GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mining Engineering

Subject Code: DI04022021

Subject Name: Underground Coal Mining

w. e. f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	PCC

Prerequisite:	Before studying Underground Coal Mining, students should have a basic foundation in Mining Geology, Basic and Advanced Mine Surveying, Surface Mining Technology, Mining Machineries, and Mine Sampling, Assaying & Mineral Dressing. These subjects provide essential knowledge of geological conditions, mine planning, equipment, surveying techniques, and coal evaluation necessary for understanding underground coal mining operations.
Rationale:	This course is designed to provide students with comprehensive knowledge of coal properties, reserves, and various underground mining methods. It equips learners with practical understanding of development, depillaring, longwall mining, and underground coal gasification, emphasizing safety, productivity, and environmental considerations essential for modern mining operations.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Identify suitable underground coal mining methods.	R, U
02	Calculate the design parameters required for bord and pillar development.	R, U, A
03	Justify the selection of safe and economical depillaring methods.	R, U, A
04	Select an appropriate longwall mining method based on geological and operational conditions.	R, U, A
05	Evaluate the safety and environmental impact of underground coal gasification.	R, U

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
4	0	0	4	70	30	0	0	100

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Fundamentals of Coal and Its Underground Mining** 1.1 Origin of coal, Rank of Coal 1.2 Banded Constituents of Coal 1.3 Coal Analysis 1.3.1 Ultimate Analysis 1.3.2 Proximate Analysis 1.4 Consumptions of coal in various Industries 1.5 Coal reserves in India 1.6 Lignite reserves in Gujarat 1.7 Classification of various underground coal mining methods. 1.8 Factors affecting selection of underground coal mining methods.	08	13%
2.	**Bord & Pillar Method – Development** 2.1 Applicability conditions of the bord and pillar method 2.2 Advantages and disadvantages of bord and pillar 2.3 Basic elements of bord and pillar mining method: pillar, gallery, junction, dip, strike, face, panel, barrier, roof, floor 2.4 Classification of bord and pillar mining system 2.5 Advantages of panel system of bord and pillar mining 2.6 Design of bord and pillar working 2.6.1 size of panel 2.6.2 size of barrier 2.6.3 size of pillars 2.6.4 width of galleries 2.7 Development 2.7.1 by blasting of solids 2.7.2 by coal cutting machines 2.7.3 by gathering arm loaders and shuttle car 2.7.4 by continuous miner 2.8 In bord and pillar working calculate 2.8.1 Percentage of extraction of coal 2.8.2 Size of the panel 2.8.3 Number of faces	16	27%
3.	**Bord & Pillar Mining– Depillaring and Stowing** 3.1 Preparatory arrangement before Depillaring. 3.2 Principles of pillar extraction techniques 3.3 Factors influencing choice of pillar extraction method 3.4 Depillaring in thin and thick seam 3.5 Local fall, main fall, air blast, line of goaf. 3.6 Precautions against fire and inundation during depillaring	12	20%

	3.7 Stowing: 3.7.1 Applicable conditions 3.7.2 Advantages of stowing 3.7.3 Classification of stowing methods: hydraulic, pneumatic, and mechanical		
4.	**Longwall Mining** 4.1 Longwall mining: Applicability conditions, elementary terms used in longwall mining 4.2 Classification of Longwall methods 4.3 Governing factors for selection of longwall method 4.4 Classification of longwall faces: Advancing and Retreating longwall faces: working method, merits and demerits 4.5 Single unit and double unit face: working method, merits and demerits 4.6 Development of panels and faces: position of development, roadway shape and size, method of drivage of roadways, construction of longwall faces 4.7 Longwall face support system: Manually operated supports, powered supports	16	27%
5.	**Underground Gasification of Coal** 5.1 Conditions suitable for underground coal gasification 5.2 Principles of underground coal gasification 5.3 Working methods of underground coal gasification 5.4 Advantages and disadvantages of underground coal gasification 5.5 Pilot projects of underground coal gasification in India 5.6 Environmental impacts of underground coal gasification 5.7 Safety hazards associated with underground coal gasification	08	13%
	Total	**60**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
29	**50**	**21**	**00**	**00**	**00**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Elements of Mining Technology Vol. I	D. J. Deshmukh	Denett & Co., Nagpur Year: 2008 ISBN-13: 978-8189904333
2	Principles and Practices of Modern Coal Mining	R. D. Singh	New Age International (P) Limited Year: 2010 ISBN 13: 9788122409741
3	Modern Coal Mining Technology	Samir Kumar Das	Lovely Prakashan Year: 1994
4	Underground Winning of Coal	T. N. Singh	Oxford & IBH Publishing Co Pvt.Ltd Year: 1992 ISBN: 978-8120404908
5	Underground Coal Mining Methods	Dr. J.G. Singh	Braj-Kalpa Publishers Year: 2000 ISBN: 978-8175252042

(b) Open-source software and website:

1. Coal mines in India - major coal fields list for competitive exams. Byjus. https://byjus.com/govt-exams/coal-mines-india/
2. Kumar, A., Vivek, Y., Gopal, M. K., Pradeep, D., & Raju, G. (2021). A Study On Hydraulic Stowing. Journal of Emerging Technologies and Innovative Research, 8(7). https://www.jetir.org/papers/JETIR2107660.pdf
3. Longwall | Komatsu. (n.d.). https://www.komatsu.com/en/products/longwall/
4. Longwall Mining Overview | Introduction | underground COAL. (n.d.). http://www.undergroundcoal.com.au/fundamentals/07_overview.aspx
5. Ministry of Coal, Government of India. (n.d.-a). https://coal.gov.in/en/about-us/history-background
6. Ministry of Coal, Government of India. (n.d.-b). https://coal.gov.in
7. NETL: Underground Coal Gasification. (n.d.). Gasifipedia. https://www.netl.doe.gov/research/Coal/energy-systems/gasification/gasifipedia/underground
8. https://nptel.ac.in MOOC Course
9. Press Information Bureau. (2023). Underground Coal Gasification Projects in India. https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=2028176

Suggested Project List:

1. Prepare a poster showing various coalfields of India.
2. Prepare spreadsheet calculating percentage of extraction.
3. Prepare an illustration banner related to panel designing and extraction.
4. Presentation on any case study related to longwall working.
5. Prepare a poster showing underground coal mine support.
6. Make slides showing pillar extraction techniques.
7. Design a layout of bord and pillar and longwall working.
8. Prepare a chart showing stowing surface arrangements.
9. Prepare a sheet showing the working cycle of the shearer in the longwall face.
10. Prepare a presentation on underground coal gasification.

Suggested Activities for Students:

1. Visit a nearby underground coal mine.
2. Attend an expert lecture based on underground coal mining methods.
3. Participate in a quiz competition related to underground coal mining techniques.
4. View online videos showing longwall and bord and pillar mining methods.
5. Make a group discussion on major issues of underground coal mining.
6. Undertake a micro project.

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