

# JHARKHAND RAI UNIVERSITY



## **MINING ENGINEERING**

### **B.Tech**



## SYLLABUS

## SEMESTER III

**Kamre | Ratu Road | Ranchi | Jharkhand**

**Web : [www.jru.edu.in](http://www.jru.edu.in) | Email : [info@jru.edu.in](mailto:info@jru.edu.in)**

## B.TECH SEMESTER III

B.TECH IN MINING ENGINEERING												
SEMESTER III												
S. No	Subject code	Name of Subject	Period			Evaluation Scheme				Subject	Credit	Hours
			L	T	P	Assignment	T A	Total	ESC			
1	8.201	Mechanical Engineering I	3	0	0	20	10	30	70	100	3	3
2	8.202	Mining Geology	3	0	0	20	10	30	70	100	3	3
3	8.203	Mine Surveying I	3	0	0	20	10	30	70	100	3	3
4	8.204	Introduction to Mining	3	0	0	20	10	30	70	100	3	3
5	9.204	Mathematics III	3	0	0	20	10	30	70	100	3	3
6	40B.201	Communication & Soft skills	2	0	0	20	10	30	70	100	2	2
<b>7</b>	<b>40B.101</b>	<b>***Life Skills I</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>10</b>	<b>30</b>	<b>70</b>	<b>100</b>	<b>0</b>	<b>2</b>
PRACTICAL/ SESSIONAL												
1	8P.201	Mechanical Engg. I Lab	0	0	2		20	20	30	50	1	2
2	8P.202	Mining Geology Lab	0	0	2		20	20	30	50	1	2
3	8P.203	Mining Surveying I Lab	0	0	2		20	20	30	50	1	2
									<b>TOTAL</b>	<b>750</b>	<b>20</b>	<b>23</b>

- **\*\*\* NOTE: For Lateral students ( Qualifying Non Credit Course )**
- **MOOCS introduced through SWAYAM in all semester.**

**Program:** B.Tech  
**Semester:** Three  
**Course:** Mechanical Engineering I  
**Course Code:** 8.201

L	T	P	C
3	0	0	3

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### Course Objective:

- To equip the mining engineering students with the basic principles of operation of Mining Machinery.
- Critically analyze problem and solve the problems related to mechanical elements and analyse 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 Strength of Materials: Stress-strain diagram; Elastic constant and their relations, Thermal stresses and strains, Stresses in oblique planes- Principal Stresses and principal planes.

### Unit II

Theory of simple bending: Deflection of beams-integration method and moment area method. Analysis of stresses in pressure vessels-thin and thick cylinders. Torsion of solid and hollow circular Shafts.

### Unit III

Introduction to theory of Machines: Basic concepts; degrees of freedom, kinematic constrains, Linkages, mechanisms. Different types of gears, gear trains, reduction ratio and torque assessment and application of gearboxes. Basic principles and constructions of governors, flywheels, brakes, clutches and dynamometers.

### Unit IV

Case Study based on laboratory setups on the above broad areas.

### Suggested Reading:

1. *Mechanical Engg.* – Dr. D.S. Kumar
2. *Strength of Material-* R.S. Khurmi
3. *Strength of Material-* R.K. Rajput
4. *Theory of Machines-* R.S. Khurmi
5. *Theory of Machines-* S.S. Ratan

**Program:** B.Tech

**Semester:** Three

**Course:** Mechanical Engineering I Lab

**Course Code:** 8P.201

L	T	P	C
0	0	2	1

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### List of Experiments:

1. Tensile test of a mild steel specimen on Universal Testing Machine (UTM).
2. Young's modulus by flexure of beam method.
3. Stiffness test of closed coiled helical spring.
4. Determination of M. I. of a connecting rod.
5. Coefficient of friction between belt/rope and pulley.
6. Efficiency of a screw jack.

**Program:** B.Tech  
**Semester:** Three  
**Course:** Mining Geology  
**Course Code:** 8.202

L	T	P	C
3	0	0	3

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### Course Objective:

- This will provide basic knowledge on identification of various rocks & minerals by verifying the physical properties.
- The course will equip the students with the ability to appreciate the structure of earth and ore formations.
- The students will have knowledge about ore reserve estimation, ore assaying, remote sensing, geological mapping and identification of geological structures in the field.
- To practice the determination of engineering properties of rocks, preparation of weathering profiles, RMR, RQD, preparation of geological and structural maps and congestion of geological structures in the field.

### Unit I

Physical Geology: Origin of Earth, Interior of Earth, Study of Earth surface and features- Mountains/valley/rivers/lakes/volcanoes, study and their formation. Types of rocks and their process of formation, types of minerals.

### Unit II

Mineralogy: Minerals: Physical and chemical properties of crystal, Types of crystallization system, classification of minerals and properties of common silicate minerals (Quartz Feldspar pyroxene Amphibole Garnet Olivine, Mica), Sulphides (Pyrite, Chalcopyrite Galena Sphalerite) and oxides (Hematite, Magnetite, Chromites, Pyrolusite Psilomelane).

### Unit III

Petrology: Igneous rocks, Magma and lava extrusive and intrusive forms classification and description of some common igneous rock (Granite Dolerite Gabbros' Basalt Rhyolite Pegmatite) Sedimentary rocks, Sedimentation processes, classification and description of common Sedimentary rocks (Conglomerate Sandstone Shale Limestone). Metamorphic rock Processes of metamorphism, texture and structure of metamorphic rock, classification and description of some common metamorphic rock (Slate Pyrite Schist Gneiss, Quartzite, Marble)

### Unit IV

Paleontology and Stratigraphy: Concept of paleontology, Fossils their mode of preservation and significance as indices of age and climate, concept of index fossils, Principle of stratigraphy, Broad stratigraphy subdivision and associated rock types of important coal belts and oil fields of India.

### Suggested Reading:

1. *A text book of Geology, P.K. Mukherjee*
2. *Structural Geology, S.W. Chiplonkar*

**Program:** B.Tech  
**Semester:** Three  
**Course:** Mine Geology Lab  
**Course Code:** 8P.202

L	T	P	C
0	0	2	1

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### List of Experiments:

#### Exploration Geology

- Study of surface features.
- Study of Topographical plans/map and preparation of Geology cross.
- Delineation of ore bodies by geology mapping Exploration.

Mineralogy: Study of physical properties of (A) Rock forming, Talc Gypsum Calcite, Fluorite, Feldspar (Orthoclase, Microcline, Plagioclase)

(B)Ore Minerals Hematite, Magnetite Chalcopyrite Malachite Azurite Chromites Bauxite, Pyrolusite, Psilomelane, Sphalerite, Galena

#### Petrology

Study of common rocks with reference to their structures, mineral composition and uses.

- i. Igneous Rock: Granite, Syenite, Gabbro, Basalt, Dolerite, Lamprophyre, Aplite, Pegmatite.
- ii. Metamorphic Rock: Slate, Schist's, Gneisses, Quartzite Marble Amphibolites, Charnockite.
- iii. Sedimentary Rocks: Conglomerate, Sandstone Shale Carbonaceous Shale Coal Limestone.

**Program:** B.Tech  
**Semester:** Three  
**Course:** Mine Surveying I  
**Course Code:** 8.203

L	T	P	C
3	0	0	3

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### Course Objective:

- The course provides for basic skills in survey and correct usage of survey instruments.
- The student will be able to enter for the Elementary Survey Course.
- Appreciate the need for accurate and thorough note taking in field work to serve as a legal record
- Gain the ability to use modern survey equipment to measure angles and distances.
- Gain the ability to measure differences in elevation, draw and utilize contour plots, and calculate volumes for earthwork.
- Improve ability to function as a member of a survey party in completing the assigned field work.

### Unit I

Surveying: Definition, objective, classification and principles of surveying. Linear Measurement: Instruments for measuring distances; ranging and taping survey lines; Chain surveying-principle, field work, off-sets, booking and plotting, obstacles in taping.

### Unit II

Angular Measurement: Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments; Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments. Levelling: Definition terminology; Levelling instruments types- tilting, auto set and digital levels; Levelling staves; Different types of levelling-differential, profile, cross-sectional and reciprocal leveling; Booking and reduction methods; Underground leveling; Temporary and permanent adjustments of levels.

### Unit III

Total Station: Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station. Contours: Concepts; Characteristics of contour; Contour Interval; Methods of contouring and uses of contours.

### Unit IV

Plane Table Surveying: Details surveying and contouring using plane table and micro-optic alidade. Computation of area and volumes.

### Suggested Reading:

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

**Program:** B.Tech

**Semester:** Three

**Course:** Mine Surveying I Lab

**Course Code:** 8P.203

L	T	P	C
0	0	2	1

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### List of Experiments:

1. Measurement of distance by Ranging and Chaining.
2. Locating various object by chain & cross staff survey.
3. Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angle.
4. To find the difference in elevation between two points using Differential or Fly leveling.
5. Calculation of R.L. for different points involving 2 instrument stations & reduction by Height of Instrument & Rise and Fall methods.
6. Study of plane table surveying equipment's and accessories. Three point problem in plane table traversing.
7. Study of Auto Level and Dumpy Level; to study different parts of a Transit Theodolite and Temporary Adjustments.
8. To determine the distance between two inaccessible points by the help of a base length.



**Program:** B.Tech  
**Semester:** Three  
**Course:** Introduction to Mining  
**Course Code:** 8.204

L	T	P	C
3	0	0	3

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### Course Objective:

- Enable students to demonstrate the importance of mining in national economy.
- Students will understand the terminology associated with the discipline and be familiar with the available regulatory mechanism to enable safe & sustainable mining operations.
- Equips the students with detail knowledge on various engineering techniques used for drilling, blasting, roof support and allied activities in mine construction for exploitation of minerals.

### Unit I

Significance of Mining Industry, History of Mining, Mining & Socio Economic impact. Mining and Surface Environment, Health and Safety. Mineral Resource of India, Mineral and energy resources of world, Terminology in Mining.

### Unit II

Mining – definition and economic importance; mine – definition, different types and classification; Mine life cycle; Mineral deposit – different types and their classification.

### Unit III

Modes of entry to a mine – shaft, incline, decline, adit and box-cut. Overview of surface mining: Types of surface mines, unit operations, basic bench geometry, applicability & limitations and advantages & disadvantages.

### Unit IV

Overview of underground mining: Different coal mining methods and their applicability & limitations; Different metal mining methods and their applicability & limitations; Basic concepts of transportation, ventilation, illumination and support in underground mines.

### Suggested Reading:

1. *Explosive and Blasting Techniques*, G.K. Pradhan
2. *Explosives and Blasting Techniques*, S.K. Das
3. *Elements of mining technology*, D.J. Deshmukh

**Program:** B.Tech  
**Semester:** Three  
**Course:** Mathematics III  
**Course Code:** 9.204

L	T	P	C
3	0	0	3

### Course Objective:

- The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.
- To find the velocity and acceleration of a particle moving along a space curve.
- Apply the principles of Differential Calculus to solve a variety of practical problems in Engineering and Applied Science.
- Apply the principles of Partial Differentiation, Directional Derivatives, and Double integral.

#### Unit I

Complex Variables: Continuity, differentiability and analyticity of a function of a complex variable, Cauchy Riemann differential equations in Cartesian and polar forms. Harmonic functions, Bilinear and conformal transformations. Complex integration, Cauchy's integral theorem and formula. Derivatives. Taylor's and Laurent's Series. Poles and Singularities. Cauchy's Residue Theorem. Contour integration (Poles on real axis excluded)

#### Unit II

Special Functions: Series solution of Differential equations by the method of Fresenius. (Roots differing by non integer and equal roots). Bessel's equation: solution and Bessel's function of the first kind, Recurrence relations. Orthogonality of Bessel's Functions. Generating function and Bessel's integral. Legendre's equation: solution and Legendre's polynomials, Rodrigue's Formula. Orthogonarity relations. Generating function and recurrence relation. Definition of Hankekl's function. Elliptic Integral of the first and second kind. Jacobi's form of elliptic integrals.

#### Unit III

Numerical Techniques: Algebraic Equations, Bisection method, Regula-Falsi method and Newton-Raphson method and Gauss elimination method and Iterative methods-Gauss Seidal and Jacobi's method.

#### Unit IV

Interpolation: Introduction, Lagrange's interpolation formula. Difference operator, relation between them. Difference Table. Newton's forward and backward difference interpolation formulae, Numerical Differentiation & Integration, Newton's forward and backward difference formulae, Numerical integration. Trapezoidal rule and Simpson's 1/3<sup>rd</sup> & 3/8<sup>th</sup> rule.

### Suggested Reading:

1. *Special Function*, M.D. Rai Singhania
2. *Numerical Analysis*, S.S. Shastri
3. *Complex Variable*, Shanti Narayan
4. *Higher Engineering Mathematics*, B.S. Grewal
5. *Higher Engineering Mathematics*, H.K. Das

**Program:** B.Tech

**Semester:** Three

**Course:** Communication & Soft Skills

**Course Code:** 40B.201

L	T	P	C
2	0	0	2

**Course Objective:** The aim is to develop students' soft skills, communication, leadership and teamwork skills; and personal development skills using practical approach and exposure of students to the realities of the world.

- To enhance Leadership – assessing the requirements of a task, identifying the strengths/weaknesses within the team, utilizing the diverse skills of the group to achieve the set objectives.
- To improve Communication – demonstrating clear briefing and listening /speaking skills.
- To make them realize that effective communication and interpersonal skills are crucial to increase employment opportunities and to compete successfully in the business environment.
- The course aims to cause a basic awareness about the significance of soft skills in professional and inter-personal communications and facilitate an all-round development of personality. Hard or technical skills help securing a basic position in one's life and career. But only soft skills can ensure a person retain it, climb

## Unit I

### Communication skills

- Introduction
- Role of Communication in Today's World
- Objective of Communication
- Process of Communication
- Elements of Communication
- Essentials of Communication
- Barriers/ Factors Inhibiting Communication
- Flow of Communication
- Verbal Mode of Communication

## Unit II

### Communication Network

- Non Verbal Mode of Communication
- Kinesics/Body Language, proxemics , chronemics, para lingual
- Style in Technical Communication
- Communication Skills; Reading, Writing, Speaking, Listening & Talking

## Unit III

### GRAPHICS

- Introduction
- Planning of Graphics
- Placing of Graphics
- Construction of Graphics
- Types of Graphics(textual, visual, tables, bar Charts, pie charts, line charts, organizational charts, flow charts, maps & Pictographs)

## Unit IV

### TELEPHONIC CONVERSATION SKILLS

- Introduction
- Stages in Telephonic Conversation
- Listening & Speaking Skills
- Telephonic Skills
- Problems in Telephonic Conversation
- Intensive Listening

### Suggested Readings:

1. *Monippally, Matthukutty. M. 2001. Business Communication Strategies. 11<sup>th</sup> 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

- [www.tatamcgrawhill.com/digital\\_solutions/monippally](http://www.tatamcgrawhill.com/digital_solutions/monippally)
- [www.dictionary.cambridge.org](http://www.dictionary.cambridge.org)
- [www.wordsmith.org](http://www.wordsmith.org)
- [www.edufind.com](http://www.edufind.com)
- [www.english\\_the\\_easy\\_eay.com](http://www.english_the_easy_eay.com)
- [www.englishclub.com](http://www.englishclub.com)
- [www.english\\_grammar\\_lessons.com](http://www.english_grammar_lessons.com)
- [www.wikipedia.org/wiki/english\\_grammar](http://www.wikipedia.org/wiki/english_grammar)

**# (For Lateral Students Only)****Program:** B.Tech**Semester:** Three**Course:** Life Skills I**Course Code:** 40B.101

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:

- Write reasonably & grammatically
- Understand (if not use) at least some 2500 general purpose words of English
- 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

**LANGUAGE INITIATORS****Unit I****Basic Grammar**

- Noun, Verb, Adverb, Adjective & Preposition
- Sentence
- Tense: Present ,Past & Future
- Voice
- Narration
- Concord
- English Modals
- Connectives
- Degree of Comparison
- Nominalization

**Unit II****Practice Exercise**

- Re-Writing Sentences
- Gap Filling
- Common Errors
- Phrases & Idioms
- Homophones ( Commonly Confused Words)
- Vocabulary Building
- Word Quiz

**Unit III****Written Communication Skills**

- Requisites of good sentence writing
- Effective sentence structure
- Sentence Building/ Sentence coherence
- Sentence Emphasis/theme
- Development of a paragraph
- Paragraph structure
- Principles of paragraph Writing
- Paragraph length/ coherence/ Division

## **Unit IV**

### **Etiquettes & manners**

- Dinning etiquettes
- Workplace etiquettes
- Professional Manners
- Social Etiquettes
- Group Behavior
- Tour & Travel Etiquettes

### **Suggested Readings:**

1. *Monippally, Matthukutty. M. 2001. Business Communication Strategies. 11<sup>th</sup> 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**

- [www.tatamcgrawhill.com/digital\\_solutions/monippally](http://www.tatamcgrawhill.com/digital_solutions/monippally)
- [www.dictionary.cambridge.org](http://www.dictionary.cambridge.org)
- [www.wordsmith.org](http://www.wordsmith.org)
- [www.edufind.com](http://www.edufind.com)
- [www.english\\_the\\_easy\\_eay.com](http://www.english_the_easy_eay.com)
- [www.englishclub.com](http://www.englishclub.com)
- [www.english\\_grammar\\_lessons.com](http://www.english_grammar_lessons.com)
- [www.wikipedia.org/wiki/english\\_grammar](http://www.wikipedia.org/wiki/english_grammar)