

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

First Year Bachelor of Technology

List of Courses Common to All Undergraduate Programmes

Foundation Courses (FC)

Basic Science Core (BSC)

MA110	Engineering Mathematics – I	(3-0-0)	3
MA111	Engineering Mathematics – II	(3-0-0)	3
PH110	Physics	(3-1-0)	4
PH111	Physics Laboratory	(0-0-2)	1
CY110	Chemistry	(3-0-0)	3
CY111	Chemistry Laboratory	(0-0-3)	2

Engineering Science Core (ESC)

AM110	Engineering Mechanics	(3-0-0)	3
ME111	Engineering Graphics	(1-0-3)	3
CS110	Computer Programming	(3-1-0)	4
CS111	Computer Programming Lab	(0-0-2)	1

Humanities and Social Science Core (HSC)

SM110	Professional Communication	(3-0-0)	3
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Mandatory Learning Courses (MLC)

CV110	Environmental Studies	(1-0-0)	1
SM111	Professional Ethics and Human Values	(1-0-0)	1
EC100	Elements of Electronics and Communication Engineering	(2-0-0)	2
	<i>(For Computer Science, Mechanical, Civil, Mining, Metallurgy, Chemical Engineering branches only)</i>		
EE110	Elements of Electrical Engineering	(2-0-0)	2
	<i>(For Computer Science, Mechanical, Civil, Mining, Metallurgy, Chemical Engineering branches only)</i>		
ME110	Elements of Mechanical Engineering	(2-0-0)	2
	<i>(For Computer Science, IT, E & C, E & E, Civil, Mining, Metallurgy, Chemical Engineering branches only)</i>		

Programme Specific Core Courses

Civil Engineering

CV100	Civil Engineering Materials and Construction	(3-1-0)	4
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Mining Engineering

MI101	Introduction to Mining Engineering	(3-0-0)	3
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Computer Science And Engineering

CS112	Discrete Mathematical Structures	(3-1-0)	4
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Electronics And Communication Engineering

EC101	Joy of Electronics and Communication	(2-0-3)	4
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EC102	Linear Systems and Signals	(3-1-0)	4
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Electrical & Electronics Engineering

EE101	Analysis Of Electric Circuits	(3-1-0)	4
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EE143	Mathematics For Electrical Engineers	(3-1-0)	4
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Information Technology

IT110	Digital System Design	(3-0-2)	4
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IT150	Object Oriented Programming	(3-0-2)	4
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Chemical Engineering

CH150	Process Calculations	(2-2-0)	4
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Mechanical Engineering

ME112	Materials Science and Engineering	(3-0-0)	3
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ME113	Mechanics of Deformable Bodies	(3-0-0)	3
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Metallurgical And Materials Engineering

MT160	Introduction to Material Science & Technology	(3-1-0)	4
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NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

Suggested Plan of Study:

GROUP – I (S1-S6)

Semester →	I	II
	(Physics Cycle)	(Chemistry Cycle)
1	MA110	MA111
2	PH110	CY110
3	EE110	CS110
4	ME110	AM110
5	EC100	CS111
6	PH111	CY111
7	SM110	CV110
8	SM111	PSC
9	ME111	
10	PSC	

GROUP – II (S7-S12)

Semester →	I	II
	(Chemistry Cycle)	(Physics Cycle)
1	MA110	MA111
2	CY110	PH110
3	CS110	EE110
4	AM110	ME110
5	CS111	EC100
6	CY111	PH111
7	CV110	SM110
8	PSC (Except CS)	SM111
9		ME111
10		PSC

- A. Sections S1 to S6 will be made up of students of CH, CV, ME, MI, MT (IstSem Physics Cycle, IIndSem Chemistry Cycle)
- B. Sections S7 to S12 will be made up of students of CS, EC, EE and IT (IstSem Chemistry Cycle, IIndSem Physics Cycle)
- C. Program Specific Core will be done in ‘F’ slot, by the respective departments.
- D. Computer Science students, in Chemistry cycle (i.e., IstSem) will do EC100 and EE110 in the D’ slot. It will be Mon, Wed : EC100 and Tue, Thu: EE110.
- E. Mechanical students instead of ME110, will be doing Program Specific Core in D’slot (in Ist Sem.) for 3 credits.

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL -

Department of Mining Engineering (MI) Bachelor of Technology in Mining Engineering

Basic Science Core (BSC)

MA110 Engineering Mathematics-I	(3-0-0)3
PH110 Physics	(3-1-0)4
PH111 Physics Laboratory	(0-0-2)1
MA111 Engineering Mathematics-II	(3-0-0)3
CY110 Chemistry	(3-0-0)3
CY111 Chemistry Laboratory	(0-0-3)2

Engineering Science Core Courses (ESC)

EC100 Elements of Electronics and Communication Engineering	(2-0-0)2
EE110 Elements of Electrical Engg	(2-0-0)2
ME110 Elements of Mechanical Engg	(2-0-0)2
CS110 Computer Programming	(3-1-0)4
CS111 Computer Programming Lab	(0-0-2)1
AM110 Engineering Mechanics	(3-0-0)3
ME111 Engineering Graphics	(1-0-3)3
ME-200 Workshop	(0-0-2)1
ME-211 Thermodynamic & Fluid Mechanics	(3-0-0)3

Humanities and Social Science & Mgt. Core (HSC)

SM110 Professional Communication	(3-0-0)3
SM300 Engineering Economics	(3-0-0)3
SM302 Principles of Management	(3-0-0)3

Programme Specific Core (PSC)

MI101 Introduction to Mining Engineering	(3-0-0)3
MI201 Development of Mineral Deposits	(3-1-0)4
MI202 Mine Surveying	(3-1-0)4
MI203 Mine Surveying Lab	(0-0-3)2
CV203 Mining Geology	(3-0-0)3
CV218 Mining Geology Lab	(0-0-3)2
MI251 Mine Environment and Ventilation Engineering	(3-1-0)4
MI252 Mine Environment and Ventilation Engineering Lab	(0-0-3)2
MI253 Applied Mine Surveying Lab	(0-0-3)2
MI254 Mining Machinery	(3-1-0)4
MI255 Industrial Training in Mines-I	1
MI301 Surface Mining Technology	(3-1-0)4
MI302 Mine Hazards, Rescue and Recovery	(3-1-0)4
MI303 Underground Coal Mining Technology	(3-1-0)4
MI304 Industrial Training in Mines-II	1
MI351 Underground Metal Mining Technology	(3-1-0)4
MI352 Rock Mechanics	(3-1-0)4
MI353 Rock Mechanics Lab.	(0-0-3)2
MI354 Mine Systems Optimization	(3-1-0)4
MI355 Industrial and Professional Practice	1
MI401 Mineral Processing Technology	(3-1-0)4
MI402 Mineral Processing Technology Lab.	(0-0-3)2
MI403 Rock Fragmentation Engineering	(3-1-0)4
MI404 Mine Design Laboratory	(0-0-3)2

MI405 Industrial Training in Mines-III	1
MI451 Mine Legislation & Safety	(4-0-0)4

Programme Specific Elective (PSE)

MI210 Drilling & Blasting Engineering	(3-0-0)3
MI211 Seabed Mining	(3-0-0)3
MI260 Applied Mine Surveying	(3-0-0)3
MI261 Electrical Machinery in Mines	(3-0-0)3
MI310 Noise Pollution & Control Engg.	(3-0-0)3
MI311 Rock Reinforcement Engg.	(3-0-0)3
MI312 Mine Power Systems	(3-0-0)3
MI360 Mine Health and Safety Engg.	(3-0-0)3
MI361 Advanced Surface Mining Technology	(3-0-0)3
MI362 Production Drilling for Oil Wells	(3-0-0)3
MI363 Mechanization and Materials Handling	(3-0-0)3
MI410 Advanced U/G Coal Mining Technology	(3-0-0)3
MI411 Strata Mechanics	(3-0-0)3
MI412 Geostatistics	(3-0-0)3
MI413 Applications of IT in Mining Projects	(3-0-0)3
MI414 Ore Reserve Estimation and Mine Valuation	(3-0-0)3
MI460 Coal Washing and Handling	(3-0-0)3
MI461 Surface Mine Design	(3-0-0)3
MI462 U/G Coal Mine Design	(3-0-0)3
MI463 U/G Metal Mine Design	(3-0-0)3
MI464 Environmental Management and Sustainable Development	(3-0-0)3

Open Elective (OE)

MI471 Reliability Analysis of Engg. Systems	(3-0-0)3
MI472 Rock Excavation in Mines and Infrastructure Projects	(3-0-0)3
MI473 Stability of Rock Slopes	(3-0-0)3
MI474 Tunneling Engg.	(3-0-0)3
MI475 Numerical Modeling Techniques	(3-0-0)3
MI476 Industrial Engineering & Management	(3-0-0)3
MI477 Remote Sensing & Geoinformatics	(3-0-0)3
MI478 Safety Engineering	(3-0-0)3
MI479 Energy Resources Utilization and Climate Change	(3-0-0)3

Project (MP)

MI449 Mine Design Project-I	(0-0-3)2
MI499 Mine Design Project-II	(0-0-6)4

Mandatory Learning Courses

CV110 Environmental Studies	(1-0-0)1
SM111 Professional Ethics and Human Values	(1-0-0)1
MI452 Mine Projects Exposure	(0-0-3)2
MI490 Seminar	1

Minor Courses

MI480 Mining Technology	(3-1-0)4
MI481 Rock Excavation Engineering	(3-1-0)4
MI482 Mine Safety Engineering	(3-1-0)4
MI483 Mine Mechanisation	(3-1-0)4
MI484 Environmental Management	(3-1-0)4

Students seeking Honours degree shall credit the following five PG courses offered by the Department of Mining Engg.

MI901 Applied Rock Mechanics	(3-1-0)4
MI804 Underground Space Technology	(3-1-0)4
MI916 Risk and Safety Management in Mines	(3-1-0)4
MI705 Project Management	(3-1-0)4
MI855 Reclamation Rehabilitation and Risk Management	(3-1-0)4

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

Suggested Plan of Study

Semester →	II	III	IV	V	VI	VII	VIII
1	MI101	MI201	MI251	MI301	MI351	MI401	MI451
2		MI202	MI252	MI302	MI352	MI402	MI452
3		MI203	MI253	MI303	MI353	MI403	MI490
4		CV203	MI254	MI304	MI354	MI404	MI499
5		CV218	MI255	SM302	MI355	MI405	Elective I
6		Elective	ME200	Elective	SM300	MI449	Elective II
7		---	ME211		Elective	Elective I	
8		---	Elective			Elective II	

Degree Requirements:

Category of Courses	Minimum Credits to be Earned
Basic Science Core(BSC)	16
Engineering Science Core(ESC)	21
Humanities and Social Sciences Core (HSC)	09
Programme Core (PC)	76
Electives	25
Project (MP)	06
Mandatory Learning Courses (MLC)	05
Total	158

Department of Mining Engineering

MI101 INTRODUCTION TO MINING ENGINEERING

(3-0-0)3

Introduction to Indian Mining Industry, National and International Scenario, Unit Operations-Drilling, Blasting, Excavation, Transportation, Size reduction. Introduction to Mining Methods Environmental Impacts. Safety.

Deshmukh D.J Elements of Mining Engineering Vol.I Central Techno Publications Nagpur, 1998

Hartman H.L –Introductory Mining Engineering, Wiley Interscience, New York, 1987

Mishra, G.B, Surface Mining Dhanad Publishers, Dhanbad, 1994

MI201 DEVELOPMENT OF MINERAL DEPOSITS

(3-1-0)4

Methods of shaft construction, Widening and deepening of shafts. Special methods of shaft sinking under difficult conditions. Methods of raising. Drivage of horizontal openings: Conventional and mechanized systems. Tunneling under difficult conditions. Supports: supporting roadways and mine faces using timber, steel (friction and hydraulic); Roof bolting and roof stitching. Over view of mining industries and relevant mining laws.

Tatiya R.R., Surface and underground excavation: methods, techniques and equipment, A. A. Balkema publishers, 2005.

Deshmukh, D. J., Elements of Mining Engineering, Vol. I, Central Techno Publications, Nagpur, 1998.

Onika D., Design of Mine Excavations, Mir Publishers, Moscow, 1973.

Pokrovskiy., Driving of Horizontal Workings, Mir Publishers, Moscow, 1992.

MI202 MINE SURVEYING

(3-1-0)4

Principles of mine surveying and its scope. Plane and geodetic surveying. Compass surveying. Leveling. Theodolites: Construction and operation. Tests and adjustments. Angle measurement. Errors in measurement. Traversing. Balancing of traverse. Calculation of coordinates and plotting. Contouring, Interpolation of contours. Calculation of areas and volumes. Dip, fault and borehole problems.

Punmia, B. C., Surveying Vol- I & II, Laxmi Publishers, New Delhi, 2008.

Kanetkar, T.P., Surveying, Vol- I & II, Tata McGraw Hill, New Delhi, 2007.

Ghatak, S., Mine Surveying and Levelling – Vol I, II & III, Coal Field Publishers, Asansol, 2005.

MI203 MINE SURVEYING LAB

(0-0-3)2

A total of 10 to 12 experiments shall be carried out pertaining to the subject.

MI210 DRILLING & BLASTING ENGINEERING

(3-0-0)3

Applications of drilling in mining industry. Classification and mechanism of rock drilling methods. Different types of drill machines. Alignment and deviation of bore holes. Factors influencing drilling in percussive and rotary methods. Developments in explosives and initiating devices. Properties of explosives. Safety aspects. Exploders & Circuit testers.

Das, S. K., Explosives and Blasting Practices in Mines, Lovely Prakashan, Dhanbad, 2001.

Pradhan, G. K. & Sandhu, M. S., Blasting Safety Manual, 2002

Deshmukh D.J. Elements of Mining Technology Vol. I; Vidyasewa Prakashan, Nagpur, 1994

Chug, C. P. Manual of drilling Technology, Oxonian Press Pvt. Ltd., Delhi, 1985.

MI211 SEABED MINING

(3-0-0)3

Resources from the seabed. Exploring and extraction of minerals from seabed. Comparison of seabed mining with traditional in-land mining. Mining systems - hydraulic mining, continuous line bucket (CLB) mining, modular or shuttle mining systems. Alternative systems for deep sea mining, transport and processing. Ore transfer technology. Environmental impact of seabed mining. Economics. Indian scenario - phase wise development of seabed mining. Vessels for conducting survey, research and extraction of ore reserves.

Hartman, H.L., Introductory Mining Engineering; Wiley Interscience, New York, 1987.

Manjula, R. Shyam, Metals from the seabed: Prospects for Mining Polymetallic Nodules of India. Oxford & IBH Publishing Co., New Delhi, 1982.

MI251 MINE ENVIRONMENT & VENTILATION ENGINEERING

(3-1-0)4

Mine gases. Mine illumination. Heat and humidity. Cooling power of mine air. Air conditioning. Airflow in mines. Natural and mechanical ventilation. Ventilation networks. Computer aided design of ventilation systems.

Mishra, G.B. – Mine Environment and Ventilation; Oxford University Press, Delhi, 1986.

Vutukuri, V.S. & Lama, R.D. – Environmental Engineering in Mines; Cambridge University Press, Cambridge, 1986.

Harsha Vardhan –An Introduction to Underground Mine Environment and Ventilation available online atNPTEL

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website

Hartman, H. L. –*Mine Ventilation & Air Conditioning*; John Wiley & Sons; New York, 1982.

MI252 MINE ENVIRONMENT & VENTILATION ENGINEERING LAB (0-0-3)2

A total of 10 to 12 experiments shall be carried out pertaining to the subject.

MI253 APPLIED MINE SURVEYING LAB (0-0-3)2

A total of 10 to 12 experiments shall be carried out pertaining to the subject.

MI254 MINING MACHINERY (3-1-0)4

Basic principles of transport of men, materials and mineral in underground mines. Techno- economic indices of transportation systems. Pit top and pit bottom lay outs. Motive power used in mines. Types of compressors used in mines. Wire ropes: construction, classification, application, inspection, maintenance and calculations. Capping and slicing of ropes. Suspension gear for drum and Koepe winding. Rope haulages: Types, principle of operation, suitability, safety appliances, calculations. Winding: Drum winding and Koepe winding, Braking systems – mechanical and electrical. Man riding systems. Drainage and Pumping. Sumps.

Ramlu M.A. *Mine Hoisting*. Oxford & IBH. New Delhi 1996.

Walker S.C. *Mine Winding and Transport*. Elsevier, Amsterdam 1988.

Deshmukh D.J. *Elements of Mining Technology Vol. III*; Vidyasewa Prakashan, Nagpur, 1994

Reese, C., *Material Handling Systems: Designing for Safety and Health*, CRC Press, 2000.

MI255 INDUSTRIAL TRAINING IN MINES-1 (0-0-0)1

Industrial training should be taken up at the end of III semester, preferably in surface mines. Relevant information pertaining to the development and extraction of mineral deposits by surface mining methods, details of different equipments, layouts and other techno-economic data should be collected. Information regarding safety aspects, manpower, production and productivity, management practices and environmental protection measures should also be included in the report.

MI260 APPLIED MINE SURVEYING (3-0-0)3

Triangulation: Station marks, signals and towers. Satellite station and reduction to center. Tacheometry: Tangential method and movable bar method. Curve ranging: Different methods of curve ranging. Laying of curves in underground. Aerial photogrammetry, Field astronomy, Correlation survey: Connection of underground and surface survey. Total station. GPS. DGPS. Introduction to Terrestrial Laser Scanner and Drone Surveying.

Punmia, B. C. *Surveying Vol- I, II & III*, Laxmi Publishers, New Delhi, 2008.

Kanetkar, T.P. *Surveying, Vol- I, II & III*, Tata McGraw Hill, New Delhi, 2007.

Ghatak, S., *Mine Surveying and Levelling – Vol I, II & III*, Coal Field Publishers, Asansol, 2005.

Operational Manuals of Lawrence & Mayo, Bangalore.

MI261 ELECTRICAL MACHINERY IN MINES (3-0-0)3

Three-phase circuit analysis, magnetic circuits, transformers, transformer losses, tests on transformers, electromechanical energy conversion, direct current motors and generators, induction motors, synchronous motors, control of speed and torque of DC and AC motors, intrinsically safe and flame-proof equipment, design of substations, switchhouses and power centers, power distribution systems in surface and underground mines, legislative and safety aspects.

Morley, L.A., *Mine Power Systems*, US Bureau of Mines Information Circular 9258, 1990.

Gross, C. A., *Electric Machines*, 1st Edition, CRC Press, 2006.

Kothari, D.P. and Nagrath, I.J., *Electric Machines*, 5th Edition, McGraw Hill, 2017.

MI301 SURFACE MINING TECHNOLOGY (3-1-0)4

Status and scope of surface mining. Elements of surface mining. Unit operations – Drilling, Blasting, Excavation and Transporting. Details of principal production equipment. Layout of workings and waste dumps. Environmental management and reclamation in mines. Operational details of major surface mines with special reference to coal, lignite, iron, limestone etc. Techno-economic evaluation of surface mining projects. Problems in deep mining.

S.K. Das, *Surface Mining Technology*, Lovely Prakashan, Dhanbad, 1984.

Misra, G.B., *Surface Mining*, Dhanbad Publishers, Dhanbad, 1994.

Deshmukh, D. J. *Elements of Mining Technology, Vol. I, II & III*, Central Techno Publishers, Dhanbad, 1988.

MI302 MINE HAZARDS, RESCUE AND RECOVERY (3-1-0)4

Spontaneous combustion. Surface and underground fires. Fire extinguishers. Isolation/Explosion proof stopping.

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Reopening of sealed off areas. Mine explosions. Inundation. Approaching water logged areas and old workings. Water dams and design. Rescue & recovery equipment's for use in mines. Rescue organization. Examples of major mine disasters in India & abroad.

Ramlu, M.A. Mine Fires, Explosions, Rescue, Recovery & Inundations; Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1991.

Rakesh & Lele, M.G. Inundation in Mines; Mrs. Asha Lata, Varanasi, 1970.

MI303 UNDERGROUND COAL MINING TECHNOLOGY (3-1-0)4

Status and scope of underground coal mining. Classification of coal reserves. Opening up of deposit. Horizon mining. Basic coal mining methods. Bord and pillar mining: development & depillaring with semi-mechanised and mechanized board and pillar mining. Longwall mining. Thick-seam mining: Classification of thick seam mining methods, inclined slicing with caving; sub-level caving. Hydraulic Mining. Underground gassification of coal.

Singh, R.D. Principles and Practices of Modern Coal Mining, 1997. ISBN 81-224-0974-1

Singh, T.N. Underground Mining of Coal, Oxford & IBH, 1992.

MI304 INDUSTRIAL TRAINING IN MINES - II (0-0-0)1

Industrial Training – II should be taken up at the end of IV semester, preferably in underground coal mines. Relevant information pertaining to the development and extraction of coal by underground mining methods, details of different equipments working in the mines and their operational information, layouts and other techno- economic data, information regarding safety aspects, man-power, production and productivity, management practices and environmental protection measures should be included.

MI310 NOISE POLLUTION AND CONTROL ENGINEERING (3-0-0)3

Basics of sound. Frequency analysis. Equipment's used for noise measurement. Various standards in India & abroad on noise exposure. Effects of noise exposure. Community noise. Industrial noise control & hearing testing. Environmental noise measurement. Noise measurement & control of HEMM, Coal handling & preparation plants, Jackhammer drills. Noise control measures for DG sets. Human vibration: measurement, control and standards. Health effect of vibration-Handarm and Whole-body vibration. Parameters influencing human response to vibration.

Harris, C.M : Handbook of Noise Control, McGraw- Hill Book Company, 1979.

Albert Thumann & Richard K. Miller : Secrets of Noise Control, The Fairmont Press, Georgia, 1976.

ISO 2631-1: Mechanical vibration and shock-Evaluation of human exposure to whole-body vibration-second edition 1997-05-01.

MI311 ROCK REINFORCEMENT ENGINEERING (3-0-0)3

Roof bolting. Cable bolting. Shotcreting. Cavability of rocks – effect on supports design. Longwall supports. Lining of tunnels and shafts. Yieldable arches and ring sets. Reinforcement of pillars. Stabilization of slopes. Roof convergence. Stope closure. Back filling, Mechanical behavior and monitoring of various supports. Capital investment for supports, cost control process.

Biron, C and Ariglu, E., Design of Supports in Mines, John Wiley & Sons, 1983.

Britton, S.G., Construction Engineering in Underground Coal Mines, SME, 1983.

MI312 MINE POWER SYSTEMS (3-0-0)3

Electric power in mining, three-phase circuit analysis, mine power system components, distribution of electrical power in surface and underground mines, grounding systems, ground wire monitoring, distribution cable construction and selection, power flow calculations, power factor correction, design of substations, switchhouses and power centers, method of symmetrical components, mine power system fault analysis, transients and overvoltages, protective equipment and relaying, legislative and safety aspects.

Morley, L.A., Mine Power Systems, US Bureau of Mines Information Circular 9258, 1990.

Stevenson, W.D., Elements of Power System Analysis, 4th Edition, McGraw Hill, 1982.

Kothari, D.P. and Nagrath, I.J., Modern Power System Analysis, 4th Edition, McGraw Hill, 2011.

MI351 UNDERGROUND METAL MINING TECHNOLOGY (3-1-0)4

Development and opening up of underground deposits. Choice and suitability of entries. Draw points and ore passes. Different methods of stoping. Problems encountered in deep mines and measures to tackle them. Introduction to solution mining and in-situ leaching. Case studies from Indian Mines.

Hartman, H.L. Introductory Mining Engineering. John Wiley & Sons, 1987.

Hustrulid, W.A., SME Handbook on Metalliferous Mining, 1985.

Niosh Snowden, Geological and Mining Reports of Underground Metal Mining: Volume II, Wide Publishing, India, 2016.

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Ratan Raj Tatiya, Surface and Underground Excavations, 2nd Edition : Methods, Techniques and Equipment, Taylor & Francis Ltd, London, United Kingdom, 2013.

MI352 ROCK MECHANICS

(3-1-0)4

Physical properties, Physico-mechanical properties of rocks, Elastic constants under static and dynamic loading. Determination of in-situ strength properties of rocks and Nondestructive testing, Analysis of stresses and strains. Mohr's representation of stress and strain. Stress – strain relations. Behaviour of rocks under stress. Engineering classification of rock mass, Rock fracture mechanics. Stress distribution around different mine openings.

Obert, L. & Duvall, W.I.- Rock Mechanics and design of structures in rock; John Wiley & Sons, New York, 1967.

Wittke, W., Rock Mechanics, Springer-Verlag, Berlin, 1990.

MI353 ROCK MECHANICS LAB

(0-0-3)2

A total of 10 to 12 experiments shall be carried out pertaining to the subject.

MI354 MINE SYSTEMS OPTIMIZATION

(3-1-0)4

Introduction to systems concept, analysis and systems engineering; models in system analysis; linear programming; integer programming; network techniques for mining projects; CPM and PERT techniques; dynamic programming; transportation and assignment models; decision theory; inventory control; queuing theory; simulation techniques for equipment selection and production scheduling; significance of management information systems in controlling and managing the mining activities.

Sharma, J.K., Mathematical Models in Operations Research, Tata Mcgraw-Hill, New Delhi, 1989.

Cummins, A.B., Mining Engineers Handbook, Vol. II, SME, AIME, New York, 1973.

Taha, H.A., Operations Research: An Introduction, 8th Edition, Pearson, 2006.

MI355 INDUSTRIAL AND PROFESSIONAL PRACTICE

(0-0-0)1

Mine camp to be held at the end of V semester. Relevant information pertaining to the development and extraction by mining methods, details of different equipments working in the mines and their operational information, layouts and other techno-economic data, information regarding safety aspects, man-power, production and productivity, management practices and environmental protection measures should be included in the report.

MI360 MINE HEALTH AND SAFETY ENGINEERING

(3-0-0)3

Mine accidents, Accident analysis and prevention, Accident report, Risk assessment & preparation of safety management Plan. Safety audits. Occupational hazards in mines, Hazard analysis. Hazard control by engineering approach, Hazard control by system approach. Economics of safety and cost-effectiveness. Occupational health and safety, Occupational diseases, Problems of safety and health in contractual work, Behavior based safety, Ergonomics and its application in mining.

Ridley, J & Channing, J.; Safety at Work; Butterworth-Heinemann, Oxford, 2001.

L.C. Kaku: A Study of Mine management, Legislation & General Safety

S. Ghatak: A Study of Mine management, Legislation & General Safety

C.P. Singh: Occupational safety and health in Industries and mines

MI361 ADVANCED SURFACE MINING TECHNOLOGY

(3-0-0)3

Analysis of elements of surface mining operations. Classification of surface mining equipment systems vis-à-vis unit operations. Equipment selection criteria and procedures, application and selection. Types, basic operations, maintenance and capacity utilization, applicability and selection considerations. Computations for the capacity and number of machines vis-à-vis mine production. Dump planning. Minimization of adverse impacts and maximization of use of mineral resources. Cost Estimation. Conversion of old underground workings into surface mines.

Amithosh Dey, Latest Development of Heavy Earth Moving Machinery, Annapurna Publishers, Dhanbad, 1995.

Martin, J. W., Martin T. J., Bennett, T. P. & Martin, K. M. Surface Mining Equipment, Martin Consultants Inc., USA, 1982.

MI362 PRODUCTION DRILLING FOR OIL WELLS

(3-0-0)3

Geography of petroleum and natural gas. Characterization of crude and natural gas deposits. Well logging. Interpretation and use of information in petroleum and natural gas engineering. Drilling technology for mining of crude and gas. Well completion and stimulation.

Chugh, C.P., Drilling Technology Handbook, Oxford & IBH Pub. Co, 1988.

Hartman, H.L., Introductory Mining Engineering; Wiley Interscience, New York, 1987.

S.Mcalecse, Operational Aspects of Oil and Gas Well Testing: Volume1, Elsevier Science & Technology, Elsevier

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

Science Ltd, Oxford, United Kingdom, 2000.

MI363 MECHANIZATION AND MATERIALS HANDLING

(3-0-0)3

Locomotive haulage, rolling stocks, conveyors, belt conveyor calculations, safety devices for conveyors, face machinery, calculation of productivity of loading machines, material handling systems, elements of material handling systems in large opencast projects, high-angle conveyors, pipeline transportation, aerial ropeways, aerial ropeway calculations, equipment for hydraulic and pneumatic stowing, roof bolting machines, variable and thyristor drives, remote control, monitoring and automation of mining processes.

Ramlu, M.A., Mine Hoisting, Oxford & IBH, New Delhi, 1996.

Walker, S.C., Mine Winding and Transport, Elsevier, Amsterdam, 1988.

Deshmukh, D.J., Elements of Mining Technology Vol. III; Vidyasewa Prakashan, Nagpur, 1994.

Reese, C., Material Handling Systems: Designing for Safety and Health, CRC Press, 2000.

MI401 MINERAL PROCESSING TECHNOLOGY

(3-1-0)4

Scope and objective of mineral processing. Ore handling and storage. Ore sorting, Sampling techniques and devices. Liberation and comminution, Laboratory and industrial sizing. Concentration methods. Magnetic and high tension separation. Froth flotation. Classifiers. Coal quality. Coal preparation for coarse and fine coal. Washability curves and washability number. Dewatering devices. Drying and tailings disposal.

Wills, B.A., Mineral Processing Technology ; Pergamon Press – 4th Edition , 1989.

Weiss, N.L. , Mineral processing Handbook – Vol. I & II, S.M.E., 1985.

Maurice C. Fuerstenau , Edited by Kenneth N. Han , Principles of Mineral Processing, Society for Mining, Metallurgy, and Exploration , United States, 2003.

Ashok Gupta , Denis S. Yan ., Mineral Processing Design and Operations : An Introduction, Elsevier Science & Technology, Oxford, United Kingdom, 2016.

G S Ramakrishna Rao , Mineral Processing Techniques Basics and Related Issues, Zorba Publishers , India, 2014.

MI402 MINERAL PROCESSING TECHNOLOGY LAB

(0-0-3)2

A total of 10 to 12 experiments shall be carried out pertaining to the subject.

MI403 ROCK FRAGMENTATION ENGINEERING

(3-1-0)4

Bulk explosive systems. Substitutes for explosives. Mechanisms of rock fragmentation due to blasting. Fragmentation prediction and assessment. Blast design. Theory of shaped charges. Recent advances in blasting techniques in both underground and surface mines. Blasting in construction projects. Special techniques of blasting. Underwater blasting. Environmental effects and their control. Controlled blasting techniques. Economic evaluation of blasting operations.

Konya, C.G. Blast design, CRC Press, London, 1989.

Persson, Rock fragmentation. International development Corporation, Sweden, 1986.

Sastry, V.R., Advances in Drilling & Blasting, Allied Publishers, 1993.

MI404 MINE DESIGN LABORATORY

(0-0-3)2

A total of 10 to 12 experiments shall be carried out pertaining to the subject.

MI405 INDUSTRIAL TRAINING IN MINES - III

(0-0-0)1

A detailed report of the industrial training undergone at the end of VI semester, preferably in underground metal mines, should be submitted. The report should consist of all details about opening up of the deposit, development and stoping techniques, specifications and operational details of equipment working in the mine, ventilation scheme, power distribution, safety aspects, management practices and environment protection measures and the relevant lay outs. Current techno-economic indices should be a part of the report.

MI410 ADVANCED U/G COAL MINING TECHNOLOGY

(3-0-0)3

Planning considerations for inclines and shafts, considerations for their location and construction. Location of shaft using sieve analysis; Design of shaft pillar. Bord & pillar mining- design of pillar, design of panel, barrier pillar. Planning inputs for development and depillaring by continuous miners. Longwall face support and machinery, Extraction of pillars in thick and steep seams with caving and stowing. Planning inputs for longwall panel. Selection design and development of most suitable mining method based on Physico - mechanical properties. Production planning. Production cost estimation. Punch entries. High wall mining. Caving characteristics of roof rocks. Shield Mining.

Singh, R.D. Principles and Practices of Modern Coal Mining, 1997, ISBN 81-224-0974-1

Singh, T.N., Thick seam Mining, Oxford & IBH, 1992.

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

Vorbjev & Deshmukh, Advanced Coal Mining, Tata McGill, 1988.

Mathur, S.P., Advanced Coal Mining, M.S. Enterprises Bilaspur, 1999.

MI411 STRATA MECHANICS

(3-0-0)3

Definition and concepts of ground control in mines; State of stress in underground openings- premining and induced stresses, influence of water, time, temperature on stress behaviour. Design of structure in rock, Design of pillars, Cavability characteristics & cavability index, design of supports. Subsidence- Concept, prediction and determination, measurement techniques, subsidence damage and its prevention. Rock bursts and bumps – mechanisms, prediction and estimation of damage.

Obert L. and Duvall W.I. – Rock Mechanics and The Design of Structures In Rocks; John Wiley & Sons, New York, 1967.

Peng, S.S. Coal Mine Ground Control ; John Wiley & Sons, New York, 1978.

Biron C. and Arioglu E- Design of Supports in Mines; John Wiley & Sons, New York, 1983.

MI412 GEOSTATISTICS

(3-0-0)3

Sampling Methods – Theory and Concepts. Classical Statistical methods: Univariate and Bivariate; Exploratory data analysis. Probability distributions: application in ore reserve estimation. Concepts of Geostatistics; Semi-variogram: Kriging: Geostatistical conditional simulation. Practical applications of Geostatistics in geotechnical investigation. *S.M Gandhi and B.C Sarkar Essentials of mineral exploration and evaluation, Elsevier publications 2016*

Chilès, J.-P., and P. Delfiner (1999), Geostatistics - Modeling Spatial Uncertainty, John Wiley & Sons, Inc., New York, USA.

Lantuéjoul, C. (2002), Geostatistical simulation: Models and algorithms, 232 pp., Springer, Berlin.

Kitanidis, P.K. (1997) Introduction to Geostatistics: Applications in Hydrogeology, Cambridge University Press.

MI413 APPLICATION OF IT IN MINING PROJECTS

(3-0-0)3

Development of algorithms and flow charts related to mining projects. Overview of mine planning software's. IT applications in: pit limits determination, reliability of equipment & preventive maintenance, blast design, ventilation planning, safety data base management system and mine safety automation, Computer aided production planning and scheduling in mines. Selected topics to be cover on IT applications in mining.

Ram, R. V. et. al. ITs in Mineral Industry, Oxford & IBH, 1994

Husterilid, Open Pit Mine Planning and Design, Bulkema, 1995.

SURPAC Software manual: www. gemcomsurpac.com Isograph

Reliability Workbench Version 13.0 User Guide

GIAN Course on IT application and data analysis in mining and other core industries.

MI414 ORE RESERVE ESTIMATION AND MINE VALUATION

(3-0-0)3

National mineral resources; national mineral policy and strategies for development of mining industry; resource conservation; technology import, taxation, royalty and subsidies; mineral trade; concept of derivatives in mineral trade; pricing mechanism of minerals; sampling; estimation of reserves; economic block model concept; valuation of mines and mineral properties, life of a mining project; project evaluation; determination of optimum size of mine; risk analysis in mineral investment decisions.

Annels, A.E., Mineral Deposit Evaluation: A Practical Approach, Chapman Hall, 1991.

Deshmukh, R.T., Mine and Mineral Economics, Emdee Publishers, 1986.

Edwards, A. C., Mineral Resource and Ore Reserve Estimation, Australasian Institute of Mining and Metallurgy, 2001.

MI449 MINE DESIGN PROJECT- I

(0-0-3)2

A small project of relevance to mining will be taken up by the student

MI451 MINE LEGISLATION & SAFETY

(4-0-0)4

Important statutory provisions related to Payment of Wages Act, History and development of mine Legislation in India (In brief) and NCWA, provident Fund Act, Mines Act- 1952, Mines Rules- 1955, Coal Mines Regulations-2017, Metalliferrous Mines Regulations-1961, Mines and Minerals (Regulation and Development) Act 1958, Mineral Conservation and Development Rules 2016. Mines Rescue Rules-1985. Vocational Training Rules-1966, Indian Electricity Rules-1956. Accident- causes and preventive measures for various accidents in mines; Accident analysis statistics; Accident cost, Accident enquiry report, safety management and audit.

Rakesh and Prasad, Legislation in Indian Mines – A critical appraisal, Ashalata Pub., Varanasi, 1986.

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

Singh, C.P. Occupational Safety and Health in Industries and Mines, Tata McGill, 2004.

MI452 MINE PROJECTS EXPOSURE (0-0-0)1
Comprehensive report about the short visits made to different mines and other industries will be submitted at the end of VIII Semester

MI490 SEMINAR (0-0-3)2
A topic of relevance to the mining industry to be chosen and the seminar be delivered with audio – visual aids. A write up of the same should also be submitted.

MI499 MINE DESIGN PROJECT- II (0-0-6)4
A major project of relevance to mining will be taken up by the student

MI460 COAL WASHING AND HANDLING (3-0-0)3
Coking and non-coking coal. Coal washeries, sink and float tests on coal, washability index, optimum degree of washability and washability number, application of jigs, heavy media cyclone, Coal cleaning techniques for fine coal and coarse coal, coal flotation, beneficiation of non-coking coal, automation and quality control in preparation plants. Environmental management in coal preparation. Coal gasification, liquefaction and new products from coal. homogenization and blending systems.
Weiss, N.L., Mineral Processing Handbook- Volume-II, Published by SME, 1985.
Muthui Richard K, Rop Bernard K, Kabugu M, Coal Handling and Equipment Selection, LAP Lambert Academic Publishing, United States, 2014.

MI461 SURFACE MINE DESIGN (3-0-0)3
Preliminary investigations. Stages of planning. Feasibility Report. Planning inputs. MMDR and MCDR. Project scheduling and monitoring. Estimation of mine life. Determination of ultimate pit limits. Interrelation and planning of unit operations. Equipment selection. Transport and dumping subsystems. Design of haul roads. Extraction methods for beach sand deposits. Mining of developed coal seams. Selective mining. Estimation of productivity & profitability. Quality control. Introduction to mine design softwares.
Rzhevsky, V.V. Opencast Mining Unit Operations, Mir Publisher, 1983.
Rshensky V.V. Opencast Mining Technology and Integrated Mechanisations, Mir Publishers, 1985.
W.Hustrulid and M.Kuchta, Open Pit Mine Planning & Design, Vol. 1 & 2, Taylor & Francis, 2006.

MI462 UNDERGROUND COAL MINE DESIGN (3-0-0)3
Objectives and Stages of Planning. Feasibility report. Detail project report (DPR); Determination of mine design parameters. Planning input for selection of mining method. Estimation of mine life. Design and production planning. Introduction to mine design software. Production cost analysis. Selection criteria for face and underground transport equipment. Planning and design layouts for ventilation, drainage and power supply. Ventilation management. Productivity and quality control; planning of deep underground coal mines; Automation in underground coal mines.
Peng, S.S. Longwall Mining , Department of Mining Engineering, West Virginia University, 2006
Mathr, S.P. Coal Mining, M.S. Enterprises Bilaspur, 1999.

MI463 UNDERGROUND METAL MINE DESIGN (3-0-0)3
Planning and scheduling of insets, shaft bottoms, winding and transportation systems. Surface lay outs including mill and concentrator plants. Determination of number and dimensions of stopes. Planning and scheduling of a cycle of operations. Concept of ore blending. Overall planning and scheduling of activities in metal mining and processing. Case studies of planning of mining operations.
Agoshkov M., et. Al., Mining of Ores and Non- Metallic Minerals, Mir Publishers, Moscow, 1983.
Hartman, H.L. Introductory Mining Engineering, John Willey & Sons, 2007.
Niosh Snowden, Geological and Mining Reports of Underground Metal Mining: VolumeII, Wide Publishing, India, 2016.
Ratan Raj Tatiya , Surface and Underground Excavations, 2nd Edition : Methods, Techniques and Equipment, Taylor & Francis Ltd, London, United Kingdom, 2013.

MI464 ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE DEVELOPMENT (3-0-0)3
Environmental problems due to mines and quarries. Land degradation. Pollution due to mining in terms of air and water. Acid Mine Drainage, Socio- economic impacts. Control measures. Pollution due to noise and vibrations. Effluents discharge. Reclamation of mined out and subsided areas. Mine closure. Environmental legislation and policies. Environmental Management Plan. Environmental Impact Assessment. Risk Analysis. Disaster management

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

plan. Preparation of EMP for various mineral industries. Cost of environmental management. Environmental audit.
Dhar, B.B., Environmental Management of Mining Operations, Ashish Publication House, New Delhi, 1991.
Chadwick et al., Environmental Impacts of Coal Mining and Utilization, Pergamon Press, 1992.

MI471 RELIABILITY ANALYSIS OF ENGG. SYSTEMS (3-0-0)3

Reliability definition. Failure data analysis of mining equipment's. System of reliability. Reliability improvement. Maintenance of mining machinery, MIS for maintenance function. Maintenance planning and scheduling. Statistical analysis and data distributions of failure data. Availability and maintainability. Reliability and availability of repairable and non-repairable system. Systems with preventive and corrective maintenance. Reliability evaluation. Reliability prediction and modelling. Application of reliability in engineering systems and case studies. Applications of reliability software's in engineering.

Patrick D. T. O' Connor. "Practical Reliability Engineering". Wiley India Pvt. Ltd., 4th Edition, 2012.

L. S. Srinath. "Reliability Engineering". East-West Press, 4th Edition, 2005.

John Davidson (Ed). The Reliability of Mechanical Systems. I Mech E. London 1994.

John P. Bentley. An Introduction to reliability & Quality Engineering. Longman Scientific & Technical, England, 1993.

MI472 ROCK EXCAVATION IN MINES & INFRASTRUCTURE PROJECTS (3-0-0)3

Rock excavation by different methods in mining and infrastructure projects. Excavation and material handling equipment. Selection of equipment. Excavation in sensitive areas. Project Planning and Management. Practical examples in mining projects, ports, tunneling projects, pipeline excavations, canal excavation projects, hydel projects, Caveens/ large excavations etc. Environmental planning, environmental impact assessment and Management. Project economics.

Stack, B., Mining and Tunneling Machine, 1978.

Martin, J. W., Martin T. J., Bennett, T. P. & Martin, K. M. Surface Mining Equipment, Martin Consultants Inc., USA, 1982.

MI473 STABILITY OF ROCK SLOPES (3-0-0)3

Mechanisms of slope failures. Field investigations and data collection. Design of slopes - physical, empirical, probabilistic methods, analytical (limit equilibrium analysis) and numerical (continuum models, discontinuum and crack propagation models) modeling. Stabilization and reinforcement of slopes. Slope failure monitoring-modern techniques (SSR). Softwares for slope stability analysis. Case studies.

Hoek, E. and Bray, J.W; Rock Slope Engineering; John Wiley & Sons; New York; 1984

Brawner, C.O; Stability in surface mining, SME of USA; New York, 1982. Giani, F;

Rock Slope Stability Analysis; Balkema; Rotterdam; 1992.

MI474 TUNNELLING ENGINEERING (3-0-0)3

Design principles of underground openings, single and multiple openings with different orientation. Dimensions, shape, structural behavior and sequence of excavations in tunnels. Rock conditions and initial state of stresses. Computer aided tunnel design. Tunnel driving techniques. Tunnel supports, automation of supports, Shield tunneling system with road headers. Field instrumentation, Tunnel stability analysis, Case studies.

Bieniawski, Z.T., Rock Mechanics and Design in Mining and Tunnelling, Rotterdam : A.A. Balkema, 1984.

Pokorovski, Driving Horizontal Workings and Tunnel, Mir Publishers, 1980

MI475 NUMERICAL MODELLING TECHNIQUES (3-0-0)3

Development and use of numerical modeling in rock excavations. Finite element (2D and 3D). Boundary element (2D and 3D). Displacement and continuity. Basic equations for mathematical modeling of rock mass. Static and dynamic behavior of rock mass. Elastic-linear and non-linear, elastoplastic and time dependent models. Case studies.

Kidybinski A. & Kwasniewski M. (Eds); Modelling of Mine Structures, A.A. Balkema, Rotterdam, 1988.

Kidybinski A. & Dubinski J. (Eds); Strata Control in Deep Mines, A.A. Balkema, Rotterdam, 1990.

MI476 INDUSTRIAL ENGINEERING & MANAGEMENT (3-0-0)3

Concepts of Management and Organisation, Functions of Management, Organisational Structures, Basic concepts related to Organisation Departmentation, Motivation, Leadership, Group dynamics, Conflict management, Work study, Time study, Job Evaluation, Project management, Network techniques, Human Resource Management.

Khanna, O.P., Rai, D. Industrial Engineering and Management, 2005.

Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2005.

Ralph M Barnes, Motion and Time Studies, John Wiley and Sons, 2004.

Chase, Jacobs, Aquilano, Operations Management, TMH 10th Edition, 2003.

MI477 REMOTE SENSING AND GEOINFORMATICS

(3-0-0)3

Concept of GPS. Application of remote sensing to mining projects. Satellite signals. GPS instruments. Sensors and platforms. Image Processing and interpretation. Data processing. Concepts of GIS. Components, data acquisition, topology and spatial relationships, data storage verification and editing, network systems, data manipulation and analysis. Spatial and mathematical operations in GIS. Various GIS packages and their salient features.

Basudev Bhatta, Remote sensing and GIS, II Edition, Oxford Publishing House, 2016.

George Jeoseph, Fundamentals of Remote Sensing, II Edition, Universal Press, 2017.

Lillisand, Keifer and Chipman, Remote Sensing and Image Interpretation, VI Edition, Wiley Publishers.

Hassan A. Karimi, Handbook of Research in Geoinformatics, Information Science Reference, 2017.

MI478 SAFETY ENGINEERING

(3-0-0)3

Basic concept of risk; Difference between hazards and risks; Risk components and types, Risk management objectives, Risk management process; Hazards Identification and Risk Assessment (HIRA). Type of injury. Causes of injury, statistical analysis of injury data. Accident and preventive measures for various accidents in mines; Accident analysis and accident statistics; Economic evaluation of accident, Accident investigation report. Safety management and audit. Ergonomics and its application in safety engineering. Behavior base safety.

Ridley, J & Channing, J.; Safety at Work; Butterworth-Heinemann, Oxford, 2001.

L.C. Kaku: A Study of Mine management, Legislation & General Safety.

S. Ghatak: A Study of Mine management, Legislation & General Safety.

C.P. Singh: Occupational safety and health in Industries and mines

Seppo Väyrynen · Kari Häkkinen Toivo Niskanen: Integrated occupational safety and health management by springer publications. SBN 978-3-319-13179-5 ISBN 978-3-319-13180-1 (eBook) DOI 10.1007/978-3-319-13180-1

MI479 ENERGY RESOURCES UTILIZATION AND CLIMATE CHANGE

(3-0-0)3

Trends in Energy Supply & Quality of Life; Energy Demand & Supply Options; Energy Resources - their distribution & Utilisation ; Non-Conventional Hydrocarbons; Concepts of Energy & Exergy flows; Sustainability and Climate Change; Environmental Economics. Carbon Emissions; Potential Impacts; Climate Change Prediction Models - Basics; Global Climate Change negotiations – Problems and Issues; Carbon sequestration – Capture & Storage.

David Coley, Energy & Climate Change — Creating Sustainable Future, John Wiley & Sons Ltd, 2008

Chris Goodall, Ten Technologies to Fix Energy and Climate, Second edition Profile Books, 2009

Anilla Cherian, Energy and Global Climate Change: Bridging the Sustainable

Development Divide, John Wiley & Sons, 2015

Courses for Minor in Mining Engineering

MI480 MINING TECHNOLOGY

(3-1-0) 4

Introduction to mining projects. Roll of mining industry in development of nation. Mine development. Basics of underground coal mining technologies. Basics of underground metal mining technologies. Basics of surface mining technologies. Application of mechanical, civil, electrical, electronics and IT in mining projects.

Tatiya R.R., Surface and underground excavation: methods, techniques and equipment, A. A. Balkema publishers, 2005.

Walker S.C. Mine Winding and Transport. Elsevier, Amsterdam 1988.

Gross, C. A., Electric Machines, 1st Edition, CRC Press, 2006.

Isograph Reliability Workbench Version 13.0 User Guide

GIAN Course on IT application and data analysis in mining and other core industries.

MI481 ROCK EXCAVATION ENGINEERING

(3-1-0)4

Rock excavation in mining and infrastructure projects. Methodologies. Mines. CNG Pipeline projects. Hydel projects, Tunnels. U/G Caverns. Ports. Material handling equipment. Selection of equipment. Excavation in sensitive areas. Project Planning and Management. Environmental impact assessment and Management. Project economics.

Stack, B., Mining and Tunneling Machine, 1978.

Martin, J. W., Martin T. J., Bennett, T. P. & Martin, K. M. Surface Mining Equipment, Martin Consultants Inc., USA, 1982.

MI482 MINE SAFETY ENGINEERING

(3-1-0)4

Accident- causes and preventive measures for various accidents in mines; Accident analysis statistics. Accident cost. Accident report, Risk assessment & preparation of safety management Plan. Safety audits. Occupational hazards in

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mines, Hazard analysis. Hazard control by engineering approach, Hazard control by system approach. Economics of safety and cost-effectiveness. Occupational health and safety, Occupational diseases, Problems of safety and health in contractual work, Behavior based safety, Ergonomics and its application in mining.

Ridley, J & Channing, J.; Safety at Work; Butterworth-Heinemann, Oxford, 2001.

L.C. Kaku: A Study of Mine management, Legislation & General Safety

S. Ghatak: A Study of Mine management, Legislation & General Safety

C.P. Singh: Occupational safety and health in Industries and mines

Rakesh and Prasad, Legislation in Indian Mines – A critical appraisal, Ashalata Pub., Varanasi, 1986.

Singh, C.P. Occupational Safety and Health in Industries and Mines, Tata McGill, 2004.

MI483 MINE MECHANISATION

(3-1-0)4

Equipment for excavation, transportation, processing. Selection of equipment. Tendering and processing.

Maintenance. Inventory. Automation. New developments. Productivity of machines. Economics.

Amithosh Dey, Latest Development of Heavy Earth Moving Machinery, Annapurna Publishers, Dhanbad, 1995.

Reese, C., Material Handling Systems: Designing for Safety and Health, CRC Press, 2000.

Martin, J. W., Martin T. J., Bennett, T. P. & Martin, K. M. Surface Mining Equipment, Martin Consultants Inc., USA, 1982.

MI484 ENVIRONMENTAL MANAGEMENT

(3-1-0)4

Environmental issues. Pollution due to mining in terms of land degradation, air and water, noise and vibrations.

Socio-economic impacts. Waste management. Reclamation and rehabilitation. Environmental Impact Assessment.

Risk Analysis. Disaster management. Environmental audit. Environmental economics.

Dhar, B.B., Environmental Management of Mining Operations, Ashish Publication House, New Delhi, 1991.

Chadwick et al., Environmental Impacts of Coal Mining and Utilization, Pergamon Press, 1992.

Courses for Honors in Mining Engineering (Refer PG and PhD curriculum for details)

MI705 Project Management (3-1-0)4

MI804 Underground Space Technology (3-1-0)4

MI855 Reclamation Rehabilitation and Risk Management (3-1-0)4

MI901 Applied Rock Mechanics (3-1-0)4

MI916 Risk and Safety Management in Mines (3-1-0)4