Course Curriculum

Second Year

B. Tech. in Mining Engineering

In line with National Education Policy 2020

(Effective from AY 2025-26 for Affiliated Institutes)

Dr. Babasaheb Ambedkar Technological University

Lonere 402 103, Dist- Raigad, Maharashtra, INDIA

Established vide Maharashtra Act No. XXII of 1989 and Act. No. XXIX of 2014
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Dr. Babasaheb Ambedkar Technological University Lonere
Course Structure and Syllabus (as per NEP 2020) Second Year
B. Tech. in Mining Engineering (Affiliated Institutes)
Semester III (w.e.f. A.Y. 2025-26)

Course Type	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credits
			L	T	P	ISE	MSE	ESE	Total	
BSC	25AF1000BS301	Engineering Mathematics- III	3	-	-	20	20	60	100	3
PCC1	25AF1701PC302	Mining Geology	2	1	-	20	20	60	100	3
PCC2	25AF1701PC303	Introduction to Fluid Mechanics and Mechanics of Solid	2	1	-	20	20	60	100	3
PCC3	25AF1701PC304	Introduction to Mining Engineering	3	-	-	20	20	60	100	3
OE-I	25AF1701OE305	OPEN ELECTIVE-I	3	-	-	20	20	60	100	3
MDM	25AF1701MD306	Multi-Disciplinary Minor-I	-	-	-	20	20	60	100	-
AES	25AF1000VE307	Modern Indian Language A. Marathi B. Hindi C. Sanskrit	2	-	-	50	-	50	100	2
VSEC	25AFCOIAE308	Constitution of India	2	-	-	-	-	-	AU	GR
VEC	25AF1000VE309	Life of Bharat Ratna Dr. Babasaheb Ambedkar	1	-	-	50	-	-	50	1
PCC Lab	25AF1701PCL310	Mining Geology Lab	-	-	2	25	-	25	50	1
PCC Lab	25AF1701PCL311	Fluid Mechanics and Strength of Material Lab	-	-	2	25	-	25	50	1
		Total	**18**	**2**	**4**	**240**	**140**	**470**	**850**	**20**

MDM to be offered to other departments: **Basics of Mining Engineering (3 Credits)**

OE*: The students can opt for the Open Elective from the Open Elective bucket declared for the particular semester.
MDM**: The students will have to choose the MDM course being offered by other disciplines available/offered at the college)

Dr. Babasaheb Ambedkar Technological University Lonere Department of Mining Engineering

Course Structure and Syllabus (as per NEP 2020) Second Year

B. Tech. in Mining Engineering (Affiliated Institutes)

Semester IV (w.e.f. A.Y. 2025-26)

Semester IV

Course Type	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credits
			L	T	P	ISE	MSE	ESE	Total	
PCC1	25AF1701PC401	Basic Mining Machinery	2	1	-	20	20	60	100	3
PCC2	25AF1701PC402	Mine Surveying	3	-	-	20	20	60	100	3
PCC3	25AF1701PC403	Rock Mechanics	3	1	-	20	20	60	100	3
PCC4	25AF1701PC404	Industrial Engineering & Management	3	-	-	20	20	60	100	3
OE-II	25AF1701OE405	OPEN ELECTIVE-II	2	-	-	20	20	60	100	2
MDM	25AF1701MD406	MDM Bucket List	-	-	-	20	20	60	100	-
VSEC	25AF1000VE407	Universal Human Values-II	3	-	-	20	20	60	100	3
VEC	25AF1000VE408	Life of Chhatrapati Shivaji Maharaj	1	-	-	50	-	-	50	1
PCC Lab	25AF1701PCL409	Mine Surveying lab	-	-	2	25	-	25	50	1
PCC Lab	25AF1701PCL410	Rock Mechanics Lab	-	-	2	25	-	25	50	1
VSEC	25AF1701VSE411	Internship-I/Mine Visit-I	-	-	-	-	-	-	-	-
		Total	**17**	**2**	**4**	**240**	**140**	**470**	**850**	**20**

MDM to be offered to other departments: **Introduction to Geo-Mechanics (2 Credits)**

OE*: The students can opt for the Open Elective from the Open Elective bucket declared for the particular semester.
MDM**: The students will have to choose the MDM course being offered by other disciplines available/offered at the college)

Exit Option-II: Qualifier for UG Diploma
Broad areas of Training: 1. Open Cast 2. UG Coal 3. UG Non-Coal

- To be completed during vacation after Second Year in the industry/institute.
- This should contain the well-defined project activity which is equivalent to 10 Credits.
- It should be carried out for the duration of 08 Weeks.
- The project training should be evaluated by examiners.

Multi-Disciplinary Minor Courses

Semester	Subject Code	Subject Name	CA	MSE	ESE	Total Credits
SEM-III	25AF1701MD306	Basics of Mining Engineering	20	20	60	3
SEM-IV	25AF1701MD406	Introduction to Geo-Mechanics	20	20	60	2
SEM-V	25AF1701HM506	Underground Mining Technology & Ventilation	20	20	60	3
SEM-VI	25AF1701MD607	Surface Mining & Environment	20	20	60	3
SEM-VII	25AF1701MD706	Mine Management & Safety	20	20	60	3
SEM-VIII	25AF1701MD803	Internship	20	20	60	3
Total credits required to complete minor degree in Mining Engineering = 14						

Course Code: 25AF1000BS301
Course Title: Engineering Mathematics- III

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week Credits: 3	Internal Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration: 03 Hours)

Course Objectives

COBJ1	To introduce the concepts and applications of Laplace transforms and their inverses for solving differential equations and evaluating integrals.
COBJ2	To develop the ability to apply Fourier transform techniques for the analysis of functions, signals, and physical systems.
COBJ3	To provide a foundation in the formulation and solution of partial differential equations arising in engineering and physical sciences.
COBJ4	To impart knowledge of analytic functions and complex variable techniques including Cauchy's theorems and residue calculus for solving integrals.
COBJ5	To enhance problem-solving skills by applying mathematical tools to model, analyze, and solve engineering-related problems.

Course Outcomes: At the end of the course, students will be able to:

CO1	Comprehend the fundamental knowledge of the Laplace and inverse Laplace transforms and their derivatives for elementary functions
CO2	Apply the properties of Laplace and inverse Laplace transforms to solve simultaneous linear and linear differential equations with constant coefficients
CO3	Conceptualize the definitions and properties of Fourier transforms, to solve boundary value problems using Fourier transforms
CO4	Find the solutions of partial differential equations governing real-world problems
CO5	Conceptualize limit, continuity, derivative and integration of complex functions, complex integrals useful in real-world problems

Course Contents

Unit 1: Laplace Transform

Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by tn, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

Unit 2: Inverse Laplace Transform

Introductory remarks; Inverse transforms of some elementary functions; General methods of finding inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

Unit 3: Fourier Transform

Definitions – integral transforms; Fourier integral theorem (without proof); Fourier sine and cosine integrals; Complex form of Fourier integrals; Fourier sine and cosine transforms; Properties of Fourier transforms; Parseval's identity for Fourier Transforms.

Unit 4: Partial Differential Equations and Their Applications

Formation of Partial differential equations by eliminating arbitrary constants and functions; heat Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one-dimensional flow equation $(i.e\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2})$ and one-dimensional wave equation $i.\frac{e}{\partial t^2}^{\partial^2 y} = c^2\frac{\partial^2 y}{\partial x^2}$

Unit 5: Functions of Complex Variables

Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs).

Texts:

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.
3. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.

References:

1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
2. A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd. Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York.

Course Code: 25AF1701PC302
Course Title: Mining Geology

Teaching Scheme	Examination Scheme
Lectures: 2 hrs./week Tutorial:1 hr./week Credits: 03	Internal Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration: 03 Hours)

Course Objectives

COBJ1	To provide fundamental knowledge of stratigraphy, mineralogy, and the geological history of India.
COBJ2	To develop an understanding of structural features such as folds, faults, joints, and their importance in mining operations.
COBJ3	To impart knowledge of igneous, sedimentary, and metamorphic rocks with respect to their origin, textures, structures, and classification.
COBJ4	To introduce the processes of mineral formation, classification of mineral deposits, and their economic importance in India.
COBJ5	To familiarize students with concepts of hydrogeology, groundwater occurrence, and exploration techniques for mineral and water resources.

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the principles of stratigraphy, geological time scale, major Indian geological formations, and identify rock-forming minerals based on physical properties.
CO2	Interpret structural elements such as dip, strike, folds, faults, joints, and unconformities, and analyze their influence on mining operations using geological maps.
CO3	Classify igneous, sedimentary, and metamorphic rocks, describe their textures and structures, and explain their formation processes.
CO4	Differentiate between various mineral-forming processes, classify mineral deposits genetically, and discuss important metallic, non-metallic, and coal deposits of India.
CO5	Explain the hydrological cycle, aquifers, and hydrological properties of rocks, and apply geophysical methods (gravity, electrical, seismic, radiometric) in mineral and groundwater exploration.

Course Contents

Unit 1

Stratigraphy:- Introduction, Definition, Principles of Stratigraphic Corelation, Units of Stratigraphy, Physiographic divisions of India, Standard Geological Time Scale, Fossils - Elementary idea about their conditions, Modes of preservation and uses, Descriptions of important Indian formationsArcheans, Cuddapahs, Vindhyans, Gondwanas and Deccan traps.

Minerology: Definitions, Classification of various rock forming minerals, General Physical properties of minerals.

Unit-2

Structural Geology:-

Altitude of strata – Dip and Strike, Fold-Element of Folds, Classification of Fold, recognition of folds ithe field, Fault – Terminology, Classification of faults, Effects of faults on ourcrops, Geological maps, Unconformity and Joints, Influences of fold and fault in Mining operations, Problems of dip and strike, thickness and depth of strata.

Unit-3

Petrology:- Igneous Rocks:- Elementary knowledge of Magma and its crystallizations, Tabular

classification of Igneous rocks, Textures and Structures of Igneous rocks, Description of common rock types.

Sedimenary & Metamorphic Rocks:- Textures and Structures of Sedimentary rocks, Classification of Sedimentary rocks, Description of common rock types. Agents of metamorphism, Textures and Structures of metamorphism rocks, Description of common rock types

Unit-4

Economic Geology:- Fundamental Terms and their definitions, Brief Review of processes of mineral formation and their Genetic classification of mineral deposits: Magmatic ore deposits, Pegmatitic ore deposits, Contact metasomatic ore deposits, Hydrothermal ore deposits, Oxidation and Supergeine enrichment deposits, Metamorphic deposits, Control of ore depositions, Study of important metallic and non metallic deposits of India, Introduction to Geology to Indian Coal Fields.

Unit-5

Hydrogeology:- Hydrological cycle, Occurrence of ground water, Water table, Water table maps and their uses, Aquifer, Aquiclude, Aquifuge, Confined and Unconfined aquifers, Artesion Wells, Springs, Hydrological Properties of Rocks, Porosity and Permeability of rocks. Prospecting and Exploration: Introduction, Definitions, Geophysical prospecting methods, Gravity methods, Electrical methods, Seismic methods and radiometric method.

Text cum Reference Books:

1. A Text Book of Geology : P.K. Mukherjee
2. Principles of Engineering Geology : K.M. Bangar
3. Engineering Geology Manual : B.S. Satyanarayana Swami
4. Principles of Petrology : G.W. Tyrell
5. Geological Maps : G.W. Chiplunkar
6. Physical & Engineering Geology : S.K. Garg

Course Code: 25AF1701PC303
Course Title: Introduction to Fluid Mechanics and Mechanics of Solid

Teaching Scheme	Examination Scheme
Lecture: 2 hrs./ week Tutorial:1 hr./week Credits: 03	Internal Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration: 03 Hours)

Course Objectives

COBJ1	To introduce fluid properties, viscosity, and pressure measurement methods relevant to engineering applications.
COBJ2	To apply principles of fluid kinematics, dynamics, and Bernoulli's equation in analyzing fluid flow and related devices
COBJ3	To understand Principle and working of different type of Pump.
COBJ4	To provide a fundamental understanding of stress, strain, material behavior, and deformation under various loading conditions.
COBJ5	To develop the ability to analyze stresses due to torsion in shafts and springs.

Course Outcomes: At the end of the course, students will be able to:

CO1	Define properties of fluids, explain viscosity and pressure concepts, and use manometers and gauges for pressure measurement.
CO2	Apply continuity, Euler's, and Bernoulli's equations to solve fluid flow problems and analyze practical devices like venturimeter, orifice meter, and pitot tube.
CO3	Study of different type of Pump and their Principle.
CO4	Construct and interpret axial force, shear force, and bending moment diagrams for beams and frames under various loading conditions.
CO5	Explain stress–strain relationships, mechanical properties of materials, and analyze deformation in uniaxial and biaxial stress systems.

Course Contents

Unit 1

Introduction and its properties of fluids: Viscosity, laws, factors affecting and its measurements. Pressure and its measurements: absolute, gauge, atmospheric and vacuum pressure and manometers types.
Hydrostatic force on surfaces: Total pressure and centre of pressure for plane, inclined and curve submerged surfaces, pressure on lock gates. Fluid kinematics: Types of fluid flows, rate of flow, continuity equation in three dimensions.

Unit 2

Equation of motion, Euler's and Bernoulli's equation and their practical applications. Venturimeter, Orificemeter and pitot tube. Momentum equation and moment of momentum.
Flow through pipes: loss of energy in friction, loss of pressure due to sudden expansion, contraction, bends, entry and exit. Darcy's and Chezy's equation. Hydraulic gradient and total energy line. Flow through pipes connected in series and parallel.

Unit 3

Mine pumps: Principle of working of reciprocating pumps and turbine pumps. Features of different types of pumps, reciprocating, centrifugal, turbine, mono pump, roto pump, three throw ram pumps, sludge pumps, borehole submersible pumps, air lift pumps, characteristics curves, simple calculations, maintenance of pumps.

Unit 4

Mechanical Properties: Type of force distribution, concepts of stress and strain, stress-strain behaviour of ductile and brittle material in uniaxial state of stress, Elastic, plastic and strain hardened zones in stress-strain relation, elastic constants, relation between elastic constants, hardness, impact strength,

Stresses Due to Torsion: Torsion of circular sections assumptions andderivation of relation between torsional moment, shear stress and angle of twist, torsional stress in solid and circular sections.

Unit 5

Axial Force, Shear Force and Bending Moment Diagrams: Concept of free body diagrams, determinations of axial force, shear force and bending moment at a section, axial force, SF and DM diagrams in beams and simple frames.

Stresses in Beams: Bending stresses in simple beams, assumptions and derivation of simple bending theory, relation between bending moment, bending stress and curvature

Deflection of Beams: Derivation of differential equation of moment curvature relation.

Text Books:

1. Fluid Mechanics & Hydraulic Machines by Dr. R.K. Bansal
2. Fluid Mechanics & Machines by Mody & Seth
3. Fluid Mechanics by R.K. Rajput
4. Hydraulic Machines by R.K. Rajput
5. Fluid Mechanics & Fluid Power Engineering by Dr. D.S. Kumar
6. Mechanics of Solid (Vol-1 & 2) by Dr. H.J. Shaha And S.B. Junarkar
7. Strength of Material by J.P.Den Hartog
8. Strength of Material by Spriger
9. Strength of Material by Shaha And Kurve
10. Strength of Materials by S. Ramamrutham, Publishers Dhanpat Rai & Co., 2008
11. Strength of Materials by R K Rajput, Publishers S Chand & Company, New Delhi
12. Strength of Materials by Dr R K Bansal, Publishers Laxmi.

Course Code: 25AF1701PC304
Course Title: Introduction to Mining Engineering

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./ week Credits: 03	Internal Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration: 03 Hours)

Course Objectives

COBJ1	To provide fundamental knowledge of mining, mineral resources, and their role in national development.
COBJ2	To familiarize students with exploration methods, mine development, and opening techniques.
COBJ3	To impart knowledge of shaft sinking methods, equipment, and modern technologies.
COBJ4	To introduce students to exploitation techniques in surface and underground mining for coal and non-coal deposits.
COBJ5	To develop understanding of tunnelling, drifting, and drivage operations using conventional and mechanized methods.

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the contribution of mining to civilization, mineral resources of India, and define basic mining terminology used in surface and underground mining.
CO2	Describe different phases of mining, methods of prospecting and exploration, and compare various modes of mine entries (adit, shaft, decline).
CO3	Explain shaft sinking operations, equipment used, cycle of operations, and modern techniques for difficult ground conditions.
CO4	Differentiate between surface and underground mining methods, explain coal mining methods (Bord & Pillar, Longwall), and describe basic unit operations in mining.
CO5	Describe the processes of drifting and tunnelling under different ground conditions, including drilling, blasting, mucking, supporting, and mechanized drivage methods.

Course Contents

Unit 1

Introduction to Mining: Mining contribution to civilization, Main mineral resources of India and world, Occurrences, Distribution and Mining of minerals in India and its contribution to national growth, Mining and its consequences.

Basic Terminology: Mine, Mining, Mining Engineering, surface mining, underground mining, mineral, rock, ore, mineral deposit, seam, veins, lode, beds, hanging wall, footwall, shaft, cross cut, drift, adit, level, incline, winze, raise, panel, pillar, gallery, roadway, face, strike and dip, sump, bench, haul road, bench slope, overall pit slope, overburden, waste dump, stripping ratio.

Unit 2

Exploration & Development: Phases of mining, Prospecting to reclamation, Brief introduction to various methods of prospecting and exploration.

Mine Opening: Development of mineral deposits; brief introduction to modes of primary access, choice of mode of entry - adit, shaft, decline, and combined model; their applicability and comparison.

Unit 3

Shaft Sinking: Location, size, shape, site selection, sinking shaft-preparatory arrangements, drilling and blasting, mucking, hosting, ventilation, pumping, lighting, supporting of sides, complete cycle of operations, special method of sinking to be used in difficult ground conditions, deepening and widening of shafts, modern technique of shaft sinking/boring.

Unit 4

Exploitation Techniques: Elementary idea of methods of mining (both surface and underground) for coal and non-coal deposits; cyclic and continuous methods of mining and their comparison.

Unit operations in mining; elementary idea about production cycle, drilling, blasting, supporting, loading, hauling and processing as applicable to underground methods of mining. Brief description of Bord and Pillar (development), and Longwall (advancing and retreating) methods of coal mining.

Brief description of elements of an opencast mine; ramp, haul roads, benches, production cycle, dumping of overburden and backfilling. Introduction to underground metalliferous stoping methods; brief descriptions of underhand and overhand stoping methods.

Unit 5

Drifting: Small and medium size tunnelling and drifting; drivage work in varying ground conditions using conventional methods – drilling, blasting, mucking, transportation, supports, services and cycle of operations. Mechanical methods of drivage of roadways and tunnels.

Text cum Reference Books:

1. Introduction to Mining Engineering by H.L. Hartman
2. Coal Mining Methods: S K Das
3. SME Mining Engineer’s Handbook by Hustrulid

Course Code: 25AF1000VE307A
Course Title: Indian Languages – Marathi

Teaching Scheme	Examination Scheme
Lecture: 2 hrs./ week Credits: 02	Internal Assessment: 50 Marks End Semester Exam: 50 Marks

Course Objectives

COBJ1	मराठी भाषेचा उगम, विकास आणि संस्कृतीसंबंधी योगदान समजून घेणे.
COBJ2	स्वातंत्र्यानंतर मराठी भाषेचे स्थान, डिजिटल युगातील उपयोग आणि जागतिक प्रभाव जाणून घेणे.
COBJ3	मराठी व्याकरण, शुद्धलेखन आणि लेखन नियमांचे अचूक ज्ञान आत्मसात करणे.
COBJ4	औपचारिक व सर्जनशील लेखन कौशल्य विकसित करणे.
COBJ5	भाषांतर तत्त्वे, प्रक्रिया आणि उपयोग जाणून घेऊन मराठी–इंग्रजी आणि इंग्रजी–मराठी भाषांतर करण्याची क्षमता विकसित करणे.

Course Outcomes: At the end of the course, students will be able to:

CO1	अभ्यासक्रमाची उद्दिष्टे:
CO2	१. मराठी भाषेचा ऐतिहासिक प्रवास, तिच्या निर्मितीतील संस्कृत, प्राकृत आणि अपभ्रंश भाषांचा प्रभाव समजून घेणे.
CO3	२. मराठी लेखनाचे नियम, व्याकरण व शुद्धलेखन यांची अचूकता आत्मसात करणे.
CO4	३. सर्जनशील आणि औपचारिक लेखन कौशल्ये विकसित करणे.
CO5	४. भाषांतर तत्त्वे, साहित्यिक आणि सांस्कृतिक संदर्भ यांचा विचार करून मराठीतून इंग्रजी आणि इंग्रजीतून मराठी भाषांतर करण्याचे कौशल्य प्राप्त करणे.

घटक १ : मराठीचा उगम आणि विकास

- मराठीचा उगम आणि विकास
- मराठी भाषेवर संत परंपरेचा प्रभाव – ज्ञानेश्वर, तुकाराम, नामदेव आणि एकनाथ यांच्या रचनांचा अभ्यास
- मराठीतील बखरी लेखन व इतिहासदर्शन
- आधुनिक मराठी आणि सुधारणा चळवळ – टिळक, फुले आणि आगरकर यांचे योगदान

घटक २ : स्वातंत्र्यानंतरची मराठी भाषा

- महाराष्ट्र राज्य निर्मिती व मराठीचा अधिकृत दर्जा
- डिजिटल युगातील मराठी भाषा : ब्लॉग, सोशल मीडिया आणि ई-साहित्य
- मराठी भाषा संरक्षणासाठी उपाययोजना
- शिक्षण व्यवस्थेत मराठीचा वापर
- जागतिक स्तरावर मराठी भाषेचा प्रभाव

घटक ३ : मराठी लेखनाचे नियम आणि व्याकरण

- संधी
- वाक्यप्रकार (विधानार्थी वाक्य, प्रश्नार्थी वाक्य, आज्ञार्थी वाक्य इ.)
- विरामचिन्हे आणि त्यांचा उपयोग
- शुद्धलेखन

- समानार्थी शब्द (पर्यायवाची शब्द), विरुद्धार्थी शब्द

घटक ४ : लेखन कौशल्य

- लेखन कौशल्याचा परिचय – लेखन कौशल्याचे महत्त्व आणि आवश्यकता
- पत्रलेखन
- निबंध लेखन
- वृत्तलेखन (वृत्तपत्रीय लेखन)
- आत्मवृत्त लेखन
- सारांश लेखन

घटक ५ : भाषांतर (मराठीतून इंग्रजी आणि इंग्रजीतून मराठी)

- भाषांतराचा मूलभूत परिचय – भाषांतराची व्याख्या आणि स्वरूप, महत्त्व आणि उपयोग, भाषांतराचे प्रकार इ.
- पारिभाषिक शब्दावली
- मराठीतून इंग्रजी आणि इंग्रजीतून मराठी भाषांतर

संदर्भ साहित्य

1. **प्रशासनिक लेखन**, भाषा संचालनालय, महाराष्ट्र शासन, मुंबई १९६६
2. **सुगम मराठी व्याकरण व लेखन** – मो. रा. वाळंबे
3. **अनुवाद सिद्धांत आणि प्रयोग** – डॉ. भालचंद्र नेमाडे (लोकवाङ्मय गृह प्रकाशन)
4. **मराठी भाषा आणि साहित्याचा इतिहास** – वि. का. राजवाडे (प्रकाशक : राजवाडे संशोधन मंडळ, धुळे)
5. **भाषांतर : सिद्धांत आणि प्रयोग** – डॉ. अशोक केळकर (प्रकाशक : लोकवाङ्मय गृह, मुंबई)

Course Code: 25AF1000VE307B

Course Title: Indian Languages – Hindi

Teaching Scheme	Examination Scheme
Lecture: 2 hrs/ week Credits: 02	Internal Assessment: 50 Marks End Semester Exam: 50 Marks

Course Objectives

COBJ1	हिंदी भाषा के उद्भव, विकास और ऐतिहासिक प्रवृत्तियों को समझाना।
COBJ2	हिंदी व्याकरण और लेखन कौशल में दक्षता प्रदान करना।
COBJ3	प्रशासन, शिक्षा और संचार में हिंदी के व्यावहारिक उपयोग को स्पष्ट करना।
COBJ4	अनुवाद कौशल विकसित करना, जिससे तकनीकी एवं व्यावहारिक संचार सुगम हो।

Course Outcomes: At the end of the course, students will be able to:

CO1	विद्यार्थी हिंदी भाषा के ऐतिहासिक और आधुनिक विकास को समझेंगे।
CO2	हिंदी व्याकरण और लेखन के नियमों में दक्षता प्राप्त करेंगे।
CO3	व्यावसायिक, प्रशासनिक और तकनीकी लेखन में हिंदी का प्रयोग कर सकेंगे।
CO4	अनुवाद के सिद्धांतों को सीखकर अंग्रेज़ी और हिंदी के बीच प्रभावी अनुवाद कर सकेंगे।

पाठ्यवस्तु (Course Contents)

इकाई – १ : हिंदी भाषा का उद्भव और स्रोत

- हिंदी भाषा की उत्पत्ति और स्वरूप
- संस्कृत, प्राकृत और अपभ्रंश से हिंदी का विकास
- हिंदी की प्रमुख बोलियाँ (ब्रज, अवधी, खड़ी बोली, भोजपुरी, राजस्थानी आदि)
- हिंदी पर फ़ारसी, अरबी और अंग्रेज़ी भाषाओं का प्रभाव

इकाई – २ : स्वातंत्र्योत्तर काल में हिंदी भाषा

- प्रशासन, शिक्षा और संचार माध्यमों में हिंदी की भूमिका
- राजभाषा के रूप में हिंदी – संवैधानिक स्थिति और व्यावहारिक उपयोग
- हिंदी का वैश्विक विस्तार और डिजिटल माध्यमों में हिंदी की उपस्थिति
- प्रशासन और संचार माध्यमों में हिंदी

इकाई – ३ : हिंदी भाषा लेखन के नियम और व्याकरण

- वर्णमाला
- शब्द-भेद
- संधि
- वाक्य रचना
- वर्तनी
- उपसर्ग, प्रत्यय और शब्द निर्माण की प्रक्रिया
- विराम चिन्हों का प्रयोग
- पर्यायवाची शब्द
- विलोम शब्द

इकाई – ४ : लेखन कौशल

- पत्र लेखन
- प्रतिवेदन (रिपोर्ट) लेखन
- विज्ञप्ति, नोटिस और परिपत्र लेखन
- निबंध लेखन
- सार लेखन

इकाई – ५ : अनुवाद (अंग्रेज़ी से हिंदी और हिंदी से अंग्रेज़ी)

- अनुवाद : सिद्धांत और परंपरा
- अनुवाद : क्षेत्र और प्रकार
- पारिभाषिक शब्दावली
- अंग्रेज़ी से हिंदी और हिंदी से अंग्रेज़ी अनुवाद

संदर्भ ग्रंथ

- **हिंदी भाषा का उद्भव और विकास** – डॉ. श्रीचंद्र वर्मा (लोकभारती प्रकाशन)
- **हिंदी भाषा का इतिहास** – डॉ. रामविलास शर्मा (राजकमल प्रकाशन)
- **भारत में राजभाषा हिंदी** – डॉ. विश्वनाथ प्रसाद (भारतीय राजभाषा परिषद)
- **हिंदी व्याकरण और रचना** – डॉ. श्रीचंद्र वर्मा (लोकभारती प्रकाशन)
- **हिंदी लेखन कौशल** – डॉ. रमेश गुप्ता (साहित्य भवन)
- **अनुवाद विज्ञान और सिद्धांत** – डॉ. एम. प्रकाश (राजकमल प्रकाशन)

Course Code: 25AF1000VE307C
Course Title: Indian Languages – Sanskrit

Teaching Scheme	Examination Scheme
Lecture: 2 hrs./ week Credits: 02	Internal Assessment: 50 Marks End Semester Exam: 50 Marks

Course Objectives

COBJ1	Historical journey of the Sanskrit language
COBJ2	To understand and assimilate the rules of Sanskrit writing and grammar
COBJ3	To study commonly used words required for daily conversation

Course Outcomes: At the end of the course, students will be able to:

CO1	विद्यार्थीः संस्कृतभाषायाः ऐतिहासिकप्रवाहस्य ज्ञानं प्राप्स्यति, तस्याः विकासे विद्यमानानां चरणान् स्पष्टरूपेण विवृणोतुं शक्नोति च।
CO2	शुद्धं नियमबद्धं लेखनं कर्तुं क्षमता लप्स्यते।
CO3	विविधप्रकारलेखनशैलीः आत्मसात्कृत्वा लेखनं कर्तुं समर्थः भविष्यति।

Course Contents

Unit 1: Introduction to Sanskrit

- Importance and history of Sanskrit
- Sanskrit alphabets (Varnamala)
- Swaras (Vowels)
- Vyanjanas (Consonants)
- Pronunciation and script (Devanagari)

Unit 2: Basic Grammar

- Nouns, pronouns, Grammatical numbers, Grammatical genders, Grammatical person
- Verbs, Tenses, Sandhi (Combination of letters)
  Karaka (Case system) – Nominative, Accusative, Instrumental, etc.
- Vibhakti (Declensions of nouns and pronouns)

- Linga (Gender: Masculine, Feminine, Neuter)
- Vakya Rachana (Sentence construction)

Unit 3: Simple Vocabulary and Sentence Formation

- Basic words and their meanings (nature, family, animals, objects, etc.)
- Greetings and basic conversational phrases
- Formation of simple sentences

Unit 4: Selected Sanskrit Shlokas and Subhashitas

- Recitation and meaning of simple verses from Bhagavad Gita, Hitopadesha, or Panchatantra
- Common proverbs (Subhashitas)

Unit 5: Reading and Writing Practice

- Reading simple Sanskrit texts
- Writing small paragraphs in Sanskrit

Course Code: 25AFCOIAE308
Course Title: Constitution of India

Teaching Scheme	Examination Scheme
Lecture: 2 hrs./ week Audit Course	Continuous Assessment: AU-GR

Course Objectives

COBJ1	To acquaint the students with legacies of constitutional development in India and help them to understand the most diversified legal document of India and philosophy behind it.
COBJ2	To make students aware of the theoretical and functional aspects of the Indian Parliamentary System.
COBJ3	To channelize students' thinking towards basic understanding of the legal concepts and its
COBJ4	implications for engineers.
COBJ5	To acquaint students with latest intellectual property rights and innovation environment with related regulatory framework.

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify and explore the basic features and modalities about Indian constitution.
CO2	Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
CO3	Differentiate different aspects of Indian Legal System and its related bodies.
CO4	Discover and apply different laws and regulations related to engineering practices.
CO5	Correlate role of engineers with different organizations and governance models

Pedagogy: Lecture, Problem based learning, Group discussions, Visual media, Films, Documentaries, Debate forums.

Course Contents

Unit 1: Introduction and Basic Information about Indian Constitution

Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947,Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government – Constitutional Scheme in India

Unit 2: Union Executive and State Executive:
Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, Lok Ayukta, The Lokpal and Lok ayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts.

Unit 3: Introduction and Basic Information about Legal System:
The Legal System: Sources of Law and the Court Structure: Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law, Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court). Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration. Contract law, Tort, Law at workplace.

Unit 4: Intellectual Property Laws and Regulation to Information:
Intellectual Property Laws- Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement, Regulation to Information- Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act.

Unit 5: Business Organizations and E-Governance:
Sole Traders, Partnerships: Companies: The Company's Act: Introduction, Formation of a Company, Memorandum of Association, Articles of Association, Prospectus, Shares, Directors, General Meetings and Proceedings, Auditor, Winding up. E-Governance and role of engineers in E-Governance, Need for reformed engineering serving at the Union and State level, Role of I.T. professionals in Judiciary, Problem of Alienation and Secessionism in few states creating hurdles in Industrial development.

References:

1. Brij Kishore Sharma: Introduction to the Indian Constitution, PHI, New Delhi, latest edition.
2. Granville Austin: The Indian Constitution: Corner stone of a Nation. 1966, Oxford Clarendon Press.
3. Subhash C. Kashyap: Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 2018.
4. P M Bakshi: The Constitution of India, Latest Edition, Universal Law Publishing.
5. V. K. Ahuja: Law Relating to Intellectual Property Rights (2007)
6. Suresh T. Viswanathan: The Indian Cyber Laws, Bharat Law House, New Delhi-88
7. P.Narayan: Intellectual Property Law, Eastern Law House, New Delhi
8. Prabudh Ganguli: Gearing up for Patents: The Indian Scenario, Orient Longman.
9. B L Wadehra: Patents, Trademarks, Designs and Geological Indications. Universal Law Publishing-Lexis Nexis.
10. Intellectual Property Rights: Law and Practice, Module III by ICSI (only relevant sections)
11. Executive Program study material Company Law, Module II, by ICSI (The Institute of Companies Secretaries of India) (Only relevant sections i.e., Study 1,4 and 36). https://www.icsi.edu/media/webmodules/publications/Company%20Law.pdf
12. Handbook on e-Governance Project Lifecycle, Department of Electronics & Information

Technology, Government of India, https://www.meity.gov.in/writereaddata/files/e-Governance_Project_Lifecycle_Participant_Handbook-5Day_CourseV1_20412.pdf
13. Companies Act, 2013 Key highlights and analysis by PWC. https://www.pwc.in/assets/pdfs/publications/2013/companies-act-2013-key-highlights- and-analysis.pdf

Referred Case Studies:

1. Keshavanand Bharati V.State of Kerala, AIR1973SC1461.
2. Maneka Gandhi V.Union of India AIR,1978 SC597.
3. S. R. Bammai V. Union of India, AIR1994 SC1918.
4. Kuldip Nayyar V. Union of India, AIR2006SC312.
5. A. D. M. Jabalpur V.Shivkant Shakla, AIR1976SC1207.
6. Remshwar Prasad V. Union of India, AIR2006SC980.
7. Keshav Singhinre,AIR1965 SC745.
8. Union of India V.Talsiram, AIR1985SC1416.
9. Atiabari Tea Estate Co.V.State of Assam, AIR1961SC232.
10. SBP & Co.Vs. Patel Engg. Ltd. 2005(8) SCC618.
11. Krishna Bhagya JalaNigam Ltd.Vs.G.Arischandra Reddy (2007)2SCC720.
12. Oil & Natural Gas Corporation Vs. Saw Pipes Ltd. 2003 (4) SCALE92 – 185.

****(Other relevant case studies can be consulted by the teacher as per the topic). Prescribed Legislations**:

1. Information Technology Act, 2000 with latest amendments.
2. RTI Act 2005withlatestamendments.
3. Information Technology Rules, 2000
4. Cyber Regulation Appellate Tribunal Rules, 2000

Suggested aid for Students and Pedagogic purpose

1. RSTV debates on corporate law,IPR and patent issues
2. NPTEL lectures on IPR and patent rights

Episodes of 10-part mini-TV series "Samvidhan: The Making of Constitution of India" by RSTV.

Course Code: 25AF1000VE309
Course Title: Life of Bharat Ratna Dr. Babasaheb Ambedkar

Teaching Scheme	Examination Scheme
Lecture: 1 hrs./ week Credit: 1	Continuous Assessment: 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	To introduce students to the socio-political context of Ambedkar's era, including British colonialism, the Indian freedom struggle, and social hierarchies like caste and untouchability.
CO2	To analyze Dr. Babasaheb Ambedkar's contributions to the Indian Constitution and his vision for social justice and empowerment.
CO3	To explore Ambedkar's ideas in relation to Marxism, economic policies, and their continuing relevance in contemporary society.

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the socio-political context of Ambedkar's era, including caste hierarchies, untouchability, social reform movements, and the Indian freedom struggle.
CO2	Analyze Ambedkar's role in framing the Constitution of India and his vision for social justice and empowerment of marginalized communities.
CO3	Evaluate Ambedkar's thoughts on Marxism, class and caste struggles, economic ideas, and their relevance in modern Indian society.

Course Contents

Unit 1: Introduction

Introduction to the socio-political context of Ambedkar's era, British Colonialism, Indian National Movement, Caste Hierarchy, Untouchability, Social Reform Movements, Role in the Indian freedom struggle

Unit 2: **The Contribution of Dr. Babasaheb Ambedkar**
Contributions to the Constitution of India, Vision for social justice and empowerment

Unit 3 Legacy and relevance today
Dr. Ambedkar and Marxism: An Exploration of His Thoughts on Marxism, Common ground with Marxism, Focus on class struggle, Caste vs Caste, Primacy of Caste in Indian Society, Economic ideas and policies

Course Code: 25AF1701PCL310
Course Title: Mining Geology Lab

Practical Scheme	Examination Scheme
Practical: 2 hrs./batch Credit: 01	Continuous Assessment: 25 Marks Practical/Oral Exam: 25 Marks

Course Objectives

COBJ1	To develop practical skills in identifying minerals, fossils, and understanding their geological significance.
COBJ2	To introduce methods for analyzing subsurface data, borehole problems, and mapping rock formations.
COBJ3	To provide the ability to prepare groundwater maps, evaluate hydrogeological conditions.
COBJ4	To familiarize students with the location of major coal fields, metallic and non-metallic mineral deposits in India.
COBJ5	To develop map interpretation skills for coal seam problems, groundwater contours, and geological features relevant to mining and exploration.

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify economic minerals and fossils and explain their geological significance.
CO2	Analyze borehole and rock formation data to determine thickness and subsurface characteristics.
CO3	Prepare groundwater maps, evaluate hydrogeological conditions.
CO4	Locate major coal fields and metallic/non-metallic mineral deposits, and solve coal seam problems on maps.
CO5	Apply geological and hydrogeological knowledge to interpret field data and communicate findings effectively using maps and reports.

List of Practical's/Experiments/Assignments (any ten experiments from the list)

1. Megascopic identification of economic minerals
2. Megascopic identification of fossils.
3. Three points bore hole problem and Thickness of rock formation problem.
4. On the basis of the given well data, to prepare the water table map of the area. Mark the direction of ground water flow and ground water conditions.
5. Discuss the hydrogeological condition of the area and mark a suitable site for a well.
6. Demarcate the area in which we can get flowing water wells. What type of ground water well will come across the well shown in the figure? Discuss the ground water condition at well site.
7. Location of major coal fields in India and outline map of physiographic division.
8. Location of important metallic and non-metallic mineral deposits on outline map of India.
9. Coal seam problem no. 1 on map. Coal seam problem no. 2 on map.
10. Draw ground water surface contours of 10 m interval, discuss the hydrogeological conditions of the area.

Reference Book/s:

1. A Text Book of Geology : P.K. Mukherjee
2. Principles of Engineering Geology : K.M. Bangar
3. Engineering Geology Manual : B.S. Satyanarayana Swami
4. Principles of Petrology : G.W. Tyrell
5. Geological Maps : G.W. Chiplunkar
6. Physical & Engineering Geology : S.K. Garg

Course Code: 25AF1701PCL311
Course Title: Fluid Mechanics and Mechanics of Solid Lab

Practical Scheme	Examination Scheme
Practical: 2 hrs./batch Credit: 01	Continuous Assessment: 25 Marks Practical/Oral Exam: 25 Marks

Course Objectives

COBJ1	To provide hands-on experience with mechanical testing of materials, including tensile, hardness, impact, and compressive strength tests.
COBJ2	To develop the ability to operate and understand the working of testing machines such as UTM, CTM, and impact testers.
COBJ3	To familiarize students with fluid flow measurement techniques using Venturimeter, Orifice meter, and Pitot tube.
COBJ4	To understand the principles of fluid dynamics, including Reynolds number, laminar and turbulent flow, and Bernoulli's theorem.
COBJ5	To cultivate analytical and observational skills required for practical problem-solving in material mechanics and fluid mechanics.

Course Outcomes: At the end of the course, students will be able to:

CO1	Conduct mechanical tests on metals and materials to determine tensile strength, hardness, impact strength, and compressive strength.
CO2	Operate Universal Testing Machines, Compression Testing Machines, and impact testing setups safely and effectively.
CO3	Measure fluid flow rates and coefficients using Venturimeter, Orifice meter, and Pitot tube.
CO4	Calculate Reynolds number to classify fluid flow and verify Bernoulli's theorem experimentally.
CO5	Analyze experimental data to interpret material behavior and fluid flow characteristics, and present results accurately.

List of Practical's/Experiments/Assignments (any ten experiments from the list)

1. The study of Universal Testing Machine (UTM)
2. To determine Tensile test on a metal (UTM)
3. The study of Hardness test of mild steel
4. To determine impact strength of steel (Izod impact test)
5. To determine impact strength of steel (Charpy test)
6. To determine compressive strength of brick (CTM)
7. To measure the discharge through a Venturimeter
8. To measure discharge through orifice meter
9. To determine coefficient of discharge of the pitot tube
10. To find out Reynold's Number
11. To verify Bernoulli's Theorem

Reference Books:

1. Fluid Mechanics & Hydraulic Machines by Dr. R. K. Bansal
2. Fluid Mechanics & Fluid Power Engineering by Dr. D.S. Kumar
3. Mechanics of Solid (Vol-1 & 2) by Dr. H.J. Shaha And S.B. Junarkar
4. Strength of Material by J.P.Den Hartog

5. Strength of Material by Spriger
6. Strength of Material by Shaha And Kurve
7. Strength of Materials by S. Ramamrutham, Publishers Dhanpat Rai & Co., 2008
8. Strength of Materials by R K Rajput, Publishers S Chand & Company, New Delhi
9. Strength of Materials by Dr R K Bansal, Publishers Laxmi.

Course Code: 25AF1701PC401
Course Title: Basic Mining Machinery

Teaching Scheme	Examination Scheme
Lecture: 2 hrs./ week Tutorial:1 hr./week Credits: 03	Internal Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration: 03 Hours)

Course Objectives

COBJ1	To introduce the fundamentals of mine transport systems including pit-top and pit-bottom circuits, and handling plants.
COBJ2	To develop knowledge of rope haulages, haulage systems, locomotives, and manriding arrangements in underground mines.
COBJ3	To familiarize students with conveyor systems, aerial ropeways, their construction, operation, and computations.
COBJ4	To impart understanding of winding systems, duty cycles, torque-time relationships, and deep/multilevel winding.
COBJ5	To provide knowledge of shaft fittings, head frames, suspension gear, cages and skips, and associated safety devices.

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the design and operation of pit-top and pit-bottom circuits, tippers, handling plants, and railway sidings, and understand wire rope selection, maintenance, and safety.
CO2	Analyze types of rope haulages, locomotives, and manriding systems, including computations, safety devices, and track maintenance.
CO3	Describe the construction, operation, and computations for conveyors and aerial ropeways, including high-angle and shiftable conveyors.
CO4	Apply principles of drum and friction winding, compute duty cycles, torque-time diagrams, and understand drives for multilevel and deep winding.
CO5	Identify shaft fittings, head frame types, cages, skips, and suspension gear, and explain safety devices including emergency braking, over-speed control, and automatic contrivances.

Course Contents

Unit-1

Pit-Top and Pit-Bottom Circuits: Simple pit-bottom circuits, pit-top circuits, tippers, screening and handling plants, railway sidings. Wire Ropes: Wore ropes of different types and their construction and selection, space factor, fill factor, bending factor and factor of safety. Rope deterioration, estimation of size of rope, rope capping, recapping and rope splicing.

Unit 2

Haulages: Types of rope haulages, selection, computations, and safety devices, Mine tubs, Mine cars, links, clips and rope capel. Application of rope haulages. Track laying and maintenance. Manriding system in underground mines, Types, construction and safety devices. Locomotives: Different types. Diesel, electric trolley wire, construction and operation, application and maintenance. Locomotive haulage computations, safety devices. Track laying and maintenance.

Unit 3

Conveyors: Construction and operation of belt, chain and cable belt conveyors. Conveyor computations. High angle conveyors, shiftable conveyors. Aerial Ropeways: Types, construction, application and operation, safety devices.

Unit 4

Winding: Drum and friction winding with their variations and limitations, duty cycle, torque time diagrams and computations. Multilevel and deep winding. Drives for winding.

UNIT 5

Head frames; types and fittings. Shaft fittings; signals, guides, Keps, tilting platform, cage receivers, protective roofing. Suspension gear, cages and skips. Safety devices on winders, emergency braking, over speed control, slow banking, depth indicators, automatic contrivances.

Text Books:

1. Mine Winding & Transport: Walker
2. Mine Transport by N. T. Karelin
3. Mine Hoisting: M. A. Ramlu, Oxford & IBH, 1996

Reference Books:

1. SME Mining Engineer's Handbook by Hustrulid
2. Underground Mining Methods Handbook by Hustrulid

Course Code: 25AF1701PC402
Course Title: Mine Surveying

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./ week Credits: 03	Internal Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration: 03 Hours)

Course Objectives

COBJ1	To introduce the principles, classification, and methods of surveying for mining and civil engineering applications.
COBJ2	To impart knowledge of levelling techniques, contour mapping, and underground levelling practices.
COBJ3	To provide understanding of theodolite surveying, traversing, coordinate computation, and modern instruments like EDM and total stations.
COBJ4	To develop knowledge of tacheometry, curve setting, and their applications in surface and underground works.
COBJ5	To familiarize students with plane table surveying and basic field astronomy relevant to surveying.

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the objectives, principles, and methods of linear and angular surveying, and apply chain and compass surveying techniques in the field.
CO2	Perform various types of levelling, prepare contour maps, and solve practical problems including shaft depth measurement and underground levelling.
CO3	Operate theodolites and total stations, carry out traversing, and compute coordinates with accuracy using conventional and modern instruments.
CO4	Apply principles of tacheometry for distance and elevation determination, and set out curves on surface and in underground workings.
CO5	Demonstrate skills in plane table surveying and determine true north using basic astronomical methods for practical field applications.

Course Contents

Unit 1

Surveying: Definition, objective, classification and principles of surveying. Linear measurement: Instruments for measuring distances, ranging and chaining out survey lines, chain surveying- principle, field work, off-sets, booking and plotting, obstacles in chaining, problem solving. Angular measurement: Prismatic compass – principle and construction; bearing of lines; local attraction; magnetic declination.

Unit 2

Levelling: Definition of levelling terms; levelling instruments; different types of levelling; booking and reduction methods; differential, profile, cross sectional and reciprocal levelling; underground levelling, shaft depth measurement; temporary and permanent adjustments of levels, problem solving. Contours: Characteristics, methods of contouring and uses of contours.

Unit 3

Theodolite: Essentials of the transit and modern micro-optic theodolites; measurement of horizontal and vertical angles; theodolite traversing, traverse calculations, adjustment of the traverse; computation of co-ordinates; temporary and permanent adjustments. EDM: Principle of measurement; types; corrections; selection of equipment; total station.

Unit 4

Tacheometry: Principles and classification of tacheometry, stadia tacheometry; distance and elevation formulae; tacheometric surveying; self reduction tacheometers. Curve setting: Elements, laying of simple circular curves on surface and belowground. Transition curve and super elevation.

Unit 5

Plane table survey: Introduction, methods of plane table surveying, micro optic alidade. Field Astronomy: Definition of various astronomical terms, methods for determination of true north of survey line.

Text Books:

1. Surveying Volume I, II, III by Dr. B. C. Punmia
2. Surveying Volume I and II by Dr T. P. Kanetkar and S V Kulkarni

Reference Book:

1. Metalliferous Mine Surveying by Winniberg

Course Code: 25AF1701PC403
Course Title: Rock Mechanics

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./ week Tutorial:1 hr./week Credits: 03	Internal Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration: 03 Hours)

Course Objectives

COBJ1	To introduce the fundamentals of rock mechanics, behavior of rocks and rock masses, and key terminology relevant to mining and civil engineering.
COBJ2	To provide knowledge of laboratory testing methods for determining static elastic properties and strength parameters of rocks.
COBJ3	To familiarize students with in-situ measurement techniques for stresses, deformability, and dynamic elastic characteristics of rocks.
COBJ4	To explain the time-dependent behavior of rocks, concepts of creep and rheology, and the importance of engineering classification of rock masses.
COBJ5	To impart understanding of rock failure criteria, theoretical models of rock behavior, and fundamental concepts of soil mechanics with engineering applications.

Course Outcomes: At the end of the course, students will be able to:

CO1	Describe the fundamentals of rock mechanics, stress–strain relationships, and key physico-mechanical properties of rocks and rock masses.
CO2	Conduct laboratory tests to determine strength indices, porosity, permeability, and evaluate post-failure behavior of rocks.
CO3	Apply in-situ stress measurement methods and analyze field deformability and dynamic elastic properties of rock masses.
CO4	Explain time-dependent properties of rocks, creep behavior, and apply rheological models for engineering problem-solving.
CO5	Evaluate rock failure using standard failure criteria and demonstrate knowledge of soil mechanics fundamentals for engineering applications.

Course Contents

Unit 1

Rock Mechanics: Definition, significance and status. Rock & Rock Masses: Study of behavior; inherent complexities in Rock MechanicsStresses & Strains: Fundamentals of stress and strain in two & three dimensions, sign convention, stress-strain relationships in average types ofrocks, types of Moduli'I' of elasticity, principal stresses, Poisson's Ratio, Mohr's Circle, Types of Strengths of Rock Important Rock Mechanics Terminology: Types of stresses, Joints & joint sets, Hardness, Porosity & Permeability, Isotropy & Anisotropy, Brittleness &Ductility, Linear & Non Linear Elasticity, Stiffness, Thermal Conductivity etc.

Unit 2

Laboratory Tests for Static ElasticProperties of Rocks: Determination of various physic-mechanical propertiessuch as different types of strengths (compressive, tensile and shear), Tri-axialCompression Test & its applications, Brittle-Ductile Transition Pressure, IndexTests such as Protodyakonov Strength Index Test, Impact Strength Index Test,Slake Durability Index Test, Point Load Index Test 9 Impact Strength Index Test,Slake Durability Index Test, Point Load Index Test etc., Measurement ofporosity and permeability, Study of Post Failure Behaviour & its practicalsignificance, significance of stiffness of Loading System.

Unit 3

Field or In-situ Measurements: Measurement of Pre-mining or in-situ states of stresses, Difficulties involved, Methods of determination e.g. Flat JackMethod, Over coring method and Hydro-fracturing method. In-situ Deformability & Strength Tests: Rock Deformability & itsmeasurement in field, In-situ tests for determination of different typesofstrengths of rock masses. Dynamic Elastic Characteristics of Rocks: Dynamic properties and their difference from static properties, preparation of different types of elastic waves through rock bodies, Determination of dynamic elastic constants of rocksin laboratory.

Unit 4

Time-Dependent Properties of Rocks: 9 Effect of prolonged loading of rock masses on their deformation behavior, creep, Different stages of Creep, Measurement of creep of rocks, Rheology, Rheological Models, Relevance of study of rheological models to mining engg., study of different types of rheological models. Engineering Classification of Rock Masses: Introductory Concept & relevance of engineering classification of rock masses, some examples of single-criteria classification schemes.

Unit 5

Rock Failure Criteria & Theories: Concept of Failure, Definition & standard forms of failure criteria for rock masses, Coulomb Criterion, Mohr's Criterion, Griffith's Theory of Failure, other empirical criteria of failure including Hock & Brown's Criterion. Concepts of Soil Mechanics: Physico-mechanical properties of soils, Types of soils, Important index properties including consistency & gradation, engineering properties and classification of soils, soil properties of engineering.

Text and Reference Book/s:

1. Rock Mechanics for Underground Mining – B.H.G. Brady and E.T. Brown, Chapman & Hall
2. Introduction to Rock Mechanics – R.E. Goodman, Wiley International
3. Handbook on Mechanical Properties of Rocks – R.D. Lama and V.S. Vutukuri, Trans Tech Pub.
4. Engineering in Rocks for slopes, Foundations & Tunnels – T. Ramamurthy, PHI
5. Fundamentals of Rock Mechanics – J.C. Jaeger and N.G.W. Cook, Chapman & Hall

Course Code: 25AF1701PC404
Course Title: Industrial Engineering & Management

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./ week Credits: 03	Internal Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration: 03 Hours)

Course Objectives

COBJ1	To provide students with an understanding of modern management theories, principles, and organizational structures relevant to mining enterprises.
COBJ2	To familiarize students with concepts of personnel management including manpower planning, training, motivation, and leadership.
COBJ3	To introduce the fundamentals of production management with reference to forecasting, planning, quality control, and productivity in mining.
COBJ4	To develop knowledge of industrial relations, trade unions, conflict management, and relevant industrial legislation.
COBJ5	To explain the role of industrial psychology in management, including psychological testing, fatigue, accident proneness, and human behavior at work.

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply principles of management and organizational design to mining enterprises.
CO2	Analyze personnel management practices such as recruitment, training, performance appraisal, and motivation in industrial settings.
CO3	Implement production management techniques for planning, quality control, and productivity improvement in mines.
CO4	Interpret and apply concepts of industrial relations, trade unionism, and conflict resolution in mining organizations.
CO5	Assess the impact of psychological factors on worker behavior, safety, and efficiency using industrial psychology tools and techniques.

Course Contents

Unit 1

Introduction: Evolution of modern management theory and practice; Principles of scientific management; Elements of management functions – planning, organisation and control; Systems and contingency approach to management; Structure and design of organisation for mining enterprises; Introduction to essential features of M.I.S. (Management Information System).

Unit 2

Personnel Management: Manpower planning and recruitment, selection, training and development of human resource; Performance appraisal and merit rating; Motivation & Incentive; Leadership; Absenteeism; Organisation development.

Unit 3

Production Management: Production forecasting, planning and control – short and long term – in mines; Determination of norms and standards of operations by work study; Analysis of mine capacities and capabilities; Quality control; Productivity – concept and measurement.

Unit 4

Industrial Relations: Human relations; Trade Union movement in India – its origin & evolution; Industrial Disputes Act; Discipline and enquiries, conflicts in an organization – sources and resolutions, communication.

Unit 5

Industrial Psychology: Psychology and its relation with business, industry and management; Physical factors and their effect on management; Psychological tests – utility and development; Tests for selection and development; Fatigue; Accident proneness.

Text Book/s: Reference Book/s:

1. Human Resource Management, S.S. Khanka
2. Industrial Engineering & Production Management, Telsang Mert T
3. Text book on Human Psysiology, Sarda Subrahamanyam, H D Singh, K Madhavankutty
4. Business Organisation & Management, Shukla M.C.
5. Basics of Production & Operations Management, S A Chunawalla
6. Essentials of Business Communication Skills for Engineers, Urmila Rai & S.M. Rai
7. Human Resource Management & Industrial Relations, P.N. Subramani

Course Code: 25AF1000VE407
Course Title: Universal Human Values-II

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./ week Credits: 03	Internal Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration: 03 Hours)

Course Objectives

COBJ1	To enable students to understand the need, content, and process of value education for a fulfilling life.
COBJ2	To develop clarity about harmony within the human being and the relationship between self and body.
COBJ3	To strengthen human values in family and society with trust, respect, and universal human order.
COBJ4	To recognize the interconnectedness and harmony in nature and existence for sustainable living.
COBJ5	To apply holistic understanding in professional and personal life through ethical conduct, humanistic education, and value-based practices.

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the significance of value education and methods to achieve continuous happiness and prosperity.
CO2	Distinguish between the needs of the self and the body, ensuring harmony within the human being.
CO3	Demonstrate the importance of trust, respect, and harmony in family and society for universal human order.
CO4	Analyze the harmony and interdependence in nature and existence for sustainable development.
CO5	Apply holistic understanding of values in professional ethics, education, and life practices.

Course Contents

Unit 1: Introduction to Value Education

- Understanding Value Education
- Self-exploration as the Process for Value Education
- Continuous Happiness and Prosperity – the Basic Human Aspirations
- Right Understanding, Relationship and Physical Facility
- Happiness and Prosperity – Current Scenario
- Method to Fulfill the Basic Human Aspirations

Unit 2: Harmony in the Human Being

- Understanding Human being as the Co-existence of the Self and the Body
- Distinguishing between the Needs of the Self and the Body
- The Body as an Instrument of the Self
- Understanding Harmony in the Self
- Harmony of the Self with the Body
- Program to Ensure self-regulation and Health.

Unit 3: Harmony in the Family and Society

- Harmony in the Family – the Basic Unit of Human Interaction
- Values in Human-to-Human Relationship
- 'Trust' – the Foundational Value in Relationship
- 'Respect' – as the Right Evaluation
- Understanding Harmony in the Society
- Vision for the Universal Human Order

Unit 4: Harmony in the Nature (Existence)

- Understanding Harmony in the Nature
- Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature
- Realizing Existence as Co-existence at All Levels
- The Holistic Perception of Harmony in Existence

Unit 5: Implications of the Holistic Understanding – a Look at Professional Ethics

- Natural Acceptance of Human Values
- Definitiveness of (Ethical) Human Conduct
- A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
- Competence in Professional Ethics
- Holistic Technologies, Production Systems and Management Models-Typical Case Studies
- Strategies for Transition towards Value-based Life and Profession

Texts:

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978- 93-87034-53-2

References

3. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
4. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
5. The Story of Stuff (Book).
6. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
7. Small is Beautiful - E. F Schumacher.
8. Slow is Beautiful - Cecile Andrews
9. Economy of Permanence - J C Kumarappa
10. Bharat Mein Angreji Raj – Pandit Sunderlal
11. Rediscovering India - by Dharampal
12. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
13. India Wins Freedom - Maulana Abdul Kalam Azad
14. Vivekananda - Romain Rolland (English)
15. Gandhi - Romain Rolland (English)

Course Code: 25AF1000VE408
Course Title: Life of Chhatrapati Shivaji Maharaj

Teaching Scheme	Examination Scheme
Lecture: 1 hr./ week Credit: 01	Continuous Assessment: 50 Marks

Course Objectives

COBJ1	To study Shivaji Maharaj as a great conqueror, strategist, and innovator in military tactics.
COBJ2	To understand his management, leadership, and military administration strategies, including logistics, intelligence, and fortifications.
COBJ3	To analyze Shivaji Maharaj's contributions towards social justice, women's rights, religious tolerance, democracy, and nationalism.

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain Shivaji Maharaj's military strategies such as guerrilla warfare, fortress policy, naval power, and diplomacy.
CO2	Analyze his management and leadership skills in areas like intelligence networks, cavalry, logistics, and fortification systems.
CO3	Discuss the architectural, metallurgical, and technological innovations during his reign, particularly Raigad Fort.

Course Contents

Unit 1

Shivaji Maharaj as a Great Conqueror, Master Strategist and innovator in Military Tactics, Guerrilla Warfare (Ganimi Kava), Fortress Strategy, Avoidance of Direct Confrontation, Diplomacy and Alliances, Naval Power.

Unit 2:

Shivaji Maharaj's Management and leadership strategies, Architecture and metallurgy of Raigad Fort, Use of Light Cavalry, Intelligence Network, Asymmetric Warfare, Logistics and Supply Chains, Fortifications and Military Architecture.

Unit 3

Shivaji Maharaj's views about Women's rights, their dignity and religious views. His views on Democracy & Nationalism

Course Code: 25AF1701PCL409
Course Title: Mine Surveying Lab

Practical Scheme	Examination Scheme
Practical: 2 hrs./batch Credit: 01	Continuous Assessment: 25 Marks Practical/Oral Exam: 25 Marks

Course Objectives

COBJ1	To provide hands-on training in distance measurement techniques using chaining, ranging, and obstacle methods.
COBJ2	To enable students to use prismatic compass and theodolite for traversing, angle measurement, and bearings.
COBJ3	To impart skills in levelling, contouring, and elevation determination of different terrains.
COBJ4	To familiarize students with plane table surveying methods and their applications.
COBJ5	To develop competence in instrument handling, calibration, error adjustment, and field data recording.

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply direct and indirect ranging methods to measure distances, even in obstructed conditions.
CO2	Use prismatic compass for traversing and building surveys to determine magnetic bearings.
CO3	Perform levelling operations, including profile levelling and contouring, for terrain mapping.
CO4	Conduct plane table surveys and theodolite angle measurements with accuracy.
CO5	Determine and compute constants for accurate field applications

List of Practical's/Experiments/Assignments (any ten experiments from the list)

1. A. To measure distance between station A and B by direct ranging.
   B. To measure distance between station A and B by indirect ranging.
2. A. To determine distance between station A and B when vision is free and obstructed.
   B. To determine distance between station P and R when vision and chaining both obstructed.
3. To observe the magnetic bearing of a close traverse by prismatic compass.
4. Building traversing by prismatic compass.
5. To determine elevation of given points by simple levelling.
6. A) Longitudinal and cross-sectional levelling. B) Contouring.
7. Plane table survey by radiation method.
8. Study of theodolite and to measure a horizontal angle by repetition method.
9. To find out multiplying constant (f/i) and additive constant (f + d) of the instrument
10. To determine reduce level of a given object at higher elevation by measuring vertical angle.

Reference Book/s:

1. Surveying Volume I, II, III by Dr. B. C. Punmia
2. Surveying Volume I and II by Dr T. P. Kanetkar and S V Kulkarni

Course Code: 25AF1701PCL410
Course Title: Rock Mechanics Lab

Practical Scheme	Examination Scheme
Practical: 2 hrs./batch Credit: 01	Continuous Assessment: 25 Marks Practical/Oral Exam: 25 Marks

Course Objectives

COBJ1	To impart knowledge of physical and mechanical properties of rocks through laboratory testing.
COBJ2	To familiarize students with experimental techniques for evaluating strength, elasticity, durability, and anisotropy of rocks.
COBJ3	To develop practical skills in using instruments for stress, strain, and sonic velocity determination.
COBJ4	To study the influence of specimen geometry, loading conditions, and environmental factors on rock behavior.
COBJ5	To provide exposure to advanced rock testing methods such as triaxial compression, point load, and Brazilian tests for engineering applications.

Course Outcomes: At the end of the course, students will be able to:

CO1	Determine basic physical properties of rocks such as water absorption, density, porosity, and specific gravity.
CO2	Conduct mechanical strength tests on rock specimens including UCS, point load, Brazilian, and triaxial tests.
CO3	Analyze elastic constants, anisotropy, and durability characteristics of rocks through laboratory experiments.
CO4	Interpret the effect of sample dimensions, strain rates, and saturation conditions on rock strength.
CO5	Apply laboratory results to assess rock behavior in field conditions relevant to mining and civil engineering projects.

List of Practical's/Experiments/Assignments (any ten experiments from the list)

1. Study of determination of some physical properties of rock - like water absorption, density and specific gravity.
2. Study of determination of porosity and void index of rocks.
3. Study of rock stress determination Insitu using flate jak technique.
4. Study of determination of sonic wave velocity of rock specimen with suitable diagram.
5. Study of determination of UCS and elastic constants.
6. Study of determination of indirect tensile strength by point load and Brazilian tests.
7. Study of the effect of L/D Ratio, strain rate, and saturation of rock specimen on compressive strength.
8. Study of determination of strength anisotropy of rock specimens by direct shear test in single, double, oblique and punch shear.
9. Study of determination of slake durability index of rock samples.
10. Study of Triaxial compression testing of rock specimen.

Text and Reference Book/s:

1. Rock Mechanics for Underground Mining – B.H.G. Brady and E.T. Brown, Chapman & Hall
2. Introduction to Rock Mechanics – R.E. Goodman, Wiley International
3. Handbook on Mechanical Properties of Rocks – R.D. Lama and V.S. Vutukuri, Trans Tech Pub.
4. Engineering in Rocks for slopes, Foundations & Tunnels – T. Ramamurthy, PHI
5. Fundamentals of Rock Mechanics – J.C. Jaeger and N.G.W. Cook, Chapman & Hall

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