. K. Pradhan
Professor (HAG), Mining, NIT-Raipur

Approved Online

Mr. Om Prakash
President and CEO, Mining,
Jindal Power Limited

Dr. M. Kalyan Phani
Head – Metallurgical and Mining Engineering,
O.P. Jindal University

Dr. Gagan Gupta
Assistant Professor, Mining,
O.P. Jindal University

Dr. Aashish Sahu
Assistant Professor, Mining,
O.P. Jindal University

OPJU

NAAC GRADE A Accredited University

The newly introduced courses and the percentage changes in subjects for the *Diploma and B. Tech* programs are outlined below:

Diploma (Mining Engineering)

S. No	Course Code	Name of Course	Revision (%)	Remarks
		Academic Semester-VI (Session: 2023-26)		
1	SOE-D- MN501	Rock Mechanics	--	Course Introduced
2	SOE-D- MN502	Mine Legislation and Safety	--	Course Introduced
3	SOE-D- MN503	Mineral Processing	--	Course Introduced
4	SOE-D- MN504	Mineral Processing Lab	--	Course Introduced
5	SOE-D- MN505	Rock Mechanics Lab	--	Course Introduced
6	SOE-D- MN506	Industrial Training – III***	--	Course Introduced
		Academic Semester-VI (Session: 2023-26)		
1	SOE-D-MN601	Mine Instrumentation	--	Course Introduced
2	SOE-D-MN602	Mine Planning and Design	--	Course Introduced
3	SOE-D-MN603	Mining Hazards	--	Course Introduced
4	SOE-D-MN604	Mine Planning and Design Lab	--	Course Introduced
5	SOE-D-MN605	Project and Report***	--	Course Introduced
		Academic Semester-III (Session: 2024-27)		
1	SOE-D-MN301	Surface Mining	No Change	--
2	SOE-D-MN302	Drilling Technology	No Change	--
3	SOE-D-MN303	Explosive and Blasting	No Change	--
4	SOE-D-MN304	Mining Machinery	No Change	--
5	SOE-D-MN305	Mining Machinery Lab	No Change	--
6	SOE-D-MN306	Explosive and Blasting Lab	No Change	--
7	SOE-D-MN307	Drilling Lab	No Change	--
8	SOE-D-MN308	Industrial Training – I***	No Change	--
		Academic Semester-IV (Session: 2024-27)		
1	SOE-D-MN401	Underground Coal Mining	No Change	--
2	SOE-D-MN402	Underground Metal Mining	No Change	--
3	SOE-D-MN403	Mine Environment and Ventilation	No Change	--
4	SOE-D-MN404	Mine Environment Lab	No Change	--
5	SOE-D-MN405	Mine Ventilation Lab	No Change	--
6	SOE-D-MN406	Industrial Training-II***	No Change	--
		Academic Semester-II (Session: 2025-28)		
1	MN25-D-201	Mine Surveying	No Change	--
2	MN25-D-202	Geology	No Change	--
3	MN25-D-203	Elements of Mining Technology	No Change	--
4	HUM25-D-202	Yoga & Meditation	--	Course Introduced
5	MAT25-D-201	Mathematics-II	No Change	--
6	HUM25-D-201	Communicative English -II	--	Course Introduced

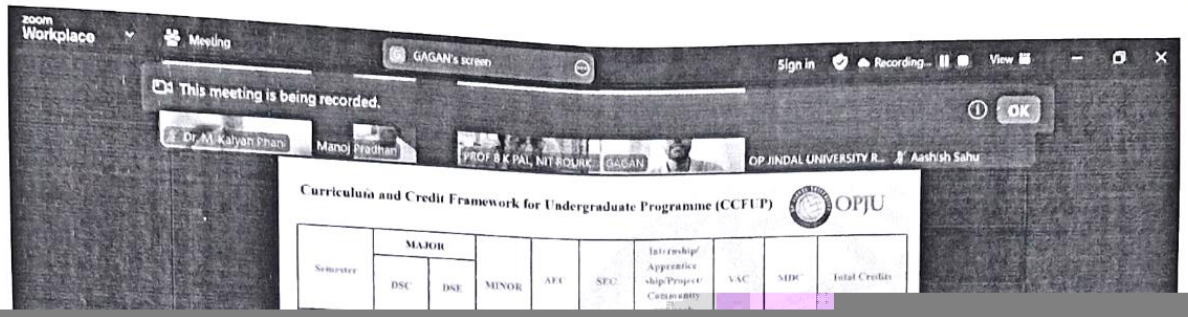
7	MN25-D-204	Mine Surveying Lab	No Change	
8	MN25-D-205	Geology Lab	No Change	

B. Tech (Mining Engineering) – NEP

S. No	Course Code	Name of Course	Revision (%)	Remarks
Academic Semester-III (Session: 2024-28)				
1	MN24-B-MJ201	Mine Development	--	Course Introduced
2	MN24-B-MJ202	Engineering Geology	--	Course Introduced
3	MN24-B-MJ203	Mine Surveying-I	--	Course Introduced
4	MN24-B-MJ204	Basic Surveying Lab	--	Course Introduced
5	MN24-B-MN201	Introduction to the Indian Minerals	--	Course Introduced
6	MN24-B-SE201	Engineering Geology	--	Course Introduced
Academic Semester-IV (Session: 2024-28)				
1	MN24-B-MJ205	Mine Surveying-II	--	Course Introduced
2	MN24-B-MJ206	Mine Machinery - I	--	Course Introduced
3	MN24-B-MJ207	Surface Mining	--	Course Introduced
4	MN24-B-MJ208	Drilling and Blasting	--	Course Introduced
5	MN24-B-MJ209	Bharatiya Khani Gyaan Tantra	--	Course Introduced
7	MN24-B-MN202	Fundamentals of Opencast Mining	--	Course Introduced
8	MN24-B-SE202	Advance Surveying	--	Course Introduced

Enclosures:

1. Screenshots of the meeting
2. Scheme and Syllabus of all programs of which approval is sought


zoom Workplace
Meeting
GAGAN's screen
Sign in
Recording...
View
This meeting is being recorded.
OK
Dr M. Kalyan Phani
Manoj Pradhan
PROF B K PAL, NIT ROURK...
GAGAN
OP JINDAL UNIVERSITY R...
Aashish Sahu
Curriculum and Credit Framework for Undergraduate Programme (CCFUP)
OPJU
Semester
MAJOR
DSC
DSE
MINOR
AEC
SEC
Internship/ Apprentice ship/Project/ Community
VAC
MDC
Total Credits

TEACHING SCHEME
of
MINING ENGINEERING

DEPARTMENT OF MINING ENGINEERING
SCHOOL OF ENGINEERING

OP JINDAL UNIVERSITY, RAIGARH
(CHHATTISGARH)

DIPLOMA

Programme Code: 01DE070

Session: 2023-2026

Diploma 5th Semester

Details Syllabus

Scheme of Teaching and Examination

Diploma (Mining Engineering)

Academic Semester-V

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Exam. and Marks				Credit
							PRE**		ESE*	Total	
				L	T	P	Mid Term	TA			(L+(T+P)/2)
1	SOE-D- MN501	MN	Rock Mechanics	3	0	0	30	20	50	100	3
2	SOE-D- MN502	MN	Mine Legislation and Safety	3	0	0	30	20	50	100	3
3	SOE-D- MN503	MN	Mineral Processing	3	0	0	30	20	50	100	3
4	SOE-D- MN504	MN	Mineral Processing Lab	0	0	4	-	30	20	50	2
5	SOE-D- MN505	MN	Rock Mechanics Lab	0	0	2	-	30	20	50	1
6	SOE-D- MN502	MN	Industrial Training – III***	0	0	16	-	100	150	250	8
Total				**9**	**0**	**22**	**90**	**220**	**340**	**650**	**20**

L: Lecture, T: Tutorial, P: Practical, C: Credit

* End Semester Examination
** Progress Review Examination
*** Training report submission and presentation

Programme:	**Diploma**	**Semester :**	**V**
Name of the Course:	**Rock Mechanics**	**Course Code:**	**SOE-D-MN501**
Credits :	**3**	**No of Hours :**	**3 hours/week**

Course Description

This course provides a comprehensive introduction to the principles and applications of rock mechanics in mining. It covers the mechanical behavior of rock materials, stress analysis, and failure theories relevant to both surface and underground mining operations. Students will gain knowledge about rock mass classification, physio-mechanical properties, instrumentation, and ground control techniques. The course also explores support systems, subsidence control, and advanced topics such as rock bursts and gas outbursts. Emphasis is placed on practical skills in monitoring, prevention, and remedial measures to ensure mine safety and efficiency.

Course Objectives:

1. To study and understand various aspects of rock mechanics and its application to mining.
2. Introducing the various instrumentation and measurement methods.
3. To study the theories of failure and approaches used for open pit and underground designs.
4. To Understand various aspects of supports and their design for various situations.
5. Carryout monitoring, predict and supervise and carryout preventive measures for rock burst, bumps etc.
6. Carryout and supervise roof bolting and stitching operation.

Syllabus

Unit-1

Definition, scope, and application of rock mechanics. Modulus of elasticity. Relation between various modulus of elasticity. In-situ and induced stress. Rock mass classification.

Unit-2

Physio-mechanical properties of rock. Specimen preparation and testing. Strength indices: point load, protodyaknov, impact and cone indenter strength index. Hardness and abrasivity.

Unit-3

Principal stress, strain, and plane. Magnitudes and directions of normal and shear stress on failure plane. Rock failure theories and criteria.

Unit-4

Fundamental of ground movement. Measurement of strata movement. Rock bursts, bumps, gas outbursts, and potholes. Types of supports.

Unit-5

Subsidence: definition, types, and controlling factors. Caving and Stowing.

Text/Reference Books:

1. J. A. Hudson, Comprehensive Rock Engineering: principles, practice & projects, Oxford; New York: Pergamon Press 1983
2. B. H. G. Brady, E.T. Brown, Rock Mechanics: For underground mining, Springer Dordrecht, 3rd Edition.
3. J. C. Jaeger, N. G. W. Cook, R. Zimmerman, Fundamentals of Rock Mechanics, Wiley-Blackwell, 4th Edition.
4. Z. T. Bieniwski, Engineering Rock Mass Classification, 1976
5. S. Peng, Coal mines ground control, Wiley–Blackwell 2008
6. M. L. Jeremic, Strata Mechanics in Coal Mining, A A Balkema Publishers 1st Edition
7. S. S. Peng, H. S. Chiang, Longwall mining theory and practice, Wiley
8. D. Deb, A. K. Verma, Fundamentals and Applications of Rock Mechanics, PHI Learning Pvt. Ltd. 2016

Course Outcomes:

On successful completion of this course:

CO Number	Course Outcomes
CO1	Explain the fundamentals and applications of rock mechanics, including rock mass classification and modulus relationships.
CO2	Assess the physio-mechanical properties of rocks through various strength and hardness tests.
CO3	Analyze stress and strain principles and apply rock failure theories and criteria.
CO4	Understand ground movement phenomena and methods to measure strata displacement and control hazards.
CO5	Describe subsidence mechanisms, types, and techniques for controlling caving and stowing.

Programme: **Diploma** **Semester : V**

Name of the Course: **Mine Legislation and Safety** **Course Code: SOE-D-MN502**

Credits : **3** **No of Hours : 3 hours/week**

Course Description

This course provides an in-depth understanding of the legal framework governing mining operations in India, with a focus on key acts, rules, and regulations relevant to the mineral industry. It covers the Mines Act, 1952, Mine Rules, 1955, and the Coal and Metalliferous Mines Regulations, along with other significant legislation like the Mines and Minerals (Development and Regulation) Act. Students will also explore provisions related to occupational health and safety, accident prevention, and emergency planning. The course equips students with the knowledge to ensure legal compliance and promote safety standards in mining operations.

Course Objective:

1. To study various acts, rules and regulations relating to the mineral industry
2. To study indepth about mine legislation.
3. To study in particular about the laws applicable to mining.
4. To study about accidents and diseases
5. To learn about mine safety.

Syllabus

Unit-1 Mines Act 1952

Development of mining legislation in India. Acts, Rules, and Regulations. Bye-laws, standing orders, and situations under which the act does not apply. Provisions for the drinking water. Provisions for employment of a person below 18 years of age. Provisions of the act in respect of notice to be given about accidents and other major acts.

Unit-2 Mine Rules 1955

Definition of key terminologies. Provisions for lavatories, urinals on the surface and underground. First aid. Pit safety committee. Ambulance, hours, and limitations of employment. Leave with wages and overtime and other major rules.

Unit-3 Coal Mines and Metalliferous Mines Regulations

Important definitions. Duties of managers, assistant/under managers, overman, foreman and surveyor. Mine plans and sections. Mine lighting, safety equipment and other major regulations.

Unit-4

Mines and Minerals (Regulation and Development) Act. Coal Mines Conservation & Development Act.

Unit-5 Safety Aspects in Mines

Occupational hazards in mines. Mine accident: causes, preventive measures, investigation, and report preparation. Safety week. Risk based safety and health management system. Principal Hazard Management Plan (PHMP). Safety management plan and emergency plan.

Text/Reference Books:

1. Mines Act, 1952
2. Coal Mines Regulation 2017
3. Metalliferous Mines Regulations, 1961
4. Coal Mines (Conservation and Development) Act, 1974
5. Mines and Minerals (Development and Regulation) Act, 1957
6. DGMS Circulars
7. R. Prasad, Legislation in Indian Mines - A Critical appraisal, Vol. I & II, Lovely Prakashan.
8. B. K. Kejriwal, Safety in Mines, Lovely Prakashan. (2002)
9. A. Hommadi, Industrial & Occupational Safety, Health & Hygiene.
10. A. Fingret and A. Smith, Occupational Health: A Practical Guide for Managers. 1st Edition

Course Outcomes:

On successful completion of this course:

CO Number	Course Outcomes
CO1	Understand the key provisions and scope of the Mines Act, 1952, including safety and employment regulations.
CO2	Explain the Mine Rules, 1955, focusing on worker welfare, safety, and employment conditions.
CO3	Identify roles, responsibilities, and safety requirements under Coal and Metalliferous Mines Regulations.
CO4	Describe the Mines and Minerals (Regulation and Development) Act and related conservation laws.
CO5	Analyze mine safety practices, hazard management, accident investigation, and emergency planning.

Programme:	**Diploma**	**Semester :**	**V**
Name of theCourse:	**Mineral Processing**	**Course Code:**	**SOE-D-MN503**
Credits :	**3**	**No of Hours :**	**3 hours/week**

Course Description

This course introduces students to the fundamental principles and techniques involved in the processing of minerals. It covers key stages such as comminution, sizing, classification, gravity separation, magnetic and electrostatic separation, and flotation. Students will learn the theoretical foundations and practical applications of various mineral processing equipment and methodologies. Emphasis is placed on equipment selection, process parameters, and optimization strategies to ensure efficient separation and concentration of valuable minerals from ores.

Course Objective:

This course enables the students to choose suitable parameters and appropriate methodology & equipments for processing various types of minerals.

Syllabus:

Unit-1 Comminution

Introduction, definition, scope and economic justification of mineral processing. Major steps in mineral processing and comminution, scope and objectives of mineral processing and sampling of ores. Theory of liberation of minerals. Theories of comminution laws – Kick's, Rittinger's and Bond's theories, concept of Work Index.

Unit-2 Crushers

Crushers- types, principles and operational processes. Grinders –principle, types and operations, open circuit and closed circuit of grinding, grinding mills – theory of operation, related parameters and numerical.

Unit-3 Sizing

Sizing: objectives, scale, laboratory sizing, screening and classification, different type of screens, their mode of operations, application and limitation. Factors affecting the performance of screens, types of screens, and shaking screens

Unit -4 Gravity Concentration

Jigging– theory of jigging, jigging processes, jigging cycle, and types of jigging machines. Concept of Tabling: theory of flowing film and wilfley table. Gravity separation, magnetic and electrostatic separation: principles and operations processes. Concept of terminal velocity, free and hindered settling ratio, the principle of classification, and types of classifiers.

Unit -5 Flotation

Principle of heavy media separations, principle of flotation, factors affecting flotation, practical utility of frother, collector, modifier, activators; types of flotation cells, application of flotation process.

Text/Reference Books:

1. A. M. Gaudin, Principles of Mineral Dressing, Tata McGraw Hill Edition, 1940.
2. S. K. Jain, Ore Processing, Oxford- IBH Publishing Company, 2005.
3. B. A. Wills', Mineral Processing Technology: An Introduction to the Practical Aspects of Ore Treatment and Mineral Recovery 7th Edition
4. Gokhale and Rao, Ore Deposits of India, Thomson Press, Delhi, (India), Publication Division 1973.

Course Outcomes:

On successful completion of this course:

CO Number	Course Outcomes
CO1	Explain the fundamentals and economic importance of comminution and mineral liberation theories.
CO2	Describe different types of crushers and grinders, including their principles and operations.
CO3	Understand sizing techniques, screening methods, and factors influencing screen performance.
CO4	Apply gravity concentration principles and classify methods including jigging and magnetic separation.
CO5	Illustrate the principles of flotation, its influencing factors, and the operation of flotation cells.

Programme:	**Diploma**	**Semester :**	**V**
Name of the Course:	**Mineral Processing Lab**	**Course Code:**	**SOE-D-MN504**
Credits :	**2**	**No of Hours :**	**4 hours/week**

Course Description

This practical course is designed to provide hands-on experience with the core techniques and equipment used in mineral processing. Through a series of structured experiments, students gain practical knowledge in sample preparation, crushing, grinding, classification, and various concentration methods such as jigging, froth flotation, and magnetic separation. The course emphasizes the operational principles, performance evaluation, and efficiency assessment of different mineral processing units, thereby reinforcing theoretical concepts through real-world laboratory applications.

Course Objectives:

To introduce technology involved in crushing /grinding/classification and concentration techniques.

List of experiments:

1. Sample preparation using coning and quartering sampling method.
2. Determine the reduction ratio for jaw crusher using geological samples.
3. Determine reduction ratio of roll crusher.
4. Study the grinding of ore using a ball mill and determine its efficiency.
5. Perform the particle size analysis using the sieve shaker.
6. Study the jigging process and determine its efficiency.
7. Study the Akin's classifier working principle and determine its efficiency.
8. Study the working principle of froth flotation cell and determine its efficiency.
9. Study of magnetic separator.
10. To conceptualize the electrostatic concentration of ores and minerals.

Course Outcomes:

On successful completion of this course:

CO Number	Course Outcomes
CO1	Perform and understand proper sampling techniques using coning and quartering methods.
CO2	Calculate reduction ratios and assess crushing efficiency for jaw and roll crushers.
CO3	Analyze grinding processes and evaluate the efficiency of ball mills.
CO4	Conduct particle size analysis and separation techniques including jigging and classification.
CO5	Explain and assess the working principles and efficiencies of ore concentration methods like flotation, magnetic, and electrostatic separation.

Programme:	**Diploma**	**Semester :**	**V**
Name of the Course:	**Rock Mechanics Lab**	**Course Code:**	**SOE-D-MN505**
Credits :	**1**	**No of Hours :**	**2 hours/week**

Course Description:

This course is designed to provide students with hands-on experience in the principles and practices of rock mechanics. This lab complements theoretical knowledge acquired in related courses by allowing students to conduct experiments that explore the physical and mechanical properties of rocks, as well as their behavior under various stress conditions.

Course Objectives:

- Conduct laboratory tests to determine the physical and mechanical properties of rock materials.
- Analyze and interpret experimental data related to rock strength and failure modes.
- Apply rock mechanics principles to real-world engineering problems in mining and civil engineering contexts.

List of Experiments:

1. Prepare cylindrical rock samples for testing.
2. Determination of Density, porosity and moisture content of rock sample by ISRM standard method.
3. Determination of slake durability strength index of rock sample by ISRM standard method.
4. Determination of point load strength index of rock sample.
5. Determination of Protodyakonov strength index of rock sample.
6. Determination of Uniaxial Compressive strength of rock sample by ISRM standard method.
7. Determination of Tensile strength of rock sample by Brazilian method.
8. Determination of Single Shear and Double Shear strength of rock sample.
9. Determination of cohesion and angle of internal friction of rock sample by tri-axial tests using ISRM standard method.
10. Determination of Young' Modulus of rock sample by ISRM standard method.

Course Outcomes:

On successful completion of this course:

CO Number	Course Outcomes
CO1	Prepare cylindrical rock samples following standard laboratory procedures.
CO2	Measure physical properties of rocks, including density, porosity, and moisture content.
CO3	Evaluate rock strength using various indices such as slake durability, point load, and Protodyakonov.
CO4	Determine uniaxial compressive and tensile strengths of rock samples using ISRM methods.
CO5	Assess shear strength parameters, cohesion, friction angle, and Young's Modulus through tri-axial testing.

Programme:	**Diploma**	**Semester :**	**V**
Name of the Course:	**Industrial Training – III**	**Course Code:**	**SOE-D- MN506**
Credits :	**8**	**No of Hours :**	**16 hours/week**

Course Description:

This course provides students with practical exposure to the entire mining cycle, including upstream activities such as exploration and extraction, as well as downstream processes like mineral processing and logistics. Through industry-based training, students develop skills to apply theoretical concepts in real-world mining operations, enhancing their understanding of mining workflows, safety practices, and operational challenges.

Course Objective:
Learn about the mining upstream and down stream activity

Course Outcomes:
On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Become more aware of industry practices.
CO2	Understand the working principles of every section of mine.
CO3	Correlate the theoretical knowledge with mine site activities.
CO4	Become more aware of industry regulations.
CO5	Get updated on the demands of the industries

Scheme of Teaching and Examination

Diploma (Mining Engineering)

Academic Semester-VI

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Exam. and Marks				Credit
							PRE**		ESE*	Total	
				L	T	P	Mid Term	TA			(L+(T+P)/2)
1	SOE-D-MN601	MN	Mine Instrumentation	2	2	0	30	20	50	100	3
2	SOE-D-MN602	MN	Mine Planning and Design	2	2	0	30	20	50	100	3
3	SOE-D-MN603	MN	Mining Hazards	3	0	0	30	20	50	100	3
4	SOE-D-MN604	MN	Mine Planning and Design Lab	0	0	2	-	15	10	25	1
5	SOE-D-MN605	MN	Project and Report***	0	0	20	-	100	150	250	10
Total				**7**	**4**	**22**	**90**	**175**	**310**	**575**	**20**

L: Lecture, T: Tutorial, P: Practical, C: Credit

* End Semester Examination

** Progress Review Examination

***Training report submission and presentation

Programme:	**Diploma**	**Semester :**	**VI**
Name of the Course:	**Mine Instrumentation**	**Course Code:**	**SOE-D-MN601**
Credits :	**3**	**No of Hours :**	**3 hours/week**

Course Description

This course introduces students to the fundamental principles and applications of instrumentation and control systems in mining operations. It covers the measurement of key parameters such as pressure, temperature, level, and flow, as well as the use of sensors and transducers. The course emphasizes the role of instrumentation in automation, environmental monitoring, and safety management in mines. Students will gain insights into control systems, data acquisition, gas detection, fire suppression, and emergency response systems, equipping them to support safe and efficient mining practices.

Course Objective:

The objective of the Mine Instrumentation course is to familiarize students with the essential instruments and control systems used in the mining industry, focusing on their applications, measurement principles, and role in enhancing safety, productivity, and environmental monitoring within mining operations.

Syllabus

Unit-1 Introduction to Mine Instrumentation

Overview of Instrumentation: Importance and applications in mining. Types of Instruments: Mechanical, electrical, and electronic instruments. Measurement Principles: Accuracy, precision, calibration. Sensors and Transducers: Types and working principles.

Unit-2 Measurement Techniques

Pressure Measurement: Instruments and techniques for measuring pressure. Temperature Measurement: Thermocouples, RTDs, and other sensors. Level Measurement: Techniques for measuring material levels in tanks. Flow Measurement: Overview of fluid flow measurement instruments.

Unit-3 Control Systems in Mining

Control Theory Basics: Open-loop vs. closed-loop systems. Automation in Mines: Technologies enhancing safety and efficiency. Data Acquisition Systems: Collection and analysis of sensor data.

Remote Monitoring: Technologies for monitoring mining operations.

Unit-4 Environmental Monitoring

Environmental Parameters: Monitoring air quality, noise, and vibrations. Dust Control Measures: Techniques for dust measurement and control. Water Quality Monitoring: Instruments for assessing water quality. Regulatory Compliance: Understanding environmental regulations.

Unit-5 Safety Instrumentation

Safety Systems in Mines: Overview of safety instrumentation systems. Gas Detection Systems: Types of gas detectors and applications. Fire Detection and Suppression Systems: Instruments for fire safety. Emergency Response Systems: Role of instrumentation in emergencies.

Text/Reference Books:

1. Mine Instrumentation and Control by R. K. Singh
2. Instrumentation in Mining by D. C. S. Reddy
3. Automation in Mining by A. K. Gupta
4. Environmental Monitoring in Mining by P. S. Rao
5. Safety Engineering in Mining by M. N. Shukla

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Understand the fundamentals of mine instrumentation and the working principles of sensors and transducers.
CO2	Apply measurement techniques for pressure, temperature, level, and fluid flow in mining operations.
CO3	Explain control systems and automation technologies used to enhance mining safety and efficiency.
CO4	Monitor and assess environmental parameters in mines using appropriate instrumentation.
CO5	Identify and evaluate safety instrumentation systems for gas detection, fire suppression, and emergency response.

Programme:	**Diploma**	**Semester :**	**VI**
Name of the Course:	**Mine Planning and Design**	**Course Code:**	**SOE-D-MN602**
Credits :	**3**	**No of Hours :**	**3 hours/week**

Course Description

This laboratory course provides hands-on experience in the fundamental unit operations of mineral processing. Students perform experiments related to crushing, grinding, classification, and concentration of minerals, using laboratory-scale equipment such as crushers, ball mills, classifiers, jigging machines, flotation cells, magnetic separators, and electrostatic concentrators. Emphasis is placed on developing practical skills, understanding process efficiencies, and applying theoretical knowledge to real-world mineral beneficiation problems. The course prepares students for operational roles in mineral processing plants and enhances their problem-solving abilities in mineral separation techniques**.**

Course Objective:

1. To understand the planning of opencast & underground mines and equipment utilization.
2. To study project implementation and monitoring.

Syllabus:

Unit-1

Objective of mine planning, components of mine planning, technical terminologies, day to day plan, short range plan and long range plan.

Unit-2

Estimation of ore body reserved. Major data required for mine planning. Life and capacity of mine. Feasibility of surface and underground mining methods. Mine opening: design, location and size. Division of mine area into units and sub units. Underground and surface mine design planning.

Unit-3

Determination of production parameters, cost of various mining operations, basics of mine investment, risk of accidents, techno economic decisions.

Unit-4

Optimization techniques, ventilation planning, drainage system, and power planning. Pit top and pit bottom layouts.

Unit-5

Introduction of computer aided mine planning and design. Environmental measures in mine planning. Mine closure planning. General and special provisions. Preparation of plan reports.

Text/Reference Books:

1. H. L. Hartman, SME Mining Engineering Handbook 2nd Edition.
2. S. P. Mathur, Mine Planning for Coal, M.G. Consultants, 1993.
3. J. G. Singh, Underground Coal Mining Methods, Braj-Kalpa Publishers.
4. J. Bhattacharya, Principles of Mine Planning, Allied Publishers Private Limited.

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Understand the objectives, components, and types of mine planning.
CO2	Estimate ore reserves and design surface/underground mines based on technical and geological data.
CO3	Analyze production parameters, operational costs, and make techno-economic decisions.
CO4	Apply optimization techniques in mine layout, ventilation, drainage, and power systems.
CO5	Utilize computer-aided tools for mine planning, incorporating environmental and closure considerations.

Programme:	**Diploma**	**Semester :**	**VI**
Name of theCourse:	**Mining Hazards**	**Course Code:**	**SOE-D-MN603**
Credits :	**3**	**No of Hours :**	**3 hours/week**

Course Description

This course provides an in-depth understanding of the hazards associated with mining operations, including the causes and control of mine fires, explosions, and inundations. Students will study workplace hazards, occupational health risks, and risk assessment methodologies used to enhance mine safety. Emphasis is placed on accident investigation, safety audits, and the appropriate selection and use of personal protective equipment (PPE). Through this course, students will gain the knowledge required to identify, analyze, and manage mining hazards, thereby promoting safer mining practices.

Course Objectives:

To introduce causes of mine fires, advances in more lighten technology, explosion causes of, mine inundation and Safety audit.

Syllabus:

Unit-1

Spontaneous heating in underground and surface coal mines: causes, detection and preventive measures. Mine fires. Fires extinguishers. Fire stopping and sealing off an area. Reopening a sealed-off area.

Unit-2

Explosions of firedamp and coal dust: causes and prevention. Stone dust and water barriers, investigations of explosion. Mine inundation: causes and precautionary measures.

Unit-3

Workplace hazards and their types. Health risks due to workplace hazards. Occupational health and its management. Physiological workload types. Introduction and overview of ergonomics. Ergonomics and human factors at work.

Unit-4

Occupational and non-occupational risks. Risk analysis methods: preliminary hazard analysis (PHA) & hazard analysis (HAZAN), failure mode effect analysis (FMEA), hazard and operability (HAZOP) study, hazard ranking, fault tree analysis, event tree analysis, job safety analysis (JSA).

Unit-5

Causes of accidents at the workplace. Process of accident investigation. Safety audit and its types. Benefits of safety audit. Personal Protective Equipment (PPE): introduction, requirements, Indian standards, factors of selection of PPE. Non-respiratory and respiratory equipment.

Text/Reference Books:

1. C. D. Reese, Occupational Safety and Health: Fundamental Principles and Philosophies, CRC Press
2. J. R. Ridley and J. Channing, Safety at Work, Publisher: Butterworth-Heinemann
3. K. U. Mistry, Fundamentals of Industrial Safety and Health: Vol. – 2, Siddharth Prakashan, Publisher: Ahmedabad, 2012, Edition: 3rd
4. A. Hommadi, Industrial & Occupational Safety, Health & Hygiene

5. A. Fingret and A. Smith, Occupational Health: A Practical Guide for Managers. 1st Edition, Taylor & Francis

Course Outcomes:
On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Identify causes, detection methods, and preventive measures for spontaneous heating and mine fires.
CO2	Explain the causes and prevention of mine explosions and inundations, and related safety measures.
CO3	Recognize workplace hazards and understand the principles of occupational health and ergonomics.
CO4	Apply various risk analysis techniques to assess and manage mining-related hazards.
CO5	Understand accident causes, investigation procedures, safety audits, and appropriate use of PPE.

Programme:	**Diploma**	**Semester :**	**VI**
Name of the Course:	**Mine planning and design Lab**	**Course Code:**	**SOE-D-MN604**
Credits :	**1**	**No of Hours :**	**2 hours/week**

Course Description

This practical course complements theoretical concepts in mine planning and design, providing hands-on experience in drawing layouts for various mining methods, including board and pillar, longwall, and opencast mining. Students will learn about ore reserve estimation using vertical cross-section and 3D block modeling techniques, economic block modeling, pit design, and mine infrastructure planning such as roadways, drainage, and waste dump storage. The lab also introduces computer-aided mine planning and emphasizes financial evaluation through cash flow analysis and mine closure planning. The course equips students with the essential skills to design, analyze, and manage mining operations effectively.=

Course Objective:

1. To learn about developing a vertical cross section method of ore reserve estimation
2. To develop a Ore reserve estimation by 3-D geological block method
3. To develop a economic block model and pit layout.
4. To study Cash flow calculations
5. Design of road width, drainage system in surface mines and waste dumps storage

List of experiments:

1. Draw the layout of a board and pillar method of mining.
2. Draw the layout of a long wall method of mining.
3. Draw the layout of an open cast pit method of mining.
4. Draw the general layout of the underground ventilation planning.
5. Draw the layout of the blasting design in the underground mining method.
6. Draw the layout of the blasting design in the opencast mining method.
7. Draw the organization chart of opencast mine management.
8. Draw the organization chart of underground mine management.
9. Introduction of different computer programs in mine planning.
10. Draw the flow chart of mine closure planning.

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Illustrate various mining methods including board and pillar, longwall, and opencast layouts.
CO2	Design ventilation and blasting layouts for both underground and opencast mines.
CO3	Develop organizational charts for opencast and underground mine management.
CO4	Understand the application of computer programs in mine planning.
CO5	Create a flow chart outlining the steps involved in mine closure planning.

Programme:	**Diploma**	**Semester :**	**VI**
Name of the Course:	**Project and Report**	**Course Code:**	**SOE-D-MN605**
Credits :	**10**	**No of Hours :**	**20 hours/week**

Course Description

The Project and Report course is designed to provide final semester diploma students with an opportunity to apply their theoretical knowledge and practical skills to solve real-world mining engineering problems. Under faculty supervision, students will identify a problem, analyze influencing factors, apply fundamental principles, and follow a systematic problem-solving procedure to propose viable solutions. Emphasis is placed on critical thinking, technical writing, and professional presentation. The course culminates in a detailed project report and viva-voce, fostering skills in research, analysis, teamwork, and effective communication. This capstone experience prepares students for professional roles or further academic pursuits in mining and related industries.

Course Objective:

1. Define the problem
2. Discuss the factors influencing it
3. Understand the factors influencing it
4. Understand the principals involved
5. Understand the problem solving procedure
6. Understand the remedial methods.

Course Outcomes:

On successful completion of this course:

CO Number	Course Outcomes
CO1	Explain the problem
CO2	Discover the factors influencing it
CO3	Categorize the principles involved
CO4	Illustrate the problem solving procedure
CO5	Discuss the result of the project

Session: 2024-2027

Scheme of Teaching and Examination

Diploma (Mining Engineering)

Academic Semester-III

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Exam. and Marks				Credit (L+(T+P)/2)
				L	T	P	PRE**		ESE*	Total	
							Mid Term	TA			
1	SOE-D-MN301	MN	Surface Mining	4	0	0	30	20	50	100	4
2	SOE-D-MN302	MN	Drilling Technology	3	2	0	30	20	50	100	4
3	SOE-D-MN303	MN	Explosive and Blasting	3	0	0	30	20	50	100	3
4	SOE-D-MN304	MN	Mining Machinery	2	2	0	30	20	50	100	3
5	SOE-D-MN305	MN	Mining Machinery Lab	0	0	4	-	30	20	50	2
6	SOE-D-MN306	MN	Explosive and Blasting Lab	0	0	4	-	30	20	50	2
7	SOE-D-MN307	MN	Drilling Lab	0	0	4	-	30	20	50	2
8	SOE-D-MN308	MN	Industrial Training – I***	0	0	12	-	50	100	150	6
Total				**14**	**0**	**24**	**120**	**220**	**360**	**700**	**26**

L: Lecture, T: Tutorial, P: Practical, C: Credit

* End Semester Examination

** Progress Review Examination

***Training report submission and presentation

Programme:	**Diploma**	**Semester :**	**III**
Name of the Course:	**Surface Mining**	**Course Code:**	**SOE-D-MN301**
Credits :	**4**	**No of Hours :**	**4 hours/week**

Course Description

This course provides an overview of surface mining, including its methods, design principles, and operational aspects. Topics covered include deposit development, drilling and blasting techniques, and the selection and application of mining machinery. Students will also learn about transportation systems in surface mining, such as dumpers, conveyors, and rail transport, along with their design considerations and suitability.

Course Objectives:

1. Provide a detailed description of the proposed surface mining method and related equipment and support infrastructure;
2. Design and evaluate materials handling and transport options
3. Conduct productivity analysis for the selected mining system
4. Identify and evaluate core risks in each mining method
5. Appraise mining systems with respect to safe, efficient, economic and environmentally and socially responsible operations
6. Demonstrate awareness of major technological trends

Syllabus:

Unit-1 Introduction

Surface mining: applicability, methods, advantages and disadvantages. Stripping ratio. Key components of open pit design, design of benches, ultimate pit. Waste dump layout.

Unit-2 Development

Methods to open the deposits. Box cuts: internal and external box cuts, driving methods. Layout of open pits. Unit operations in development.

Unit-3 Drilling and Blasting

Drilling patterns in blasting and dimensions of blast hole. Types of explosives used. Major problems in blasting and their remediation.

Unit-4 Machinery

Introduction: shovel, dragline, hydraulic excavators, multi-bucket excavators, surface miners, dozers, scrapers, front-end loaders, graders, and backhoes. Applicability and working of mentioned equipment.

Unit-5 Transportation

Dumpers: types, applicability, advantages and disadvantages. Haul road gradient and width. Suitability of conveyors and rail transport.

Text/Reference Books:

1. G.B. Mishra, Surface Mining
2. S. K. Das, Surface Mining Technology, Lovely Prakashan; 3rd edition

3. J. W. Martin, Surface mining equipment, Martin Consultants
4. W. Hustrulid, M. Kuchha, R. Martin, Open Pit Mine Planning & Design, CRC Press
5. E. P. Pfleider, Surface Mining, American Institute Mining
6. H. L. Hartman, SME handbook

Course Outcomes:

On successful completion of this course:

CO Number	Course Outcomes
CO1	Explain the fundamentals of surface mining methods, stripping ratio, and open-pit design principles.
CO2	Describe development techniques including box cuts and pit layout for deposit access.
CO3	Identify drilling patterns, explosives, and methods to mitigate blasting-related issues.
CO4	Understand the working and applicability of various surface mining machinery.
CO5	Evaluate transportation systems in surface mining, including dumpers, conveyors, and railways.

Programme:	**Diploma**	**Semester :**	**III**
Name of the Course:	**Drilling Technology**	**Course Code:**	**SOE-D-MN302**
Credits :	**4**	**No of Hours :**	**4 hours/week**

Course Description:

This course offers a comprehensive overview of drilling technology with a focus on its applications in mining. It covers fundamental drilling methods, mechanics, equipment, and rock drillability. Students will explore advanced techniques such as directional and exploratory drilling, along with automation and environmental considerations. Emphasis is placed on operations management, safety, cost analysis, and quality control, supported by real-world case studies and practical training.

Course Objectives:

The objective aim to ensure that students are well-prepared for careers in mining engineering and related fields, equipped with both theoretical knowledge and practical skills necessary for effective drilling operations.

Unit-1 Introduction to Drilling Technology

Overview of Drilling: Definition, importance, and applications in mining. Types of Drilling Methods: Percussive, rotary, and diamond drilling. Drilling Equipment: Overview of various drilling machines and their components. Drillability of Rocks: Factors affecting drillability including rock type, hardness, and geological conditions.

Unit-2 Drilling Mechanics and Principles

Mechanics of Drilling: Thrust, rotation, feed, and flushing mechanisms. Drilling Parameters: Impact of feed rate, weight on bit, and rotation speed on drilling efficiency. Flushing Techniques: Air-water flushing and suction drilling methods. Ergonomics in Drilling: Human factors affecting drilling operations.

Unit-3 Advanced Drilling Techniques

Directional Drilling: Techniques for deviating boreholes and applications in mining. Exploratory Drilling: Methods for geological exploration and sampling. Innovative Technologies: Use of automation and remote control in modern drilling practices. Environmental Considerations: Best practices for minimizing environmental impact during drilling.

Unit-4 Drilling Operations Management

Planning and Scheduling: Strategies for effective drilling project management. Cost Analysis: Understanding the economics of drilling operations including bit life and operational costs. Safety Protocols: Safety measures in drilling operations to prevent accidents. Quality Control: Techniques for ensuring the quality of drilled holes.

Unit-5 Practical Applications and Case Studies

Case Studies in Mining Operations: Analysis of successful drilling projects in various mining environments. Field Practices: Hands-on training in drilling techniques and equipment operation. Future Trends in Drilling Technology: Exploration of emerging technologies and their potential impact on the industry. Project Work: Application of learned concepts through a practical project related to drilling technology.

Reference Books:

1. Fundamentals of Drilling Engineering by Robert F. Mitchell.
2. Drilling Technology by R. K. Gupta.
3. Drilling Fluid Mechanics by M. A. Al-Mansoori.
4. Advanced Drilling Technology by A. J. Smith.
5. Mining Engineering Handbook by Peter Darling.

Course Outcomes:

On successful completion of this course:

CO Number	Course Outcomes
CO1	Understand the fundamentals of drilling methods, equipment, and rock drillability in mining.
CO2	Analyze drilling mechanics, operational parameters, and ergonomics affecting performance.
CO3	Apply advanced drilling techniques and assess their environmental implications.
CO4	Manage drilling operations with focus on planning, cost, safety, and quality control.
CO5	Demonstrate practical skills through case studies, fieldwork, and project-based applications.

Programme:	**Diploma**	**Semester :**	**III**
Name of the Course:	**Explosive and Blasting**	**Course Code:**	**SOE-D-MN303**
Credits :	**3**	**No of Hours :**	**3 hours/week**

Course Description:

This course provides an in-depth understanding of explosives, their classification, properties, and applications in rock fragmentation. It covers initiation systems, safe storage, and transportation of explosives, with emphasis on underground blast design in mining. Students will also explore the environmental impacts of blasting, including ground vibrations and controlled blasting techniques

Course Objectives:

This course aims to equip students with an understanding of various explosives, their properties, and initiation systems. It focuses on optimizing surface and underground blasting practices while addressing safety, environmental impacts, and effective blast design methodologies for efficient rock fragmentation.

Syllabus:

Unit-1 Explosives

Classification, major constituents, important properties, application, packed and bulk explosive.

Unit-2 Rock Fragmentation

Rock fragmentation mechanism. Factors affecting rock fragmentation. Explosive energy distribution.

Unit-3 Initiation System, Storage and Transportation of Explosives

Detonators, safety fuse, detonation cord, detonating relay, non-electric initiation system, electronic detonators, primers and boosters, exploder and other blasting tools. Storage, transportation and disposal of explosives.

Unit-4 Underground Blast Design

Blasting pattern in coal metal mines. Types of explosives used. Effect on the earth's surface.

Unit-5 Environmental Impacts

Induced ground vibration: measurement and threshold values for different structures. Air overpressure and fly rock. Controlled blasting techniques.

Text/Reference Books:

1. C. J. Konya; Edward J Walter, Surface blast design, Prentice Hall, (1990)
2. U. Langefors, The modern technique of rock blasting, Björn Kihlström Publisher: New York, Wiley 1967
3. G. K. Pradhan, Explosives & Blasting Techniques, Mintech Publications, Bhubaneswar.
4. Indian Explosive Act 1884 and Rules 2008.
5. S. Bhandari, Engineering Rock Blasting Operations, Taylor & Francis, 1997
6. D. J. Deshmukh, Elements of Mining Technology, Vol. I, Denett & Co., Nagpur
7. DGMS Circulars

Course Outcomes:
On successful completion of this course:

CO Number	Course Outcomes
CO1	Classify different types of explosives and understand their properties and applications.
CO2	Explain rock fragmentation mechanisms and factors influencing explosive energy distribution.
CO3	Describe various initiation systems and the safe storage, transport, and disposal of explosives.
CO4	Design underground blasting patterns for coal and metal mines with appropriate explosive selection.
CO5	Assess environmental impacts of blasting and apply controlled blasting techniques to minimize them.

Programme:	**Diploma**	**Semester :**	**III**
Name of theCourse:	**Mine Machinery**	**Course Code:**	**SOE-D-MN304**
Credits :	**3**	**No of Hours :**	**3 hours/week**

Course Description:

This course covers essential mining machinery and systems used in underground operations. Topics include wire ropes, haulage systems, and various winding methods including drum, skip, and Koepe winding. It also explores mine water management with pumping systems, hydraulic and compressed air power transmission, and mechanized coal cutting equipment like shearers and continuous miners. Emphasis is placed on construction, operation, safety, and maintenance of each system.

Course Objective:

The course provide students basic knowledge and skill about various types of winding system, underground machineries, loading and hauling machine, hoisting machine and various safety devices used in mines, their installation operation and safety feature of all the machines.

Syllabus

Unit-1

Wire Ropes: usage, types, construction, size, safety factor, and maintenance. Haulage: types, construction, operation and application.

Unit-2

Drum winding: headgear arrangement, shaft fittings, safety devices, cages & skips, suspension gear arrangements. Electric winders, winding drums, mechanical & electrical breaking, safety devices on winders. Skip & Koepe Winding: types & construction, pit top & pit bottom arrangements, advantages and disadvantages.

Unit-3

Mine water sources. Pump: types, characteristics, operation, maintenance and selection. Special types of pumps. Pumping problems.

Unit-4

Hydraulic transmission: fundamental, fluids, pumps, motors. Types of valves. Hydraulic circuits. Compressed Air Power Transmissions: compression process, working and constructional features of single stage and multistage compressor. Transmission of compressed air.

Unit-5

Applicability, construction and operation of shearers and coal plough, road headers, and continuous miner.

Text/Reference Books:

1. W. A. Hustrulid, Underground Mining Methods Handbook, Society for Mining Metallurgy
2. M. A. Ramlu, Mine Hoisting, White Falcon Self Publishing Platform; 2nd edition
3. W. A. Hustrulid, SME Mining Engineer's Handbook
4. D. J. Deshmukh, Elements of Mining Technology Vol. 1 & 3, Denett & Co.
5. S. C. Walker, Mine Winding and Transport, Elsevier Science, 2012

6. H. L. Hartman, SME Mining Engineering Handbook 2nd Edition.

Course Outcomes:

On successful completion of this course:

CO Number	Course Outcomes
CO1	Explain the types, construction, and maintenance of wire ropes and haulage systems used in mining.
CO2	Describe drum, skip, and Koepe winding systems along with associated safety devices and operational features.
CO3	Identify mine water sources and demonstrate knowledge of pump types, operations, and troubleshooting.
CO4	Understand the principles and applications of hydraulic and compressed air transmission systems in mining.
CO5	Describe the construction, working, and applicability of modern coal cutting and loading machines.

Programme:	**Diploma**	**Semester :**	**III**
Name of theCourse:	**Mining Machinery Lab**	**Course Code:**	**SOE-D-MN305**
Credits :	**2**	**No of Hours :**	**4 hours/week**

Course Description:

This course provides hands-on knowledge of essential underground mining equipment and systems. It covers rope capels, haulage safety devices, Koepe winding arrangements, skips, and rope splicing techniques. Students will also study drilling machines, belt conveyors, underground cables, hydraulic pumps, and the layout of underground substations, focusing on their construction, operation, and safety.

Course Objective:

1. Explain various types of wire ropes
2. Illustrate types of gear
3. Describe the safety procedure in mining
4. Learn about the power consumption & distribution in mining industry
5. Study rope ways used in transportation of minerals
6. Learn about the safety devices implanted in transportation equipment

List of experiments:

1. Study of different types of rope capels.
2. Study of various safety devices on rope haulages.
3. Study of various Koepe arrangements
4. Study of various types of skips.
5. Study of rope splicing.
6. Study of different rock and coal drill machines.
7. Study of construction of belt conveyors.
8. Study of construction of underground cables.
9. Study of hydraulic pumps.
10. Study of the layout of an underground substation.

Course Outcomes:

On successful completion of this course:

CO Number	Course Outcomes
CO1	Identify and explain various rope capels, skips, and Koepe winding arrangements used in mines.
CO2	Understand the function and importance of safety devices in rope haulage systems.
CO3	Demonstrate knowledge of rope splicing techniques and their applications in underground mining.
CO4	Describe the construction and working of drilling machines, belt conveyors, and underground cables.
CO5	Understand the layout and components of underground substations and hydraulic pump systems.

Programme:	**Diploma**	**Semester :**	**III**
Name of the Course:	**Explosive and Blasting Lab**	**Course Code:**	**SOE-D-MN306**
Credits :	**2**	**No of Hours :**	**4 hours/week**

Course Description:

This course provides practical and theoretical knowledge on the measurement and analysis of blast-induced effects such as ground vibration, air overpressure, and fumes. It covers the use of tools like VOD measurement systems, WIPFRAG software for fragmentation analysis, and various blasting instruments. Students will explore controlled blasting techniques, explosive delivery systems, and the design of blast patterns in both surface and underground mining. The course emphasizes safety, efficiency, and environmental considerations in modern blasting practices

Course Objectives:

This course aims to provide students with practical, hands-on experience in various aspects of blasting technology used in mining.

List of Experiments:

1. Measurement of blast Induced ground vibration and development of ground vibration predictor equation
2. Measurement of air over pressure, noise, and blasting fumes
3. Measurement of unconfined VOD of Explosives
4. Measurement of in hole VOD of Explosives column
5. Fragmentation analysis using WIPFRAG software
6. Study of various types of Exploders
7. Study of various blasting tools
8. Study of bulk delivery system of explosive
9. Study of various controlled blasting techniques
10. Design of Pattern of holes in surface and underground mines

Text/Reference Books:

1. C. J. Konya; Edward J Walter, Surface blast design, Prentice Hall, (1990)
2. U. Langefors, The modern technique of rock blasting, Björn Kihlström Publisher: New York, Wiley 1967
3. G. K. Pradhan, Explosives & Blasting Techniques, Mintech Publications, Bhubaneswar.
4. Indian Explosive Act 1884 and Rules 2008.
5. S. Bhandari, Engineering Rock Blasting Operations, Taylor & Francis, 1997
6. D. J. Deshmukh, Elements of Mining Technology, Vol. I, Denett & Co., Nagpur
7. DGMS Circulars

Course Outcomes:

On successful completion of this course:

CO Number	Course Outcomes
CO1	Measure and analyze blast-induced ground vibrations to develop predictor equations.
CO2	Monitor and evaluate air overpressure, noise levels, and blasting fumes for safety assessment.

CO3	Determine unconfined and in-hole velocity of detonation (VOD) of explosives.
CO4	Perform fragmentation analysis using WIPFRAG software for blast performance evaluation.
CO5	Understand and apply blasting tools, exploders, delivery systems, and blast design techniques.

Programme:	**Diploma**	**Semester :**	**III**
Name of theCourse:	**Drilling Technology Lab**	**Course Code:**	**SOE-D-MN307**
Credits :	**2**	**No of Hours :**	**4 hours/week**

Course Description:

This course focuses on the analysis and optimization of drilling operations through real-time data monitoring and laboratory simulations. Students will explore drilling parameters, bit wear, vibrations, and directional techniques while evaluating well integrity, cuttings transport, and environmental impacts. Advanced tools such as MWD systems, borehole cameras, and automated drilling technologies will be utilized to enhance operational efficiency and safety

Course Objectives:

This course aims to provide students with practical, hands-on experience in various aspects of drilling technology used in mining.

List of Experiments:

1. To analyze drilling parameters such as torque, penetration rate, and weight on bit in real-time.
2. To optimize drilling performance by testing various drilling parameters on different rock samples.
3. To assess the wear patterns of different drill bits under controlled conditions.
4. To monitor and analyze vibrations during drilling to improve stability and performance.
5. To evaluate geological conditions in real-time using MWD and borehole camera systems.
6. To study the effectiveness of various cementing techniques in maintaining well integrity.
7. To simulate and analyze directional drilling techniques and their effectiveness in various formations.
8. To investigate the efficiency of cuttings transport in different drilling fluids under varying conditions.
9. To test the functionality and efficiency of automated drilling systems in a controlled environment.
10. To evaluate the environmental effects of drilling activities using simulation models.

Text/Reference Books:

1. Measurement While Drilling: A Practical Guide by J. D. McCarthy.
2. Drilling Engineering by J. P. McCann.
3. Rock Bit Technology by R. K. Gupta.
4. Vibration Analysis for Electronic Equipment by David S. Steinberg.
5. Geotechnical Engineering: Principles and Practices by Donald P. Coduto.
6. Cementing in the Oil and Gas Industry by R. B. Hossain.
7. Directional Drilling by R. L. McClendon.
8. Drilling Fluid Systems Technology by A. B. Smith.
9. Automation in Drilling by J. T. Smith.
10. Environmental Impact Assessment for Sustainable Development by M. P. Singh.

Course Outcomes:

On successful completion of this course:

CO Number	Course Outcomes
CO1	Analyze and interpret real-time drilling parameters to enhance operational efficiency.
CO2	Evaluate drill bit performance and wear patterns under varying geological conditions.
CO3	Apply vibration monitoring techniques to improve drilling stability and safety.
CO4	Assess directional drilling, cementing, and cuttings transport methods for different formations.
CO5	Examine the role of automation and environmental impact in modern drilling practices.

Programme:	**Diploma**	**Semester :**	**III**
Name of the Course:	**Industrial Training – I**	**Course Code:**	**SOE-D-MN308**
Credits :	**6**	**No of Hours :**	**12 hours/week**

Course Description:

This industrial training provides hands-on experience in mine operations, safety practices, and equipment handling. Students gain practical insights into real-world mining environments and processes.

Course Objective:

1. An opportunity to get exposure to the real workstations, plants, machines, and systems
2. Company tour to understand the end to end process at all levels

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Become more aware of industry practices.
CO2	Understand the working principles of every section of mine.
CO3	Correlate the theoretical knowledge with mine site activities.
CO4	Become more aware of industry regulations.
CO5	Get updated on the demands of the industries

Diploma 4th Semester

Details Syllabus

Scheme of Teaching and Examination

Diploma (Mining Engineering)

Academic Semester-IV

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Exam. and Marks				Credit (L+ (T+P) /2)
				L	T	P	PRE**		ESE*	Total	
							Mid Term	TA			
1	SOE-D-MN401	MN	Underground Coal Mining	4	0	0	30	20	50	100	4
2	SOE-D-MN402	MN	Underground Metal Mining	3	0	0	30	20	50	100	3
3	SOE-D-MN403	MN	Mine Environment and Ventilation	2	2	0	30	20	50	100	3
4	SOE-D-MN404	MN	Mine Environment Lab	0	0	4	-	30	20	50	2
5	SOE-D-MN405	MN	Mine Ventilation Lab	0	0	4	-	30	20	50	2
6	SOE-D-MN406	MN	Industrial Training-II***	0	0	20	-	50	100	150	10
Total				**10**	**0**	**28**	**90**	**170**	**290**	**550**	**24**

L: Lecture, T: Tutorial, P: Practical, C: Credit

* End Semester Examination

** Progress Review Examination

***Training report submission and presentation

Programme:	**Diploma**	**Semester :**	**IV**
Name of the Course:	**Underground Coal Mining**	**Course Code:**	**SOE-D-MN401**
Credits :	**4**	**No of Hours :**	**4 hours/week**

……..

Course Description:

This course offers a comprehensive overview of coal mining, covering its historical background, exploration, and development stages. Students will learn key underground mining methods such as Bord and Pillar and Longwall mining, along with techniques for thick seam extraction and special mining approaches. The course also explores coal classification, geological structures, and the distribution of coal in India, providing foundational knowledge for understanding the coal mining industry and its operational challenges.

Course Objectives:

The primary objective of the course is to impart knowledge of various theories about coal creation, coal classification, and coal mining techniques. Additionally, the course will cover thick seam mining, the Bord & Pillar and Longwall type of extraction, as well as a number of specialized coal mining techniques like hydraulic mining, shortwall mining, room & pillar mining, and underground coal gasification.

Syllabus

Unit-1

History of mining. Prospecting, exploration, development, exploitation and rehabilitation. Coal: formation theories and classification. Coal Seam: classification, structures and abnormalities. Distribution of coal in India. Indian coal mining industries.

Unit-2

Development of the Bord and Pillar Method using the Panel and without the Panel systems Dimensions and Form of the Pillar, Galleries, and Operational Cycle Depillaring Issues with depillaring, setting up, pillar extraction methods, depillaring with stowing and caving procedures, and risks related to depillaring

Unit-3

Key Terminology for Longwall Mining, Types of Longwall Faces and Their Selection, Benefits and Drawbacks of Longwall Mining, The creation of longwall panels and faces, the advancement and retreating of longwalls, the length of longwall faces, the rate of face advancement, the organization of faces, and the variations in longwall mining.

Unit-4

Thick Seam Mining Problem in Mining of Thick Seams, Choice of Thick Seam Mining method, inclined slicing, horizontal slicing, Diagonal Slicing, Transverse Slicing, Sublevel Caving, Blasting Gallery Method, Cable bolting method.

Unit-5

Unique Mining Techniques: Short wall mining, room and pillar mining, hydraulic mining, coal gasification underground, and an introduction to CBM recovery.

Text/Reference Books:

1. W. A. Hustrulid Rechard Bullock, Underground Mining Methods, SME Publication
2. J. G. Singh, Underground Coal Mining Methods, Braj-Kalpa Publishers
3. R.D. Singh, Principle and practices of modem Coal Mining
4. S.P. Mathur, Coal Mining in India

5. R.T. Deshmukh, Wining & working coal
6. T.N. Singh, Underground winning of Coal
7. S. Peng, Longwall Mining

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Understand the history, processes, and classification of coal and coal seams, along with coal distribution in India.
CO2	Explain the principles and practices of Bord and Pillar mining, including development, depillaring, and associated risks.
CO3	Describe longwall mining techniques, face organization, and evaluate their advantages and limitations.
CO4	Identify suitable methods for thick seam mining and analyze their application and challenges.
CO5	Gain knowledge of specialized coal mining methods, including hydraulic mining, UCG, and CBM recovery.

Programme:	**Diploma**	**Semester :**	**IV**
Name of theCourse:	**Underground Metal Mining**	**Course Code:**	**SOE-D-MN402**
Credits :	**3**	**No of Hours :**	**3 hours/week**

Course Description:

This course provides an in-depth understanding of metal mining methods, covering key terminologies and factors influencing method selection. It explores development techniques including modes of access and drivage operations. The syllabus details various stoping methods used in metal mining and examines practical applications through case studies of Indian mines and current mining technologies.

Course Objective:

1. To introduce concepts of metal mining and metal mining terminology.
2. To study development and operations of metal mines.
3. To study about special methods of metal mining methods.
4. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

Syllabus

Unit-1 General
Definitions of key terminologies. Types of metal mining methods. Factors governing the selection of mining methods.

Unit-2 Development
Mode of access. Factors affecting the selection of mode of access. Method of drivage and unit operations of levels, crosscuts, raises, winzes, and ore passes.

Unit-3 Stoping Methods-I
Underhand, overhand, and breast stoping. Open stoping. Vertical crater retreat method. Sub-level stoping, room and pillar method, resuing method.

Unit-4 Stoping Methods-II
Shrinkage stoping, cut and fill stoping, square set stoping, sub-level caving, block caving, and top slicing.

Unit-5 Metal Mining Practices
Case studies of India mines. Current metal mining technologies.

Text/Reference Books:

1. D. J. Deshmukh, Elements of Mining Technology Vol. 2–2016.
2. H. L. Hartman, Underground mining methods SME Mining Engineering Handbook 2nd Edition
3. H. L. Hartman, Introductory Mining Engineering, 2nd Edition
4. H. L. Hartman, SME Mining Engineering Handbook 2nd Edition

Course Outcomes:
On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Define key mining terminologies and explain factors influencing the selection of metal mining methods.
CO2	Describe various mine development methods and unit operations involved in level and raise drivage.
CO3	Explain the principles and applications of primary stoping methods like underhand, overhand, and room and pillar.
CO4	Illustrate advanced stoping techniques including shrinkage, cut and fill, and caving methods.
CO5	Analyze current metal mining practices through case studies and modern technological applications.

Programme:	**Diploma**	**Semester :**	**IV**
Name of the Course:	**Mine Environment and**	**Course Code**:	**SOE-D- MN403**
Credits :	**3**	**No of Hours :**	**3 hours/week**

Course Description:

In view of very difficult /uncomfortable environment envisaged in deeper mines in future, this course aims at sampling and analysis of mine air, understanding of heat, humidity, distribution of air, natural ventilation etc for underground mines. Mechanical ventilation devices including auxiliary fans, booster fans etc are also covered in this course.

Course Objective:

1. Understand mine atmosphere composition, gas detection, and methane drainage techniques.
2. Analyze and control heat, humidity, and dust for safe and comfortable mine environments.
3. Apply ventilation principles to measure and manage airflow, pressure, and resistance in mines.
4. Learn the use and maintenance of flame safety lamps and follow DGMS illumination standards.

Syllabus:

Unit-1 Mine Atmosphere

Mine atmosphere: gases present and their origin and compositions. Physiological effects and detection. Monitoring equipment. Analysis of mine air. Methane drainage.

Unit-2 Heat, Humidity and Dust

Sources and effects. Analysis of comfort conditions. Air conditioning of mine air. Mine Dust: classification and measurement. Air Borne Dust: sampling, prevention and suppression.

Unit-3 Ventilation

Objective and standard. Degree of gassiness of mines. Measurement of air quantity, pressure and velocity. Airflow through ducts and mine roadways. Resistance of airways. Laws of ventilation. Chezy's and Atkinson's equations, equivalent resistance and equivalent orifice of mine.

Unit-4 Mine ventilation

Natural ventilation: pressure and its measurements, and thermodynamics. Distribution and control of air current. Doors, regulators, stopping and their types. Air crossings and airlocks.

Unit-5 Flame Safety Lamps and Mine Illumination

Construction of flame safety lamp. Working of the flame safety lamp. Portable Lamps: Types, maintenance and examination. Lamp room design and organization. Illumination standards set by DGMS for underground and open cast working.

Text/Reference Books:

1. D. J. Deshmukh, Elements of Mining Technology Vol.2.
2. S. P. Banerjee, Mine Ventilation, Lovely Prakashan
3. G. B. Mishra, Mine Environment and Ventilation, Oxford University Press.
4. K. L. Tiwari and Jadhav, Paryavaran Addhyan

5. Standard of Lighting Circulars issued by DGMS

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Identify the composition, origin, and physiological effects of mine gases and describe air monitoring techniques.
CO2	Analyze heat, humidity, and dust conditions in mines and apply methods for air conditioning and dust control.
CO3	Measure and interpret mine ventilation parameters using standard equations and resistance concepts.
CO4	Explain natural and mechanical ventilation systems, including airflow control devices and their functions.
CO5	Understand the design, use, and safety standards of flame safety lamps and mine illumination systems.

Programme:	**Diploma**	**Semester :**	**IV**
Name of the Course:	**Mine Environment Lab**	**Course Code:**	**SOE-D-MN404**
Credits :	**2**	**No of Hours :**	**4 hours/week**

Course Description:

This course provides hands-on training in mine safety and environmental monitoring equipment. Students will study various safety devices such as flame safety lamps, breathing apparatus, and self-rescuers, along with instruments for measuring dust, gas, noise, temperature, and humidity. Emphasis is placed on understanding the operation, application, and significance of these tools in ensuring workplace safety and environmental compliance.

Course Objectives:

The student shall be enabled with the practical knowledge of ventilation planning, mechanical ventilators, selection of mine fan, ventilation survey of the underground mine, dust sampling instruments.

List of Experiments:

1. Study of the flame safety lamp.
2. Study of the gravimetric dust sampler.
3. Study of the stone dust barrier.
4. Study of the self-contained breathing apparatus.
5. Study of the self-rescuer.
6. Study of the thermal precipitator dust sampler.
7. Measurement of Ambient Temperature and Wet Bulb Temperature
8. Determination of Relative Humidity using Hygrometers
9. Measurement of Noise Levels using Sound Level Meter
10. Assessment of Air Quality using Gas Detectors

Text/Reference Books:

1. D. J. Deshmukh, Elements of Mining Technology Vol.2.
2. S. P. Banerjee, Mine Ventilation, Lovely Prakashan
3. G. B. Mishra, Mine Environment and Ventilation, Oxford University Press.
4. K. L. Tiwari and Jadhav, Paryavaran Addhyan
5. Standard of Lighting Circulars issued by DGMS
6. M. J. McPherson, Subsurface Mine Ventilation
7. Down and Stokes, Environmental Impact of Mining
8. H.L. Hartman, Subsurface Mine Ventilation

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Understand the working and safety applications of mine rescue equipment like flame safety lamps, self-rescuers, and breathing apparatus.
CO2	Demonstrate knowledge of dust sampling methods using gravimetric and thermal precipitator dust samplers.
CO3	Analyze the function and importance of stone dust barriers in mine explosion prevention.

CO4	Measure and interpret environmental parameters such as temperature, humidity, and noise levels in mining settings.
CO5	Assess mine air quality using various gas detection instruments to ensure a safe working environment.

Programme:	**Diploma**	**Semester :**	**IV**
Name of theCourse:	**Mine Ventilation Lab**	**Course Code:**	**SOE-D-MN404**
Credits :	**2**	**No of Hours :**	**4 hours/week**

Course Description:

This course provides practical insights into the installation and operation of various mine ventilation systems, including axial, centrifugal, and booster fans. Students will study airflow measurement tools such as vane anemometers, velometers, and Pitot static tubes. The course also covers ventilation system configurations, including central and boundary systems, along with advanced topics like air current splitting and reversal in mine airways.

Course Objective:

1. To determine the psychrometric properties, gas percentage in atmosphere.
2. To study the principles and characteristics governing mine fans.
3. To understand lamp design and perform underground illumination surveys.
4. To understand the temporary and permanent stoppings, preventive measures for mine explosions and rescue apparatus.

List of experiments:

1. Study of installation of Axial flow fan.
2. Study of installation of Centrifugal flow fan.
3. Study of installation and positioning of Booster fan.
4. Study of characteristic curves of different fans and their comparison.
5. Study of principal and working of Vane anemometer.
6. Study of principal and working of Velometer.
7. Study of principal and working of Pitot static tube.
8. Study of central and boundary ventilation system.
9. Study of the central and boundary ventilation system.
10. Study of Splitting and Reversal of Air Currents in Mine Airways

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Understand the installation procedures of axial, centrifugal, and booster fans used in mine ventilation.
CO2	Analyze and compare the performance characteristics of various mine ventilation fans.
CO3	Explain the working principles of airflow measuring devices like vane anemometer, velometer, and pitot static tube.
CO4	Describe the design and operation of central and boundary ventilation systems in mines.
CO5	Demonstrate knowledge of air current control through splitting and reversal techniques in mine airways.

Programme:	**Diploma**	**Semester :**	**IV**
Name of the Course:	**Industrial Training – II**	**Course Code:**	**SOE-D-MN406**
Credits :	**10**	**No of Hours :**	**20 hours/week**

Course Description:

This training offers hands-on experience in real-world mining operations, focusing on mine planning, safety practices, and equipment handling. It bridges academic knowledge with practical skills essential for a professional mining career.

Course Objective:

1. An opportunity to get exposure to the real workstations, plants, machines, and systems
2. Company tour to understand the end to end process at all levels

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Become more aware of industry practices.
CO2	Understand the working principles of every section of mine.
CO3	Correlate the theoretical knowledge with mine site activities.
CO4	Become more aware of industry regulations.
CO5	Get updated on the demands of the industries

Session: 2025-2028

Scheme of Teaching and Examination

Diploma (Mining Engineering)

Academic Semester-II

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Exam. and Marks				Credit
							PRE**		ESE*	Total	
				L	T	P	Mid Term	TA			(L+(T+P)/2)
1	MN25-D-201	MN	Mine Surveying	4	0	0	15	15	70	100	4
2	MN25-D-202	MN	Geology	3	0	0	15	15	70	100	3
3	MN25-D-203	MN	Elements of Mining Technology	4	0	0	15	15	70	100	4
4	HUM25-D-202	HUM	Yoga & Meditation	0	0	2	-	15	35	50	1
5	MAT25-D-201	MAT	Mathematics-II	3	0	0	15	15	70	100	3
6	HUM25-D-201	HUM	Communicative English-II	2	0	0	7.5	7.5	35	50	2
7	MN25-D-204	MN	Mine Surveying Lab	0	0	4	-	15	35	50	2
8	MN25-D-205	MN	Geology Lab	0	0	2	-	15	35	50	1
Total				**16**	**0**	**8**	**67.5**	**112.5**	**420**	**600**	**20**

L: Lecture, T: Tutorial, P: Practical, C: Credit

* End Semester Examination

** Progress Review Examination

Programme:	**Diploma**	**Semester :**	**II**
Name of theCourse:	**Mine Surveying**	**Course Code:**	**SOE-D-MN201**
Credits :	**4**	**No of Hours :**	**4 hours/week**

Course Description:

This course introduces the fundamentals of surveying, including linear and angular measurements, chain, compass, plane table surveying, and theodolite operations. It covers leveling techniques, underground measurements, and the use of instruments like dumpy levels and total stations. The course also explores advanced technologies such as GPS, LiDAR, remote sensing, and UAVs for modern mine surveying applications.

Course Objective:

1 Explain the basic principles of surveying
2. Discuss surveying methods & equipments used in it
3. Describe the measurement of angles in planes
4. Explain the levelling, instruments and types of levelling
6. Explain the uses of surveying in mineral exploration.

Syllabus:

Unit-1 Fundamentals of Surveying
Definition, objective, classification and essentials of surveying. Linear and angular measurement. Chain surveying: principle, types and error.

Unit-2 Compass Surveying
Purpose and types. Prismatic and Surveyor's compass: purpose, parts, construction, working and adjustment. Meridian and Bearing: fundamentals, types and measurement. Traversing: purpose, types, measurement, errors, adjustments and precautions.

Unit-3 Plane Table Surveying
Fundamentals. Equipment. Methods. Advantages and disadvantages

Unit-4 Theodolite
Significance and purpose of the modern micro-optic and transit theodolite. Components of theodolite. Theodolite traversing: measurement of horizontal and vertical angles and calculations. Temporary and permanent adjustments.

Unit-5 Leveling
Purpose, key terminologies and essentials of leveling. Dumpy level: parts and their function. Methods of leveling. Errors and adjustments. Leveling in the underground and shaft depth measurement.

Unit-6 New Technologies
Principle, operation, application to mine: Total Station, Remote Sensing, Photogrammetry, Geographic Information System, GPS & DGPS, Laser profilers, LiDAR, UAV

Text/Reference Books:

1. B.C. Punmia, Surveying Vol I and II, Laxmi Publication, New Delhi,1991

2. Ghatak, Mining Surveying, Lovely Prakashan, Dhanbad,1990
3. F. Winiberg, Metalliferous Mine Surveying. Mining Publications Ltd., London
4. W. Schofield and M. Breach, Engineering Surveying, ELSEVIER, B & H, Sixth edition, 2007

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Understand the fundamentals, objectives, and types of surveying with focus on linear and angular measurements.
CO2	Operate and interpret compass instruments for traversing and bearing measurements with error adjustment.
CO3	Conduct plane table surveys using various methods and evaluate their applicability.
CO4	Use theodolites for precise angular measurements and perform adjustments for accurate traversing.
CO5	Apply leveling techniques using dumpy levels, including underground leveling and shaft depth measurement.

Programme:	**Diploma**	**Semester :**	**II**
Name of the Course:	**Geology**	**Course Code:**	**SOE-D-MN202**
Credits :	**3**	**No of Hours :**	**3 hours/week**

Course Description:

This course introduces the fundamentals of geology with a focus on its applications in mining engineering. Topics include the Earth's structure, mineralogy, and the classification and formation of rocks. It also covers geological structures like folds and faults, principles of stratigraphy and paleontology, and the origin and properties of coal and petroleum. Emphasis is placed on understanding geological processes and formations relevant to resource exploration and extraction.

Course Objective:
This course is aimed at providing the necessary geological inputs required for a mining engineer. The components would help the mining engineering student to understand recognition of important minerals and rock units and their properties, genesis, concepts of mineral prospecting, basic engineering geological aspects which is of immense use in mining engineering practices.

Syllabus:

Unit-1: General Geology
Branch, scope and applications of geology in mining engineering. Origin, composition and internal structure of the earth. Weathering: definition and types.

Unit-2: Mineralogy
Definition, properties and classification of minerals. Coal measuring rocks and their characteristics. Introduction and preliminary study of rock-forming silicate and non-silicate mineral groups with respect to the physical properties. Coal: origin, classification, bended constituents, and chemical properties. Structural features of coal seams. Petroleum: origin, migration. Oil traps and petroleum deposits in India.

Unit-3: Petrology
Origin and mode of occurrence of rocks. Rock cycle. Classification of rocks. Description of major igneous, sedimentary and metamorphic rocks.

Unit-4: Structural Geology
Attitude, dip and strike of strata. Geological discontinuities: folds, faults, cleavages, joints, etc. and their impact on mining operations. Geological maps: terminologies and representation of topography.

Unit-5: Principles of Stratigraphy & Paleontology
Definitions, basic principles and units of stratigraphy. Classification and correlation for criteria of stratigraphic. Standard geological time scale.

Text/Reference Books:

1. M. P. Billings, Structural Geology, Third Edition, Pearson Education Limited, 2016.
2. F. G. Bell, Fundamentals of Engineering Geology, Elsevier Publications, 2007
3. E. J. Tarbuck, F. K. Lutgens, D. Tasa, Earth: An Introduction to Physical Geology 2013.

4. J. Monroe, R. Wicander, Richard Hazlett, Physical Geology: Exploring the Earth, 2006.
5. K. M. Bangar, Principals of Engineering Geology, Standard Publishers Distributors
6. P. Singh. Text book of Engineering and General Geology, S. K. Kataria & Sons, 2013
7. U. Prasad, Economic Geology: Economic Mineral Deposits, CBS Publications, 2016
8. R. N. P. Arogyaswamy, Courses in Mining Geology, Oxford & IBH Publishing
9. W.E. Ford, Dana's Textbook of Mineralogy (4th edition), CBS Publishers, 2006

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Understand the scope of geology and Earth's structure relevant to mining engineering.
CO2	Identify and classify minerals, coal, and petroleum based on their properties and origins.
CO3	Classify major rock types and explain their formation through the rock cycle.
CO4	Interpret geological structures and maps, and assess their influence on mining activities.
CO5	Apply principles of stratigraphy and paleontology to geological correlation and dating.

Programme:	**Diploma**	**Semester :**	**III**
Name of the Course:	**Elements of Mining Technology**	**Course Code:**	**SOE-D-MN203**
Credits :	**4**	**No of Hours :**	**4 hours/week**

Course Description:

This course provides a foundational understanding of mining engineering, covering the history, phases, and significance of mining activities. Students will learn about mineral access, exploratory drilling, shaft sinking techniques, and both underground and surface mining methods. The course also includes an overview of coal formation, classification, and distribution, with a focus on Indian mining industries. Practical insights into conventional and mechanized operations are emphasized throughout.

Course Objectives:

1. To learn about mining industry and its role in nation economy.
2. To know the basic mining operations and mining methods.
3. To understand environmental issues due to mining.

Syllabus:

Unit-1: Introduction
History, importance and consequences of mining. Phases during the mining: prospecting, exploration, development, exploitation and rehabilitation. Access to minerals: types, choice and location. Unit operations during drivage of inclines/adits/drifts in conventional and mechanized methods. Coal: formation theories and classification. Coal Seam: classification, structures and abnormalities. Distribution of coal in India. Indian coal mining industries.

Unit-2: Exploratory Drilling
Drilling: methods, essential components and applicability. Core barrels. Borehole survey. Directional drilling. Underground drilling methods.

Unit-3: Shaft Sinking
Unit processes of conventional shaft sinking method. Special methods of shaft sinking. Deepening and widening of shafts. Shaft lining and its design.

Unit-4: Underground Mining
Key terminology, applicability and unit operations in the development. Advantages and disadvantages. Introduction to different types of underground mining methods: Board and Pillar, Longwall, Thick Seam Working and special mining methods.

Unit-5: Surface Mining
Key terminology, applicability and unit operations in the development. Advantages and disadvantages. Introduction to different types of surface mining methods.

Text/Reference Books:

1. H. L. Hartman, Introductory Mining Engineering, Wiley; Second edition
2. L. Shevyakov, Mining of Mineral Deposits, Foreign Languages Publishing House, Moscow, 1963
3. S. P. Mathur, Coal Mining in India, Sahyog Publishers
4. D. J. Deshmukh, Elements of mining technology, Vol. 1, 2, & 3, Denett & Co.
5. R. D. Singh, Principles and Practices of Coal Mining, New Age International publisher.
6. P. Darling, SME Mining Engineering Handbook, 3rd Edition
7. S. K. Das, Modern Coal Mining, Lovely Prakashan
8. S. Peng, Longwall Mining, CRC Press, 3rd Edition
9. W. A. Hustrulid, Rechard Bullock; "Underground Mining Methods" SME Publication
10. G. B. Mishra, Surface Mining (Revised Ed)

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Understand the history, phases, and significance of mining, including coal formation and classification.
CO2	Explain various exploratory drilling methods, equipment, and their underground applications.
CO3	Describe conventional and special shaft sinking methods, including shaft lining and design.
CO4	Identify key operations and applicability of different underground mining methods.
CO5	Distinguish between surface mining techniques, their unit operations, and practical advantages.

Programme:	**Diploma**	**Semester :**	**II**
Name of theCourse:	**Mine Surveying Lab**	**Course Code:**	**SOE-D-MN204**
Credits :	**2**	**No of Hours :**	**4 hours/week**

Course Description:

This course offers hands-on training in fundamental and advanced surveying techniques used in mining and geospatial applications. Students will learn methods like chaining, compass surveying, leveling, plane tabling, and total station operations. The curriculum also introduces modern technologies including remote sensing, photogrammetry, laser profiling, and UAVs for geological mapping and volumetric analysis. Emphasis is placed on practical skill development and data interpretation.

Course Objective:

The course aims to develop practical skills in fundamental and advanced surveying methods used in mining. Students will learn to measure distances, angles, elevations, and coordinates using traditional and modern instruments like Total Station, UAVs, and laser profilers. Emphasis is placed on applying remote sensing and photogrammetry for geological mapping, profiling, and volume estimation in mining operations.

List of experiments:

1. Measurement of distance by Chaining and Ranging.
2. Determine the area of a given polygon by chain and cross-staff survey.
3. Measurement of bearings of sides of traverse with a prismatic compass and computation of correct included angle.
4. Determination of the reduced level by fly leveling and check leveling.
5. Plane table survey using radiation and intersection method.
6. Determination of Coordinates and Elevation of Mine Points using Total Station
7. Create geological mapping with Remote Sensing Data
8. Estimate the volume of stockpiles or excavated areas using photogrammetry.
9. Draw the profile of the given structure using a Laser profiler.
10. Study of unmanned aerial vehicle (UAV).

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Measure distances and areas using chaining, ranging, and cross-staff survey techniques.
CO2	Determine bearings, angles, and traverse data using a prismatic compass.
CO3	Calculate reduced levels through fly leveling and check leveling methods.
CO4	Apply Total Station, remote sensing, and photogrammetry for mine mapping and volume estimation.
CO5	Utilize UAVs and laser profilers for profiling and advanced surveying applications in mining.

Programme:	**Diploma**	**Semester :**	**II**
Name of theCourse:	**Geology Lab**	**Course Code:**	**SOE-D-MN205**
Credits :	**1**	**No of Hours :**	**2 hours/week**

Course Description:

This course introduces students to the fundamental techniques of mineral and rock identification through hands-on examination of physical properties. It covers silicate and non-silicate minerals, as well as igneous, sedimentary, and metamorphic rocks. Students will also learn basic geological mapping skills, including interpretation of faults, folds, dip and strike, and contour line representation and profiling.

Course Objective:

1. To identify minerals, rocks, ores and geological structures.
2. To learn geological mapping and topography profile.

List of experiments:

1. Study of physical properties of minerals.
2. Identification of important rock forming minerals based on physical properties of silicate group in the hand specimen.
3. Identification of important rock forming minerals based on physical properties of non-silicate group in the hand specimen.
4. Identification of igneous rocks in hand specimen.
5. Identification of sedimentary rocks in hand specimen.
6. Identification of metamorphic rocks in hand specimen.
7. Study and draw the models showing different types of faults and folds with respect to topography.
8. Determination of dip, strike and attitude from geological maps.
9. Representation of contour lines based on terrain of ground surface.
10. Draw topography profile from contour lines.

Course Outcomes:

On successful completion of this course, students will be able to:

CO Number	Course Outcomes
CO1	Identify and classify minerals based on their physical properties in hand specimens.
CO2	Distinguish between silicate and non-silicate rock-forming minerals.
CO3	Recognize and differentiate igneous, sedimentary, and metamorphic rocks in hand specimens.
CO4	Interpret geological structures such as faults and folds using models and maps.
CO5	Analyze topographic features through contour lines and generate topographic profiles.

B.TECH.

Programme Code: 01NUG070

Session: 2024-2028

Scheme of Teaching and Examination

B. Tech (Mining Engineering)

Academic Semester-III

S. No.	Subject Code	Course Category	SUBJECT	Periods per week			Scheme of Exam. and Marks				Credit (L+ (T+P)/2)
							PRE**		ESE*	Total	
				L	T	P	Mid Term	TA			
1	MN24-B-MJ201	MAJOR	Mine Development	3	0	0	15	15	70	100	3
2	MN24-B-MJ202	MAJOR	Engineering Geology	3	0	0	15	15	70	100	3
3	MN24-B-MJ203	MAJOR	Mine Surveying-I	3	0	0	15	15	70	100	3
4	MN24-B-MN201	MINOR	Introduction to Indian Minerals	4	0	0	15	15	70	100	4
5		AEC	Select from the Pool	2	0	0	7.5	7.5	35	50	2
6	MN24-B-MJ205	MAJOR	Basic Surveying Lab	0	0	4	0	15	35	50	2
7	MN24-B-SE201	SEC	Select from the pool	0	0	4	0	15	35	50	2
				2	0	0	7.5	7.5	35	50	
8		VAC	Select from the Pool	2	0	0	7.5	7.5	35	50	2
9		MDC	Select from the Pool	3	0	0	15	15	70	100	3
Total				**20**	**0**	**8**	**97.5**	**127.5**	**525**	**750**	**24**

L: Lecture, T: Tutorial, P: Practical, C: Credit

* End Semester Examination
** Progress Review Examination

Program:	**B. Tech**	**Semester:**	**III**
Name of the Course:	**Mine Development**	**Code:**	**MN24-B- MJ201**
Credit:	**3**	**No of Hours:**	**3 hours/week**
Max. Marks:	**100**		

……

Course Description:

This course aims to introduce the students to the general idea of mining. This course comprises the concept of the history of mining, pre mining activities and unit operations in drivage process. A brief introduction of drilling, shaft sinking, underground mining and surface mining has also been provided.

Course Objectives:

The objective of this course is to give a basic introduction to the mining engineering core operations. Types of drilling, types of mine openings, shaft sinking, and an introduction to surface and underground mining techniques are among the subjects that will be covered.

Syllabus

Unit-1 Introduction

Types of access and their suitability. mechanized and conventional methods, Unit operations involved in drivage of inclines/adits/drift. Ventilation, lighting and drainage, Extension of center line.

Unit-2 Drilling

Drilling methods, essential components and applicability. Core barrels and their attachments, borehole survey, directional drilling. Underground drilling methods. Organization and operation cycle.

Unit-3 Shaft Sinking

Shaft sinking unit processes of conventional shaft sinking method. Special methods of shaft sinking, shaft boring. Deepening and widening of shafts. Shaft lining and its design, upward drivage.

Unit-4 Underground Mining

Underground Mining: Key terminology, applicability and unit operations in the development. Different stages, advantages and disadvantages. Introduction to different types of underground mining methods, Choice of mining methods.

Unit-5 Surface Mining

Surface Mining: Essential terminology, applicability and unit operations in the development. Advantages and disadvantages. Introduction to different types of surface mining methods. Machines in surface mining.

Text/Reference Books:

1. H. L. Hartman, Introductory Mining Engineering, Wiley; Second edition
2. L. Shevyakov, Mining of Mineral Deposits, Foreign Languages Publishing House, Moscow, 1963
3. S. P. Mathur, Coal Mining in India, Sahyog Publishers
4. D. J. Deshmukh, Elements of mining technology, Vol. 1, 2, & 3, Denett & Co.
5. R. D. Singh, Principles and Practices of Coal Mining, New Age International publisher.

6. P. Darling, SME Mining Engineering Handbook, 3rd Edition
7. S. K. Das, Modern Coal Mining, Lovely Prakashan
8. S. Peng, Longwall Mining, CRC Press, 3rd Edition
9. W. A. Hustrulid, Rechard Bullock; "Underground Mining Methods" SME Publication
10. G. B. Mishra, Surface Mining (Revised Ed)

Course Outcomes:

CO	Mining Engineering Graduates will be able to:
C301-01	Explain types of mine access and associated unit operations including ventilation, drainage, and alignment.
C301-02	Describe various drilling methods, tools, and borehole survey techniques used in mining.
C301-03	Understand shaft sinking processes, special methods, and shaft lining design.
C301-04	Identify stages, methods, and operations involved in underground mining.
C301-05	Describe surface mining methods, equipment, and their operational advantages and limitations.

Program:	**B. Tech**	**Semester:**	**III**
Name of the Course:	**Engineering Geology**	**Code:**	**MN24-B-MJ202**
Credit:	**3**	**No of Hours:**	**3 hours/week**
Max. Marks:	**100**		

Course Description

This course provides a foundational understanding of geology tailored for mining engineering applications. It covers the Earth's structure, minerals, and various types of rocks along with their formation processes. Students will also learn about geological structures like folds and faults, and how to interpret geological maps. Emphasis is placed on the practical significance of these concepts in mining operations.

Course Objectives

The course's goal is to impart a fundamental grasp of the main theories and processes affecting the earth, as well as geological formations, their forces and mechanisms of operation, and the identification of minerals and rocks. determining the provenance of a rock by examining examples; For an economical, environmentally friendly, safe, and sustainable mining operation, geology concepts, maps, and drawings should be read, drawn, and understood by mining engineering students.

Syllabus

Unit-1 Introduction

Branch, scope and applications of geology in mining engineering. Origin, composition and internal structure of the earth. Weathering: definition and types. Geodynamic Theories and Processes. Physical Geology and Processes.

Unit-2 Mineralogy

Definition, properties and classification of minerals. Coal measuring rocks and their characteristics. Introduction and preliminary study of rock-forming silicate and non-silicate mineral groups with respect to the physical properties. Coal: origin, classification, bended constituents, and chemical properties. Structural features of coal seams. Petroleum: origin, migration. Oil traps and petroleum deposits in India.

Unit-3 Petrology-I

Igneous rocks: Origin and mode of occurrence. Magma, lava and its crystallization, textures, structures and classification of igneous rocks. Petrographic description of common igneous rocks.

Metamorphic rocks: origin, types of metamorphism, grades of metamorphism, textures, structures and classification. Petrographic description of common metamorphic rocks.

Unit-4 Petrology-II

Sedimentary rocks: origin, weathering, deposition and lithification. Textures, structures and classification. Petrographic description of common sedimentary rocks. Rock cycle.

Unit-5 Structural Geology

Rock deformation, attitude, dip and strike of strata. Geological discontinuities: folds, faults, cleavages, joints, etc. and their impact on mining operations. Geological maps: terminologies and representation of topography. Development of a geological section from the geological maps and its description.

Text/Reference Books:

1. M. P. Billings, Structural Geology, Third Edition, Pearson Education Limited, 2016.
2. F. G. Bell, Fundamentals of Engineering Geology, Elsevier Publications, 2007
3. E. J. Tarbuck, F. K. Lutgens, D. Tasa, Earth: An Introduction to Physical Geology 2013.
4. J. Monroe, R. Wicander, Richard Hazlett, Physical Geology: Exploring the Earth, 2006.
5. K. M. Bangar, Principals of Engineering Geology, Standard Publishers Distributors
6. P. Singh. Text book of Engineering and General Geology, S. K. Kataria & Sons, 2013
7. U. Prasad, Economic Geology: Economic Mineral Deposits, CBS Publications, 2016
8. R. N. P. Arogyaswamy, Courses in Mining Geology, Oxford & IBH Publishing
9. W.E. Ford, Dana's Textbook of Mineralogy (4th edition), CBS Publishers, 2006.

Course Outcomes:

CO	Mining Engineering Graduates will be able to:
C302-01	Understand the scope of geology and its applications in mining engineering.
C302-02	Identify and classify minerals, coal, and petroleum with reference to their properties and origin.
C302-03	Describe the formation, classification, and characteristics of igneous and metamorphic rocks.
C302-04	Explain the processes involved in sedimentary rock formation and the rock cycle.
C302-05	Interpret geological structures and maps to assess their impact on mining operations.

Program:	**B. Tech**	**Semester:**	**III**
Name of the Course:	**Mine Surveying-I**	**Code:**	**MN24-B-MJ203**
Credit:	**3**	**No of Hours:**	**3 hours/week**
Max. Marks:	**100**		

Course Description:

This course provides a comprehensive introduction to the fundamentals of surveying, covering essential principles, instruments, and methods. Students will learn about linear and angular measurements, compass and plane table surveying, as well as the use and operation of modern instruments like Total Stations and theodolites. The course also includes detailed instruction on leveling techniques, error analysis, and underground surveying applications.

Course Objectives:

1. Learn the basic concepts and methods of mine surveying, including surface and underground surveying techniques.
2. Understand the importance of mine surveying in the mining process and its applications.
3. Develop the ability to analyze mining and engineering surveying problems and generate innovative solutions.

Syllabus

Unit-1 Fundamentals

Definition, objective, classification and essentials of surveying. Principles of surveying, classification of surveying. Linear and angular measurement. EDM, Total Station, Miner's Dial. Chain surveying: principle, types and error.

Unit-2 Compass Surveying

Working, construction of Prismatic and Surveyor's compass, adjustments, meridian and bearing, measurement, errors, adjustments and precautions in traversing.

Unit-3 Plane Table Surveying

Significance and uses, equipment, methods, advantages, disadvantages and errors.

Unit-4 Theodolite

Significance, application, types of theodolites, modern micro-optic and transit theodolite, components of theodolite. Theodolite traversing: measurement of horizontal and vertical angles and calculations. Temporary and permanent adjustments. Errors.

Unit-5 Leveling

Purpose and key terminologies of leveling, instruments used in levelling, types of levels and levelling staffs, Dumpy level: parts and their function, methods of leveling, errors and adjustments. Leveling in the underground and shaft depth measurement.

Text/Reference Books:

1. B.C. Punmia, Surveying Vol I and II, Laxmi Publication, New Delhi,1991
2. Ghatak, Mining Surveying, Lovely Prakashan, Dhanbad,1990
3. F. Winiberg, Metalliferous Mine Surveying. Mining Publications Ltd., London
4. W. Schofield and M. Breach, Engineering Surveying, ELSEVIER, B & H, Sixth edition, 2007

Course Outcomes:

CO	Mining Engineering Graduates will be able to:
C303-01	Explain the fundamentals, principles, and classifications of surveying along with basic measurement tools.
C303-02	Perform compass surveying and apply error correction techniques in traversing.
C303-03	Conduct plane table surveying using different methods and understand its advantages and limitations.
C303-04	Use theodolites for measuring angles and traversing with proper adjustments and error handling.
C303-05	Apply leveling techniques in surface and underground settings, including shaft depth measurement.

Program:	**B. Tech**	**Semester:**	**III**
Name of the Course:	**Introduction to the Indian Minerals**	**Code:**	**MN24-B-MN201**
Credit:	**4**	**No of Hours:**	**4 hours/week**
Max. Marks:	**100**		

……

Course Description:

This course introduces the physical properties, types, and distribution of metallic and non-metallic minerals in India. It covers the organizational structure of mineral governing bodies, key public sector companies and institutions involved in mining, and outlines major mineral resources and their significance. Students will gain a foundational understanding of India's mineral wealth and the regulatory framework governing its exploration and utilization.

Course Objective

To provide students with foundational knowledge of metallic and non-metallic minerals, their distribution in India, the role of public sector undertakings (PSUs) in mining, and the regulatory authorities governing the Indian mineral sector.

Syllabus

UNIT I: Introduction

Minerals – Physical properties of minerals – Metallic and Non-metallic minerals – Distribution of minerals..

UNIT 2: Governing body of minerals in india

Ministry of Mines - Organisational structure – Cabinet minister – Minister of state – Secretary – Financial advisor – Director - Geological Survey of India- Indian Bureau of Mines.

UNIT 3: Public Sector Companies & Institutions

National Aluminium Company Limited (NALCO), Bhubaneswar – Hindustan Copper Limited (HCL), Kolkata - Mineral Exploration Corporation Limited(MECL), Nagpur - Jawaharlal Nehru Aluminium Research Development an Design Centre (JNARDDC), Nagpur - National Institute of Rock Mechanic (NIRM), Kolar Gold Fields, Karnataka - National Institute of Miners' Health (NIMH), Nagpur.

UNIT 4: Mineral Resources

Occurrence - Mineral fuels - Coal & lignite – Petroleum - Metallic Minerals – Bauxite Chromite - Iron ore - Manganese ore - Industrial Minerals – Barytes Kyanite, andalusite & sillimanite – Magnesite - Apatite & rock phosphate - Talc/steatite/ pyrophyllite – Mica.

UNIT 5: Metal Mineral Resources

Occurrence – Aluminium – Copper – Steel – Lead – Zinc – Gold and other valuable mineral

Text/Reference Books:

1. NCERT E-books on mining.
2. S. Krishnaswamy Indian mineral resources

Course Outcomes:

CO	Mining Engineering Graduates will be able to:
C305-01	Identify and differentiate between metallic and non-metallic minerals.
C305-02	Describe the organizational structure of India's mineral regulatory authorities.
C305-03	Explain the role of key PSUs in the Indian mining sector.
C305-04	Analyze the distribution of major mineral resources in India.
C305-05	Summarize the occurrence and uses of important metal and industrial minerals.

Program:	**B. Tech**	**Semester:**	**III**
Name of the Course:	**Basic Surveying-I Lab**	**Code:**	**MN24-B-MJ205**
Credit:	**2**	**No of Hours:**	**4 hours/week**
Max. Marks:	**50**		

Course Description:

This course provides hands-on training in fundamental surveying techniques used in mining engineering. Students will learn linear and angular measurements using instruments such as chains, prismatic compasses, plane tables, and theodolites. Practical exercises include polygon area calculation, traverse plotting with error correction, and determination of reduced levels using leveling methods. The course emphasizes field data collection, interpretation, and basic mapping techniques essential for site development and planning.

Course Objectives:

The course aims to provide an overview of basic mine surveying, including how to use surveying tools and the basic methods of measuring linearly, angularly, and co-ordinately.

List of experiments:

1. Linear measurement by Ranging and Chaining.
2. Determine the area of a given polygon by chain and cross-staff survey.
3. Study of the prismatic compass.
4. Measurement of bearings of sides of traverse with a prismatic compass and computation of correct included angle.
5. Angular measurement, plotting a closed traverse and elimination of errors using prismatic compass.
6. Determine reduced level using height of collimation method.
7. Determine reduced level using rise & fall method.
8. Plane table survey using radiation method.
9. Plane table survey using intersection method.
10. Study of transit theodolite.
11. Determine horizontal and vertical angle using theodolite.

Course Outcomes:

CO	Mining Engineering Graduates will be able to:
C305-01	Perform linear measurements using chaining and ranging techniques.
C305-02	Calculate areas and plot traverses using chain, cross-staff, and prismatic compass.
C305-03	Measure bearings and compute angles to complete closed traverses with error correction.
C305-04	Determine reduced levels using height of collimation and rise & fall methods.
C305-05	Conduct plane table and theodolite surveys for angular measurements and map preparation.

Scheme of Teaching and Examination

B. Tech (Mining Engineering)

Academic Semester-IV (NHEQF Level: 5)

S. No.	Subject Code	Course Category	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2
							PRE**		ESE*	Total Marks	
				L	T	P	Mid-Sem	TA			
1	MN24-B-MJ207	MAJOR	Mine Surveying-II	3	0	0	15	15	70	100	3
2	MN24-B-MJ208	MAJOR	Mine Machinery - I	2	0	0	7.5	7.5	35	50	2
3	MN24-B-MJ209	MAJOR	Surface Mining	2	0	0	7.5	7.5	35	50	2
4	MN24-B-MJ210	MAJOR	Drilling and Blasting	3	0	0	15	15	70	100	3
5	MN24-B-MN202	MINOR	Fundamentals of Opencast Mining	4	0	0	15	15	70	100	4
6		AEC	Select from the Pool	2	0	0	7.5	7.5	35	50	2
7	MN24-B-SE202	SEC	Select from the Pool	0	2	4	0	15	35	50	3
8	MN24-B-MJ211	Major	Bharatiya Khani Gyaan Tantra	4	0	0	15	15	70	100	4
9		MDC	Select from the Pool	3	0	0	15	15	70	100	3
TOTAL				**23**	**2**	**4**	**97.5**	**112.5**	**420**	**700**	**26**

Program: B.Tech
Name of the Course: Mine Surveying-II
Credit: 3
Max. Marks: 100

Semester: IV
Code: MN24-B-MJ207
No of Hours: 3 hours/week

Course Description:
This course offers an in-depth overview of modern surveying techniques with applications in mining. It covers remote sensing principles, photogrammetry, GIS, and digital elevation modeling. Students gain practical exposure to tools like Total Stations, GPS/DGPS, LiDAR, and UAVs. Emphasis is placed on integrating theory with field applications to support effective decision-making in mining operations.

Course Objectives:
1. Fundamental of modern techniques.
2. Applications of modern techniques.
3. To enable students to select the appropriate type of survey required for a given mining situation.

Syllabus

Unit-1 Remote Sensing-I
A Brief Introduction to Remote Sensing: Data collection and processing, sensor systems, applications, Planck's Law Electromagnetic, Stefan's Law, Properties of Solar Radiant Energy, Atmospheric Windows, Radiation (EMR) and Its Characteristics, Radiation Principles.

Unit-2 Remote Sensing-II
Energy sources; active and passive radiation; electromagnetic radiation: reflectance, transmission, absorption, thermal emissions; interaction with the atmosphere; spectral reflectance of Earth's surface characteristics; and multiple concepts of remote sensing.

Unit-3 Photogrammetry
aerial and terrestrial, types of aerial photograph, geometry of aerial photograph, scale, flying height, relief displacement, parallax, stereo-pair and stereovision, stereoscopes, 3D mapping, DEM, DSM & DTM, height determination, digital photogrammetry, photogrammetric mapping, applications of photogrammetry.

Unit-4 Geographic Information System (GIS)
Introduction, difference between image processing system geographical system (GIS), utility of GIS, various GIS packages and their salient features, essential components of a GIS, scanners and digitisers, raster and vector data storage, hierarchical data, network systems, relational database, dat a management, conventional database management systems, spatial database management, data manipulation and analysis.

Unit-5
Principle, operation, application to mine: Total Station, GPS & DGPS, Laser profilers, LiDAR, UAV

Reference Books:

1. Fundamentals of Remote Sensing, by George Joseph &C. Jeganathan, 3rd Edition
2. Lillesand, T.L., Kieffer, R. W. and Chipman, J., "Remote Sensing and Image Interpretation", John Wiley and Sons, 6th Ed.

3. Advanced Surveying: Total Station, GPS, GIS & Remote Sensing by Pearson, by Gopi Satheesh, R. Sathikumar, N. Madhu, 2nd Edition
4. Valavanis, K and Vachtsevanos, G.J. (Eds) Handbook of UAV, Springer
5. Garg, P.K. Theory and Principles of Geoinformatics, Khanna Book Publishing Co. Delhi
6. Garg, P K., Digital Land Surveying and Mapping, New Age International Publishers, New Delhi

Course Outcomes:

CO	Mining Engineering Graduates will be able to:
C402-01	Understand the principles of electromagnetic radiation and its role in remote sensing.
C402-02	Distinguish between active and passive sensors and analyze spectral reflectance behavior.
C402-03	Apply photogrammetric techniques for 3D mapping and elevation modeling.
C402-04	Utilize GIS tools for spatial data management, analysis, and mining applications.
C402-05	Operate modern surveying instruments like Total Station, GPS/DGPS, LiDAR, and UAVs for mine surveying.

Program: B. Tech **Semester: IV**
Name of the Course: Mine Machinery - I **Code: MN24-B-MJ208**
Credit: 2 **No of Hours: 2 hours/week**
Max. Marks: 100

……

Course Description

Mining Machinery-I introduces key mechanical systems used in underground and surface mining, beginning with wire ropes and their safe operation. It covers haulage systems, drum winding equipment, and shaft installations including cages, skips, and braking systems. The course also compares skip and Koepe winding and examines pit layouts. Students learn about mine water management and pumping systems, focusing on maintenance, selection, and troubleshooting.

Course Objectives

The objective of this course is to teach students about the various kinds of haulage, winding, and pumping equipment that are utilized in mines.

Syllabus

Unit-1

Wire Ropes: usage, types, construction, size, safety factor, and maintenance.

Unit-2

Haulage: types, construction, operation, Safety devices and application.

Unit-3

Drum winding: headgear arrangement, shaft fittings, safety devices, cages & skips, suspension gear arrangements. Electric winders, winding drums, mechanical & electrical breaking, safety devices on winders.

Unit-4

Skip & Koepe Winding: types & construction, pit top & pit bottom arrangements, advantages and disadvantages.

Unit-5

Mine water sources. Pump: types, characteristics, operation, maintenance and selection. Special types of pumps. Pumping problems.

Text/Reference Books:

1. W. A. Hustrulid, Underground Mining Methods Handbook, Society for Mining Metallurgy
2. M. A. Ramlu, Mine Hoisting, White Falcon Self Publishing Platform; 2nd edition
3. W. A. Hustrulid, SME Mining Engineer's Handbook
4. D. J. Deshmukh, Elements of Mining Technology Vol. 1 & 3, Denett & Co.
5. S. C. Walker, Mine Winding and Transport, Elsevier Science, 2012
6. H. L. Hartman, SME Mining Engineering Handbook 2nd Edition

Course Outcomes:

CO	Mining Engineering Graduates will be able to:
C403-01	Know about wire ropes.
C403-02	Understand the different haulage system.
C403-03	Understand drum winding system.
C403-04	Understand Skip & Koepe winding system.
C403-05	Have understanding on various mine water sources.

Program: B. Tech **Semester: IV**
Name of the Course: Surface Mining **Code: MN24-B-MJ209**
Credit: 2 **No of Hours: 2 hours/week**
Max. Marks: 100

……

Course Description:

This course provides a foundational understanding of surface mining methods, equipment, and open-pit mine design. Topics include stripping ratio, bench design, pit limits, and dump planning. Students learn about drilling, blasting, and the operation of key mining machinery and transport systems. The course equips students to plan and manage surface mining projects effectively and safely.

Course Objectives

Developing a basic understanding of various surface mining techniques, surface mine layouts, and equipment utilized for drilling, excavation, transportation, and land reclamation is the course's main goal.

Syllabus

Unit-1 Introduction

Surface mining: applicability, methods, advantages and disadvantages. Stripping ratio. Key components of open pit design, design of benches, ultimate pit. Waste dump layout.

Unit-2 Development

Methods to open the deposits. Box cuts: internal and external box cuts, driving methods. Layout of open pits. Unit operations in development.

Unit-3 Drilling and Blasting

Drilling patterns in blasting and dimensions of blast hole. Types of explosives used. Major problems in blasting and their remediation.

Unit-4 Machinery

Introduction: shovel, dragline, hydraulic excavators, multi-bucket excavators, surface miners, dozers, scrapers, front-end loaders, graders, and backhoes. Applicability and working of mentioned equipment.

Unit-5 Transportation

Dumpers: types, applicability, advantages and disadvantages. Haul road gradient and width. Suitability of conveyors and rail transport.

Text/Reference Books:

1. G.B. Mishra, Surface Mining
2. S. K. Das, Surface Mining Technology, Lovely Prakashan; 3rd edition
3. J. W. Martin, Surface mining equipment, Martin Consultants
4. W. Hustrulid, M. Kuchha, R. Martin, Open Pit Mine Planning & Design, CRC Press
5. E. P. Pfleider, Surface Mining, American Institute Mining
6. H. L. Hartman, SME handbook

Course Outcomes:

CO	Mining Engineering Graduates will be able to:
C605(4)-01	Understand the principles, methods, and design elements of surface mining operations.
C605(4)-02	Explain development methods including box cuts and layout planning for open-pit mines.
C605(4)-03	Identify drilling and blasting techniques along with common issues and their solutions.
C605(4)-04	Describe the functions and applicability of various surface mining machinery.
C605(4)-05	Evaluate transportation systems in surface mining, including dumpers, conveyors, and rail.

Program: B. Tech **Semester: IV**
Name of the Course: Drilling and Blasting **Code: MN24-B-MJ210**
Credit: 3 **No of Hours: 3 hours/week**
Max. Marks: 100

……

Course Description:

This course provides comprehensive knowledge of drilling and blasting practices in mining, covering drilling methods, equipment, and rock breakage mechanics. It includes a detailed study of explosives, initiation systems, blast design, and safety protocols. Emphasis is placed on automation, environmental impact control, and statutory guidelines. Students gain both theoretical and practical insights for efficient and safe excavation operations.

Course Objectives:

- To provide a comprehensive understanding of drilling methods, equipment, and applications in mining.
- To understand principles and practices of rock blasting for safe and efficient mining operations.
- To introduce modern trends and technologies in drilling and blasting.

Syllabus

Unit-1 Fundamentals of Drilling

Introduction to drilling in mining; Drilling objectives and classification; Mechanics of rock breakage by drilling; Drillability, bit life, and selection of drilling tools; Types of drilling methods: percussion, rotary, rotary-percussive, DTH; Drill patterns for surface and underground mining, Core recovery and its importance.

Unit-2 Drilling Equipment and Accessories

Drill rigs: crawler-mounted, wagon, jackhammer, jumbo drills; Drill rods, bits, reamers, and accessories; Selection of drilling machines based on application; Drilling fluids and flushing media; Maintenance and operational safety of drilling equipment; Advancements in automated and remote- controlled drilling systems

Unit-3: Explosives and Initiation Systems

History and classification of explosives; Properties of explosives: sensitivity, velocity of detonation, strength, stability; Commercial explosives used in India: ANFO, slurry, emulsion, permitted explosives; Initiating devices: detonators, detonating cords, safety fuse, electronic detonators; Explosive storage, transportation, and safety regulations

Unit-4: Blasting Techniques and Design

Mechanics of rock blasting; Types of blasts: bench blasting, secondary blasting, underground blasting, controlled blasting; Blast design parameters: burden, spacing, stemming, sub-drilling; Delay patterns and sequencing; Vibration control and air overpressure; Flyrock, backbreak, and overbreak mitigation; Misfire identification and handling

Unit-5: Modern Trends and Environmental Aspects

Blast monitoring tools and software (e.g., VOD meters, fragmentation analysis); Digital initiation systems and electronic blasting; Blast-induced ground vibration prediction and

control; Environmental impacts of blasting: noise, vibration, dust; Regulatory framework and statutory guidelines; Case studies of blasting failures and lessons learned

Text/Reference Books:

1. C. J. Konya; Edward J Walter, Surface blast design, Prentice Hall, (1990)
2. U. Langefors, The modern technique of rock blasting, Björn Kihlström Publisher: New York, Wiley 1967
3. G. K. Pradhan, Explosives & Blasting Techniques, Mintech Publications, Bhubaneswar.
4. Indian Explosive Act 1884 and Rules 2008.
5. S. Bhandari, Engineering Rock Blasting Operations, Taylor & Francis, 1997
6. D. J. Deshmukh, Elements of Mining Technology, Vol. I, Denett & Co., Nagpur
7. DGMS Circulars
8. Jimeno, Jimeno & Carcedo, Drilling and Blasting of Rocks

Course Outcomes:

CO	Mining Engineering Graduates will be able to:
C405-01	Understand the fundamentals of drilling methods, equipment, and core recovery in mining operations.
C405-02	Identify and select appropriate drilling machines, tools, and accessories for various applications.
C405-03	Classify explosives and initiation systems, and understand their properties and safety requirements.
C405-04	Design effective blasting patterns and techniques for surface and underground mining.
C405-05	Evaluate modern blasting technologies and assess environmental and regulatory aspects of blasting.

Program: B. Tech **Semester: IV**
Name of the Course: Fundamentals of Opencast Mining **Code: MN24-B-MN202**
Credit: 4 **No of Hours: 4 hours/week**
Max Marks: 100

……..

Course Description:
This course introduces the principles, methods, and technologies of surface mining, including open-pit, strip, and quarry mining. Students learn about mine development, drilling and blasting, excavation equipment, and haulage systems. It covers mine planning, pit design, safety, and environmental management. Emerging trends like automation, drones, and AI in opencast mining are also explored.

Course Objectives:
- To introduce the basic concepts, methods, and operations involved in opencast mining.
- To understand the planning, design, and equipment used in surface mining.
- To create awareness about safety, environmental concerns, and current industry practices.

Syllabus

Unit 1: Introduction to Opencast Mining
Definition and scope of opencast mining; Comparison with underground mining methods; Classification of surface mining methods: open-pit, strip mining, quarrying, contour mining; Factors influencing the selection of surface mining methods; Overview of mine development: box cut, ramp, and haul road construction

Unit 2: Drilling, Blasting, and Excavation
Drilling methods and equipment used in opencast mines; Types of explosives and blasting techniques; Design of blast patterns for benches; Excavation equipment: shovels, draglines, backhoes, front-end loaders, bucket wheel excavators; Productivity and selection criteria for excavation equipment

Unit 3: Haulage, Transportation, and Waste Disposal
Haulage systems: trucks, conveyors, and rail; Design and maintenance of haul roads; Cycle time analysis and optimization; Overburden handling and dump management; Rehandling and waste dump stability

Unit 4: Mine Planning and Design
Bench design parameters: height, width, slope; Pit design and ultimate pit limit; Stripping ratio and break-even analysis; Short-term and long-term planning; Use of software in mine planning and design (introductory overview)

Unit 5: Safety, Environmental Aspects & Emerging Trends
Hazards in opencast mines: slope failure, blasting, equipment operation; Safety measures and statutory guidelines (DGMS provisions); Dust and noise control techniques; Water management in opencast mines; Reclamation, rehabilitation, and mine closure; Introduction to sustainable mining and digital technologies (AI, drones, and automation)

Text/Reference Books:

1. G.B. Mishra, Surface Mining
2. S. K. Das, Surface Mining Technology, Lovely Prakashan; 3rd edition
3. J. W. Martin, Surface mining equipment, Martin Consultants
4. W. Hustrulid, M. Kuchha, R. Martin, Open Pit Mine Planning & Design, CRC Press
5. E. P. Pfleider, Surface Mining, American Institute Mining
6. H. L. Hartman, SME handbook

Course Outcomes:

CO	Mining Engineering Graduates will be able to:
C405-01	Explain the fundamentals, scope, and selection criteria of opencast mining methods.
C405-02	Describe drilling, blasting, and excavation techniques along with related equipment.
C405-03	Analyze haulage systems, dump management, and waste disposal practices.
C405-04	Interpret basic mine planning parameters and apply design principles using software tools.
C405-05	Identify safety, environmental concerns, and emerging technologies in opencast mining.

Program: B. Tech **Semester: IV**
Name of the Course: Bharatiya Khani Gyaan Tantra **Code: MN24-B-MJ211**
Credit:4 **No of Hours: 4 hours/week**
Max. Marks: 100

……

Course Description:

Bharatiya Khani Gyaan Tantra explores traditional Indian mining knowledge as documented in ancient texts, archaeological findings, and indigenous practices. The course covers classical sources like the Arthashastra and Rasaratna Samuccaya, highlighting India's contributions to geology, mining, and metallurgy. Students study historical mining techniques, tools, and regions such as Kolar and Zawar. Emphasis is placed on ancient environmental ethics, dharmic principles, and traditional sustainability methods. The course concludes by linking classical knowledge with modern mining practices through field or documentary projects.

Course Objectives:

- To explore traditional Indian mining practices and wisdom from ancient texts and archaeology.
- To understand the philosophical, environmental, and technological aspects of ancient mining systems.
- To integrate classical knowledge with modern mining engineering concepts.
- To promote sustainable and ethical practices rooted in indigenous science.

Syllabus

Unit 1: Introduction to Bharatiya Khani Gyaan Tantra

Meaning and scope of Khani Gyaan Tantra; Ancient Indian texts and their references to mining and metallurgy (e.g., Arthashastra, Rasaratna Samuccaya, Brihat Samhita); Overview of ancient Indian contributions in geology, metallurgy, and resource utilization; Indian Knowledge System (IKS) and its relevance to mining education

Unit 2: Ancient Mining Techniques and Tools

Tools, methods, and minerals used in ancient Bharat; Evidence of mining activities from Harappan, Mauryan, and Gupta periods; Traditional prospecting and exploration techniques; Ancient knowledge of rock types and ore identification; Copper, iron, and gold mining in ancient India (case studies: Kolar, Zawar, Singhbhum)

Unit 3: Traditional Environmental Ethics and Sustainability

Indigenous philosophies on land and resource use (Vedic and Jain traditions); Dharmic principles related to mining and environment; Panchmahabhuta and its application in balancing mining with nature; Ancient techniques for waste management and water conservation in mines

Unit 4: Metallurgy, Smelting, and Alchemy in Ancient India

Indian contributions to zinc, iron, and steel production (e.g., Delhi Iron Pillar); Alchemical traditions (Rasashastra) and their influence on mining sciences; Techniques of ore processing and purification; Historical development of furnace and forge systems in India

Unit 5: Integration with Modern Mining Practices

Comparative study: Ancient vs. modern mining practices; Reviving traditional wisdom

through sustainable technologies; Case studies of successful integration of IKS in contemporary Indian mines; Role of AICTE, IKS division, and NEP 2020 in promoting Bharatiya mining wisdom; Student project work: Documenting traditional practices from local mining communities

Text/Reference Books:

1. Arthashastra – Kautilya
2. Rasaratna Samuccaya – Ancient text on alchemy and minerals
3. Tripathi, V., History of Metallurgy in India
4. Ray P., Indian Knowledge System
5. Research papers and case studies from IKS division (AICTE)
6. Reports by Geological Survey of India on historical mining sites

Course Outcomes:

CO	Mining Engineering Graduates will be able to:
C405-01	Understand the concept and historical significance of Khani Gyaan Tantra and ancient Indian mining texts.
C405-02	Identify traditional mining tools, techniques, and key historical mining sites.
C405-03	Recognize ancient environmental ethics and sustainable resource practices.
C405-04	Summarize India's contributions to metallurgy, smelting, and alchemical traditions.
C405-05	Apply traditional knowledge to modern mining through case studies and field projects.

OPJU

Dr Makkuva Kalyan Phani <kalyan.makkuva@opju.ac.in>

Board of Studies - BOS Meeting Invitation - Department of Mining Engineering, O.P. Jindal University

3 messages

Dr. M. Kalyan Phani <kalyan.makkuva@opju.ac.in> Wed, Apr 23, 2025 at 4:40 PM
To: pradhan_nitrr@yahoo.co.in

Dear Sir,

Greetings from O.P. Jindal University!!

You are cordially invited to attend the Board of Studies (BOS) meeting of the Department of Mining Engineering, scheduled as follows:

🗓 **Date:** April 24, 2025
⏰ **Time:** 03:00 PM IST
📍 **Mode:** Online (Zoom)

Zoom Meeting Details:
https://us06web.zoom.us/j/85946994987?pwd=ohmwTPn9BK5ZRGA8jFQaxtkqgvT3RN.1
Meeting ID: 859 4699 4987
Passcode: 387538

Your presence and valuable inputs will be highly appreciated as we deliberate on key academic matters and curriculum advancements in the field of Mining Engineering. I have attached the BOS Presentation, Scheme and Syllabus for your kind perusal.

Looking forward to your participation.

Thanks,

With Regards,
Kalyan Phani

Dr. M. Kalyan Phani
Head – Metallurgical and Mining Engineering
Director – R&D Cell II IQAC
O. P. Jindal University
Raigarh – 496 109, Chhattisgarh, India

Email: kalyan.makkuva@opju.ac.in
Mobile: +91 9445884028
Website: www.opju.ac.in

Professional Memberships:

2 attachments

Mining Scheme of Teaching and Examination.docx
212K

New 2025 BoS Mining 2 (1).pptx
995K

Dr. M. Kalyan Phani <kalyan.makkuva@opju.ac.in> Sun, May 25, 2025 at 10:27 PM
To: pradhan_nitrr@yahoo.co.in

Dear Sir,

Please find attached the Minutes of the Meeting (MoM) of the Board of Studies, along with the revised teaching scheme and syllabus, updated in line with your suggestions.

Kindly review the documents and provide your approval at your earliest convenience.

Thanks,

[Quoted text hidden]
[Quoted text hidden]

BOS-MOM and Scheme and Syllabus.pdf
1109K

Manoj Pradhan <pradhan_nitrr@yahoo.co.in> Wed, May 28, 2025 at 8:45 PM
To: "Dr. M. Kalyan Phani" <kalyan.makkuva@opju.ac.in>

Approved.

Thanks & Regards

Manoj Pradhan
Professor (HAG)
National Institute of Technology
Raipur.

[Quoted text hidden]
[Quoted text hidden]

Dr Makkuva Kalyan Phani <kalyan.makkuva@opju.ac.in>

Board of Studies - BOS Meeting Invitation Department of Mining Engineering, O.P. Jindal University

4 messages

Dr. M. Kalyan Phani <kalyan.makkuva@opju.ac.in> Wed, Apr 23, 2025 at 4:41 PM
To: om.prakash@jindalpower.com

Dear Sir,

Greetings from O.P. Jindal University!!

You are cordially invited to attend the Board of Studies (BOS) meeting of the Department of Mining Engineering, scheduled as follows:

🗓 **Date:** April 24, 2025
⏰ **Time:** 03:00 PM IST
📍 **Mode:** Online (Zoom)

Zoom Meeting Details:
https://us06web.zoom.us/j/85946994987?pwd=ohmwTPn9BK5ZRGA8jFQaxtkqgvT3RN.1
Meeting ID: 859 4699 4987
Passcode: 387538

Your presence and valuable inputs will be highly appreciated as we deliberate on key academic matters and curriculum advancements in the field of Mining Engineering. I have attached the BOS Presentation, Scheme and Syllabus for your kind perusal.

Looking forward to your participation.

Thanks,

With Regards,
Kalyan Phani

Dr. M. Kalyan Phani
Head – Metallurgical and Mining Engineering
Director – R&D Cell II IQAC
O. P. Jindal University
Raigarh – 496 109, Chhattisgarh, India

Email: kalyan.makkuva@opju.ac.in
Mobile: +91 9445884028
Website: www.opju.ac.in

Professional Memberships: LM-IIM | LM-EMSI | LM-PMAI | LM-CAERD | PM-IEEE

2 attachments

New 2025 BoS Mining 2 (1).pptx
995K

Mining Scheme of Teaching and Examination.docx
212K

Dr. M. Kalyan Phani <kalyan.makkuva@opju.ac.in> Thu, Apr 24, 2025 at 3:16 PM
To: om.prakash@jindalpower.com

Dear Sir,

Kindly join the meeting with the following link.

🗓 **Date:** April 24, 2025
⏰ **Time:** 03:00 PM IST
📍 **Mode:** Online (Zoom)

Zoom Meeting Details:
https://us06web.zoom.us/j/85946994987?pwd=ohmwTPn9BK5ZRGA8jFQaxtkqgvT3RN.1
Meeting ID: 859 4699 4987
Passcode: 387538

[Quoted text hidden]
[Quoted text hidden]

Dr. M. Kalyan Phani <kalyan.makkuva@opju.ac.in> Sun, May 25, 2025 at 10:26 PM
To: om.prakash@jindalpower.com

Dear Sir,

Please find attached the Minutes of the Meeting (MoM) of the Board of Studies, along with the revised teaching scheme and syllabus, updated in line with your suggestions.

Kindly review the documents and provide your approval at your earliest convenience.

Thanks,

[Quoted text hidden]
[Quoted text hidden]

BOS-MOM and Scheme and Syllabus.pdf
1109K

Prakash . <om.prakash@jindalpower.com> Sun, May 25, 2025 at 10:32 PM
To: "Dr. M. Kalyan Phani" <kalyan.makkuva@opju.ac.in>

Dear Sir,
Thanks for the update. It is approved from my side.
With Regards
Om Prakash
CEO-Mining Business
JPL

[Quoted text hidden]
[Quoted text hidden]

Dr Makkuva Kalyan Phani <kalyan.makkuva@opju.ac.in>

Board of Studies - BOS Meeting Invitation Department of Mining Engineering, O.P. Jindal University

4 messages

Dr. M. Kalyan Phani <kalyan.makkuva@opju.ac.in> Wed, Apr 23, 2025 at 4:43 PM
To: drbkpal2007@gmail.com

Dear Sir,

Greetings from O.P. Jindal University!!

You are cordially invited to attend the Board of Studies (BOS) meeting of the Department of Mining Engineering, scheduled as follows:

🗓 **Date:** April 24, 2025
⏰ **Time:** 03:00 PM IST
📍 **Mode:** Online (Zoom)

Zoom Meeting Details:
https://us06web.zoom.us/j/85946994987?pwd=ohmwTPn9BK5ZRGA8jFQaxtkqgvT3RN.1
Meeting ID: 859 4699 4987
Passcode: 387538

Your presence and valuable inputs will be highly appreciated as we deliberate on key academic matters and curriculum advancements in the field of Mining Engineering. I have attached the BOS Presentation, Scheme and Syllabus for your kind perusal.

Looking forward to your participation.

Thanks,

With Regards,
Kalyan Phani

Dr. M. Kalyan Phani
Head – Metallurgical and Mining Engineering
Director – R&D Cell II IQAC
O. P. Jindal University
Raigarh – 496 109, Chhattisgarh, India

Email: kalyan.makkuva@opju.ac.in
Mobile: +91 9445884028
Website: www.opju.ac.in

Professional Memberships: LM-IIM | LM-EMSI | LM-PMAI | LM-CAERD | PM-IEEE

2 attachments

Mining Scheme of Teaching and Examination.docx
212K

New 2025 BoS Mining 2 (1).pptx
995K

Dr. B. K. Pal <drbkpal2007@gmail.com> Wed, Apr 23, 2025 at 8:15 PM
To: "Dr. M. Kalyan Phani" <kalyan.makkuva@opju.ac.in>

Thanks, I will be there.

[Quoted text hidden]

[Quoted text hidden]

--
Dr. B. K. Pal
Professor & Former Head
Department of Mining Engineering
National Institute of Technology
Rourkela -- 769 008, India.
Cell: +91-9437686106/ +916371114823;
Ph. No.: +91-661-2462605/2463605.
e-mail: bkpal@nitrkl.ac.in/
drbkpal2007@gmail.com

Dr. M. Kalyan Phani <kalyan.makkuva@opju.ac.in> Sun, May 25, 2025 at 10:24 PM
To: drbkpal2007@gmail.com

Dear Sir,

Please find attached the Minutes of the Meeting (MoM) of the Board of Studies, along with the revised teaching scheme and syllabus, updated in line with your suggestions.

Kindly review the documents and provide your approval at your earliest convenience.

Thanks,

With Regards,
Kalyan Phani

Dr. M. Kalyan Phani
Head – Metallurgical and Mining Engineering
Director – R&D Cell II IQAC
O. P. Jindal University
Raigarh – 496 109, Chhattisgarh, India

Email: kalyan.makkuva@opju.ac.in
Mobile: +91 9445884028
Website: www.opju.ac.in

Professional Memberships: LM-IIM | LM-EMSI | LM-PMAI | LM-CAERD | PM-IEEE

On Wed, Apr 23, 2025 at 4:43 PM Dr. M. Kalyan Phani <kalyan.makkuva@opju.ac.in> wrote:
[Quoted text hidden]

BOS-MOM and Scheme and Syllabus.pdf
1109K

Dr. B. K. Pal <drbkpal2007@gmail.com> Mon, May 26, 2025 at 3:41 PM

To: "Dr. M. Kalyan Phani" <kalyan.makkuva@opju.ac.in>

Dear Sir,
The minutes of the meeting is approved.

Prof B K Pal, MN, NIT, Rourkela.

Dr. B. K. Pal
Professor & Former Head
Department of Mining Engineering
National Institute of Technology
Rourkela -- 769 008, India.
Cell: +91-9437686106/ +916371114823;
Ph. No.: +91-661-2462605/2463605.
e-mail: bkpal@nitrkl.ac.in/
drbkpal2007@gmail.com

[Quoted text hidden]

> [Quoted text hidden]