JHARKHAND Rai University

JHARKHAND RAI UNIVERSITY

MINING ENGINEERING

B.Tech

SYLLABUS

SEMESTER IV

Kamre | Ratu Road | Ranchi | Jharkhand

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JHARKHAND Rai University

B.TECH SEMESTER IV

B.TECH IN MINING ENGINEERING												
SEMESTER IV												
			Period			**Evaluation Scheme**				**Subject**	**Credit**	**Hours**
S. No	**Subject code**	**Name of Subject**	**L**	**T**	**P**	**Assignment**	**TA**	**Total**	**ESC**			
1	8.251	Drilling & Blasting	3	0	0	20	10	30	70	100	3	3
2	8.252	Geology for Mining Engineers	3	0	0	20	10	30	70	100	3	3
3	8.253	Mine Development	3	0	0	20	10	30	70	100	3	3
4	8.254	Mechanical Engineering II	3	0	0	20	10	30	70	100	3	3
5	8.256	Mine Electrical Engineering	3	0	0	20	10	30	70	100	3	3
6	8.257	Mine Surveying II	3	0	0	20	10	30	70	100	3	3
7	40B.251	Professional Skills	2	0	0	20	10	30	70	100	2	2
8	**40B.201**	***Life Skills II	**2**	**0**	**0**	**20**	**10**	**30**	**70**	**100**	**0**	**2**
PRACTICAL/ SESSIONAL												
1	8P.252	Geology for Mining Engineers Lab	0	0	2		20	20	30	50	1	2
2	8P.254	Mechanical Engineering II Lab	0	0	2		20	20	30	50	1	2
3	8P.257	Mine Surveying II Lab	0	0	2		20	20	30	50	1	2
4	8P.256	Mine Electrical Engineering Lab	0	0	2		20	20	30	50	1	2
									Total	**900**	**24**	**28**

- **Vocational Training in a Surface / Underground Mine of minimum 30 (Thirty) days to be taken at the end of IVth Semester Will be Credited in Vth Semester.**
- **MOOCS introduced through SWAYAM in all semester.**
- ***** NOTE: For Lateral students (Qualifying Non Credit Course)**

Program: B.Tech
Semester: Four
Course: Drilling and Blasting
Course Code: 8.251

L	T	P	C
3	0	0	3

Course Objective:

- The students will have knowledge on drilling and blasting operations in underground and surface mines.
- They will also know to design blasting pattern for mines, dimensional stones, road constructions, oil and ground water.
- The students will get knowledge about exploration techniques, drilling operations, casing,
- Cementation, well completion and production in petroleum industry.

Unit I

Exploratory Drilling : Drilling for exploration; Various types of exploratory drills and their applicability- Auger, Cable-tool, Odex, Core Drills; Core recovery; single and double tube core barrels, wire line core barrel; Storage of cores; Interpretation of borehole data.

Unit II

Explosives and Initiation systems : Types of explosives, their composition and properties, classification; Selection of explosives; Manufacture, transport, storage and handling of explosive; Testing of explosives; Types of initiating systems- Electrical Detonators, Detonator fuse, Detonator Relays, NONEL, Electronic Detonators, Blasting accessories, exploders.

Unit III

Drilling &Surface Mines**:** Drilling, Blast hole drills –types, classification, applicability and limitations; Mechanics of drilling, performance parameters, drilling cost, compressed air requirement for hole cleaning; Selection of drilling systems, drilling errors, organization of drilling. Blasting: Mechanics of rock fragmentation; Living stone theory of crater formation; Factors affecting blasting, Blast design –estimation of burden and spacing, estimation of charge requirement; Initiation patterns; Secondary blasting – pop and plaster shooting; Problems associated with blasting, Ground vibration and air over pressure, Blast instrumentation.

Unit IV

Drilling & Blasting in Underground Mines: Coalmines: Drilling systems and their applicability, blasting-off-solid, different blasting cuts, ring hole blasting, calculation of specific charge, specific drilling and detonator factor, initiation patterns. Metal mines: Drilling systems and their applicability, blast design for horizontal drivages, different blasting cuts, long hole blasting, and vertical crater retreat blasting.

Suggested Reading:

1. *Explosive and Blasting Techniques, G.K. Pradhan*
2. *Explosives and Blasting Techniques, S.K. Das*

Program: B.Tech
Semester: Four
Course: Geology for Mining Engineers
Course Code: 8.252

L	T	P	C
3	0	0	3

Course Objective:

- The course provides for basic knowledge on economics of ore, exploration and practical site investigation.
- The students will have familiarity about economic geology and Indian mineral deposits. They will have deep knowledge about geophysics, remote sensing and GIS.
- The students will have knowledge about ore reserve estimation, ore assaying, remote sensing, geological mapping and identification of geological structures in the field.

Unit I

Structural Geology: Study of topographical maps; Altitude of planar and linear structures; Effects of topography on outcrops. Unconformities, folds, faults and joints - their nomenclature, classification and recognition. Forms of igneous intrusions - dyke, sill and Batholith. Effects of folds and fractures on strata/ore bodies and their importance in mining operations. Principles of stereographic projections of linear and planar features of rocks.

Unit II

Economic Geology and Exploration Geology**:** Introduction and scope of economic geology; Ore and gangue; Processes of ore formation; Major Indian mineral deposits (Iron, Manganese, Copper, Lead, Zinc) - distribution and mode of occurrence. Mineral Exploration – concepts and methods viz. surface and subsurface; Exploration strategy and design; Stages of exploration; Resources and reserves.

Unit III

Coal Geology **:** Rank, characteristics and important constituents of coal; Classification and origin of coal; Chief characteristics of Indian coals; Geology of the principal coalfields of India.

Unit IV

Petroleum Geology **:** Concept of organic constituents of petroleum origin, migration, accumulation, concept of traps and important petroliferous basins of India.

Suggested Reading:

1. *A text book of Geology, P.K. Mukherjee*
2. *Physical Geology, A.K. Dutta*

Program: B.Tech
Semester: Four
Course: Geology for Mining Engineers Lab
Course Code: 8P.252

L	T	P	C
0	0	2	1

Course Objective:

1. Study of topographic maps.
2. Completion of outcrops: 1– point and 3–point problems; Map illustrating‘V’ rules.
3. Calculation of attitude, thickness and depth of ore bodies.
4. Fracture patterns in rose diagram.
5. Maps illustrating fold, fault and unconformity.
6. Stereographic projection.

Program: B.Tech
Semester: Four
Course: Mine Development
Course Code: 8.253

L	T	P	C
3	0	0	3

Course Objective:

- The students will have basic insight into field of mining along with basic concept relating to history of mining, drilling methods, shaft sinking, explosive and blasting along with drifting and tunneling technology.
- The students will have knowledge about the available mineral resources, exploration techniques and its strategy. They will know about the methods of preparation of feasibility reports and its evaluation techniques.

Unit I

Opening-up of Deposits: Choice of mode of entry, shaft, decline and combined mode, their applicability, number and disposition. Vertical and Inclined Shafts: Location, shape, size, and organization of shaft sinking, construction of shaft collar, shaft fittings. Shaft Sinking Operations: Ground breaking and muck disposal, tools and equipment, lining; ventilation, lighting and watering; sinking in difficult and water-bearing ground.

Unit II

Insets: Design, excavation and lining. Mechanized Sinking: Simultaneous sinking and lining; slip-form method of lining; high speed sinking, Shaft Boring: Methods and equipment**.**

Unit III

Special Attributes: Widening and deepening of inclined and vertical shafts; staple shafts, raised shafts. Main Haulage Drifts and Tunnels: Purpose, shape, size and location; excavation ground breaking, muck disposal, ventilation and supporting. High Speed Drifting/Tunneling**:** Application of mechanized methods; road headers and tunnel boring machines.

Unit IV

Recent Developments in shaft sinking and drifting/tunneling. Layouts of pit-top and pit-bottom, Coal Handling Plant, Bunkers and Railway Sidings.

Suggested Reading:

1. *Explosive and Blasting Techniques, G.K. Pradhan*
2. *Explosives and Blasting Techniques, S.K. Das*

Program: B.Tech
Semester: Four
Course: Mechanical Engineering II
Course Code: 8.254

L	T	P	C
3	0	0	3

Course Objective:

- Determine the strength parameters of the materials
- Solve principal stress and principal plane problems
- Apply various methods of analysis of plane truss
- Analyze members subjected to torsion
- Critically analyze problem and solve the problems related to mechanical elements and analyze the deformation behavior for different types of loads.
- To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

Unit I

Introduction to thermodynamics; Analysis of various thermodynamic processes, P-V and T-S diagrams. Analysis of air standard cycles – Otto, Diesel and Dual cycles. Classifications, applications and performance estimation of internal combustion engines;

Unit II

Fundamentals of simple open cycle and closed cycle gas turbines and reciprocating air compressors – single and multi-stage.Performance study on laboratory experimental data.Power estimation on laboratory experimental data.

Unit III

Introduction to Fluid Mechanics; Properties of fluid, classifications, ideal fluid, Newtonian fluid and non-Newtonian fluids, Newton's law of viscosity. Fluid pressure and its measurement– Piezometers, Manometers, Mechanical gauges. Continuity equation, types of flow. One dimensional equation of motion, Bernoulli's equation, applications of Bernoulli's equation, Venturimeter.

Unit IV

Flow through pipes – Darcy- Weisbach's equation. Classification, basic construction and applications of different types of pumps and water turbines. Performance study and power estimation based on laboratory experimental data.

Suggested Reading:

1. *Mechanical Engg. – Dr. D.S. Kumar*
2. *Fluid Mechanics – R. K. Bansal*
3. *Fluid Mechanics – R. K. Rajput*
4. *Thermal Engg – R k Rajput*
5. *Applied Thermodynamics- P. K. Nag*

Program: B.Tech
Semester: Four
Course: Mechanical Engineering II Lab
Course Code: 8P.254

L	T	P	C
0	0	2	1

List of Experiments:

1. Study of construction and operation of4-strokeSI engine model.
2. Study of construction and operation of4-strokeCI engine model.
3. Performance testing of a 4-strokeDieselengine.
4. Determination of coefficient of discharge of venturimeter.
5. Verification of Bernoulli's Theorem.
6. Determination of friction factor for pipes.

Program: B.Tech
Semester: Four
Course: Mine Electrical Engineering
Course Code: 8.256

L	T	P	C
3	0	0	3

Course Objective:

- To understand the electrical layouts and power distribution in mine.
- To study the various modes of transport means and electrical circuits.
- To study the types of electrical equipment used in mines.
- Students should able to verify the principles studied in theory by performing experiments in the laboratory.

Unit I

Transmission and Distribution of Electrical Power in Mines: Performance of short transmission lines; radial and ring–main distribution systems, substation arrangements for opencast and underground mines, distribution of electrical power in mines, mining type cable. Mining type switchgears and protective devices: Types of circuit breakers, Gate end box, Drill panel, and Tran switch, Field Switch.

Unit II

Symmetrical faults and circuit breaker rating calculation. Protective relays: Thermal and induction disc type overload relays; mining type earth fault relay.

Unit III

Signaling and communication: Haulage and Coal face signaling systems for underground coal mines, basic concept of underground mine communication. Power Economics: Types of industrial tariffs, power factor improvement in mines. Electrical drives and Power Semiconductor Controller: Selection of motors and starters for mining applications; introduction to power semiconductor devices, basic principles of operation of thyristor controlled variable speed mine electrical drives, electrical braking.

Unit IV

Electrical Safety in Mines: Neutral Grounding and Equipment earthing practice in mines, principles of flameproof enclosure, intrinsic safety, Indian Electricity Rules as applied to mines – main provisions. Mine lighting system.

Suggested Reading:

1. *Electrical Technology , A.K. Theraja*
2. *Electrical Engineering In mines, N.K Dutta*

Program: B.Tech
Semester: Four
Course: Mine Surveying II
Course Code: 8.257

L	T	P	C
3	0	0	3

Course Objective:

- The student will enable to carry out underground surveys and stope measuring.
- Plotting contour plans
- Understand advanced surveying techniques such as remote sensing and geodetic surveying.
- The students will have practical knowledge about recent development of surveying and mine planning.
- The students will have practical knowledge about survey instruments and its workings.

Unit I

Control Surveys: Triangulation–classification; Reconnaissance; Procedures for angles and Base-Line measurement; Comparison with precise EDM traversing. Direction Measurement by Astronomical observation: Definition of astronomical terms; Time systems; Determination of true bearing of a survey line by astronomical observations. Gyro-North Determination: Principle of Gyro-theodolite/ Gyromat; Determination of Gyro-north.

Unit II

Correlation: Methods of correlation–direct traversing in inclined shaft, correlation in vertical shaft–single and two shafts, Gyro-Laser combination; Shaft depth measurement. Development Surveys: Control of direction and gradient in drifts, tunnels, raises, winzes. Slope Surveying: Purpose; Methods of survey in moderately and steeply inclined ore bodies, flat and vertical ore bodies/seams.

Unit III

Slope Monitoring in Opencast Mines: Geodetic and Remote Sensing Methods, Slope Stability Radars GPS: Principle of GPS; Instrument; Errors and working with GPS; Application of GPS in mine surveying; Developments in satellite based Navigation system.

Unit IV

Application of Automation& IT in surveying: Data acquisitions; Preparation of plans and sections; Calculation of earth works. Introduction to surveying software's. Application of GIS and Remote Sensing in Surveying.

Suggested Reading:

1. *Surveying and leveling , T. P. Kanetkar*
2. *Surveying & Levelling , B.C. Punmia*

Program: B.Tech
Semester: Four
Course: Mine Surveying II Lab
Course Code: 8P.257

L	T	P	C
0	0	2	1

List of Experiments:

1. Precise Levelling and distribution of closing error.
2. Study and sketch of Digital Level.
3. Detailed surveying and contouring with Total Station.
4. Working with SURPAC and preparation of Mine Plan.
5. Earthwork calculation using SURPAC and plotting.
6. Plotting of sections using LISCAD.
7. Study and practice of Gyro-theodolite/Gyromat.
8. Study of GPS and data collection; GPS data downloading and post- processing.
9. Study of Nadir Plummet and LASER for Correlation survey.
10. Subsidence monitoring using1" – Micro-optic Theodolite & Precise Level.

Program: B.Tech
Semester: Four
Course: Professional Skills
Course Code: 40B.251

L	T	P	C
2	0	0	2

Course Objective: It is student-centric, value based, activity oriented professional education, where the Faculty is not only the disseminator of common wealth of knowledge and experience but the organizer of learning situations, facilitator of the learning process and co coordinator of learning following the age old adage of "I hear, I forget, I see, I remember, I do, I understand

- In this unit the students get opportunities to apply their classroom learning to practical situation. This course aims to develop the professional traits in them, so that they can meet the neo-challenges of job opportunities.
- Students become the architect of their career goals.
- Acquire leadership traits,
- Interpersonal skills,
- Adaptability, discussion skills, interview skills etc.

Unit I

DISCUSSION SKILLS

- Introduction
- Importance of Group Discussion Skills
- Process, Scope & Limits of Group Discussion
- Group Discussion, Interaction Strategies, Individual Contribution
- Leadership Skills, Team Management, Creating Friendly Co-operative Atmosphere
- Selection Group Discussion, Interactive Oral Process, Purposeful & Goal Oriented Characteristics, Agreement on Group Goals, Agreement on Procedure, Effective Communication, Equitable Distribution of Time; Speaking & Listening Skills; Adaptability; Assertiveness; Command Over the Subject

Unit II

NEGOTIATION SKILLS

- Speaking & Listening Skills
- Rapport Building skills
- Decision Making Ability
- Problem Solving Skill
- Attitudes
- Adaptability
- Conflict Handling Ability

Unit III

JOB SEARCH & CORRESPONDENCE SKILLS

- Introduction; Job Search Strategies
- Developing Job Communication Skills
- Skill Analysis
- Job Communication Process
- Creating Network,
- Prelude; Biodata, Curricula Vitae (CV) Resume
- Determining the Need of the Employer

- Relevant Information Analysis
- Preparing Final Draft
- Developing Confidence, Apprehension, Set Realistic Goals, Negative Thoughts
- Stress Reduction Techniques
- Follow up Corresponded

Unit IV

INTERVIEW SKILLS

- Interview; Introduction
- The Interview Process
- Types of Interview; Face to Face, Group Interview, Through Video Conferencing, Telephonic,
- Skype, Panel Interview
- Planning/Purpose
- Pre-Interview Techniques
- Answering Strategies
- Follow up

Suggested Readings:

1. *Monippally, Matthukutty. M. 2001. Business Communication Strategies. 11th Reprint. Tata McGraw-Hill. New Delhi*
2. *Swets, Paul. W. 1983. The Art of Talking So That People Will Listen: Getting Through to Family, Friends and Business Associates. Prentice Hall Press. New York*
3. *Lewis, Norman. 1991. Word Power Made Easy. Pocket Books*
4. *Sen , Leena .Communication Skills ; Eastern Economy Edition*
5. *Ghanekar, Dr. Anjali. Essentials of Business Communication Skills ; Everest Publishing House*
6. *David Green. Contemporary English Grammar, Structure & Composition ; MacMillan*
7. *Dictionary; Oxford*
8. *Dictionary ; Longman*

Websites

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- www.dictionary.cambridge.org
- www.wordsmith.org
- www.edufind.com
- www.english_the_easy_eay.com
- www.englishclub.com
- www.english_grammar_lessons.com

 # (For Lateral Students Only)

Program: B.Tech
Semester: Four
Course: Life Skills II
Course Code: 40B.201

L	T	P	C
2	0	0	0

Course Objective: To impart basic skills of Professional Communication in English through intensive practice to the Students, so as to enable them to function confidently & effectively in that Language in the Professional Sphere of their life.

The student must have some basic command of English so that the Student must be able to:

- At the end of the course the student should become a good communicator not only in the organization but in day today life also. Should know and learn the dynamics of external and internal communication.
- Use some 2000 (at least 1500) general-purpose words of English to express himself/herself in writing & 1500 such words to talk about day-to-day events & experiences of life.
- Understand slowly-delivered spoken material in Standard Indian English, and
- Speak reasonably clearly (if not fluently) on routine matters with his fellow Students, with proper word stress, intonation pattern, accent and perfect articulation.
- Should have command over the language.

WRITING SKILLS

Unit I

Letter Writing

- Business/official Letters
- Letter Writing Skills
- Planning of the Letter
- Letter Writing Process
- Form & Structure
- Essentials of Letter Writing
- Types of Professional Letters: letter of enquiry, letter of placing order, information seeking letter, letter of claim & complaint, information giving letter, letter of acceptance, letter of rejection

Unit II

Professional Writing

- Job Application, introduction, layout & format (specimen)
- D O letter
- Resume & Job Application
- Covering Letter
- Editorial Letter
- Writing Mails & SMS (E-Language)
- Notice, Memo, Circular & Minutes Writing.
- Social Letters (letters to friends/relatives etc.)

STUDY SKILLS

Unit III

Reading Skills

- Newspaper Reading
- Mechanics of Note making
- Note Making Techniques/ Reduction Devices
- Organization Techniques/Method of Sequencing
- Mechanics of Summarizing
- Outlining & Paraphrasing

Unit IV

Referencing Skills

- Referencing Skills
- Method of Referencing
- Using Foot Notes
- Scanning and Skimming Skills
- Finding required Information/Meaning/ Pronunciation

Suggested Readings:

1. *Monippally, Matthukutty. M. 2001. Business Communication Strategies. 11th Reprint. Tata McGraw-Hill. New Delhi*
2. *Swets, Paul. W. 1983. The Art of Talking So That People Will Listen: Getting Through to Family, Friends and Business Associates. Prentice Hall Press. New York*
3. *Lewis, Norman. 1991. Word Power Made Easy. Pocket Books*
4. *Sen , Leena .Communication Skills ; Eastern Economy Edition*
5. *Ghanekar, Dr. Anjali. Essentials of Business Communication Skills ; Everest Publishing House*
6. *David Green. Contemporary English Grammar, Structure & Composition ; MacMillan*
7. *Dictionary; Oxford*

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