

National Institute of Technology, Raipur (C.G.)

Course of Study & Scheme of Examination							B.Tech. VII Semester					Branch: Mining Engg.	
S.No.	Board of Studies	Sub. Code	Subject Name	Periods/week			Examination Scheme					Total Marks	Credits L+(T+P)/2
				L	T	P	TA	FE	SE	T.C.A.	ESE		
1	Mining Engg.	MI20711(MI)	Rock Mechanics	3	1	-	20	15	15	50	70	120	4
2	Mining Engg.	MI20712(MI)	Strata Control	3	1	-	20	15	15	50	70	120	4
3	Mining Engg.	MI20713(MI)	Blasting Technology	3	1	-	20	15	15	50	70	120	4
4	Reference Table-I (Mining Engg.)	MI20734(MI)	Professional Elective-I	4	1	-	20	15	15	50	70	120	5
5	Mining Engg.	MI20721(MI)	Rock Mechanics Lab	-	-	3	30	-	-	30	20	50	2
6	Mining Engg.	MI20722(MI)	Blasting Technology Lab	-	-	3	30	-	-	30	20	50	2
7	Humanities	MI20723(MI)	Practical Training*	-	-	-	50	-	-	50	-	50	2
8	Mining Engg.	MI20724(MI)	Minor Project	-	-	12	100	-	-	100	50	150	6
9	Mining Engg.	MI20725(MI)	Seminar & Report Writing	-	-	2	50	-	-	50	-	50	1
Total				13	4	20	340	60	60	460	370	830	30

* Every student has to undergo one month practical training at Mines after IVth & VIth sem. and has to submit a training reports in VIIth Sem. for award of marks.

Note : For attendance of a student in every theory and practical class, the teachers are supposed to keep records ultimately in the following format which will be included in the semester mark-sheets.

Format for attendance				
Attendance				Category
> 85			----->	High "H"
> 70 & < 85			----->	Medium "M"
> 60 & < 70			----->	Low "L"
< 60			----->	Detained "D"

TABLE –I FOR PROFESSIONAL ELECTIVE -I

1	Mining Engg	Surface Mining -II
2	Mining Engg.	Numerical Methods in Mining

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Semester: B.Tech. VII Sem.

Code: MI20711(MI)

Subject: Rock Mechanics

Branch : Mining Engg

UNIT 1: Application of rock mechanics in mining, Definition of important terms used in Rock mechanics, Classification of rock mass, Parameters of rock mass classification, Objective & Importance of rock mass classification, RQD, Q –system and Bieniaswki's Geomechanics classification of rock mass., RSR system, CMRI-ISM Geomechanics Classification, Terzaghi Rock load theory.

UNIT 2: Rock properties, Physico-mechanical properties of rock, Preparation and testing of specimen in the laboratory, ISRM standards, Determination of Physico-mechanical properties of rock as per ISRM standard testing procedures, Strength indices and their importance. Point load, Protodyaknov, Impact and Cone Indenter strength Index.

UNIT 3: Rock as an elastic medium, Principle of elastic analysis, Rheological properties of rock, Importance of rheological models, Different types of rheological models, Dynamic properties of rocks, Anisotropy and Creep.

UNIT 4: Principal stress and Principal plane, Analytical method of determining the magnitudes and directions of normal and shear stress on failure plane, Mohr's circle, Theories of failure of rock, Mohr's theory, Mohr's Coulomb failure criteria, Griffith's theory, Empirical theories of failure of rock, Different modes of failure of rock.

UNIT 5: Earth stresses, Importance of measurements of in situ stress, measurements of in situ stress by Flat jack, Overcoring and Hydraulic fracturing technique. Design of circular and elliptical openings. Determination of safe span of roof.

Reference Books:

1. Rock Mechanics By Obert and Duvall
2. Rock Mechanics By Goodman
3. Rock Mechanics By Jager & Cook
4. Rock Mechanics by B.S. Verma

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Semester: B.Tech. VII Sem.
Subject: Strata Control

Code: MI20712(MI)
Branch : Mining Engg

UNIT 1: SUPPORTS

Timber & steel supports, Examination of roof, Roof bolting, roof stitching, method of supporting roadways. Supporting under different conditions viz. Pit bottom, crossing, junctions, faulted area, longwall faces, depillaring areas and stoping areas, support loads .SSR, CTR, Support plan, Support withdrawal.

UNIT 2: POWERED SUPPORTS

Powered supports - their principles of operation, Classification, designation, constructional features and applications, Hydraulic fluids.

UNIT 3 : STOWING

Principal methods of stowing, their relative merits and applicability, Hydraulic stowing, Pneumatic stowing, Mechanical stowing, Hand packing, face arrangements, pipe wear, pipe jams.

UNIT 4: STRATA CONTROL

Theories of ground movement, Rock pressure due to Narrow and Wide excavation, Front abutment and back abutment, Failure of roof and floor, measurement of strata movement, rock burst, bumps, gas outbursts, pot holes.

UNIT 5: SUBSIDENCE

Theories of subsidence, damage and loss due to subsidence, vertical and lateral movements and their estimation, angle of fracture and angle of draw, factors affecting subsidence, subsidence control, protection of surface structures, design of protection pillars including shaft pillars. Pot holes.

Reference Books:

1. Strata control in mines Chaing & Peng
2. Winning and Working of Coal R. T. Deshmukh & D. J. Deshmukh
3. Modern Coal Mining Practices R. D. Singh
4. D.G.M.S. Circulars (Tech.) 1995 onwards
5. Longwall Mining Syd. S. Chaing & Peng

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Semester: B.Tech. VII Sem.
Subject: Blasting Technology

Code: MI20713(MI)
Branch : Mining Engg

UNIT 1 COMMERCIAL EXPLOSIVES

Classification, Low and High Explosive, Permitted and non permitted explosives, Important characteristics, ANFO, Slurry, Emulsion explosives, Primers and boosters, cast booster, Bulk explosive system.

UNIT 2 INITIATION SYSTEM, STORAGE AND TRANSPORTATION OF EXPLOSIVES

Detonators, safety fuse, Detonation cord, Detonating relay, Non-electric initiation system, NONEL, Electronic detonators, Exploder and other blasting tools, Magazines, transportation of explosives.

UNIT 3 SURFACE BLAST DESIGN

Theory of Breakage, Bench Blasting terminology, Estimation of Spacing, Burden, Stemming length, Sub-grade drilling etc., Charge calculation, initiation sequence, delay timing, Decking decoupling, Secondary Blasting.

UNIT 4 UNDERGROUND BLAST DESIGN

Terminology, cut holes, easers, trimmers, commonly used cut patterns, Wedge cut, drag cut, Pyramid cut, Burn cut, etc., blasting in sinking shaft, underground coal mine blasting, series and parallel connections of detonators.

UNIT 5 ENVIRONMENTAL IMPACT OF BLASTING

Blast induced ground vibration, its measurement, prediction and control, Noise, its measurements and control, Fly rock its causes and control, Controlled Blasting Techniques.

Reference Books:

1. Surface Blast Design by C.J. Konya.
2. Explosives and Blasting by G.K. Pradhan
3. Modern Techniques of Rock Blasting by U. Langefors and B. Kihlstrom.
4. Indian Explosive Act and Rules.
5. Engineering Rock blasting operations, Bhandari
6. Surface Blast Evaluation, N. R. Thote & Pradhan
7. Surface Blasting, P. Pal Roy

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Semester: B.Tech. VII Sem.
Subject: Professional Elective-I
(Surface Mining –II)

Code: MI20734(MI)
Branch : Mining Engg

Unit I: Dragline, Stripping Shovel Layouts of open pit mines, Methods of sidelaying, Sidelaying by Stripping Shovel and Dragline, Range/ Balancing Diagram, calculation of operating radius. Layouts of waste dumps. Design of Haul roads.

Unit II: Introduction to continuous surface mining equipment, Bucket wheel excavators, constructional features, basic operation and productivity, Continuous surface miner, their construction, basic operation and productivity. Face Layouts.

Unit III: Ultimate pit design, Factors affecting ultimate pit limits; Significance of ultimate pit limits; Manual methods of developing ultimate pit limits. Floating cone technique, Production planning, some basic mine life and plant size concepts, Mine and Mill plant sizing

Unit IV: Introduction to rock slope engineering, Slopes in surface mines and their formation, Pit slopes and their influence on mine economics, Slope/Dump stability, Factors influencing slope/dump stability, various types of slope failure and their geometrical conditions.

Unit V: Determination of factor of safety of a slope under plane and circular failure, planning of slope stability investigations, Stabilization and protection methods for stability of slopes. Waste dump stability parameters

Reference Books:

1. Surface Mining : G.B. Misra
2. Surface mining equipment : Martin
3. Surface Mining : Pfeider
4. Rock slope Engg. : Hoek & Bray
5. SME handbook : Hartman
6. Surface Mine Planning & Design : Hustrulid & Kuchha

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Semester: B.Tech. VII Sem.

Code: MI20734(MI)

Subject: Professional Elective-I (Numerical
Methods in Mining Engg.)

Branch: Mining Engg

UNIT-I INTRODUCTION TO ELASTIC AND PLASTIC MODELS

Fundamentals, elastic, plastic, homogeneous and isotropic, non-linear elastic and elasto-plastic models.

UNIT-II FINITE DIFFERENCE METHODS

Concept, formation of mesh element, finite difference patterns, solutions, application to mining.

UNIT-III FINITE ELEMENT METHODS

Concept, discretisation, element configuration, element stiffness, assemblage and solutions, two and three dimensional solutions, linear and non-linear analysis, applications in geomechanics; simulation of joints in strata.

UNIT-IV BOUNDARY ELEMENT METHOD

Concept, discretisation, different methods of solution for isotropic and infinite media.

UNIT-V PRACTICAL APPLICATIONS IN MINING AND ROCK MECHANICS

Practical Applications in stress analysis, slope stability, subsidence prediction, pillar design, rock burst, etc.

Reference Books:

1. Desai, C.S. and Abel, J.F. Introduction to the finite Element Method, Van Nostrand Riehkol Co., New York, 1983
2. Zienkiewicz, O.C. The Finite Element Method in Engineering Science, Tata McGraw Hill.
3. Segerlind, L.J., Applied Finite Element Analysis, John Wiley and Sons, New York, 1987
4. Mukhopadhyay, M. Matrix Finite Element – Computer and Structural Analysis, Oxford and IBH Publishing co., 1984
5. Brown, E.T. (Ed) Analytical and Computational Methods in Engineering and Rock Mechanics, Allen and Unwin, London, 1987

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Semester: B.Tech. VII Sem.
Subject: Rock Mechanics Lab

Code: MI20721(MI)
Branch: Mining Engg

List of Practical:

1. Determination of moisture content of rock sample by ISRM standard method
2. Determination of porosity of rock sample by ISRM standard method
3. Determination of Density of rock sample by ISRM standard method
4. Determination of slake durability strength index of rock sample by ISRM standard method
5. Determination of point load strength index of rock sample
6. Determination of Proto-dyakonov strength index of rock sample
7. Determination of Uni-axial Compressive strength of rock sample by ISRM standard method
8. Determination of Tensile strength of rock sample by Brazilian method
9. Determination of Single Shear and Double Shear strength of rock sample
10. Determination of Tri-axial Compressive strength of rock sample by ISRM standard method
11. Determination of Young' Modulus of rock sample by ISRM standard method

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Semester: B.Tech. VII Sem.
Subject: Blasting Technology Lab

Code: MI20722(MI)
Branch: Mining Engg

List of Experiments:

1. Measurement of ground vibration by seismograph
2. Development of predictor equation from the recorded data
3. Measurement of VOD by VOD mate and its analysis
4. Study of various fragmentation assessment techniques
5. Handling of WIPFRAG software
6. Design of blast for coal face
7. Design of blast for underground metal mine
8. Design of blast for bench blasting
9. Study of various blasting tools
10. Study of bulk explosive systems