DEPARTMENT OF MINING ENGINEERING

Scheme of Instruction and Syllabus of

B.E. (Mining Engineering)

Full Time

UNIVERSITY COLLEGE OF ENGINEERING

(AUTONOMOUS)

OSMANIA UNIVERSITY HYDERABAD – 500 007, TELANGANA

(With effect from the Academic Year 2021-22)

SEMESTER WISE SCHEMA WITH CREDITS

Scheme of Instruction for BE (Mining Engineering) for 8 Semesters

S. No.	Programme Work-Subject Area	Credits/Semester								Credits
		I	II	III	IV	V	VI	VII	VIII	
1.	Humanities and Social Sciences (HS)		3							**3**
2.	Basic Sciences (BS)	9.5	9.5	3						**22**
3.	Engineering Sciences (ES)	9	7	7	6					**29**
4.	Professional Subjects- Core (PC)			13	14	17	14	5		**71**
5.	Professional Subjects-Electives(PE)						3	12		**12**
6.	Open Subjects-Electives (OE)						3	3	2	**6**
7.	Project Work, Seminar and/or Internships (PW)				1	2	2	3	6	**17**
9.	Mandatory Programmes (MC) (*Credit*)				3	3				
	TOTAL	**18.5**	**19.5**	**23**	**24**	**22**	**22**	**23**	**8**	**160**
8.	Mandatory Programmes (MC) (*Non-Credit*)			1				1	1	
	Contact Hours/ Week	**25**	**26**	**28**	**25**	**23**	**28**	**31**	**16**	

With effect from the Academic Year 2021-22

Scheme of Instruction for BE (Mining Engineering) - I Semester

S.No.	Course Code	Course Title	Scheme of Instruction				Contact Hrs/ Week	Scheme of Examination		Credits
			L	T	Dr	P		CIE	SEE	
THEORY										
1	MC100HS	Induction Program	3 weeks							
2	MT101BS	Engineering Mathematics-I	3	1	-	-	4	30	70	4
3	PH102BS	Engineering Physics	3	1	-	-	4	30	70	4
4	CE101ES	Engineering Mechanics	3	1	-	-	4	30	70	4
PRACTICALS										
5	PH151BS	Engineering Physics Lab	-	-	-	3	3	25	50	1.5
6	CE151ES	Engineering Graphics	-	-	2x3	-	6	50	50	3
7	ME151ES	Workshop Practice	-	-	-	4	4	25	50	2
		Total	**9**	**3**	**6**	**7**	**25**	**190**	**360**	**18.5**

Scheme of Instruction for BE (Mining Engineering) - II Semester

S.No.	Course Code	Course Title	Scheme of Instruction				Contact Hrs/ Week	Scheme of Examination		Credits
			L	T	Dr	P		CIE	SEE	
THEORY										
1	MT201BS	Engineering Mathematics-II	3	1	-	-	4	30	70	4
2	CH102BS	Engineering Chemistry	3	1	-	-	4	30	70	4
3	EG201HS	English	2	-	-	-	2	30	70	2
4	CE201ES	Programming & Problem Solving	3	-	-	-	3	30	70	3
PRACTICALS										
5	CH151BS	Engineering Chemistry Lab	-	-	-	3	3	25	50	1.5
6	MN252ES	Computer-Aided CivilEngg. Drawing	-	-	4	-	4	50	50	2
7	EG251HS	English Lab	-	-	-	2	2	25	50	1
8	CS251ES	Computer programming Laboratory	-	-	-	4	4	25	50	2
		Total	**11**	**2**	**4**	**9**	**26**	**245**	**480**	**19.5**

L : Lectures
P : Practical's
T : Tutorials

SEE : Semester End Examination
CIE : Continuous Internal Evaluation

Scheme of Instruction for BE (Mining Engineering) - III Semester

S.No.	Course Code	Course Title	Scheme of Instruction			Cont. Hrs/ Wk	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	MT301BS	Engineering Mathematics-III (PDE, Probability)	3	-	-	3	3	30	70	3
2	PC301MN	Development of Mineral Deposits	3	-	-	3	3	30	70	3
3	PC302MN	Underground Coal Mining	3	-	-	3	3	30	70	3
4	PC303MN	Mine Environmental Engineering-I	3	-	-	3	3	30	70	3
5	PC304MN	Engineering Geology	3	-	-	3	3	30	70	3
6	ES302CE	Introduction to Fluid Mechanics	3	-	-	3	3	30	70	3
7	EE201ES	Basic Electrical Engineering	3	-	-	3	3	30	70	3
8	MC 302CE	Mandatory Course (MC) (*Non-Credit*) Environmental Sciences	2	1	-	3	3	30	70	0
PRACTICALS										
9	ES351CE	Fluid Mechanics- lab	-	-	2	2	3	25	50	1
10	PC351MN	Engineering Geology Lab	-	-	2	2	3	25	50	1
			23	**1**	**04**	**28**		**260**	**590**	**23**
* At the end of III semester (during vacation) students should undergo Internship-I (UG Mines). Marks will be awarded in IV semester.										

Scheme of Instruction for BE (Mining Engineering) - IV Semester

S.No.	Course Code	Course Title	Scheme of Instruction			Cont Hrs/ Wk	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	PC401MN	Surface Mining Technology	3	-	-	3	3	30	70	3
2	PC 402MN	Mining Machinery I	3	-	-	3	3	30	70	3
3	PC403MN	Mine Environmental Engineering-II	3	-	-	3	3	30	70	3
4	PC404MN	Mine Surveying	3	-	-	3	3	30	70	3
5	ES 404ME	Strength of Materials	3	-	-	3	3	30	70	3
6	MC301HS	Managerial Economics And Accountancy	3			3	3	30	70	3
7	ES 401 EC	Basic Electronics Engineering	3	-	-	3	3	30	70	3
PRACTICALS										
8	PC 451MN	Mine Surveying Lab	-	-	2	2	3	25	50	1
9	PC452MN	Mining Environmental Lab	-	-	2	2	3	25	50	1
10	PW921MN	Internship-I	-	-	-	-	2	50	-	1
			21	**0**	**04**	**25**	**27**	**310**	**590**	**24**
Note: Evaluation of Internship-I Grade: Satisfactory/ Good/ Excellent										
* At the end of IV semester (during vacation) students should undergo Survey camp. Marks will be awarded in V semester.										

With effect from the Academic Year 2021-22

Scheme of Instruction for BE (Mining Engineering) - V Semester

S.No.	Course Code	Course Title	Scheme of Instruction			Contact Hrs/ Wk	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	PC501MN	Drilling and Blasting	3	-	-	3	3	30	70	3
2	PC502MN	Mining Machinery II	3	-	-	3	3	30	70	3
3	PC503MN	Mineral processing	3	-	-	3	3	30	70	3
4	PC504MN	Advanced Surveying Techniques	3	-	-	3	3	30	70	3
5	PC505MN	Rock Mechanics	3	-	-	3	3	30	70	3
6	HS501 EG	Business Communication and Presentation Skills	3	1	-	4	3	40	60	3
PRACTICALS										
7	PC551MN	Mining Machinery Lab	-	-	2	2	3	25	50	1
8	PC552 MN	Mineral Processing Lab	-	-	2	2	3	25	50	1
9	PW941MN	Survey Camp (Report)	-	-	-	-	-	50	-	2
			18	**01**	**04**	**23**	**24**	**280**	**520**	**22**

Note: Evaluation of Survey Camp Grade: Satisfactory/ Good/ Excellent

Scheme of Instruction for BE (Mining Engineering) – VI Semester

S. No	Course Code	Course Title	Scheme of Instruction			Cont Hrs/ Wk	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	PC601 MN	Mine Ground Control	3		-	3	3	30	70	3
2	PC602 MN	Underground Metal Mining	3	-	-	3	3	30	70	3
3	PC603 MN	Rock Excavation engineering	3	-	-	3	3	30	70	3
4	PC604 MN	Computer Applications in Mining	3	-	-	3	3	30	70	3
5	PE 631 MN	IoT Applications in Mining	3	-	-	3	3	30	70	3
	PE 632 MN	Material Management in Mines								
	PE633 MN	Coal Bed Methane And Coal Gasification								
6	OE-I	Open Elective I	3	-	-	3	3	30	70	3
PRACTICALS										
7	PC651 MN	Computer Applications in Mining Lab	-	-	2	2	3	25	50	1
8	PC652 MN	Rock Mechanics Lab	-	-	2	2	3	25	50	1
9	PW653MN	Mini Project	-	-	6	6	-	50	-	2
			18	**0**	**10**	**28**	**24**	**280**	**520**	**22**

* At the end of VI semester students should undergo Internship-II (OC Mines) (Coal/Metal). Marks will be awarded in VII semester.

CODE	OPEN ELECTIVE-I
OE611MN	Introduction to Mining Technology/ Benefit to Society from Mining Industry

With effect from the Academic Year 2021-22

Scheme of Instruction for BE (Mining Engg) - VII Semester

S.No.	Course Code	Course Title	Scheme of Instruction			Contact Hrs/ Wk	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	PC701 MN	Mine Legislation	3	-	-	3	3	30	70	3
2	PE I	Professional Elective-I	3	-	-	3	3	30	70	3
3	PE II	Professional Elective-II	3	-	-	3	3	30	70	3
4	PE III	Professional Elective-III	3	-	-	3	3	30	70	3
5	PE IV	Professional Elective-IV	3	-	-	3	3	30	70	3
6	OE-II	OE II	3	-	-	3	3	30	70	3
7	Mandatory Course I	Constitution of India	3	-	-	3	3	30	70	0
PRACTICALS										
8	PC751MN	Seminar	-	-	2	2	3	50	-	1
9	PC752MN	Comprehensive subject	2	-	-	2	2	50	-	1
10	PW761MN	Project Work-I	-	-	6	6	3	50	-	2
11	PW961MN	Internship-II						50	-	1
			23	**0**	**8**	**31**	**26**	**330**	**420**	**23**

Evaluation of Summer Internship-II Grade: Satisfactory/ Good/ Excellent

Sl No	Course Code	Course Title
PROFESSIONAL ELECTIVE-I		
1	PC702MN	Mine Economics
2	PE523 MN	Mine Disasters & Rescue
3	PE 411 MN	Mine Surface Environment Management
PROFESSIONAL ELECTIVE-II		
1	PC703MN	Numerical Modelling In Mining
2	PE 412 MN	Sustainable Mineral Industry
3	PE413 MN	Mineral Exploration
PROFESSIONAL ELECTIVE-III		
1	PC704MN	Rock Slope Engineering
2	PE 521 MN	Mining Instrumentation And Automation
3	PE 522 MN	Surface Coal mining and Mechanization
PROFESSIONAL ELECTIVE-IV		
1	PE741MN	Mine Planning
2	PE742MN	Geo-Statistics
3	PE743MN	Deep Sea Mining

CODE	OPEN ELECTIVE-II
OE721MN	Solid Fuel Technology

With effect from the Academic Year 2021-22

Scheme of Instruction for BE (Mining Engg) – VIII Semester

S.No.	Course Code	Course Title	Scheme of Instruction			Contact Hrs/ Wk	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	OE III	Open Elective - III	2	-	-	2	3	30	70	2
2	MC II	Artificial Intelligence	2	-	-	2	3	30	70	0
PRACTICALS										
3	PW891MN	Project Work-II	-	-	12	12	-	50	100	6
			4	**0**	**12**	**16**	**6**	**110**	**240**	**8**

CODE	OPEN ELECTIVE-III
OE831MN	

DEPARTMENT OF MINING ENGINEERING

Scheme of Instruction and
Syllabi of

B.E. I to IV- SEMESTER

2021-22

UNIVERSITY COLLEGE OF ENGINEERING
(AUTONOMOUS)
OSMANIA UNIVERSITY HYDERABAD – 500 007, TELANGANA

DEPARTMENT OF MINING ENGINEERING
UNIVERSITY COLLEGE OF ENGINEERING, O.U.
SEMESTER WISE SCHEMA WITH CREDITS

(With effect from the Academic Year 2021-22)

SEMESTER WISE SCHEMA WITH CREDITS

Scheme of Instruction for BE (Mining Engineering) - I Semester

S.No.	Course Code	Course Title	Scheme of Instruction				Contact Hrs/ Week	Scheme of Examination		Credits
			L	T	Dr	P		CIE	SEE	
THEORY										
1	MC100HS	Induction Program	3 weeks							
2	MT101BS	Engineering Mathematics-I	3	1	-	-	4	30	70	4
3	BS102PH	Engineering Physics	3	1	-	-	4	30	70	4
4	CE101ES	Engineering Mechanics	3	1	-	-	4	30	70	4
PRACTICALS										
5	CH151BS	Engineering Physics Lab	-	-	-	3	3	25	50	1.5
6	CE151ES	Engineering Graphics	-	-	2x3	-	6	50	50	3
7	ME151ES	Workshop Practice	-	-	-	4	4	25	50	2
		Total	**9**	**3**	**6**	**7**	**25**	**190**	**360**	**18.5**

L : Lectures T : Tutorials
P : Practical Dr. : Drawing
CIE : Continuous Internal Evaluation SEE : Semester End Examination

Induction Program

3 weeks

(Classroom teaching on various issues, campus visits and outside of the campus visit to bring awareness to the students about the future 4 years learning process at UCE, OU)

ENGINEERING MATHEMATICS – I

Instructions	3L+1T periods per week
Duration of University Examination	3 hours
Sessional	30 Marks
University Examination	70 Marks
Credits	4

Objectives:

- Introduce the concepts of sequences, series and their properties
- Provide the knowledge of curve sketching
- Introduce the concepts of functions of several variables and multiple integrals
- Study vector differential and integral calculus

Course Outcomes: After completing this course, the students will able to

1) Find the nature of sequences and series
2) Expand functions as a Fourier series.
3) Use the knowledge of multiple integrals in finding the area and volume of any region bounded by given curves
4) Apply this knowledge to solve the curriculum problems

UNIT – I

Sequences and Series:

Sequences, Series, General properties of series, Series of positive terms, Comparison tests, tests of Convergence D'Alembert's ratio test, Cauchy's nth root test, Raabe's test, Logarithmic test, Alternating series, Series of positive and negative terms, Absolute convergence and Conditional convergence ; Fourier Series, Half range Sine and Cosine Series, Parseval's theorem.

UNIT – II

Calculus of one variable:

Rolle's theorem, Lagrange's , Cauchy's mean value theorems (without proof) Taylor's series, Curvature, Radius of curvature, Circle of curvature, Envelope of a family of curves, Evolutes and Involutes, Evaluation of definite and improper integrals, Beta, Gamma and Error functions.

UNIT – III

Multivariable Calculus (Differentiation):

Functions of two variables, Limits and continuity, Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions (Chain rule), Change of variables, Jacobian , Higher order partial derivatives, Taylor's series of functions of two variables, Maximum and minimum values of functions two variables, Lagrange's method of multipliers.

UNIT – IV

Multivariable Calculus (Integration):

Double integrals,Change of order of integration, Triple integrals, Change of variables in integrals and applications-areas and volumes.

UNIT – V

Vector Calculus:

Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, Line, Surface and Volume integrals , Green's theorem in a plane, Gauss's divergence theorem, Stoke's theorem (without proofs) and their verification.

Suggested Reading:

1) R.K.Jain& S.R.K Iyengar, Advanced Engineering Mathematics, Narosa Publications, 4th
2) Edition 2014.
3) Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley, 9th Edition, , 2012.
4) B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 43rd Edition, 2014.
5) G.B.Thomas , Maurice Weir and Joel Hass, Thomas' Calculus , Peterson, 12th Edition,2010.
6) B.V. Ramana, Higher Engineering Mathematics, 23rd reprint, 2015.
7) N.P.Bali and M. Goyal, A text book of Engineering Mathematics, Laxmi Publications 2010.
8) H.K. Dass, Er. Rajnish Varma, Higher Engineering Mathematics, Schand Technical Third Edition.

BS 102 PH

ENGINEERING PHYSICS

Instructions	(3L+1T)/week
Duration of University Examination	3 Hours
Sessional	40 Marks
University Examination	60 Marks
Credits	4

Course Objectives:

- To make student understand the basic concepts of waves and oscillations.
- To understand the different types of crystals and the analysis of crystal parameters to investigate crystal structures. To classify the type of the defect present in the crystal.
- To make student understand the formation of energy bands and classification of the solids based on the band theory. To understand the concept of semiconductors, ultrasonics and its wide applications.
- To study different types of dielectric polarizations and dielectric properties of materials.
- To know the significance of Maxwell's equations in engineering applications.
- To make student understand the basic concepts of superconductivity and nanomaterials.

Course Outcomes:

At the end of this course, the student will be able to:

1) Solve engineering problems using the concepts of waves and oscillations.
2) Explain the basic understandings of the matter, crystal structure and its fundamental properties including crystal systems and Miller indices.
3) Show their understanding of the conductivity nature of metals and the classification of the solids learned from the Band Theory of Solids. Apply the basic concepts of ultrasonics for various applications.
4) Demonstrate the knowledge in dielectric materials applications and its importance and explain the transportation of electromagnetic waves.
5) Apply the basic concepts of superconductivity and nano-materials in engineering applications.

UNIT - I

Waves and Oscillations: Simple harmonic oscillators - Complex number notation and phasor representation of simple harmonic motion, damped harmonic oscillator – Heavy, critical and light damping - Energy decay in a damped harmonic oscillator - Quality factor - Forced oscillators – Impedance - Steady state motion of forced damped harmonic oscillator - Power absorbed by oscillator.

UNIT - II

Crystallography: Introduction – Types of crystal systems - Bravais lattices – Lattice planes and Miller Indices (Cubic system) – Inter planar spacing (Cubic system) - Bragg's law - Powder diffraction method.

Crystal defects: Classification of point defects - Concentration of Schottky defects in metals and ionic crystals - Concentration of Frankel defects – Line defects – Screw and Edge dislocations – Burger's vector.

UNIT - III

Band Theory of Solids & Semiconductors: Classical free electron theory (qualitative) – Kronig-Penney model (qualitative treatment) - Energy band formation in solids - Intrinsic and Extrinsic semiconductors - Concept of a hole - Carrier concentration and conductivity in intrinsic semiconductors – Formation of P-N junction diode and its I-V characteristics – Thermistor and its characteristics - Hall effect and its applications.

***Ultrasonics*:** Introduction to Ultrasonic waves – Production of ultrasonic waves by Piezoelectric method – Detection of ultrasonic waves: Piezoelectric detector – Properties of Ultrasonic's – Wavelength of Ultrasonics by Debye-Sears method – Applications.

UNIT - IV

***Dielectric Materials*:** Dielectrics - Types of polarizations – Electronic, Ionic, Orientational and Space charge polarizations – Expression for Electronic polarizability - Frequency and temperature dependence of dielectric polarizations - Determination of dielectric constant by capacitance Bridge method - Ferro electricity - Barium titanate - Applications of Ferroelectrics.

Electromagnetic theory: Basic laws of electricity and magnetism - Maxwell's equations in integral and differential forms - Conduction and displacement current – Relation between D, E and P - Electromagnetic waves: Equation of plane wave in free space – Poynting theorem.

UNIT - V

Superconductivity: Introduction - General properties of super conductors - Meissner effect - Type I and Type II superconductors - BCS theory (qualitative) – Introduction to High T_c superconductors - Applications of superconductors.

Nano materials: Introduction - Properties of materials at reduced size - Surface to volume ratio at nano scale – Classification of nanomaterials - Preparation of nanomaterials: bottom– up methods (sol gel and CVD), Top-down methods (ball milling) - Basic ideas of carbon nanotubes – Applications nanomaterials and their health hazards.

Suggested Reading:

1) B.K. Pandey and S.Chaturvedi – Engineering Physics, Cengage Learning.

2) M.S. Avadhanulu and P.G. Kshirasagar - Engg. Physics, S.Chand& Co.

3) C. Kittel - Introduction to Solid State Physics, Wiley Eastern Ltd.

4) A.K Bhandhopadhya - Nano Materials, New Age International.

5) C.M. Srivastava and C. Srinivasan - Science of Engg. Materials, New Age International.

CE101ES

ENGINEERING MECHANICS

Instruction:	3L+1T periods per week
Duration of Semester End Examination:	3 hours
CIE:	30 marks
SEE:	70 marks
Credits:	4

Course Objectives:

- Understand the resolution of forces, equilibrium of force systems
- Learn the analysis of forces in the structures
- Understand the concept of centroid, moment of inertia and dynamics

Course Outcomes:

1) Determine the resultant and moment of a force system
2) Apply the equations of equilibrium for a generalized force system
3) Analyze the forces in trusses and frames
4) Determine the centroid and moment of inertia for 1D & 2D bodies
5) Apply the concepts of dynamics in solving the engineering problems

UNIT - I

Introduction to Engineering Mechanics covering: Force SystemsBasic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy

UNIT – II

Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines.

UNIT - III

Centroid and Centre of Gravity covering,Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

UNIT - IV

Virtual Work and Energy Method-Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.

UNIT - V

Mechanical Vibrations covering**,**Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum,

use of simple, compound and torsion pendulums

Suggested Reading:

1. F.L. Singer, *Engineering Mechanics*, Collins, Singapore, 1975.
2. S.P. Timoshenko and D.H. Young, *Engineering Mechanics*, McGraw-Hill International Edition, 1983.
3. S. Rajeshakharam and G. Sankarasubrahmanyam, *Mechanics*, Vikas Publications, 2002.
4. S.B. Junarkar and H.J. Shah, *Applied Mechanics*, 2001.
5. J.H. Shames, *Engineering Mechanics*, Prentice Hall, 1987.
6. B. Bhattacharyya, *Engineering Mechanics*, Oxford Higher Education, 2015.

e-Resources:

1. http://nptel.ac.in/
2. http://mhrd.gov.in/e-contents
3. http://spoken-tutorial.org/

PH151BS

ENGINEERING PHYSICS LAB

Instructions	3h/week
Duration of University Examination	3 Hours
Sessional	25 Marks
University Examination	50 Marks
Credits	1.5

Course Objectives:

- Demonstrate an ability to make physical measurements and understand the limits of precision in measurements.
- Demonstrate the ability to use experimental statistics to determine the precision of a series of measurements.
- Demonstrate the ability to prepare a valid laboratory notebook.
- Demonstrate the ability to understand the construction and working of different experiments.

Course Outcomes:

1) Student recognizes the correct number of significant figures in a measurement or in the results of a computation.
2) Students can use a best fit to create a graph from a series of data points. Students can extrapolate and interpolate.
3) Students will keep a lab notebook that documents their experience in each lab procedure.
4) Develop skills to impart practical knowledge in real time solution and learn to design new instruments with practical knowledge.

List of experiments:

1. To determine the Dielectric constant and Phase transition temperature of Lead Zirconium Titanate (PZT).
2. Determination of Velocity of ultrasonic waves in a liquid by Debye-Sears method.
3. To draw the I-V Characteristics of P-N Junction diode and to evaluate the value of potential barrier of the diode.
4. To find the values of Electrical conductivity and energy gap of Ge crystal by Four probe method.
5. Determination of rigidity of modulus of Torsion pendulum.
6. Determination of Logarithmic decrement of a Torsional pendulum.
7. Determination of carrier concentration, Mobility and Hall Coefficient of Ge Crystal using Hall Effect Experiment.
8. To determine the constants of A, B and α using Thermistor characteristics.

CE151ES

ENGINEERING GRAPHICS

No. of Credits	3 Credits
Instruction	6 Periods per week
Continuous Internal Evaluation	50 Marks
Semester End Evaluation	50 Marks
Duration of University Examination	3 Hours

Course Objectives:

- Introduction to fundamentals and need of AUTOCAD software drawings
- Knowledge about various 2D command of AUTOCAD drawing applicable for drawing and printing options.
- Inputs on basic concepts of engineering drawing, lettering formats for analyzing various topics via, conic sections, invoutes.
- Awareness towards the various types of projections and the drawings of 2D and 3D views.

Course Outcomes

1) Knowledge on the fundamentals of AUTOCAD 2D commands
2) Application of basic principles of drawing and scales for representation of prototype objects
3) Relate the logic of projections to straight lines and various views of 2D and 3D objects
4) Capability to imagine and project the developed surface and truncated portion of 3D solids
5) Assimilation of visualization process to efficiently communicate ideas graphically and provide editable solutions

UNIT - I

Overview of Computer Graphics covering, listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.'

UNIT - II

Commands, initial settings, drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command.

UNIT - III

Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute.

UNIT - IV

Scales – Reduced and Enlarged scales, representative fraction, Plain, Diagonal and Vernier Scales, Projections of Points – placed in different quadrants, Projection of straight lines parallel to one plane, perpendicular to one plane, inclined to one plane and lines inclined to both planes.

UNIT - V

Projections of planes, inclined Planes - Auxiliary Planes, Projections of Regular Solids covering, those inclined to both the Planes. Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone.

Suggested Text/Reference Books:

1) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3) Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5) S.N. Lal., Engineering Drawing (2018), M/S. Cengage Learning India Pvt. Ltd., PratapGunj, Delhi
6) CAD Software Theory and User Manuals.

ME 151ES

WORKSHOP PRACTICE

Instructions:	4 hours/week
Duration of SEE:	3 hours
CIE:	25 Marks
SEE:	50 Marks
Credits:	2

Course Objectives:

- To learn about different tools used in workshop.
- To understand the different manufacturing processes.
- To learn about fabrication of components using different materials.

Course Outcomes: Upon completion of this laboratory course, students will be able to

1) Fabricate components with their own hands.
2) They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3) By assembling different components, they will be able to produce small devices of their interest.

1. Machine shop	(10 hours)
2. Fitting shop	(8 hours)
3. Carpentry	(6 hours)
4. Electrical & Electronics	(8 hours)
5. Welding shop	(8 hours)
	(Arc welding 4 hrs + gas welding 4 hrs))
6. Casting	(8 hours)
7. Smithy	(6 hours)
8. Plastic moulding & Glass Cutting	(6 hours)

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Suggested Text/Reference Books:

(1) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop
(2) Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

SEMESTER WISE SCHEMA WITH CREDITS

Scheme of Instruction for BE (Mining Engineering) - II Semester

S.No.	Course Code	Course Title	Scheme of Instruction				Contact Hrs/ Week	Scheme of Examination		Credits
			L	T	Dr	P		CIE	SEE	
THEORY										
1	BS201MT	Engineering Mathematics-II	3	1	-	-	4	30	70	4
2	BS102CH	Engineering Chemistry	3	1	-	-	4	30	70	4
3	HS201EG	English	2	-	-	-	2	30	70	2
4	CE201ES	Programming & Problem Solving	3	-	-	-	3	30	70	3
PRACTICALS										
5	BS151CH	Engineering Chemistry Lab	-	-	-	3	3	25	50	1.5
6	ES 252MN	Computer-Aided CivilEngg. Drawing	-	-	4	-	4	50	50	2
7	HS 251EG	English Lab	-	-	-	2	2	25	50	1
8	CS 251 ES	Computer programming Laboratory	-	-	-	4	4	25	50	2
		Total	**11**	**2**	**4**	**9**	**26**	**245**	**480**	**19.5**

L : Lectures
T : Tutorials
P : Practical
Dr. : Drawing
CIE : Continuous Internal Evaluation
SEE : Semester End Examination

BS 201 MT

ENGINEERING MATHEMATICS – II

Instruction	3L+1T Periods per week
Duration of University Examination	3 Hours
Sessional	30 Marks
University Examination	70 Marks
Credits	4

Course objectives:

- To study matrix algebra and its use in solving system of linear equations and in
- Solving Eigen value problems
- To provide an overview of ordinary differential equations
- To study special functions like Legendre and Bessel functions
- To introduce the concept of functions of complex variable and their properties

Course Outcomes: After completion of course, the students will be able to

1) Solve system of linear equations and eigen value problems
2) Solve certain first order and higher order differential equations
3) Determine the analyticity of complex functions and expand functions as
4) Taylor and Laurent series
5) Evaluate complex and real integrals using residue theorem

UNIT – I

Matrices:

Elementary row and column operations, Rank of a matrix, Echelon form, System of linear equations, Linearly dependence and independence of vectors, Linear transformation, Orthogonal transformation, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Diagonalization of Matrices, Reduction of quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms.

UNIT – II

First Order Ordinary Differential Equations:

Exact first order differential equations, Integrating factors, Linear first order equations, Bernoulli's, Riccati's and Clairaut's differential equations, Orthogonal trajectories of a given family of curves.

UNIT – III

Differential Equations of Higher Orders:

Linear independence and dependence, Solutions of second and higher order linear homogeneous equations with constants coefficients, Method of reduction of order for the linear homogeneous second order differential equations with variable coefficients, Solutions of non-homogeneous linear differential equations, Method of variation of parameters, solution of Euler-Cauchy equation, Simultaneous linear differential equations, Power Series solution, Legendre Polynomial of first kind, Bessel's function of first kind and their properties.

UNIT – IV

Functions of a Complex Variable:

Limits and continuity of a function, differentiability and analyticity, Elementary Analytic functions, Necessary and Sufficient conditions for a function to be analytic, Cauchy- Riemann equations in polar form, harmonic functions, complex integration, Cauchy's integral theorem, extension of Cauchy's integral theorem for multiply connected regions, Cauchy's integral formula, Cauchy's inequality, Cauchy's formula for derivatives, Liouville's theorem, Maximum Modulus principle (without proof)and its applications.

UNIT – V

Residue Calculus:

Power series, Taylor's series, Laurent's series, zeros and singularities, residues, residue theorem, evaluation of real integrals using residue theorem, Argument principle, Rouche's Theorem and their applications, conformal mapping Bilinear transformations. (**All Theorems without Proof).**

Suggested Reading:

1) R.K. Jain & S.R.K. lyengar, *Advanced Engineering Mathematics*, Narosa Publications, 4th Edition,2014.
2) Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley , 9th Edition, , 2012.
3) Dr.B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 43rd Edition,2014.
4) Dr.M.D.Raisinghania, Ordinary and Partial differential equations, S.CHAND, 17th Edition 2014.
5) James Brown, R.V Churchill, Complex Variables and applications, Mc GrawHill 9th Edition 2013.
6) B.V. Ramana, Higher Engineering Mathematics, 23rd reprint, 2015
   S.L Ross, Differential Equations 3rd Edition, Wiley India.
7) G.F. Simmons and S.G. Krantz, Differential Equations, Tata Mc Graw Hill, 2007.
8) N. Bali, M.Goyal, A text book of Engineering Mathematics,Laxmi publications,2010
9) H.K. Dass, Er. Rajnish Varma, Higher Engineering Mathematics, Schand Technical Third Edition.

BS102CH

ENGINEERING CHEMISTRY

Instruction	3L+1T per week
Duration of University Examination `	3 Hours
Sessional	30 Marks
University Examination	70 Marks
Credits	4

Course Objectives: To provide students with knowledge of engineering chemistry for building technical competence in Industry, Research and Development in the following fields:

- Water chemistry and Corrosion
- Thermodynamics and Electrochemistry
- Molecular Structure and Spectroscopy
- Engineering Materials
- Energy Sources and Nanomaterials

Course Outcomes:

The concepts developed in this course will help in quantification of several concepts in chemistry that have been introduced at the 10+2 level. Technology is being increasingly based on the Electronic, Atomic and Molecular level modifications. The course will enable the student to:

1) Analyse microscopic chemistry in terms of atomic, molecular orbitals and intermolecular forces.
2) Rationalise bulk properties and processes using thermodynamic considerations.
3) Distinguishes the ranges of electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
4) Gains knowledge in causes of corrosion and its prevention.
5) Attains knowledge about the disadvantages of hard water for domestic and industrial purposes. Also learns the techniques of softening of hard water and treatment of water for drinking purpose.

UNIT - I

WATER CHEMISTRY AND CORROSION:

Water chemistry: Hardness of water-Types and units of hardness, estimation of temporary and permanent hardness of water by EDTA method. Alkalinity of water and its determination. Water softening by Ion exchange and Reverse Osmosis methods. Boiler troubles-scales and sludges formation-causes, effects and prevention, Numerical problems.

Specifications of potable water. Water treatment for drinking purpose-coagulation, sedimentation, filtration, sterilization by Chlorination and Ozanization.

Corrosion-causes and its effects. Types of corrosion-Dry or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism. Electrochemical corrosion and its types. Factors influencing rate of corrosion.

Corrosion control methods: Cathodic protection methods- Sacrificial anodic and Impressed current cathodic protection methods. Surface coating methods: Hot dipping-Galvanizing and Tinning. Electroplating.

UNIT – II

THERMODYNAMICS AND ELECTROCHEMISTRY:

Thermodynamics: Definition of thermodynamic functions- Enthalpy, Entropy, Free energy and their significance. Entropy and Free energy change for isothermal process. Variation of free

energy change with temperature and pressure. Concept of spontaneity. Criteria of spontaneity in terms of entropy and free energy. Carnot cycle-efficiency of heat engine. Numerical problems.
Electrochemistry: Electrochemical cells- Electrolytic and Galvanic cells. Cell notation, cell reaction and cell potentials. Types of electrodes-Calomel, Quinhydrone and Glass electrodes. Determination of P_H of a solution by using Quinhydrone electrode. Thermodynamics of emf of cells- Nernst equation and its derivation. Application of Nernst equation to electrode potential and emf of cells. Numerical problems.
Principle and applications of Conductometric and Potentiometric titrations.

UNIT – III
MOLECULAR STRUCTURE AND SPECTROSCOPY:
Molecular Orbital Theory. Linear Combination of Atomic Orbitals (LCAO).Molecular Orbital energy level diagrams of diatomic molecules-O_2,N_2 and NO. Crystal field theory-salient features, Crystal Field Splitting of d-orbitals of transition metal complexes in Octahedral, Tetrahedral and Square planar geometries. Magnetic properties of complexes.
Spectroscopy:
Principles and selection rules of Vibrational, Rotational and Electronic Spectroscopy and their applications. Atomic Absorption Spectroscopy and its applications.

UNIT – IV
Engineering materials:
Lubricants: Introduction, functions and mechanism of lubrication. Hydrodynamic, Boundary and Extreme pressure lubrication. Classification of lubricants-solid, semi-solid and liquid lubricants. Properties of lubricants: viscosity, viscosity index, saponification number and acid value.
Composites: Introduction, constituents and characteristics of composites. Types of composites-reinforced, Particulate and Layered composites. Advantages and applications of Composites.

Unit – V
Energy Sources
Fuels: Introduction. Classification, advantages, disadvantages of solid, liquid and gaseous fuels. Requirements of a good fuel. Biofuels - Biodiesel.
Combustion: Calorific value of the fuel-Lower calorific value (LCV), Higher calorific value (HCV).Theoretical calculations of calorific value by Dulongs formula-Numerical problems.
Solid Fuels: Coal-Proximate and Ultimate analysis and its significance.
Liquid Fuels: Source-Fractional distillation of petroleum, important fractions and their uses. Knocking, fuel rating-Octane and Cetane numbers.
Gaseous Fuels: LPG, CNG composition and uses.
Batteries: Primary batteries-Zn carbon battery. Secondary batteries-Pb- Acid battery and Ni-Cd battery. Lithium-ion batteries- advantages and applications.
Fuel cells: Concept of fuel cells and their advantages. Construction and working of H_2-O_2 fuel cells.

Suggested Readings:
1. Jain & Jain, *Engineering chemistry*, Dhanpat Rai publishing Co.,16thEdition.
2. B.L.Tembe,Kamaluddin and M.S.Krishnan, Engineering Chemistry(NPTELWeb-book)
3. PrashanthRath, Engineering Chemistry, Cengage Learning.
4. M.J.Sienko and R.A.Plane, Chemistry: Principles and Applications, MGH Publishers.
5. B.H.Mahan, University Chemistry, Pearson Publishing Co., 4th Edition.
6. C.N. Banwell, *Fundamentals of Molecular Spectroscopy*, TMH

HS101EG

ENGINEERING ENGLISH

Instruction	2 periods per week
Duration of University Examination	3 Hours
Sessional	30 Marks
University Examination	70 Marks
Credits	2

Course Objectives: The following are the objectives of the course:
To enable the students to

- Communicate clearly, accurately and appropriately
- Learn different models of interpersonal communication
- Learn to communicate grammatically
- Learn to write essays, formal letters and technical reports
- Comprehend the different types of texts

Course Outcomes: The student will be able to

1) Communicate clearly, accurately and appropriately
2) Learn minimal pairs and types of syllables
3) Overcome the difficulties with sounds of English
4) Learn to participate well in GDs, Debates and Presentations
5) Communicate with appropriate body language, expressions

UNIT – I
Effective Communication: Role and importance of communication; Features of human communication; Process of communication; Barriers to communication; Oral and Written Communication; Importance of listening, speaking, reading, and writing; Types of communication: Verbal – formal versus informal communication, one-way versus two-way communication, Non-verbal communication.

UNIT – II
Personality Development and Interpersonal Communication: Time management; Emotional Quotient; Teamwork; Persuasion techniques. Models of interpersonal development: Johari window, Knapp's model; Styles of communication;

UNIT - III
Remedial English: Tenses, Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés. (Note: The focus is on appropriate usage)

UNIT – IV
Vocabulary Building and Written Communication: Roots and affixes; Words often confused: Homonyms, Homophones, Homographs; One-word substitutes; Idiomatic usage: Idioms, Phrases, Phrasal Verbs; Synonyms; Antonyms; Paragraph writing; Précis writing; Essay writing; Official letters; E-mail etiquette; Technical report writing: Feasibility, Progress and Evaluation reports.

UNIT – V

Reading Comprehension: Unseen Passages, A.P.J. Abdul Kalam, Azim Premji, Sachin Tendulkar, Sathya Nadella, Sam Pitroda (Note: No descriptive questions to be set from this unit and only Reading Comprehension/s from unseen passages should be set in the Examination Question Papers)

Suggested Reading:

1. E. Suresh Kumar, *Engineering English*, Orient BlackSwan, 2014.
2. Language and Life A Skills Approach, Orient Black Swan, 2018
3. Michael Swan, *Practical English Usage.* OUP, 1995.
4. Ashraf Rizvi, M, *Effective Technical Communication,* Tata McGraw Hill, 2009.
5. Meenakshi Raman and Sangeeta Sharma. *Technical Communication: Principles and Practice. OUP, 2011.*

CE 201 ES

COMPUTER PROGRAMMING FOR PROBLEM SOLVING

Instruction	: 3 Hours/Week
Duration of SEE	: 3 Hours
CIE	: 30 Marks
SEE	: 70 Marks
Credits	: 3

Course Objectives:

- To introduce the basic concepts of Computing environment, number systems and flowcharts
- To familiarize the basic constructs of C language – data types, operators and expressions
- To understand modular and structured programming constructs in C
- To learn the usage of structured data types and memory management using pointers
- To learn the concepts of data handling using files

Course outcomes: Student will be able to:

1) Explain various functional components in computing environment
2) Develop algorithmic solutions to problems and draw the flow charts
3) Explain and use basic constructs of C in writing simple programs
4) Use standard library functions in C and develop modular programs using user defined
5) functions and structured data types
6) Use the concepts of data handling using files

UNIT – I

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts.

Number Systems: Binary, Octal, Decimal, Hexadecimal

Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements

Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

UNIT - II

Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and Goto statements.

Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. **Recursion-** Recursive Functions. **Storage Classes:** Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.

UNIT – III

Pre-processors: Pre-processor Commands

Arrays - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two-Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

UNIT - IV

Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, L value and R value, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments.

Strings - Concepts, C Strings, String Input/output Functions, Arrays of Strings, String Manipulation Functions.

UNIT - V

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types.

Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/ Output Functions.

References:

1) B.A. Forouzan and R.F. Gilberg, "*A Structured Programming Approach in C",* Cengage Learning, 2007
2) Kernighan BW and Ritchie DM, "*The C Programming Language"*, 2nd Edition, Prentice Hall of India, 2006.
3) Rajaraman V, "*The Fundamentals of Computer"*, 4th Edition, Prentice-Hall of India, 2006.
4) Dromey, How to solve it by Computer, Pearson Education, 2006

BS 151 CH

ENGINEERING CHEMISTRY LAB

Instruction	3 periods per week
Duration of Semester End Examination	3 hours
CIE	25 mar
SEE	50 marks
Credits	1.5

1. Water analysis:

i) Determination of total hardness of water by EDTA method

ii) Determination of Chloride content of water

2. Conductance measurements:

i) Determination of cell constant.

ii) Estimation of HCl and CH_3COOH by conductometric titration.

3. Potentiometric measurements:

i). Estimation of HCl by potentiometric titration.

ii).Estimation of ferrous iron by potentiometric.

4. Kinetic Studies:

i) Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.

ii) Study of kinetics of Iodine-Clock reaction.

5. Synthesis of a drug molecule:

i) Synthesisof Aspirin.

6. Distribution Studies:

i) Determination of partition coefficient of acetic acid between Butanol and Water.

7. Physical constants:

i) Determination of a viscosity of a given liquid.

ii) Determination of surface tension of a given liquid.

Suggested Reading:

1. Senior Practical Physical Chemistry ,B.D.Khosla, A.Gulati and V.Garg (R.Chand &Co., Delhi)
2. An Introduction to Practical Chemistry, K. K. Sharma and D.S.Sharma (Vikas publishing, N. Delhi)

ES 252 MN

COMPUTER-AIDED CIVIL ENGINEERING DRAWING

Instruction	: 4 Periods per week
Duration of University Examination	: 4 Hours
Semester End Evaluation	: 50 Marks
Continuous Internal Evaluation	: 50 Marks
No. of Credits	: 2 Credits

COURSE OBJECTIVES:

- To prepare you to design a system, component, or process
- To meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health, safety,
- To prepare you to design a system for its manufacturability and sustainability•

COURSE OUTCOMES:

1) Able to use drawing as tool for engineering practice
2) Able to prepare Layout plans for residential buildings
3) Able to Layout plans with various fittings & fixtures of residential buildings

UNIT – I

Module 1: Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids, Draw the sectional orthographic views of geometrical solids. AutoCAD: Setting up and use of Layers, layers to create drawings

UNIT – II

Module 2: SYMBOLS AND SIGN CONVENTIONS: Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards.

UNIT – III

Module 3: MASONRY BONDS: English Bond and Flemish Bond – Corner wall and Cross walls - One brick wall and one and half brick wall.

UNIT – IV

Module 4: BUILDING DRAWING: Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing, Site plan, floor plans, elevation and section drawing of small residential buildings, Foundation plan, Roof drainage plans. Depicting joinery, standard fittings & fixtures, finishes. Use of Notes to improve clarity

UNIT – V

Module 5: PICTORIAL VIEW: Principles of isometrics and perspective drawing, Perspective view of building, Fundamentals of Building Information Modelling (BIM) With effect from the academic year 2021-2022

Suggested Reading:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals
6. S.N. Lal., Engineering Drawing (2018), M/S. Cengage Learning India Pvt. Ltd., PratapGunj, Delhi

HS251EG

ENGLISH LABORATORY

Instruction	2 periods per week
Duration of University Examination	2 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	1

Objectives: The following are the **objectives** of the course: To enable the students to

- Learn IPA
- Learn minimal pairs and types of syllables
- Overcome the difficulties with sounds of English
- Learn to participate well in GDs, Debates and Presentations
- Communicate with appropriate body language and expressions

1) **Introduction to English Phonetics**: Organs of Speech: respiratory, articulatory and phonatory systems; Sounds of English: Introduction to International Phonetic Alphabet; Minimal pairs; Syllable; Word Stress; Introduction of rhythm and intonation; Difficulties of Indians speakers with stress and intonation.

2) **Speaking Activities**: Self Introduction, Picture perception, JAM.

3) Group discussion, Debate, Presentation skills

4) **Listening Activities**: Listening to different types of materials for effective comprehension

5) **Role play**: Use of dialogues in a variety of situations and settings.

Suggested Reading:

1) E. Suresh Kumar. *A Handbook for English Language Laboratories (with CD).*
2) T. Balasubramanian. *A Textbook of English Phonetics for Indian Students.*
3) J. Sethi et al., *A Practical Course in English Pronunciation (with CD).* Prentice Hall of India, 2005.
4) Hari Mohan Prasad. *How to Prepare for Group Discussions and Interviews*. Tata McGraw Hill, 2006.

CS251ES

COMPUTER PROGRAMMING FOR PROBLEM SOLVING LAB

(Common to all Branches)

Instruction	4 Hours/Week
Duration of SEE	4 Hours
CIE	25 Marks
SEE	50 Marks
Credits	2

Course Objectives:

- To use tools available under LINUX for C programming
- To gain hands-on experience on basic constructs of C programming
- To formulate problems and implement algorithmic solutions in C
- To write modular programs in C using structure programming techniques and data files.

Course Outcomes: Student will be able to:

1) Write, compile and debug C programs in Linux environment
2) Write simple programs using control structures, user defined functions and data manipulation using arrays
3) Use standard C library functions to develop modular programs in C

List of experiments:

1) Introducing to programming Environment (Linux commands, editing tools such as vi editor, sample program entry, compilation and execution)
2) Write programs using arithmetic, logical, bitwise and ternary operators.
3) Write programs simple control statements : Roots of a Quadratic Equation, extracting digits of integers, reversing digits ,finding sum of digit ,printing multiplication tables, Armstrong numbers, checking for prime, magic number,
4) Sin x and Cos x values using series expansion
5) Conversion of Binary to Decimal, Octal, Hexa and Vice versa
6) Generating a Pascal triangle and Pyramid of numbers
7) Recursion: Factorial, Fibonacci, GCD
8) Finding the maximum, minimum, average and standard deviation of given set of numbers using arrays
9) Reversing an array, removal of duplicates from array
10) Matrix addition, multiplication and transpose of a square matrix .using functions
11) Bubble Sort, Selection Sort ,
12) Programs on Linear Search and Binary Search using recursion and iteration
13) Functions of string manipulation**:** inputting and outputting string, using string functions such as strlen( ), strcat( ), strcpy( ) ..... etc
14) Writing simple programs for strings without using string functions.
15) Finding the No. of characters, words and lines of given text file
16) File handling programs: student memo printing
17) Create linked list, traverse a linked list, insert a node, delete a node, reversing list.

For online practice problems: https://projecteuler.net

DEPARTMENT OF MINING ENGINEERING

Scheme of Instruction and
Syllabi of

B.E. III to IV- SEMESTER

2022-23

UNIVERSITY COLLEGE OF ENGINEERING
(AUTONOMOUS)
OSMANIA UNIVERSITY HYDERABAD – 500 007, TELANGANA

DEPARTMENT OF MINING ENGINEERING
UNIVERSITY COLLEGE OF ENGINEERING, O.U.
SEMESTER WISE SCHEMA WITH CREDITS

(With effect from the Academic Year 2022-23)

Scheme of Instruction for BE (Mining Engineering) - III Semester

S.No.	Course Code	Course Title	Scheme of Instruction			Cont. Hrs/ Wk	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	MT301BS	Engineering Mathematics-III (PDE, Probability)	3	-	-	3	3	30	70	3
2	PC301MN	Development of Mineral Deposits	3	-	-	3	3	30	70	3
3	PC302MN	Underground Coal Mining	3	-	-	3	3	30	70	3
4	PC303MN	Mine Environmental Engineering-I	3	-	-	3	3	30	70	3
5	PC304MN	Engineering Geology	3	-	-	3	3	30	70	3
6	ES302CE	Introduction to Fluid Mechanics	3	-	-	3	3	30	70	3
7	EE201ES	Basic Electrical Engineering	3	-	-	3	3	30	70	3
8	MC 302CE	Mandatory Course (MC) (*Non-Credit*) Environmental Sciences	2	1	-	3	3	30	70	0
PRACTICALS										
9	ES351CE	Fluid Mechanics- lab	-	-	2	2	3	25	50	1
10	PC351MN	Engineering Geology Lab	-	-	2	2	3	25	50	1
			23	**1**	**04**	**28**		**260**	**590**	**23**
* At the end of III semester (during vacation) students should undergo Internship-I (UG Mines) for 10 days. Marks will be award in IV semester.										

L : Lectures
P : Practicals
T : Tutorials
SEE : Semester End Examination
CIE : Continuous Internal Evaluation

MT301BS

ENGINEERING MATHEMATICS – III

(PDE AND PROBABILITY)

Instruction	3 periods per week
Duration of Semester End Examination	3 hours
CIE	30 marks
SEE	70 marks
Credits	3

Course Objectives:

- To introduce the solution methodologies for first and second order Partial Differential Equations with applications in engineering
- To provide an overview of probability and statistics to engineers

Course Outcomes:

Upon completion of this course, students will be able to

1) Solve field problems in engineering involving PDEs.
2) They can also formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.

Unit – I

Definition of Partial Differential Equations, First order partial differential equations, Solutions of first order linear PDEs , Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method.

Unit – II

Second-order linear equations and their classification, Initial and boundary conditions, Heat diffusion and vibration problems, Separation of variables method to Solve simple problems in Cartesian coordinates.

Unit – III

Discrete random variables, expectation of discrete random variables, moments, variance of a sum, continuous random variables & their properties.

Unit – IV

Probability distributions: Binomial, Poisson and Normal, evaluation of statistical parameters for these three distributions,

Unit – V

Curve fitting by the method of least squares: fitting of straight lines, second degree parabolas and more general curves, Correlation, regression and rank correlation.

Suggested Reading:

1. R.K.Jain & S.R.K Iyengar, Advanced Engineering Mathematics, Narosa Publications, 4th Edition 2014.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 43rd Edition.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.2006.
4. S. Ross, “A First Course in Probability”, Pearson Education India, 2002.
5. S.C Gupta & Kapoor: Fundamentals of Mathematical statistics, Sultan Chand & Sons, New Delhi.

PC301MN

DEVELOPMENT OF MINERAL DEPOSITS

Instruction	3 periods per week
Duration of Semester End Examination	*3 hours*
CIE	*30 marks*
SEE	*70 marks*
Credits	*3*

COURSE OBJECTIVES:

- To demonstrate the importance of mining in national economy, understand the terminology associated with the discipline and be familiar with the available regulatory mechanism to enable safe & sustainable mining operations.
- To know the history of mining and describe the correlation between the development of mining and cultural progress.
- To introduce the field of mining and provide basic input about mining unit operations.
- To learn the various modes of access and study the methods of designing the access.

COURSE OUTCOMES:

At the end of the course the student will be able to

1) Know the status and significance of mining Industry.
2) Apply different methods of Shaft sinking according to the ground conditions.
3) Know about Development of workings.
4) Know about different types of supports, their advantages and disadvantages.
5) Know about different tunnelling methods.

UNIT-I: INTRODUCTION TO MINING ENGINEERING 10 PERIODS

Significance of mining industry in national economy and infrastructure building, basic mining terminologies, mineral types as per law, stages in mine life cycle, Economic, Social, Environmental and Health impacts of Mining. Industrial progress and mining. Knowing about deposit through exploration. Classification of mining methods and their selection criteria. Scheme of mining. Opening up of deposits: Types, size and location of entries into underground coal and other minerals.

UNIT -II: MINE ENTRIES 10 PERIODS

Selection criteria of mode of entry between shaft, Incline and Adit. Preliminary investigations about strata for making entry and equipment. Methods of sinking shaft in water-logged, pressurized strata in loose and running soils. Mechanized shaft sinking methods. Need for widening and deepening of operating shafts. Different methods for widening and deepening shafts. Design of shaft insets, pit bottom excavation.

UNIT -III: DEVELOPMENT OF WORKINGS 10 PERIODS

A: Drivage of cross cuts, drifts, inclines and raises by conventional and mechanized methods. Pull and progress, Calculation of OMS.

B: Arrangements for loading transportation ventilation, support, lighting, and drainage. Drilling patterns and blast design parameters for underground coal mines and hard rock mines.

UNIT -IV: ENVIRONMENTAL PROTECTION 09 PERIODS

Introduction to environmental maintenance and controlling pollutions. Restoration of land to its shape productivity and environment. Planning of mine closure. Legal provisions for development of workings.

UNIT -V: Modern Technologies for mine development **09 Periods**

Modern drill zambos, modern loading and transporting equipment for development of drivages, Tunnel boring machine and its application, Mechanized methods of shaft sinking. Drop rising. Risk to health and safety of workmen, rescue, first aid.

TEXT BOOKS/ REFERENCES:

1. Introductory mining engineering-, Howard L.Hartman, Jan M.Mutmansky/ wileyIndia (P) Ltd
2. Elements of mining technology Vol-I - D.J. Deshmukh /Denett&Company
3. Roy Piyush Pal, Blasting in ground excavations and mines, Oxford and IBH, 1st ed 1993
4. C.P. Chugh, Drilling technology handbook, Oxford and IBH, 1sted,1977

E RESOURCES:

1. https://www.nap.edu/read/10318/chapter/5#23
2. http://www.alta.eu/commodities/mining-technology/surface-mining/long-distance- beltconveyors/
3. Indian Mining Journal

PC 302MN

UNDERGROUND COAL MINING

Instruction	*: 3 classes per week*
Duration of Semester End Examination	*: 3 hours*
CIE	*: 30marks*
SEE	*: 70 marks*
Credits	*: 3*

Course Objectives:

- To understand the details of development of a mine for exploitation of mineral deposits.
- To Analyze design requirements of Underground Coal and metal mining methods.
- To apply different support systems including backfilling techniques for underground mines for stability of workings.

Course Outcomes:

At the end of the course, students will be able to

1) Understand Various theories, factors affecting the liability of coal seams to spontaneous heating
2) Understand Advances in firefighting techniques and Reopening of sealed-off areas
3) Understand fire damp explosions and coal dust explosions
4) Understand Mine Inundation and Noise
5) Understand Mine illumination.

UNIT-I: Introduction to Mine Planning

Size of mining property, reserves and production capacity. Opening of Deposits; Development of mine for in-seam mining and horizon mining (including shaft pillar and their comparison, advantages and disadvantages), division into levels and districts.

UNIT -II: Development

General principle of Bord & Pillar Development, their choice, suitability, advantages and disadvantages, layout of Bord & Pillar panel, size of panel, statutory provisions, manual and mechanized system of development: conditions suitable for application of mechanized loader and continuous miners; factor affecting the selection of equipment.

UNIT -III: Pillar Extraction

A: Preparatory arrangement for depillaring operation, statutory provision for depillaring, principle and designing of pillar extraction, size of a district.
B: Factor, affecting choice of pillar extraction, depillaring with caving, stowing, mechanized depillaring operation, organization and safety.
Layout for required outputs, types of machines, personnel and working of thick seams and blasting gallery method.

UNIT -IV: Long wall mining

Longwall methods of working, their choice, suitability, advantages and disadvantages. Layout of the workings for the required output, length and orientation of longwall faces, Shape & size of development roadways and gate roads and their maintenance. Mechanized longwall face organization.

UNIT -V: Special methods of working

Problems of working thick & thin seams, multi slices, sublevel caving, gallery blasting method, contiguous seam working, working steeply inclined seams, working under surface structures and seams liable to spontaneous heating, outburst and bumps, etc. hydraulic mining, Wongawalli, shortwall, highwall mining, underground coal gasification, coal bed methane, shield mining.

TEXT BOOKS/ REFERENCES:

1. Principles and Practices & Modern Coal Mining, R.D. Singh, New Age International Publication.
2. Underground Mining & Coal, Singh, T.N. Singh – Oxford Publication.
3. Elements of Mining Technology – D J Deshmukh Vol.1
4. Longwall mining, Peng S.S., Chiang H/S. – John Willey Publication.
5. Mine Planning for Coal, Mathur S.P. – M.J Consultant Publications.

E RESOURCES:

1. https://www.nap.edu/read/18766/chapter/5
2. http://www.canoseco.com/general-description/technologies-and-practices/modernunderground-coal-mining-technologies.html
3. https://link.springer.com/article/10.1007/s40789-014-0043-0

PC303MN

MINE ENVIRONMENTAL ENGINEERING – I

Instruction	*3* periods per week
Duration of Semester End Examination	*3 hours*
CIE	*30marks*
SEE	*70 marks*
Credits	*3*

COURSE OBJECTIVES:

- Students should be aware of the principles of ventilation and basic ventilation systems.
- To know the various ventilation systems in underground mines
- To know the various ventilation plannings and distribution methods

COURSE OUTCOMES:

At the end of the course, students will be able to

1) Understand origin, physical and chemical properties of mine gases and their physiological effects
2) Understand Heat, Humidity and Air flow in mines
3) Understand Principal types of mine fans, Series and parallel operation of mine fans.
4) Understand Standards of ventilation and Air distribution 5. Understand Ventilation Planning and Network analysis.

UNIT -I: MINE GASES

Atmospheric air – its composition, mine air – its general composition, origin, physical and chemical properties of mine gases, physiological effects of breathing mine gases and its detection, sampling and analysis of mine air, methane drainage.

UNIT -II: HEAT, HUMIDITY AND AIR FLOW

Sources of heat in mines, effects of heat and humidity, kata thermometer and hygrometer. Laws governing the airflow in mines, resistance of airways, Equivalent orifice, Natural ventilation, determination of NVP, direction of natural ventilation

UNIT-III: MECHANICAL VENTILATION

A: Principal types of mine fans, fan characteristic curves, mine characteristic curves, operating point, reversal of mine fans, Evasee and its importance.

B: Series and parallel operation of mine fans, booster fans, Face Ventilation. Overlap ventilation systems and controlled re-circulation

UNIT -IV: STANDARDS OF VENTILATION AND AIR DISTRIBUTION

Standards of ventilation including permissible air velocities, Ascensional, Descensional, Homotropal, Antitropal ventilation, Distribution of air, ventilation stoppings, Air crossings, Measurement of air velocities and pressure.

UNIT -V: VENTILATION PLANNING

Quantity and pressure requirement. Ventilation layout for coal mining and metal mining. Calculation of air quantity and total mine head required for ventilating a mine. Introduction to Network analysis: Hardy-Cross method, Ventilation survey.

TEXT BOOKS/ REFERENCES:

1. Mine Environment and Ventilation – G.B. Misra, Oxford University Press

2. Mine Ventilation and Air Condition – HL Hearlman,Wiley India (p) ltd

3. Environmental Engineering in Mines, Vatukuri V.S. & Lama R.D,Cambridge Unversity Press.

4. Mining and Environment, Dhar B.B, APH Publishing.

E RESOURCES:

1. http://technology.infomine.com/reviews/ventilation/welcome.asp?view=full

2. https://link.springer.com/article/10.1134/S1062739116041178

PC304MN

ENGINEERING GEOLOGY

Instruction	*: 3 periods per week*
Duration of Semester End Examination	*: 3 hours*
CIE	*: 30 marks*
SEE	*: 70 marks*
Credits	*: 3*

Course Objectives

This course is designed for

- Introducing basic concepts of geology to the mining engineers
- Offering an understanding of the geology-related aspects of the mining industry to mining engineers
- developing expertise in dealing the mineral exploration and extraction-related issues
- Gaining the technical knowledge to communicate with the mining industry geologist effectively.

Course Outcomes

By the end of the course, students will be able

1) To appreciate the importance of geological science to mining engineers
2) To know various geological aspects influencing the mining operations
3) To understand the significance of geological structures in mineral recovery and mine operations
4) To learn about the distribution of mineral resources across the world and India
5) To gain expertise to maximize the mining output at the lowest cost

UNIT I: Introduction to Geology

Physical Geology: Various branches and their application in mining engineering. Geo-tectonics: internal structure of the earth, Continental Drift Theory and Plate Tectonics, Isostasy, Geological hazards.

Paleontology: Fossils and their uses in constructing the geological past.

Stratigraphy: Principles, geological time scale, Major geological formations of India, their distribution, and associated metallic and energy minerals.

UNIT II: Minerals and Rocks

Mineralogy: Minerals and their classification, Determinative properties of minerals, common rock-forming, economic and energy minerals.

Petrology: Types of rocks, their origin, distribution, and classification. Rock Cycle,

Igneous petrology; Forms of igneous intrusions. Elementary knowledge of magma and its consolidation & mineral-rock formation. Minerals are associated with hydrothermal fluids.

UNIT III: Structural Geology

Strike and Dip: Attitude of strata, strike, true and apparent dip;

Primary and Secondary Structure: Elementary knowledge of rock deformation and structural characteristics of deformed rocks; Folds: definition and associated terminology and classification. Joints: definition and classification; Faults: mechanism of formation, elements, terminology, geometric and genetic classification;Structural control of mineral deposits.

UNIT IV: Economic Geology

Economic Geology: Introduction and scope; ore and gangue; processes of ore formation; Global mineral resources, occurrence, and distribution

Mineral Deposits of India: distribution and mode of occurrenceof metallic (Iron, Manganese, Copper, Lead, Zinc) and non-metallic deposits.

UNIT V: Energy Minerals

Coal: Rank, characteristics, and important constituents of coal; classification and origin of coal; chief characteristics of Indian coals; geology of the principal coalfields of India.

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

Nuclear minerals: distribution and occurrence of Uranium and Thorium in India

ESSENTIAL READING

1. P. K. Mukherjee, *A Text Book of Geology*, The World Press Pvt. Ltd., 9th Edition, 1982
2. Parbin Singh, *Engineering and General Geology.S.K. Kataria& Sons, 2008*
3. Umeshwar Prasad, *Economic Geology: Economic Mineral Deposits*, CBS Publications, 2016
4. William C. Peters, Exploration and Mining Geology, Wiley, 1987
5. Cosgrove, John W., and John A. Hudson. Structural geology and rock engineering. World Scientific Publishing Company, 2016.

SUPPLEMENTARY READING

1. Marat Abzalov, *Applied Mining Geology*, Springer International Publishing AG Switzerland, 2016
2. Chatterjee, KaulirKisor. Uses of energy, minerals and changing techniques. New Age International, 2006.
3. Stevens, Robert. Mineral exploration and mining essentials. Port Coquitlam, British Columbia, Canada: PakawauGeoManagement, 2010.
4. Aswathanarayana, U. "Principles of nuclear geology." (1985).
5. Saklani, PremSwarup, ed. Glossary of structural geology and tectonics. Satish Serial Publishing House, 2008.

INTRODUCTION TO FLUID MECHANICS

Instruction	3 periods per week
Duration of Semester End Examination	3 hours
CIE	30 marks
SEE	70 marks
Credits	3

Course Objectives:

- Understand concepts of various fluid properties
- Understand the basic concepts of fluid motion
- Knowledge of forces due to fluids and energy principles
- Study of flow measurement devices
- Study of compressible fluid flows for different conditions of expansion

Course Outcomes:

1) Application of basic principles in Fluid Mechanics
2) Application of the concepts of Bernoulli's equation to Fluid mechanics problems
3) Knowledge of incompressible flows and its applications

Unit – I:

Fluid Properties: Basic concepts: Specific weight, specific volume, specific mass, gravity, viscosity, bulk modulus, vapour pressure, capillarity and surface tension, viscosity-Newton's law of viscosity, Newtonian and Non-Newtonian fluids, classification of fluids-ideal and real.

Unit – II:

Fluid Kinematics: Fundamentals of fluid flow-description of flow pattern, stream lines, path lines, streak lines, stream tubes, classification of fluids, steady and unsteady flows, laminar and turbulent flows, uniform and non-unsteady flows, rotational and irrotational flows, laminar and turbulent flows, uniform and non- uniform flow, one, two and three dimensional flows, stream function, and velocity potential function, flow net significance and use.

Unit – III:

Fluid Statics: Fluid pressure at a point, variation of pressure in a fluid, measurement of pressure - simple and differential manometers. Fluid Dynamics: Convective and local acceleration, concept of continuity, three dimensional continuity equation, body forces and surface forces, body force potential, Euler's equation of motion for 3-D flow, Bernoulli's equation by integration of Euler's equation, significance of Bernoulli's equation and its limitations, applications of Bernoulli's equation- venturimeter, pitot tube. Impulse-momentum equation and its applications- forces on a pipe bend.

Unit – IV:

Flow Through Pipes: Introduction, types of flows-laminar and turbulent, Reynolds experiment, Darcy-Weisbach equation, and steady laminar flow through circular pipes, Hagen-Poiseuille's equation, hydro-dynamically smooth and rough boundaries- criteria and resistance to flow of fluid in smooth and rough boundaries, variation of friction factor.

Unit – V:

Compressible Flow: Compressibility of liquids and gases, differential form of continuity equation, Bernoulli's energy equation for isothermal and adiabatic conditions, velocity of pressure wave, wave velocity for adiabatic and isothermal conditions, Mach Number and Mach cone, stagnation pressure and temperature.

Suggested Reading:

1) K. Subramanya, 'Theory and Applications of Fluid Mechanics', Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1993
2) Vijay Gupta and Santosh K. Gupta, 'Fluid Mechanics and its applications', Wiley Eastern Ltd., New Delhi,1984
3) K.L. Kumar, 'Engineering Fluid Mechanics', Eurasia Publishing House Pvt Ltd., New Delhi, 2009
4) Valentine, H.R., 'Applied Hydrodynamics', Butterworths & Co Ltd., London, 1959 5. P.N. Modi and S.M.Seth, 'Hydraulics and Fluid Mechanics', Standard Book House, New Delhi, 2013

BASIC ELECTRICAL ENGINEERING

Instruction	3 classes per week
Duration of Semester End Examination	3 hours
CIE	40marks
SEE	60 marks
Credits	3

Course Objectives:

- To understand the fundamentals of DC and AC electrical circuits.
- To understand the working principles of DC motor, DC generator, Transformers and single phase induction motors.
- To understand working principles of protection devices used in electrical circuits.

Course Outcomes:

The students will able to

1) Analyze the performance of simple electrical circuits exciting with Dc and AC excitations.
2) Apply different theorems to solve complicated electrical circuits to obtain the current, voltage and power.
3) Understand the main components, Characteristics, applications of different DC and AC electrical machines used in industry.
4) Understand the importance of protective devices and their rating used in electrical circuits.

Unit – I: DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, The venin and Norton Theorems.

Unit – II: AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, and RL, RC, RLC combinations (series only). Three phase balanced circuits, voltage and current relations in star and delta connections.

Unit – III: Transformers and 3-ph Induction Motors

Transformers: Electromagnetic induction,Faradays laws, Statically induced emf, Lenz law, BH characteristics, ideal and practical transformer, losses and efficiency, Auto-transformer and three-phase transformer connections. Three Phase Induction motor: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, squirrel cage IM, slip-ring IM, Applications With effect from the Academic year 2018-2019

Unit – IV: Single-phase induction motor & DC Machines

Single-phase induction motor: Construction and principle of operation, Capacitor start & capacitor run motor, applications DC Generators: Dynamically induced emf, Flemming's Right hand and Left hand rules, Construction and principle of operation of DC generator, EMF equation, Types of DC Generators, OCC characteristics, applications DC Motors: principle of operation of DC Motor, Types of DC motors, applications

Unit – V: Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB,ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Reading:

1) J.B. Gupta, “Fundamentals of Electrical Engineering and Electronics” S.K. Kataria & Sons Publications, 2002.
2) J.B.Gupta, “Utilization of Electric Power and Electric Traction” S.K. Kataria &Sons Publications, 2010
3) Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, “Basic Elactrical Engineering” Tata McGraw Hill, Publications, 2009
4) Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc., 1995.

Mandatory Programmes (MC) (*Non-Credit*)

Environmental Sciences

Instruction	*: 3 periods per week*
Duration of Semester End Examination	*: 3 hours*
CIE	*: 30 marks*
SEE	*: 70 marks*
Credits	*: 0*

Course Objectives:

- Comprehend the need of environmental science, ethics and issues
- Illustrate the characteristics and functions of ecosystem
- Understand the concepts of Biodiversity and its conservation needs
- Study various environmental pollution effects, prevention and control acts

Course Outcomes:

1. Application of awareness on environmental Issues for sustainable society
2. Acquaintance with utilization of various natural resources and ecosystems
3. Ability in conserving and protecting the biodiversity
4. Knowledge of social and environment related issues and their preventive measures

Unit – I

Multidisciplinary nature of Environmental studies: Definition, scope and importance, Need for public awareness. Environmental ethics: issues and possible solutions. Population growth. Sustainable development and SDGs. Current Environmental Issues: global warming and Climate change, acid rain, ozone layer depletion. Environment protection Acts. Environment and human health

Unit – II

Natural Resources: Renewable and nonrenewable resources: Natural resources and associated problems Forest resources, Water resources, Mineral Resources, Water conservation, Food Resources Energy Resources. Land Resources: Land as a resource, land degradation, soil erosion, and desertification Role of individual in conservation of natural resources, Equitable use of resources for sustainable life styles.

Unit – III

Ecosystems: Concept of an ecosystem Structure and function of an ecosystem, Producers, consumers, decomposers. Energy flow in the eco systems. Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and functions: Terrestrial ecosystem, Forest ecosystem, Grass land ecosystem, Desert ecosystem. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit – IV

Biodiversity and its Conservation: Introduction-Definition: genetics, species and ecosystem diversity. Biogeographically classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, national and local level. India as a mega diversity nation. Hot-spots of biodiversity, Threats to biodiversity: habitats loss, poaching of wild life, man wildlife conflicts. Endangered and endemic spaces of India, Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity, Wildlife conservation and protection act, Forest conservation and protection act

Unit – V

Environmental Pollution: Definition, Causes, effects and control measures – Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act Solid waste

Management: Causes, effects and control measures of urban and industrial wastes Role of an individual's, communities and NGOs in prevention of pollution

Suggested Reading:

1. Gilbert, M. Masters Introduction to Environmental Engineering and Science, Prentice- Hall of India Pvt. Ltd., New Delhi, 1995.
2. Textbook of Environmental studies, Erach Bharucha, UGC.
3. Hammer. M J. and Hammer. MJ. Jr., Water and Wastewater Technology.
4. Prentice-Hall of India Pvt. Ltd., New Delhi. 1998
5. Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd.
6. Sasi Kumar, K. and Sanoop Gopi Krishna., Solid waste Management, Prentice-Hall of India Pvt. Ltd., New Delhi, 2009

ES351CE

FLUID MECHANICS LABORATORY

Instruction	*2 practical classes per week*
Duration of Semester End Examination	*3 hours*
CIE	*25marks*
SEE	*50 marks*
Credits	*1*

Course Objectives:

- Calibration of flow measuring devices
- Verification of the Bernoulli's theorem
- Demonstration of the various losses in pipes

Course Outcomes:

1) Ability to measure flow in closed conduits and flumes
2) Application of Bernoulli's principle in Hydraulics
3) Computation of various losses in pipes and pipe fittings

List of Experiments:

1) Determination of Cd and Cv of an orifice
2) Calibration of a mouth piece
3) Determination of Cd of a mouth piece for unsteady flow in a hemi-spherical tank
4) Calibration of a rectangular notch
5) Calibration of a triangular notch
6) Calibration of a broad crested weir
7) Verification of Bernoulli's principle
8) Determination of types of flows
9) Determination of major and minor losses in the pipes
10) Calibration of a Venturi meter

PC351MN

ENGINEERING GEOLOGY LAB

Instruction	*2 periods per week*
Duration of Semester End Examination	*3 hours*
CIE	*25 marks*
SEE	*50 marks*
Credits	*1*

COURSE OBJECTIVES

- Identification and familiarizing properties of minerals, rocks, and ores
- Interpreting and solving geological maps and structural geology problems
- Understanding of distribution of various mineral resources and their quantification

COURSE OUTCOMES

By the end of the course, students will be able

1) to identify various metallic and non-metallic and ore-forming minerals and major rocks
2) to gain knowledge to interpret various geological maps pertaining to the mining industry requirements
3) to understand the significance of geological structures in mineral recovery and mine operations
4) to have the expertise for maximizing the mine output
5) to have the expertise for estimating mineral tonnage, grade, and reserves

List of experiments to be conducted (Any ten)

Study of minerals and rocks in hand specimens:

1. Metallic and non-metallic minerals
2. Igneous, metamorphic and sedimentary rocks
3. Mohs hardness scale: characterizing and arranging the minerals

Study of primary and secondary structures

4. Study of 3-D structural models
5. Measurement of strike and dip
6. Effects of folds and fractures on strata/orebodies and their importance in mining operations

Study the maps

7. Geological map of India
8. Topographical map of India
9. Mineral province of India

Quantitative mapping

10. Determining the outcrop thickness by graphical methods
11. Estimation of tonnage, grade, resources, and reserves

Field-based study

12. Visit to open and underground mine

ESSENTIAL READING

- Bradley Deline, Randa Harris, and Karen Tefend, Laboratory Manual for Introductory Geology, University of North Georgia Press 2015
- N.ChennaKesavulu Engineering Geology Lab Record / Manual, Trinity Press, 2016

PW 921MN

SUMMER INTERNSHIP*

Instruction	*: 2 weeks*
CIE	*: 50 marks*
Credits	*: 1*

Course Objectives:

- To expose the students in understanding the real-life practical problems and technologies.
- To provide an opportunity to integrate various aspects of learning reference of practical problems.
- To enhance the confidence of the students by interaction with field professionals

Course Outcomes: Student will be

1. Able to complete the task or realize a prespecified target within a limited scope.
2. Able to learn to find alternate viable solutions for a given problem based on criteria.
3. Ability to learn field constraints and also documentation of technical report.

Summer Internship is introduced as part of the curricula to encourage students to work on problems of interest to industries or in a consulting organization. A batch of two or three students will be attached to Underground projects in Mining Industry for a period of two weeks. This will be during the vacation followed after the completion III semester course. Faculty member (s) will be acting as an internal guide(s) for the batches to mentor and monitor the progress and also interacts with the Industry guide (s) as per the need.
After the completion of the internship, students need to submit a brief technical report on the project executed and present the work through a seminar talk to be organized by the Department. Award of sessional are based on the performance of the student at the work place and will be judged by internal guide (s) (25 Marks) followed by presentation before the committee constituted by the Department (25 Marks). One faculty member will coordinate the overall activity of Summer Internship.

***Students have to undergo internship of 2 Weeks duration at the end of semester III and the credits will be awarded after evaluation in IV semester.**

SEMESTER WISE SCHEMA WITH CREDITS

Scheme of Instruction for BE (Mining Engg) - IV Semester

S.No.	Course Code	Course Title	Scheme of Instruction			Cont Hrs/ Wk	Scheme of Examination			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	PC401MN	Surface Mining Technology	3	-	-	3	3	30	70	3
2	PC 402MN	Mining Machinery I	3	-	-	3	3	30	70	3
3	PC403MN	Mine Environmental Engineering-II	3	-	-	3	3	30	70	3
4	PC404MN	Mine Surveying	3	-	-	3	3	30	70	3
5	ES 404ME	Strength of Materials	3	-	-	3	3	30	70	3
6	MC301HS	Managerial Economics And Accountancy	3			3	3	30	70	3
7	ES 401 EC	Basic Electronics Engineering	3	-	-	3	3	30	70	3
PRACTICALS										
8	PC 451MN	Mine Surveying Lab	-	-	2	2	3	25	50	1
9	PC452 MN	Mining Environmental Lab	-	-	2	2	3	25	50	1
10	PW921MN	Internship-I	-	-	-	-	2	50	-	1
			21	**0**	**04**	**25**	**27**	**310**	**590**	**24**
Note: Evaluation of Internship Grade: Satisfactory/ Good/ Excellent										
* At the end of IV semester (during vacation) students should undergo Survey camp. Marks will be award in V semester.										

PC401MN

SURFACE MINING TECHNOLOGY

Instruction	*:* 3 periods per week
Duration of Semester End Examination	*: 3 hours*
CIE	*: 30marks*
SEE	*: 70 marks*
Credits	*: 3*

COURSE OBJECTIVES:

The objective of this course is to provide students in mining engineering with the necessary knowledge

- To know about excavation methods in surface mines
- To design safe of suitable machinery for Surface mines
- To plan efficient and environmentally responsible surface mining operations.
- To know surface transportation methods in surface mines

COURSE OUTCOMES:

At the end of the course, students will be able to

1) Understand Status of surface mining, types of surface mines and basics of surface mines.
2) Design the surface mines Layouts.
3) Understand Ground preparation methods and various equipment related to ground preparation
4) Understand Excavation system in surface mines
5) Understand different modes of transport system in surface mines and Types of waste dump

UNIT-I: Introduction

Status of surface mining, types of surface mines, applicability and limitations, concept of stripping ratio, stripping economics, concept of ultimate pit limits, design of haul roads, elements of surface mine planning – selection of site for box cut, selection of operating parameters like bench height, width, slope, etc.

UNIT -II: Layout and design of surface mine

Slopes in surface mines – Highwall and waste dumps; Working pit slope and ultimate pit slope, common modes of slope failure, factors influencing stability of slopes, development of open cast mine layouts for various shapes of deposits. Conversion of underground mine to opencast mine vis-a vis open cast mine to underground mine related problems and probable solutions.

UNIT -III: Ground preparation methods

A: Preparation of the site – ripping, drilling and blasting; types, operation, selection, applications and limitations of ground preparation equipment's-ripper, dozer,

B: Blast hole drills and rock breakers, determining number of drilling machines, dozers and rippers for planned production. Concept of ripability, blasting in open cast mines over developed galleries.

UNIT -IV: Excavation system in surface mines

Selection criteria for equipments used in surface mines. Classification, application and limitations of different types of equipments used in surface mining projects; Cycle time and productivity calculation for excavating and loading equipments. Drag line - calculation of required bucket capacity for a given handling requirement, method and cycle of operations of drag lines, front end loaders, scrapers, bucket wheel and bucket chain excavators, surface miners. Determining the capacity and number of shovels and dumpers for planned production.

UNIT -V: Transport and waste dumps

Scope and application of different modes of transport system in surface mine-trucks, synchronization of shovel and dumper capacity for required production; locomotives; conveyers, mode of operations, applicability and limitations, scope and application of in-pit crusher in surface mines. Illumination in surface mines.

Types of waste dump- internal and external; dump formation methods and corresponding equipment; dump stability and stabilization measures.

TEXT BOOKS/ REFERENCES:

1. Surface Mining Technology Samir Kumar Das, Lovely Prakashan.
2. Surface Mining – GB Misra, Dhanbad Publishers
3. Principles and Practices & Modern Coal Ming, Singh R.D, New Age International.
4. Mine Planning For Coal, Mathur S.P., M.G. Consultants
5. Introductionary Mining Technology – H L Hartman, Wiley India (p) Ltd

E-RESOURCES:

1. http://www.edumine.com/courses/online-courses/conventional-methods-of-resource-reserveestimation/
2. http://www.springer.com/in/book/9783319477909

PC402MN

MINING MACHINERY-I

Instruction	3 periods per week
Duration of Semester End Examination	3 hours
CIE	30 marks
SEE	70 marks
Credits	3

Course Objectives:

- To understand the electrical layouts and power distribution in mine.
- To study the rope haulage layouts, technical details and applications.
- To study the various modes of transport means and electrical circuits.
- To study the types of pumps, installations and design calculations.

Course Outcomes:

At the end of the course, students will be able to

1) Understand Different types of motive power used in mines and different types of wire ropes and their applications
2) Understand different types of rope haulages
3) Understand diesel, trolley-wire, battery locomotives and machinery used in underground workings
4) Understand different types of pumps and belt conveyor
5) Understand how electricity will be supplied in mines.

UNIT-I: Introduction

Different types of motive power used in mines – their field of application, relative merits and demerits; transmission and distribution of compressed air in mines, compressed air in mines, compressed air drills. Elements of the transport system, classification and techno economic indices. Wire ropes – classification, construction, fields of application, rope capping and splicing; deterioration of rope in use and its prevention; testing of ropes, selection and maintenance, rope calculations.

UNIT -II: Rope haulage

Construction of the wire ropes, rope haulages–gravity, direct, balanced direct, main & tail, endless, reversible endless. Suitability of these haulages and their limitations. Dimension of ropes, drums and pulleys, care and maintenance of ropes, changing of haulage ropes, rope splicing, safety appliances in haulage road, and signaling, statutory requirements of haulages.

UNIT -III: Other transport systems

A: Locomotives – diesel, trolley-wire, battery locomotives, constructional features and safety devices and comparison of different types; underground and surface battery charging stations and safety measures, locomotive calculations;

B: Shuttle cars, underground trucks, load-haul- dumpers, SDL, aerial rope ways, gravity transport, principles of hydraulic& pneumatic transportation and their fields of application, electric layouts, man-riding systems.

UNIT -IV: Pumping & Conveying

Different types of drives, installation and maintenance of pumps and pipes in shafts and roadways, electrical layouts, various sources of water in mines, design of sumps.

Face haulage and conveyors – Various types of conveyors, Scraper chain conveyors, AFCs, belt conveyors, cable belt conveyor, shaking and vibrating conveyors, armoured flexible conveyors, high angle conveying, electrical layouts. Numerical problems in conveyors.

UNIT -V: Mine electrical engineering

Distribution of electric power in mines, types of mine cables and their fields of applications, mining switch gears and their installation in hazardous atmosphere, flame proof enclosures, intrinsically safe circuits, (examples) safety aspects and signaling. Mine telephone system and latest development in mine communications.

TEXT BOOKS/ REFERENCES:

1. Elements of Mining Technology Vol. III, D.J. Deshmukh, Denett & Company,
2. Mine Transport – N.T. Karelin, Orient Longmans,
3. Mining and Transport – S. C. Walker, Elsevier
4. Introduction to Mining Engineers – Hartman. H.L, John Wiley & Sons.

E RESOURCES:

1. http://www.westrac.com.au/Industries/Pages/Mining.aspx
2. http://www.springer.com/in/book/9783319477909

PC403MN

MINE ENVIRONMENTAL ENGINEERING - II

Instruction	3 periods per week
Duration of Semester End Examination	*3 hours*
CIE	*30marks*
SEE	*70 marks*
Credits	*3*

Course Objectives:

The main objective this course is

- To know about spontaneous coal heating,
- How to control mine fires and its measures,
- To know about various methods of adapted to combat fires, various firefighting techniques,
- To know mine inundation, mine illumination, rescue and recovery work, principle of management.

Course Outcomes:

At the end of the course, students will be able to

1) Understand various theories, factors affecting the liability of coal seams to spontaneous heating
2) Understand Advances in firefighting techniques and Reopening of sealed-off areas
3) Understand fire damp explosions and coal dust explosions
4) Understand Mine Inundation and Noise
5) Understand Mine illumination.

UNIT-I: Spontaneous Combustion

Various theories, factors affecting the liability of coal seams to spontaneous heating, Experimental methods to determine relative tendencies of coal seams to spontaneous combustion, prevention of coal seam fires.

Mine Fires:

Various methods adopted to combat fires and their advantages and disadvantages.

UNIT -II: Fire Fighting and Reopening of sealed-off areas

Advances in firefighting techniques, different inert gases used for firefighting, their advantages and disadvantages, different types of fire extinguishers.

Reopening of sealed-off areas

Factors to be considered, methods, precautions to be taken to reopen the sealed off areas. Causes of fires in surface coal stocks, precautions against fire in coal stocks on surface, fighting the surface coal stock fires.

UNIT -III: Mine Explosions

A: Different inflammable gases in underground coal mines and explosive triangles. Causes of fire damp explosions, different sources of ignition of fire damp, prevention of fire damp explosions, Characteristics of fire damp explosions.

B: Causes of coal dust explosion, factors affecting the coal dust explosion and preventive measures against coal dust explosion. Comparison of Coal dust explosions with the Fire damp explosions.

UNIT -IV: Mine Inundation and Noise

Surface causes and underground causes of mine inundation, precautions against mine inundation, approaching of water logged areas, dewatering of water logged areas.

Noise: Causes and measurement of noise levels. Precautions, prevention and reduction of noise levels.

UNIT -V: Mine illumination and Rescue

Illumination standard, common types of flame safety lamps, their use and limitations, cap lamp, and organization. Illumination arrangement of opencast and underground working. Rescue and recovery work, Rescue apparatus, Rescue stations, principles of risk management. Introduction to disaster management plan.

TEXT BOOKS:

1. Mine Fires, Explosion , Rescue, Recovery and Inundation – M.A. Ramulu, Mukharjee Publishers
2. Mine Environment & Ventilation – G.B. Misra, Oxford University Press.

REFERENCES:

1. Fires in Coal Mines – L.C. Kaku, Oriental Publishers.
2. Mine Environment Engineering- M. Sengupta

E RESOURCES:

1. https://sites.google.com/site/mineventilationiitkgp/mine-hazards-and-rescue
2. http://www.edumine.com/courses/online-courses/mine-safety-and-rescue-2-underground-irehazards/

PC404MN

MINE SURVEYING

Instruction	*:* 3 periods per week
Duration of Semester End Examination	*: 3 hours*
CIE	*: 30 marks*
SEE	*: 70 marks*
Credits	*: 3*

Course Objectives:

- Ability to apply knowledge of mathematics in surveying to calculate areas and volumes for different projects.
- Ability to identify, formulate and solve problems in the field of advanced surveying.
- Ability to analyze survey data and design mining engineering projects.
- Ability to engage in life- long learning with the advances in survey techniques.

Course Outcomes:

At the end of the course, students will be able to

1) Understand basics and historical methods of survey.
2) Understand application Leveling as a part of surveying.
3) Understand traversing methods using various survey instruments.
4) Understand the fundamentals of triangulation survey.
5) Understand contours and using contours for calculations.

UNIT – I: Introduction & Leveling

Overview of Surveying, Objectives, Principles and classifications. Distance and Directions: Distance measurements using conventional methods. Use of chain and compass, meridians, Azimuths and Bearings, declination, computation of angles. Leveling Instruments – component parts, Temporary and Permanent adjustments – methods of leveling.

UNIT–II: Traversing:

Principles of Traversing, Open and Close traverse using theodolite, Bowditch correction.

Triangulation

Principles of triangulation survey, triangulation using theodolite, basic figures used in triangulation.

UNIT–III: Contouring and Theodolite Surveying

A: Contouring

Characteristics and uses of contours, methods of conducting contour surveys – their plotting. L.S. and C.S. Surveying – their plotting, Calculation of volume from contours.

B: Theodolite Surveying

Theodolite – basic definitions, Temporary and Permanent Adjustments, Measurement of horizontal and vertical angles, Principles of Electronic Theodolite.

UNIT –IV: Correlation survey

Basics of correlation, verticality of shafts, measurement of depth of shafts, Correlation by Weisbach triangle method, Weisbach quadrilateral method

Setting out curves: types of curves, curve ranging, design and setting out simple curves, surface and underground curves.

UNIT–V: Photogrammetric, Global Positioning System

Principles of photogrammetry, Aerial Photographs, scale of vertical photographs, Terrestrial Photogrammetry. Introduction to Global Positioning System, Application of GPS in mining, Remote Sensing –basic Principles, Application of Remote Sensing. EDM and modern instruments slope and open pit surveys, statutory requirements for mine plans, open pit benches.

TEXT BOOKS:

1. Surveying (Vol-1,2& 3) by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain- Laxmi Pubicaions (P) Ltd., NewDelhi.
2. Surveying and leveling (Vol 1 & 2) – Kanitkar, A.V.G. Prakash
3. Surveying (Vol – 1,2 & 3), by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) Ltd., NewDelhi.
4. Surveying (Vol 1,2& 3), Duggal S.K. Tata Mc.Graw Hill Publishing Co.Ltd. New Delhi, 2004
5. Surveying Vol 1 & 2 & 3, Arora K R Standard Book House, Delhi,2004.

REFERENCES:

1. Elements of Plane Surveying, Arthur R. Benton and Philip J Taetly, McGrawHill-2000
2. Plane Surveying, Chandra A M, New age International Pvt. Ltd., Publishers, New Delhi,2002.
3. Apply Principles of triangulation survey. Text book of surveying by C. Venkataramaiah, Universities Press.
4. Higher Surveying, Chandra A M. ,New age International Pvt. Ltd. Publisher, NewDelhi,2002
5. Surveying and leveling by R. Subramanian, Oxford University Press, NewDelhi

E RESOURCES:

1. http://www.ism-minesurveying.org/mine-surveying.html
2. http://www.minesurveyor.net/
3. http://www.pobonline.com/articles/84226-underground-surveying
4. http://www.ism-minesurveying.org/mine-surveying.html
5. http://www.springer.com/gp/book/9781504123679

ES404ME

STRENGTH OF MATERIALS

Instructions	*(3L) hrs per week*
Duration of SEE	*3hours*
CIE	*30 Marks*
SEE	*70 Marks*
Credits	*3*

Course Objectives:

- Understand the concept of stress, strain and elastic behaviour of materials
- Know the concepts of strain energy, principal stress and principal planes
- Learn the bending moment, shear force and the corresponding stress distribution
- Study the deflections and its applications
- Understand the theory of torsion and stresses in springs

Course Outcomes:

1) Apply the fundamental concepts of stress and strain
2) Determine principal stresses and principal planes of a state of stress
3) Analyze the structural members subjected to tension, compression, bending, torsion and combined stresses
4) Determine the deflections of beams
5) Solve the stresses in springs

UNIT - I

Simple Stresses and Strains: Types of stresses and strains, Hook's law, stress-strain curve for ductile materials, moduli of elasticity, Poisson's ratio, linear strain, volumetric strain, relation between elastic constants, bars of varying sections, bar of uniform strength, compound bars and temperature stresses.

UNIT - II

Shear Force and Bending Moment: Relation between intensity of loading, shear force and bending moment, shear force and bending moment diagrams for cantilever and simply supported beams with and without overhanging for point loads, uniformly distributed loads, uniformly varying loads and couples. Compound Stresses: Stresses on oblique planes, principle stresses and principle planes, Mohr circle of stress and ellipse of stress.

UNIT - III

Theory of Simple Bending: Assumptions, derivation of basic equation, section modulus, moment of resistance, determination of flexural stresses. Direct and Bending Stresses: Basic concepts, core for rectangular solid and hollow circular and I sections. Distribution of Shear Stress: Equation of shear stress, distribution across rectangular, circular, diamond, T and I sections.

UNIT - IV

Torsion: Theory of pure torsion, derivation of basic equation, hollow circular shafts, strain energy, transmission of power, combined bending and torsion. Springs: Close and open coiled helical springs subjected to axial loads and axial couples, strain energy in springs, carriage springs.

UNIT - V

Deflections: Deflections of cantilever and simply supported beams including overhanging beams for point loads and uniformly distributed loads by double integration and Macaulay's method. Strain Energy: Strain energy in bars due to gradually applied loads, sudden loads, impact loads and shock loads.

Suggested Reading:

1. Ferdinand P Beer et.al., Mechanics of Materials, Tata McGraw-Hill, 2004.
2. B.C. Punmia, Strength of Materials, Laxmi Publishers, 2000.
3. S. Ramamrutham, Strength of Materials, Dhanpat Rai & Sons, 1993.
4. D.S. Prakash Rao, Strength of Materials - A Practical Approach, Universities Press, 1999.
5. R.K. Rajput, Strength of Materials, S. Chand & Co., 2003.
6. G.H. Ryder, Strength of Materials, Third Edition in SI units, Macmillan Indian Limited, Delhi, 2002.

MANAGERIAL ECONOMICS AND ACCOUNTANCY

Instruction	*: 3+1* classes per week*
Duration of Semester End Examination	*: 3 hours*
CIE	*: 30marks*
SEE	*: 70 marks*
Credits	*: 3*

Course Objectives:

• To learn important concepts of Managerial Economics and apply them to evaluate business decisions.
• To understand various parameters that determine the consumers' behavior.
• To evaluate the factors that affect production.
• To understand the concepts of capital budgeting and payback period.
• To study the concepts of various book-keeping methods.

Unit – I

Meaning and Nature of Managerial Economics: Managerial Economics and its usefulness to Engineers, Fundamental Concepts of Managerial Economics-Scarcity, Marginalism, Equimarginalism, Opportunity costs, Discounting, Time Perspective, Risk and Uncertainty, Profits, Case study method.

Unit – II

Consumer Behavior: Law of Demand, Determinants, Types of Demand; Elasticity of Demand (Price, Income and Cross-Elasticity); Demand Forecasting, Law of Supply and Concept of Equilibrium. (Theory questions and small numerical problem can be asked)

Unit – III

Theory of Production and Markets: Production Function, Law of Variable Proportion, ISO quants, Economics of Scale, Cost of Production (Types and their measurement), Concept of Opportunity Cost, Concept of Revenue, Cost-Output relationship, Break-Even Analysis, Price - Output determination under Perfect Competition and Monopoly (theory and problems can be asked)

Unit – IV

Capital Management: Significance, determination and estimation of fixed and working capital requirements, sources of capital, Introduction to capital budgeting, methods of payback and discounted cash flow methods with problems. (Theory questions and numerical problems on estimating working capital requirements and evaluation of capital budgeting opportunities can be asked)

Unit – V

Book-keeping: Principles and significance of double entry book keeping, Journal, Subsidiary books, Ledger accounts, Trial Balance, concept and preparation of Final Accounts with simple adjustments, Analysis and interpretation of Financial Statements through Ratios.
(Theory questions and numerical problems on preparation of final accounts, cash book, petty cash book, bank reconciliation statement, calculation of some ratios)

Suggested Reading:

1. Mehta P.L., *Managerial Economics* —Analysis, Problems and Cases , Sulthan Chand & Sons Educational Publishers, 2011
2. Maheswari S.N., *Introduction to Accountancy* , Vikas Publishing House, 2005
3. Pandey I.M., *Financial Management* , Vikas Publishing House, 2009

ES401EC

BASIC ELECTRONICS ENGINEERING

Instruction	3 periods per week
Duration of Semester End Examination	*3 hours*
CIE	*30marks*
SEE	*70 marks*
Credits	*3*

Course Objectives:

- To analyze the behavior of semiconductor diodes in Forward and Reverse bias.
- To design of Half wave and Full wave rectifiers with L,C, LC & CLC Filters.
- To explore V-I characteristics of Bipolar Junction Transistor in CB, CE & CC configurations.
- To explain feedback concept and different oscillators.
- To analyze Digital logic basics and Photo Electric devices.

Course Outcomes:

Students will be

1) Able to learn about forward biased and reversed biased circuits.
2) Able to plot the V-I Characteristics of diode and transmission.
3) Able to design combinational logic circuits and PLDs.

UNIT-I

Semi-Conductor Theory: Energy Levels, Intrinsic and Extrinsic Semiconductors, Mobility, Diffusion and Drift current. Hall Effect, Characteristics of P-N Junction diode, Parameters and Applications.

Rectifiers: Half wave and Full wave Rectifiers (Bridge, center tapped) with and without filters, ripple regulation and efficiency. Zener diode regulator.

UNIT-II

Bipolar Junction Transistor: BJT, Current components, CE, CB, CC configurations, characteristics, Transistor as amplifier. Analysis of CE, CB, CC Amplifiers (qualitative treatment only).

JFET: Construction and working, parameters, CS, CG, CD Characteristics, CS amplifier.

UNIT-III

Feedback Concepts – Properties of Negative Feedback Amplifiers, Classification, Parameters. Oscillators – Barkhausen Criterion, LC Type and RC Type Oscillators and Crystal Oscillators. (Qualitative treatment only).

UNIT-IV

Operational Amplifiers – Introduction to OP Amp, characteristics and applications – Inverting and Non-inverting Amplifiers, Summer, Integrator, Differentiator, Instrumentation Amplifier.

Digital Systems: Basic Logic Gates, half, Full Adder and Subtractors.

UNIT – V

Data Acquisition Systems: Study of transducer (LVDT, Strain gauge, Temperature, and Force). Photo Electric Devices and Industrial Devices: Photo diode, Photo Transistor, LED, LCD, SCR, UJT Construction and Characteristics only.

Display Systems: Constructional details of C.R.O and Applications.

Suggested Readings:

1. Jocob Millman, Christos C. Halkias and Satyabrata Jit, *Electronics Devices and Circuits*,3rd Edition, McGraw Hill Education (India) Private Limited, 2010.
2. Rama Kanth A. Gaykward, *Op-AMPS and Linear Integrated Circuit*, 4thEdition Prentice Hall of India, 2000.
3. M. Morris Mano, *Digital Design*, 3rdEdition, Prentice Hall of India, 2002.
4. William D Cooper, and A.D. Helfrick, *Electronic Measurements and Instrumentations Techniques*, 2ndEdition, Prentice Hall of India, 2008.
5. S. Shalivahan, N. Suresh Kumar, A. Vallava Raj, *Electronic Devices and Circuits*, 2ndEdition., McGraw Hill Education (India) Private Limited, 2007.

PC451MN

MINE SURVEYING LAB

Instruction	*2* periods per week
Duration of Semester End Examination	*2 hours*
CEE	*25 marks*
SEE	*50 marks*
Credits	*1*

Course Objectives:
To familiarize with the various surveying instruments and methods.

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

1) Do the Range and to measure the distance between two points.
2) Conduct the chain triangulation survey.
3) Determine the area by using different methods.
4) Determine the elevation of a given point.
5) Use the instruments used in the surveying.
6) Conduct the correlation by two shaft co-planar method.
7) Conduct the correlation by shaft weisbatch methods and shaft Weiss quadrilateral methods.
8) Set a curve by ranging offsets from long chord and ranging ranking method.

LIST OF EXPERIMENTS:
Ranging a line, measuring the distance between two points, pacing.
1. Chain triangulation, booking, calculation of areas and plotting.
2. Traversing with compass.
3. Introduction to levels.
4. Fly leveling.
5. Profile leveling and plotting the section.
6. Contouring
7. Measurement of horizontal and vertical angle.
8. Theodolite Traversing
9. Finding distance between two in-accessible points.
10. Determination of elevation of various points with dumpy level by collimation plane method and rise & fall method.
11. Correlation by single shaft /two shafts by total station.
12. Correlation by single shaft weiss quadrilateral by total station.
13. Curve ranging offsets from long chord
14. Reading mine plans
15. Study of opencast map.
16. Study of underground map

PC 452MN

MINE ENVIRONMENTAL LAB

Instruction	*2* periods per week
Duration of Semester End Examination	*2 hours*
CIE	*25marks*
SEE	*50 marks*
Credits	*1*

Objectives:

- To determine the psychrometric properties, gas percentage in atmosphere.
- To study the principles and characteristics governing mine fans.
- To understand lamp design and perform underground illumination surveys.
- To understand the temporary and permanent stoppings, preventive measures for mine explosions and rescue apparatus.

Course Outcomes:

At the end of the course, students will be able to

1) Determine the psychrometric properties, gas percentage in atmosphere.
2) Determine the relative humidity by hygrometer.
3) Knowledge of principles and characteristics governing mine fans.
4) Analyses ventilation network circuit.
5) Knowledge of mine air-conditions plant.

LIST OF EXPERIMENTS:

1. Detection of mine gases.
2. Measurement of relative humidity by hygrometer and Kata thermometer.
3. Study of Constructional features and Characteristic curves of centrifugal and axial flow fans.
4. Measurement of air quantity by anemometer, velometer, smoke tube
5. Study and analysis ventilation network circuit.
6. Study of mine air-conditioning plant.
7. Constructional features of a flame safety lamp and cap lamp.
8. Fire extinguishers used in mines.
9. Study of cowards Diagram.
10. Study of stone dust barrier.
11. Oxygen self-rescuer
12. Self-contained breathing apparatus.

SURVEY CAMP

CIE : *50 marks*
Credits : *2*

Course Objectives:

- Know the importance of Theodolite, Total station and their practical applications
- Analyze the horizontal and vertical curves for survey work related to Buildings
- Study the various applications of GPS, GIS and remote sensing for field work.

Course Outcomes:

1. Understand use Total station to calculate linear measurements of structures
2. Apply corrections to the measured values
3. Ability to Compute omitted measurements and areas

The students will be given basic training of handling various survey instruments including the Total stations. The students are given certain tasks on all the instruments and equipments to solve the real practical problems in the vicinity of campus which enables them to learn and apply to the real life survey problems.

After the completion of the survey camp, students need to submit a brief technical report on the project executed and present the work through a seminar talk to be organized by the Department. Award of sessional are based on the performance of the student at the work place and will be judged by internal guide (s) (25 Marks) followed by presentation before the committee constituted by the Department (25 Marks). One faculty member will coordinate the overall activity of Survey camp.

***Students have to undergo Survey camp for 2 Weeks duration at the end of semester IV and the credits will be awarded after evaluation in V semester.**