JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF MINING ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For

B. TECH MINING ENGINEERING

(Applicable for batches admitted from 2019-2020)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

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DEPARTMENT OF MINING ENGINEERING

COURSE STRUCTURE – R19

I Year – I SEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	BS1101	Mathematics – I	3	0	0	3
2	BS1102	Mathematics – II	3	0	0	3
3	BS1110	Engineering Chemistry	3	0	0	3
4	ES1101	Programming for Problem Solving Using C	3	0	0	3
5	ES1104	Engineering Mechanics	3	0	0	3
6	HS1102	English Lab	0	0	2	1
7	BS1111	Engineering Chemistry Laboratory	0	0	3	1.5
8	ES1102	Programming for Problem Solving Using C Lab	0	0	3	1.5
9	MC1101	Environmental Science	3	0	0	0
Total Credits			**18**	**0**	**8**	**19**

I Year – II SEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	HS1201	English	3	0	0	3
2	BS1203	Mathematics – III	3	0	0	3
3	BS1208	Engineering Physics	3	0	0	3
4	ES1206	Basic Electrical & Electrical Engineering	3	0	0	3
5	ES1203	Engineering Drawing	1	0	3	2.5
6	HS1203	Communication Skills Lab	0	0	2	1
7	BS1209	Engineering Physics Lab	0	0	3	1.5
8	ES1208	Electrical and Electronics Engineering lab	0	0	3	1.5
9	ES1220	Engineering Workshop & IT Workshop	0	0	2	1.5
10	PR1201	Engineering Exploration Project	0	0	3	1
Total Credits			**13**	**0**	**16**	**21**

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II Year – I Semester

S.No	Category	Subjects	L	T	P	Credits
1	PCC	Development of Mineral Deposits	3	--	--	3
2	ESC	Fluid Mechanics and Hydraulic Machines	3	--	--	3
3	PCC	Mine Surveying-I	3	--	--	3
4	PCC	Mining Geology –I	3	--	--	3
5	BSC	Managerial Economics & Financial Analysis	3	--	--	3
6	ESC	Computer Aided Engineering Drawing Practice	--	--	**3**	**2**
7	PCC	Mine Surveying-I Lab	--	--	3	1.5
8	ESC	Fluid Mechanics and Hydraulic Machines Lab	--	--	3	1.5
		Total Credits				**20**

II Year – II Semester

S.No	Category	Subjects	L	T	P	Credits
1	PCC	Drilling and Blasting	3	--	--	3
2	ESC	Mechanics of Solids	3	--	--	3
3	PCC	Mining Geology –II	3	--	--	3
4	PCC	Mine Surveying – II	3	--	--	3
5	PCC	Surface Mining	3	--	--	3
6	PCC	Mine Environmental Engineering-I	3	--	--	3
7	PCC	Geology Lab	-	--	3	1.5
8	ESC	Mechanics of Solids Lab	-	--	3	1.5
9	MC	Professional Ethics & Human Values	-	3	--	--
		Total Credits				**21**

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III Year - I Semester

S.No	Category	Subjects	L	T	P	Credits
1	PCC	Underground Coal Mining Technology	3	--	--	3
2	PCC	Mine Environment Engineering – II	3	--	--	3
3	PCC	Rock Mechanics	3	--	--	3
4		**OPEN ELECTIVE-I** 1. Waste Water Management 2. Environmental impact analysis 3. Disaster Management and Mitigations	3	--	--	3
5	PCC	Mining Machinery & Mechanization-I	3	--	--	3
6	BSC	Advanced English Communication Skills Lab	-	--	3	1.5
7	PCC	Mine Surveying - II Lab	-	--	3	1.5
8	PCC	Rock Mechanics Lab	-	--	3	1.5
9	PCC	Corporate Social Responsibility in mining	1			0.5
10	PCC	Mine Field visit(Mandatory)(internship)	-	--	--	1
		Total Credits				**21**

III Year - II Semester

S.No	Category	Subjects	L	T	P	Credits
1	PCC	Mine Ground Control	3	--	--	3
2	PCC	Mineral processing	3	--	--	3
3	PCC	Under Ground Metal Mining Technology	3	--	--	3
4	PCC	Mining Machinery & Mechanization –II	3	--	--	3
5		**OPEN ELECTIVE - II** 1.Industrial Robotics 2.Artificial intelligence 3.Introduction to Data Base Management System	3	--	--	3
6	PCC	Mineral processing Lab	--	--	3	1.5
7	PCC	Mine Environmental Engineering Lab	--	--	3	1.5
8	PCC	Mining Machinery & Mechanization Lab	--	--	3	1.5
9	PCC	Industrial Training(3-4weeks) or Skill development or Research project	--	--	--	0.5
		Total Credits				**20**

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IV Year – I Semester

S.No.	Category	Subjects	L	T	P	Credits
1	PCC	Computer Applications in Mining	3	--	--	3
2	PCC	Mine Planning and Design	3	--	--	3
3	PCC	Mine Legislation & General Safety	3	--	--	3
4	PEC-I	**Professional ELECTIVE Course** –I 1. Rocks slope Engineering 2. Mine Subsidence Engineering 3. Mine systems engineering	3	--	--	3
5	MC	IPR & Patents	--	2	--	--
6	PCC	Computer Applications in Mining Lab	--	--	2	1.5
7	PCC	Mine Planning and Design Lab	--	--	2	1.5
8	PCC	Survey Camp (One Week)	--	--	--	2
9	PCC	Mini Project	3	--	--	2
		Total Credits				**19**

IV Year – II Semester

S.No	Category	Subjects	L	T	P	Credits
1	PCC	Mine Economics & Investment	3	--	--	3
2	PCC	Numerical Modeling in Mining	3	--	--	3
3	PEC-II	**Professional ELECTIVE Course II** **1.**Planning of Underground Metal Mining Projects **2.**Long wall mining **3.**Planning of Surface Mining Projects	3	--	--	3
4	PCC	Seminar and Technical Writing	--	--	3	2
5	PCC	Major project	--	--	4	8
		Total Credits				**19**

- *BSC –Basic Science Course*
- *ESC – Engineering Science Course*
- *OEC- I – Open Elective (Offered by Civil branch)*
- *OEC- II – Open Elective (Offered by CSE branch)*
- *PEC - Professional ELECTIVE Course*
- *PCC - Professional Core Course*
- *HS – Humanities Science*
- *MC – Mandatory Course*

Total Course Credits =40+41+ 41+ 38= 160

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I Year - I Semester		L	T	P	C
		3	0	0	3
Mathematics-I (BS1101) **(Common to all Branch's for I Year B. Tech)**					

Course Objectives:

- This course will illuminate the students in the concepts of calculus.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

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

- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- Apply double integration techniques in evaluating areas bounded by region (L3)
- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)

UNIT I: Sequences, Series and Mean value theorems: (10 hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

UNIT II: Differential equations of first order and first degree: (10 hrs)

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.
Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

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UNIT III: Linear differential equations of higher order: (10 hrs)

Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, e^{ax} V(x) and x^nV(x) – Method of Variation of parameters.
Applications: LCR circuit, Simple Harmonic motion.

UNIT IV: Partial differentiation: (10 hrs)

Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT V: Multiple integrals: (8 hrs)

Double and Triple integrals – Change of order of integration – Change of variables.
Applications: Finding Areas and Volumes.

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. **Joel Hass, Christopher Heil and Maurice D. Weir,** Thomas calculus, 14th Edition, Pearson.
3. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press, 2013.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford University Press.

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I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - II (BS1102) **(Common to all Branch's for I Year B. Tech)**					

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

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

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate approximating the roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations (L3)

Unit I: Solving systems of linear equations, Eigen values and Eigen vectors: (10 hrs)

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous equations linear equations – Gauss Elimination for solving system of equations – Eigen values and Eigen vectors and their properties.

Unit-II: Cayley-Hamilton theorem and Quadratic forms: (10 hrs)

Cayley-Hamilton theorem (without proof) – Finding inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.

Singular values of a matrix, singular value decomposition (Ref. Book – 1).

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UNIT III: Iterative methods: (8 hrs)

Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations.

UNIT IV: Interpolation: (10 hrs)

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Newton's divide difference formula.

UNIT V: Numerical integration and solution of ordinary differential equations: (10 hrs)

Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order).

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43^{rd} Edition, Khanna Publishers.
2. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. **David Poole,** Linear Algebra- A modern introduction, 4^{th} Edition, Cengage.
2. **Steven C. Chapra,** Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
3. **M. K. Jain, S. R. K. Iyengar and R. K. Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
4. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press.

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I Year - I Semester		L	T	P	C
		3	0	0	3
ENGINEERING CHEMISTRY (BS1110)					

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Learning Objectives:

- ***Importance*** of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- ***Outline*** the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
  Express the increase in demand as wide variety of advanced materials are introduced; which have excellent engineering properties.
  Classify and discuss the materials used in major industries like steel industry, metallurgical industries and construction industries and electrical equipment manufacturing industries. Lubrication is also ***summarized***.
- ***Relate*** the need of fuels as a source of energy to any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence introduced.
- ***Explain*** the importance and usage of water as basic material in almost all the industries; ***interpret*** drawbacks of steam boilers and also how portable water is supplied for drinking purposes.

UNIT I: POLYMER TECHNOLOGY

Polymerisation:- Introduction-methods of polymerization (emulsion and suspension)-physical and mechanical properties.

Plastics: Compounding-fabrication (compression, injection, blown film, extrusion) - preparation, properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

Elastomers:- Natural rubber-drawbacks-vulcanization-preparation, properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics-conducting polymers-biodegradable polymers-biopolymers-biomedical polymers.

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Learning Outcomes: ***At the end of this unit, the students will be able to***

- ***Outline*** the properties of polymers and various additives added and different methods of forming plastic materials.
- ***Explain*** the preparation, properties and applications of some plastic materials.
- ***Interpret*** the mechanism of conduction in conducting polymers .
- ***Discuss*** natural and synthetic rubbers and their applications.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION

Single electrode potential-Electrochemical series and uses of series-standard hydrogen electrode, calomel electrode-concentration cell-construction of glass electrode-Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li ion battery, zinc air cells–Fuel cells: H_2-O_2, CH_3OH-O_2, phosphoric acid, molten carbonate.

Corrosion:-Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, waterline corrosion-passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control (proper designing, cathodic protection)-Protective coatings: Surface preparation, cathodic and anodic coatings, electroplating, electroless plating (nickel). Paints (constituents, functions, special paints).

Learning Outcomes: ***At the end of this unit, the students will be able to***

- ***Explain*** the theory of construction of battery and fuel cells.
- ***Categorize*** the reasons for corrosion and study some methods of corrosion control.

UNIT III: CHEMISTRY OF MATERIALS

Part- A:

Nano materials:- Introduction-sol-gel method-characterization by BET, SEM and TEM methods-applications of graphene-carbon nanotubes and fullerenes:Types, preparation and applications

Thermal analysis techniques: Instrumentation and applications of thermogravimetric analysis (TGA), differential thermal analysis (DTA), differential scanning calorimetry (DSC).

Part-B:

Refractories: **-** Definition, classification, properties (refractoriness, refractoriness under load, porosity and thermal spalling), failure of refractories.

Lubricants: **-** Definition, mechanism of lubricants and properties (definition and importance).

Cement: **-** Constituents, manufacturing, parameters to characterize the clinker formation: lime saturation factor (LSF), silica ratio (SR) and alumina ratio (AR), chemistry of setting and hardening, deterioration of cement.

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Learning Outcomes: ***At the end of this unit, the students will be able to***

- ***Outline*** the awareness of materials like nanomaterials and fullerenes and their uses.
- ***Explain*** the techniques that detect and measure changes of state of reaction.
- ***Illustrate*** the commonly used industrial materials.

UNIT IV: FUELS

Introduction-calorific value-HCV and LCV-problems using Dulong's formula-proximate and ultimate analysis of coal sample-significance of these analyses-problems-Petroleum (refining-cracking)-Synthetic petrol (Fischer Tropsch and Bergius)-petrol knocking-diesel knocking-octane and cetane ratings-anti-knock agents-Introduction to alternative fuels (Bio-diesel, ethanol, methanol, Natural gas, LPG, CNG)-Flue gas analysis by Orsat apparatus-Rocket fuels.

Learning Outcomes: ***At the end of this unit, the students will be able to***

- ***Differentiate*** petroleum, petrol, synthetic petrol and have knowledge how they are produced.
- ***Study*** alternate fuels.
- ***Analyse*** flue gases.

UNIT V: WATER TECHNOLOGY

Hardness of water-determination of hardness by complexometric method-boiler troubles (priming and foaming, scale formation, boiler corrosion, caustic embrittlement)-internal treatments-softening of hard water (zeolite processs and related sums, ion exchange process)-treatment of industrial waste water

Portable water and its specifications-steps involved in purification of water-chlorination, break point chlorination-reverse osmosis and electro dialysis.

Learning Outcomes: ***At the end of this unit, the students will be able to***

- ***Explain*** the impurities present in raw water, problems associated with them and how to avoid them are understood.

Standard Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co. Latest edition
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition

Engineering Chemistry by Shashi Chawla; Dhanpat Rai Publicating Co. Latest edition

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I Year - I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C (ES1101)					

COURSE OBJECTIVES:

The objectives of Programming for Problem Solving Using C are

1) To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
2) To gain knowledge of the operators, selection, control statements and repetition in C
3) To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
4) To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
5) To assimilate about File I/O and significance of functions

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

UNIT III

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application

UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value

Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application

Processor Commands: Processor Commands

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UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

TEXT BOOKS:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson

REFERENCES:

1. Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill
2. Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson
3. Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD

COURSE OUTCOMES:

Upon the completion of the course the student will learn

1) To write algorithms and to draw flowcharts for solving problems
2) To convert flowcharts/algorithms to C Programs, compile and debug programs
3) To use different operators, data types and write programs that use two-way/ multi-way selection
4) To select the best loop construct for a given problem
5) To design and implement programs to analyze the different pointer applications
6) To decompose a problem into functions and to develop modular reusable code
7) To apply File I/O operations

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I Year - I Semester		L	T	P	C
		3	0	0	3
ENGINEERING MECHANICS (ES1104)					

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

UNIT – I

Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.
Introduction to Engg. Mechanics – Basic Concepts.
Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.
Friction: Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT II
Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.
Equilibrium of Systems of Forces: Free Body Diagrams, , Lami's Theorm, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses.

UNIT – III
Objectives : The students are to be exposed to concepts of centre of gravity. The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.
Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures
Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.
Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – IV
Objectives: The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.
Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics- Work Energy method and applications to particle motion- Impulse momentum method.

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UNIT – V

Objectives: The students are to be exposed to rigid motion kinematics and kinetics

Rigid body Motion: Kinematics and kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse momentum method.

TEXT BOOK:

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.

Course outcomes:

1. The student should be able to draw free body diagrams for FBDs for particles and rigid bodies in plane and space and problems to solve the unknown forces, orientations and geometric parameters.
2. He should be able to determine centroid for lines, areas and center of gravity for volumes and their composites.
3. He should be able to determine area and mass movement of inertia for composite sections
4. He should be able to analyze motion of particles and rigid bodies and apply the principles of motion, work energy and impulse – momentum.

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I Year - I Semester		L	T	P	C
		0	0	2	1
ENGLISH LAB (HS1102)					

UNIT I:
Vowels, Consonants, Pronunciation, Phonetic Transcription

UNIT II:

Past tense markers, word stress-di-syllabic words, Poly-Syllabic words

UNIT III:

Rhythm & Intonation

UNIT IV:

Contrastive Stress (Homographs)

UNIT V:

Word Stress: Weak and Strong forms
Stress in compound words

References books:

1. Infotech English, Maruthi Publications. (with Compact Disc).
2. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
3. English Pronunciation in use- Mark Hancock, Cambridge University Press.
4. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
5. English Pronunciation in use- Mark Hewings, Cambridge University Press.
6. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
7. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

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DEPARTMENT OF MINING ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGINEERING CHEMISTRY LAB (BS1111)					

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn (II) using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of copper (II) using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of iron (III) by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of the concentration of strong acid vs strong base (by conductometric method).
10. Determination of strong acid vs strong base (by potentiometric method).
11. Determination of Mg^{+2} present in an antacid.
12. Determination of $CaCO_3$ present in an egg shell.
13. Estimation of Vitamin C.
14. Determination of phosphoric content in soft drinks.
15. Adsorption of acetic acid by charcoal.
16. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

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DEPARTMENT OF MINING ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ES1102)					

Course Objectives:

1) Apply the principles of C language in problem solving.
2) To design flowcharts, algorithms and knowing how to debug programs.
3) To design & develop of C programs using arrays, strings pointers & functions.
4) To review the file operations, preprocessor commands.

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

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Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

Course Outcomes:

By the end of the Lab, the student

1) Gains Knowledge on various concepts of a C language.
2) Able to draw flowcharts and write algorithms.
3) Able design and development of C problem solving skills.
4) Able to design and develop modular programming skills.
5) Able to trace and debug a program

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I Year - I Semester		L	T	P	C
		3	0	0	0
ENVIRONMENTAL SCIENCE (MC1101)					

Learning Objectives:
The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT-I:
Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects;. Role of information technology in environment and human health.
Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-II:
Natural Resources: Natural resources and associated problems.
Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT-III:
Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

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UNIT – IV Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.
Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT – VI Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.
The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

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I Year - II Semester		L	T	P	C
		3	0	0	3
ENGLISH (HS1201)					

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Learning Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

Unit 1:

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications
Lesson-2: Deliverance by Premchand from "**The Individual Society",** Pearson Publications.
(Non-detailed)

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Listening: Listening to short audio texts and identifying the topic. Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions both in speaking and writing.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.

Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.

Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.
Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications. (Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

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Unit 3:

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications

Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications. (Non-detailed**)**

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing. E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Pronunciation: word stress-poly-syllabic words

Unit 4:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.** (Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

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Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

Unit 5:

Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications. (Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.

Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words

Prescribed text books for theory:

1. "**Infotech English**", Maruthi Publications. (Detailed)
2. "**The Individual Society",** Pearson Publications. (Non-detailed)

Reference books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

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I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - III (BS1203) **(Common to all Branch's for I Year B. Tech)**					

Course Objectives:

- To familiarize the techniques in partial differential equations.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

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

- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3).
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

UNIT I: Vector calculus: (10 hrs)

Vector Differentiation: Gradient — Directional derivative — Divergence — Curl — Scalar Potential. Vector Integration: Line integral — Work done — Area — Surface and volume integrals — Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

UNIT II:Laplace Transforms: (10 hrs)

Laplace transforms of standard functions — Shifting theorems — Transforms of derivatives and integrals —
Unit step function — Dirac's delta function — Inverse Laplace transforms — Convolution theorem (without proof).
Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT III:Fourier series and Fourier Transforms: (10 hrs)

Fourier Series: Introduction — Periodic functions — Fourier series of periodic function — Dirichlet's conditions — Even and odd functions — Change of interval — Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) — Fourier sine and cosine integrals — Sine and cosine transforms — Properties — inverse transforms — Finite Fourier transforms.

UNIT IV:PDE of first order: (8 hrs)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions — Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

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UNIT V: Second order PDE and Applications: (10 hrs)

Second order PDE: Solutions of linear partial differential equations with constant coefficients — RHS term of the type $e^{ax + by}$,sin(ax + by), cos(ax + by), $x^m y^n$

Applications of PDE: Method of separation of Variables — Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

Text Books:

1. **B.S. Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **B. V. Ramana**, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10thEdition, Wiley-India.
2. **Dean. G. Duffy**, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3. **Peter O' Neil**, Advanced Engineering Mathematics, Cengage.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford University Press.

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DEPARTMENT OF MINING ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
ENIGINEERING PHYSICS (BS1208)					

Course Objectives:

Physics curriculum which is re-oriented to the needs of non-circuital branches of graduate engineering courses offered by JNTUniversity:kakinada that serves as a transit to understand the branch specific advanced topics. The course is designed to:

- Impart concepts of mechanics required to identify forces and moments in mechanical systems by vector representation-extend Newton's second law for inertial and non-inertial frames of reference- study different types of harmonic oscillatory motions.
- Tap the Simple harmonic motion and its adaptability for improved acoustic quality of concert halls- impart concepts of flaw detection techniques using ultrasonics.
- Study the structure- property relationship exhibited by solid materials within the elastic limit.
- Impart knowledge in basic concepts of LASERs along with its Engineering applications- Familiarize types of sensors for various engineering applications
- Explore the knowledge of magnetic and dielectric materials and their utility in appliances.

UNIT-I **(10hrs)**

MECHANICS: Basic laws of vectors and scalars, rotational frames-conservative and non – conservative forces , F = - grad V, Newton's laws in inertial and linear accelerating non-inertial frames of reference, rotating frame of reference with constant angular velocity, Harmonic oscillator ; damped harmonic motion ; Forced oscillations and resonance.

Outcome:

The students will be able to

- Identify forces and moments in mechanical systems using scalar and vector techniques
- extend Newton's second law for inertial and non-inertial frame of reference
- explain simple harmonic motion and damped harmonic motions

UNIT-II **(10hrs)**

ACOUSTICS & ULTRASONICS: Introduction – Reverberation - Reverberation time - Sabine's formula (Derivation using growth and decay method)–absorption coefficient and its determination-factors affecting acoustics of buildings and their remedies.

Production of ultrasonics by Magnetostriction and piezoelectric methods – Detection of ultrasonics - acoustic grating - Non-Destructive Testing- pulse echo system through transmission and reflection modes - Applications.

Outcome:

The students will be able to

- explain how sound is propagated in buildings
- analyze acoustic properties of typically used materials in buildings
- recognize sound level disruptors and their use in architectural acoustics
- Use of ultrasonics in flaw detection using NDT technique

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UNIT-III **(9hrs)**

ELASTICITY:, stress, strain, Hooke's law, stress-strain curve, generalized Hooke's law with and without thermal strains for isotropic materials, different types of moduli and their relations, bending of beams – Bending moment of a beam – Depression of cantilever.

Outcome:

The students will be able to

- Understand the elasticity and plasticity concepts
- Study different types of moduli and their relation
- Analyze the concepts of shearing force and moment of inertia

UNIT-IV **(9hrs)**

LASERS & SENSORS: Characteristics–Spontaneous and Stimulated emission of radiation – population inversion - Einstein's coefficients & Relation between them and their significance - Pumping Mechanisms - Ruby laser – Helium Neon laser – Applications.

SENSORS (qualitative description only): Different types of sensors and applications; Strain and Pressure sensors- Piezoelectric, magnetostrictive sensors, Temperature sensor - bimetallic strip, pyroelectric detectors.

Outcome:

The students will be able to

- **Understand** the basic concepts of LASER light Sources
- Study Different types of laser systems
- Identify different types of sensors and their working principles

UNIT-V **(10hrs)**

MAGNETISM & DIELECTRICS: Introduction – Magnetic dipole moment – Magnetization-Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr Magneton - Classification of magnetic materials (Dia, Para and Ferro) – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – Applications of Ferromagnetic materials.

Introduction - Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative)-Lorentz internal field – Claussius_Mossoti equation- Frequency dependence of polarization - Applications of dielectrics.

Outcome:

The students will be able to

- **explain** the concept of dielectric constant and polarization in dielectric materials.
- **summarize** various types of polarization of dielectrics .
- **interpret** Lorentz field and Claussius_Mosotti relation in dielectrics.
- **classify** the magnetic materials based on susceptibility and their temperature dependence.
- **explain** the applications of dielectric and magnetic materials .
- **Apply** the concept of magnetism to magnetic devices.

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Text Books:

1. "Engineering Mechanics" by Manoj K Harbola, Cengage Publications 2nd Eds.
2. "A text book of Engineering Physics" by P G Kshirsagar & M N Avadhanulu, S Chand & Company Ltd.
3. "Engineering Physics" by R K Gaur and S L Gupta, Dhanpat Rai Publications.
4. "Sensor and Transducers" by Ian R Sinclair, Elsevier (Newnes) 3rd Eds.

Reference Books:

1. "Engineering Physics" by M R Srinivasan, New Age International Publishers.
2. "Lectures on Physics" by Richard P Feynman, Pearson Publishers, New Millennium Eds.
3. "Lasers and Non-linear Optics" by B B Laud, New Age International Publishers (3rd Eds.).

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DEPARTMENT OF MINING ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
BASIC ELECTRICAL & ELECTRONICS ENGINEERING (ES1206)					

Preamble:
This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines and electronic components to perform well in their respective fields.

Learning Objectives:
- To learn the basic principles of electrical circuital law's and analysis of networks.
- To understand principle of operation and construction details of DC machines.
- To understand principle of operation and construction details of transformers, alternator and 3-Phase induction motor.
- To study operation of PN junction diode, half wave, full wave rectifiers and OP-AMPs.
- To learn operation of PNP and NPN transistors and various amplifiers.

Unit - I
Electrical Circuits
Basic definitions – types of network elements – Ohm's Law – Kirchhoff's Laws – inductive networks – capacitive networks – series – parallel circuits – star-delta and delta-star transformations.-Numerical Problems.

Unit - II
DC Machines
Principle of operation of DC generator – EMF equation – types of DC machines – torque equation characteristics of DC motors – applications – three point starter – speed control methods of DC motor – Swinburne's Test-Brake test on DC shunt motor-Numerical problems.

Unit - III
AC Machines:
Transformers
Principle of operation and construction of single phase transformers – EMF equation – Losses – OC & SC tests – efficiency and regulation-Numerical Problems.
AC Rotating Machines
Principle of operation and construction of alternators – types of alternators Regulation of alternator by synchronous impedance method – principle of operation of synchronous motor – principle of operation of 3-Phase induction motor – slip-torque characteristics – efficiency – applications-Numerical Problems.

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Unit IV
Rectifiers & Linear ICs
PN junction diodes – diode applications (half wave and bridge rectifiers). Characteristics of operation amplifiers (OP-AMP) – application of OP-AMPs (inverting, non-inverting, integrator and differentiator)-Numerical Problems.

Unit V
Transistors
PNP and NPN junction transistor, transistor as an amplifier– frequency response of CE amplifier – Basic concepts of feedback amplifier-Numerical problems.

Learning Outcomes:
The student should be able to:
- Analyse various electrical networks.
- Understand operation of DC generators,3-point starter and DC machine testing by Swinburne's Test and Brake test.
- Analyse performance of single-phase transformer and acquire proper knowledge and working of 3-phase alternator and 3-phase induction motors.
- Analyse operation of half wave, full wave bridge rectifiers and OP-AMPs.
- Understanding operations of CE amplifier and basic concept of feedback amplifier.

Text Books:
1. Electrical Technology by Surinder Pal Bali, Pearson Publications.
2. Electronic Devices and Circuits by R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

Reference Books:
1. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group
2. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications,2nd edition
4. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications,2nd edition
5. Industrial Electronics by G.K. Mittal, PHI

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DEPARTMENT OF MINING ENGINEERING

I Year - II Semester		L	T	P	C
		1	0	3	2.5
ENGINEERING DRAWING (ES1203)					

Course Objective: Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Unit I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for the curves.

Scales: Plain scales, diagonal scales and vernier scales

Unit II

Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

Unit III

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

Unit IV

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

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Unit V

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD

Note: In the End Examination there will be no question from CAD.

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

Course Outcome: The student will learn how to visualize 2D & 3D objects.

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I Year - II Semester		L	T	P	C
		0	0	2	1
COMMUNICATION SKILLS LAB (HS1203)					

UNIT I:
Oral Activity: JAM, Hypothetical Situations, Self/Peer Profile
Common Errors in Pronunciation, Neutralising Accent

UNIT II:
Oral Activity: Telephonic Etiquette, Role Plays
Poster Presentations

UNIT III:
Oral Activity: Oral Presentation skills, Public speaking
Data Interpretation

UNIT IV:
Oral Activity: Group Discussions: Do's and Don'ts- Types, Modalities

UNIT V:
Oral Activity: Interview Skills: Preparatory Techniques, Frequently asked questions, Mock Interviews.
Pronunciation: Connected speech (Pausing, Tempo, Tone, Fluency etc.,)

References:

1. Infotech English, Maruthi Publications (with Compact Disc).
2. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
3. English Pronunciation in use- Mark Hancock, Cambridge University Press.
4. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
5. English Pronunciation in use- Mark Hewings, Cambridge University Press.
6. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
7. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.
8. Technical Communication- Meenakshi Raman, Sangeeta Sharma, Oxford University Press.
9. Technical Communication- Gajendrea Singh Chauhan, Smita Kashiramka, Cengage Publications.

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I Year - II Semester		L	T	P	C
		0	0	3	1.5
ENGINEERING PHYSICS LAB (BS1209)					

(Any 10 of the following listed 15 experiments)

LIST OF EXPERIMENTS:

1. Determination of Rigidity modulus of a material- Torsional Pendulum.
2. Determination of Young's modulus by method of single cantilever oscillations.
3. Determination of Acceleration due to Gravity and Radius of Gyration - Compound Pendulum.
4. Verification of laws of vibrations in stretched strings – Sonometer.
5. Determination of spring constant of springs using coupled oscillators.
6. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
7. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
8. Measurement of magnetic susceptibility by Gouy's method.
9. Determination of ultrasonic velocity in liquid (Acoustic Grating)
10. Determination of dielectric constant by charging and discharging method
11. Determination of wavelength of Laser by diffraction grating
12. Determination of particle size using Laser.
13. Determeination of Pressure variation using strain Gauge sensor.
14. Determination of Moment of Inertia of a Fly Wheel.
15. Determination of Velocity of sound –Volume Resoantor.

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I Year - II Semester		L	T	P	C
		0	0	3	1.5
BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB (ES1208)					

Learning Objectives:

- To predetermine the efficiency of dc shunt machine using Swinburne's test.
- To predetermine the efficiency and regulation of 1-phase transformer with O.C and S.C tests.
- To obtain performance characteristics of DC shunt motor &3-phase induction motor.
- To find out regulation of an alternator with synchronous impedance method.
- To control speed of dc shunt motor using Armature voltage and Field flux control methods.
- To find out the characteristics of PN junction diode & transistor
- To determine the ripple factor of half wave & full wave rectifiers.

Section A: Electrical Engineering:

The following experiments are required to be conducted as compulsory experiments:

1. Swinburne's test on D.C. Shunt machine (predetermination of efficiency of a given D.C. shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (predetermination of efficiency and regulation at given power factors).
3. Brake test on 3-phase Induction motor (determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
   a) Armature Voltage control b) Field flux control method
6. Brake test on D.C. Shunt Motor.

Section B: Electronics Engineering:

The following experiments are required to be conducted as compulsory experiments:

1.PN junction diode characteristics a) Forward bias b) Reverse bias (Cut in voltage and resistance calculations)
2. Transistor CE characteristics (input and output)
3. Half wave rectifier with and without filters.
4. Full wave rectifier with and without filters.
5. CE amplifiers.
6. OP- amp applications (inverting, non inverting, integrator and differentiator)

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Learning Outcomes:

The student should be able to:

- Compute the efficiency of DC shunt machine without actual loading of the machine.
- Estimate the efficiency and regulation at different load conditions and power factors for single phase transformer with OC and SC tests.
- Analyse the performance characteristics and to determine efficiency of DC shunt motor &3-Phase induction motor.
- Pre-determine the regulation of an alternator by synchronous impedance method.
- Control the speed of dc shunt motor using Armature voltage and Field flux control methods.
- Draw the characteristics of PN junction diode & transistor
- Determine the ripple factor of half wave & full wave rectifiers.

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I Year - II Semester		L	T	P	C
		0	0	2	1.5
ENGINEERING WORKSHOP & IT WORKSHOP (ES1220)					

Engg Workshop

Course Objective: To impart hands-on practice on basic engineering trades and skills.

Note: At least two exercises to be done from each trade.

Trade:

1.Carpentry	1. T-Lap Joint
	2. Cross Lap Joint
	3. Dovetail Joint
	4. Mortise and Tenon Joint
2.Fitting	1. Vee Fit
	2. Square Fit
	3. Half Round Fit
	4. Dovetail Fit
3.Black Smithy	1. Round rod to Square
	2. S-Hook
	3. Round Rod to Flat Ring
	4. Round Rod to Square headed bolt
4.House Wiring	1. Parallel / Series Connection of three bulbs
	2. Stair Case wiring
	3. Florescent Lamp Fitting
	4. Measurement of Earth Resistance
5.Tin Smithy	1. Taper Tray
	2. Square Box without lid
	3. Open Scoop
	4. Funnel
6.IT Workshop	1.Assembly & Disassembly of Computer

IT Workshop

COURSE OBJECTIVES:

The objective of IT Workshop is to

1. Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
2. Demonstrate basic command line interface commands on Linux
3. Teach the usage of Internet for productivity and self paced lifelong learning
4. Describe about Compression, Multimedia and Antivirus tools
5. Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Computer Hardware:

Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Operating Systems:

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Experiment 2: Internet Services:

- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins
- Antivirus installation, configuring a firewall, blocking pop-ups
- Email creation and usage, Creating a Digital Profile on LinkedIn
- Source control on Github, Hackerrank, Codechef, HackerEarth, etc
- Google hangout/ Skype/ gotomeeting video conferencing
- archive.org for accessing archived resources on the web

Productivity Tools:

Experiment 3: Demonstration and Practice on archival and compression tools

- scanning and image editing tools
- OCR and text extraction
- audio players, recording using Mic, editing, podcast preparation
- video players, recording using webcam/camcorder, editing
- podcast, screencast, vodcast, webcasting

Office Tools:

Experiment 4: Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Experiment 5: Demonstration and practice on Microsoft Word, Power Point

Experiment 6: Demonstration and practice on Microsoft Excel.

Experiment 7: Demonstration and practice on LaTeX and produce professional pdf documents.

Experiment 8: Cloud based productivity enhancement and collaboration tools:

- Store, sync, and share files with ease in the cloud using Google Drive
- Document creation and editing text documents in your web browser using Google docs
- Handle task lists, create project plans, analyze data with charts and filters using Google Sheets
- Create pitch decks, project presentations, training modules using Google Slides
- Manage event registrations, create quizzes, analyze responses using Google Forms
- Build public sites, internal project hubs using Google Sites
- Online collaboration through cross-platform support using Jamboard
- Keep track of important events, sharing one's schedule, and create multiple calendars using Google Calendar

TEXT BOOKS:

1. Computer Fundamentals, Anita Goel, Pearson Education, 2017
2. PC Hardware Trouble Shooting Made Easy, TMH

REFERENCES:

1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Vekateswarlu, S.Chand

WEB RESOURCES:

1. https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.doc
2. https://explorersposts.grc.nasa.gov/post631/2006-2007/bitsnbyte/Digital_Storage_Basics.doc
3. https://www.thegeekstuff.com/2009/07/linux-ls-command-examples
4. https://www.pcsuggest.com/basic-linux-commands/
5. https://www.vmware.com/pdf/VMwarePlayerManual10.pdf
6. https://geek-university.com/vmware-player/manually-install-a-guest-operating-system/

7. https://gsuite.google.com/learning-center/products/#!/

COURSE OUTCOMES:

Students should be able to:

1. Assemble and disassemble components of a PC
2. Construct a fully functional virtual machine, Summarize various Linux operating system commands,
3. Secure a computer from cyber threats, Learn and practice programming skill in Github, Hackerrank, Codechef, HackerEarth etc.
4. Recognize characters & extract text from scanned images, Create audio files and podcasts
5. Create video tutorials and publishing, Use office tools for documentation, Build interactive presentations, Build websites, Create quizzes & analyze responses.

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DEPARTMENT OF MINING ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	3	1
ENGINEERING EXPLORATION PROJECT (PR1201)					

COURSE OBJECTIVES:

- Build mindsets & foundations essential for designers
- Learn about the Human-Centered Design methodology and understand their real-world applications
- Use Design Thinking for problem solving methodology for investigating illdefined problems.
- Undergo several design challenges and work towards the final design challenge

Apply Design Thinking on the following Streams to

- Project Stream 1: Electronics, Robotics, IOT and Sensors
- Project Stream 2: Computer Science and IT Applications
- Project Stream 3: Mechanical and Electrical tools
- Project Stream4: Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.

HOW TO PURSUE THE PROJECT WORK?

- The first part will be learning-based-masking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.
- The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human- centered design.
- The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.
- The teams start with **Design Challenge** and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.
- Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc
- At the end, Students are required to submit the final reports, and will be evaluated by the faculty.

TASKS TO BE DONE:

Task 1: Everyone is a Designer

- Understand class objectives & harness the designer mindset

Task 2: The Wallet/Bag Challenge and Podcast

- Gain a quick introduction to the design thinking methodology
- Go through all stages of the methodology through a simple design challenge
- Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.

Task 3: Teams & Problems

- Start Design Challenge and learn about teams & problems through this
- Foster team collaboration, find inspiration from the environment and learn how to identify problems

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Task 4: Empathizing

- Continue Design Challenge and learn empathy
- Learn techniques on how to empathize with users
- Go to the field and interview people in their environments
- Submit Activity Card

Task 5: Ideating

- Continue Design Challenge and learn how to brainstorm effectively
- Encourage exploration and foster spaces for brainstorming
- Submit Activity Card

Task 6: Prototyping

- Continue Design Challenge and learn how to create effective prototypes
- Build tangible models and use them as communication tools
- Start giving constructive feedback to classmates and teammates
- Submit Activity Card

Task 7: Testing

- Finish Design Challenge and iterate prototypes and ideas through user feedback
- Evolve ideas and prototypes through user feedback and constructive criticism
- Get peer feedback on individual and group performance
- Submit Activity Card

Task 8:

- Final Report Submission and Presentation

Note: The colleges may arrange for Guest Speakers from Various Design Fields: Graphic Design, Industrial Design, Architecture, Product Design, Organizational Design, etc to enrich the students with Design Thinking Concept.

REFERENCES:

1. Tom Kelly, *The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm* (Profile Books, 2002)
2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (HarperBusiness, 2009)
3. Jeanne Liedtka, Randy Salzman, and Daisy Azer, Design Thinking for the Greater Good: Innovation in the Social Sector (Columbia Business School Publishing, 2017)

OTHER USEFUL DESIGN THINKING FRAMEWORKS AND METHODOLOGIES:

- Human-Centered Design Toolkit (IDEO); https://www.ideo.com/post/design-kit
- Design Thinking Boot Camp Bootleg (Stanford D-School); https://dschool.stanford.edu/resources/the-bootcamp-bootleg
- Collective Action Toolkit (frogdesign); https://www.frogdesign.com/wpcontent/ uploads/2016/ 03/CAT_2.0_English.pdf
- Design Thinking for Educators (IDEO); https://designthinkingforeducators.com/

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DEPARTMENT OF MINING ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3
DEVELOPMENT OF MINERAL DEPOSITS					

Course Objectives: To impart the knowledge of mineral deposits and to make the student learn and understand the ordinary methods of drilling, blasting and special methods of shaft sinking. Also to make the student understand the detonators and drivage of drifts.

UNIT I:
Various types of development openings shape and size, Selection of suitable type for actual situations raises, winzes or passes, ore chutes.

UNIT II:
Location of shaft shape and size, incline and vertical shafts. Surface arrangements for sinking shafts, tools and equipments ordinary methods of sinking drilling, blasting removal of debris and water.
Special methods of shaft sinking piling, caisson, freezing and cementation method of shaft sinking Modern techniques of shaft sinking. Design of shafts inserts and pit bottoms

UNIT III:
Ventilation and lighting, temporary and permanent lining, widening and deepening of shafts.

UNIT -IV:
Classification and properties of explosives, detonators. Detonating cords, and detonating fuse and nonel detonator. Blasting systems, electrical and non electrical methods, delay blasting techniques. Blasting in open pit mines, blasting in underground coal and metal mines. Mechanics of blasting.

UNIT -V:
Drivage of drifts, organization and cycle of operations, drilling, blasting, blasting patterns, loading, transport, support, drainage, ventilation and lighting. Mechanized drifting, road heading and tunnel boring.

Course Outcomes: Students can design procedure for shaft sinking ;drilling and blasting for various mining operations.

TEXT BOOKS:
1. Surface Mining by Dr. G.B.Mishra,Dhanbad publishers,1978
2. EMT Volume-I by D.J.Deshmukh(9^{th} edition),central techni publication.

REFERENCE BOOKS:
1. SME Hand Book
2. Blasting Manual- Sandhu & Pradhan.

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DEPARTMENT OF MINING ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3
FLUID MECHANICS AND HYDRAULIC MACHINES					

Course Objective: The students completing this course are expected to understand the properties of fluids, its kinematic and dynamic behavior through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations. Further, the student shall be able to understand the theory of boundary layer, working and performance characteristics of various hydraulic machines like pumps and turbines.

UNIT I

Fluid statics:Dimensions and units: physical properties of fluids- specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric gauge and vacuum pressure – measurement of pressure. Manometers- Piezometer, U-tube, inverted and differential manometers. Pascal's law, hydrostatic law.

Buoyancy and floatation:Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.

UNIT II

Fluid kinematics:Introduction, flow types. Equation of continuity for one dimensional flow.circulation and vorticity. Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrotational flow, flow net, source and sink, doublet and vortex flow.

Fluid dynamics:surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its applications, force on pipe bend.

Closed conduit flow:Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line.

UNIT III

Boundary Layer Theory:Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluff body and its applications, basic concepts of velocity profiles.

Dimensional Analysis:Similitude and modeling – Dimensionless numbers

UNIT IV

Basics of turbo machinery:hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

Centrifugal pumps:classification, working, work done – manometric head- losses and efficiencies- specific speed- pumps in series and parallel-performance characteristic curves, cavitation & NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

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UNIT V

Hydraulic Turbines: classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube-theory- functions and efficiency.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, Hydraulic systems- hydraulic ram, hydraulic lift, hydraulic coupling.

Course Outcomes: Identify importance of various fluid properties at rest and in transit. Understand the concept of boundary layer theory and flow seperation. Plot velocity and pressure profiles for any given fluid flow. evaluate the perfomance characteristics of hydraulic turbines and pumps.

TEXT BOOKS:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.
3. Fluid Mechanics and Hydraulic Machines/ RK Bansal/Laxmi Publications (P) Ltd.

REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria& Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
4. Instrumentation for Engineering Measurements by James W. Dally, William E. Riley ,John Wiley & Sons Inc. 2004 (Chapter 12 – Fluid Flow Measurements)
5. Fluid Mechanics and Hydraulic Machines by Domkundwar&Domkundwar, Dhanpatrai& Co.

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DEPARTMENT OF MINING ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3
MINE SURVEYING – I					

Course Objectives: To impart the knowledge of measurements of distances and angles, determination of different levels and level difference and computation of areas, volumes which includes determination of capacity of reservoirs, volumes of barrow pits. The knowledge of modern instruments like Theodolite surveying and tachometric surveying, designing & setup of curves and global positioning systems.

UNIT – I

Introduction & distances and direction: Overview of plane surveying (chain, compass and plane table), Objectives, Principles and classifications. Direct and indirect ranging, chaining along sloping ground. Obstacle in chaining, errors and their elimination.

Distance measurement conventions and methods; use of chain and tape, Electronic distance measurements, Meridians, Azimuths and Bearings, declination, computation of angle.

UNIT – II

Leveling and contouring: Concept and Terminology, Temporary and permanent adjustments-method of leveling. Characteristics and Uses of contours- methods of conducting contour surveys and their plotting. Methods of plane table, radiations. Intersection, traversing and resection. 2-point and 3-point problem. Adjustment and common error in plane table survey.

UNIT – III

Computation of areas and volumes: Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

UNIT –IV

Theodolite & tacheometric surveying: Theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite. Trigonometrically leveling, traversing.

Stadia and tangential methods of Tachometry. Distance and Elevation formulae for Staff vertical position.

Curves: Types of curves, design and setting out – simple and compound curves.

UNIT -V

Introduction to geodetic surveying, Total Station and Global positioning system, Introduction to Geographic information system (GIS).

Course Outcomes: Students can perform surveying of mine areas with variopous instruments such**as** Theodolite , plane table , total station etc,.

TEXT BOOKS:

1. "Surveying (Vol – 1, 2 & 3), by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
2 .Duggal S K, "Surveying (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co. Ltd. New Delhi, 2004.

REFERENCE BOOKS:

1.Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
2.Mine surveying and levelling by S.Gatak(vol-i,ii,iii)
3.Surveying by Kanetkar

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DEPARTMENT OF MINING ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3
MINING GEOLOGY – I					

Course objectives: Geo means "earth" and logos means "science". Hence geology is the science of the earth or the study of the earth. Geology is a must for mining engineers as they deal with the material of the earth's crust i.e. rocks and minerals. Truly speaking, all the material (rock, mineral , soil etc) are the outcome of one of the processes viz. igneous, sedimentary and metamorphic. In mining the ore, geology plays an important role. It gives a clear picture about the nature of the material, the attitude of the beds, structures caused by deformed forces, etc. Hence, Geology helps in choosing the method of exploitation, finding the solution for the problems associated.

UNIT – I
Definition of Geology – Branches of Geology – Importance of Geology in Mining – Interior of the earth – Weathering, Erosion, Denudation, Geological processes. Ground water – Origin and occurrence – Hydrological cycle - Sources of water in Mines - Classification of rocks based on porosity and permeability – Water table and types of Ground water – Geological controls on ground water movement in mines. Crystallography: Characteristics of Crystals – Laws of Crystallography – Classification and study of crystal systems.

UNIT – II
Mineralogy: Definition of mineral – Classification of minerals – Physical and chemical properties of minerals – Study of Silicate structures individual minerals.
Mineralogy: Study of individual groups – Quartz – Feldspar – Pyroxenes – Amphiboles – Micas – Aluminum silicates – Garnets – Olivine.

UNIT – III
Optical Mineralogy : Ordinary light and Polarized light – Reflection, refraction, double refraction – Polarizing and Ore microscopes - Polarizer and analyzer – Thin sections and polished sections – Examination of the minerals under the microscope – Optical properties – Pleochroism, Extinction, Interference colors.

UNIT – IV
Petrology : Igneous petrology – Rocks , 3 fold classification – Origin, form, structures, textures and classification of igneous rocks – Bowen's reaction principle – Study of rocks – Granite, syenite, gabbro, pegmatite, dolerite.

UNIT – V
Sedimentary petrology – Formation, structures, textures and classification of sedimentary rocks – Petro graphic characteristics of conglomerate, breccia, sandstone, shale, limestone – Metamorphic petrology – Formation, structures, textures and classification of metamorphic rocks – Petrography of gneiss, schist, slate, marble, quartzite, charnockite.

TEXT BOOKS :
1. Engineering and general Geology by ParbinSingh,kataria ,S.k.sons publishers.
2. Principles of Engineering Geology by K.M.Bangar , standard publishers and distributers

REFERENCE BOOKS:
3. A text book of Geology – G.B.Mahapathra

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DEPARTMENT OF MINING ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS					

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Unit-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

Unit – II:

Theories of Production and Cost Analyses:

Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

Unit – III:

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

Unit – IV:

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

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Unit – V:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS:

A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

REFERENCES:

1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd,
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd,
4. MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5. I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6. V. Maheswari, Managerial Economics, S. Chand & Company Ltd,

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II Year - I Semester		L	T	P	C
		0	0	3	2
COMPUTER AIDED ENGINEERING DRAWING PRACTICE					

Course Objective: To enhance the student's knowledge and skills in engineering drawing and to introduce drafting packages and commands for computer aided drawing and modeling.

UNIT-I:
Projections of solids: Projections of Regular Solids inclined to both planes – Auxiliary Views.

UNIT-II:
Sections of solids: Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.
Development and interpenetration of solids: Development of Surfaces of Right
Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts.

UNIT-III:
Interpenetration of right regular solids: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.
Perspective projections: Perspective View: Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods (General Method only).

In part B computer aided drafting is introduced.

UNIT IV:
Introduction to computer aided drafting: Generation of points, lines, curves, polygons, dimensioning. Types of modeling : object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,.

UNIT V:
View points and view ports: view point coordinates and view(s) displayed, examples to exercise different options like save, restore, delete , joint , single option.

Computer aided solid modeling: Isometric projections, orthographic projections of isometric projections, Modeling of simple solids, Modeling of Machines & Machine Parts.

TEXT BOOKS :
1. Engineering drawing by N.D Bhatt ,Charotar publications.
2. Engineering Graphics, K.C. john, PHI Publications

REFERENCES:
1. Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura, Sybex
2. Auto CAD 2013 fundamentals- Elisemoss, SDC Publ.
3. Engineering Drawing and Graphics using Auto Cad – T Jeyapoovan, vikas
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, New Age
5. Engineering Drawing – RK Dhawan, S Chand
6. Engineering Drawing – MB Shaw, BC Rana, Pearson
7. Engineering Drawing – KL Narayana, P Kannaiah, Scitech

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8. Engineering Drawing – Agarwal and Agarwal, Mc Graw Hill
9. Engineering Graphics – PI Varghese, Mc Graw Hill
10. Text book of Engineering Drawing with auto-CAD ,K.venkatareddy/B.S . publications.
11. Engineering Drawing with Auto CAD/ James D Bethune/Pearson Publications
12. Engineering Graphics with Auto CAD/Kulkarni D.M, Rastogi A.P, Sarkar A.K/PHI Publications

End Semester examination shall be conducted for **Four** hours with the following pattern:

a) Two hours-Conventional drawing
b) Two hours – Computer Aided Drawing

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II Year - I Semester		L	T	P	C
		0	0	3	1.5
MINE SURVEYING – I LAB					

Course objectives: To Understand different equipment and compare accuracy levels and to study several experiments and conversant with it. To find the importance of latest technology through total station. To be familiar with conventional symbols used in mines. it enables the student to attain good practical knowledge.

List of Experiments

1. Triangulation survey by theodolite
2. Measure horizontal and vertical angles by theodolite
3. Measure horizontal angles by method of repetition and reiteration using theodolite
4. Trigonometric Leveling - Heights and distance problem
5. Signs and conventions used by GSI, MMR, CMR
6. Finding heights and distance using Principles of tachometric surveying
7. Curve setting – different methods by total station
8. Setting out works for buildings & pipe lines.
9. Determine area using total station
10. Traversing using total station
11. contouring using total station
12. Determination of remote height using total station
13. Coordinate measurement by total station and GPS
14. Traversing and recording position of points by GPS
15. Distance, gradient, Difference, height between two inaccessible points using total stations.

Course outcome: Familiar with equipment and capable to do work independently at any time if you get chance

EQUIPMENT TO BE USED:

1. Theodolites, and leveling staffs.
2. Tachometers.
3. Total Station

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II Year - I Semester		L	T	P	C
		0	0	3	1.5
FLUID MECHANICS AND HYDRAULICS MACHINES LAB					

Course Objective: To impart practical exposure on the performance evaluation methods of various flow measuring equipment and hydraulic turbines and pumps.

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Turbine flow meter.

Course Outcomes: Student will be able to utilize the knowledge in the design of water supply pipe networks and measure the rate of flow in pipes and channels. Students will have confidence in the hydraulic design of turbines and should be able to identify suitable pumps and turbines for different working conditions.

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II Year - II Semester		L	T	P	C
		3	0	0	3
DRILLING AND BLASTING					

Course Objectives:
To understand the principles and mechanism of different drilling methods, novel drilling techniques. To learn the basic mechanism of rock fragmentation by blasting. To know the various types of explosives and accessories used in blasting. To learn the different methods of blasting adopted in surface and underground coal / non-coal mines including adverse effects of blasting & their control

UNIT I: Principles of Drilling and Drill bits
Principles of drilling: Principles of rock drilling, drillability, factors affecting the drillability, selection of drills.
Drill Bits: Various types of drill bits, study of bit life, factors affecting bit life, Thrust and rotation

UNIT-II: Explosives
Historical development, properties of explosives, low and high explosives, ANFO, slurries, Emulsion explosives, heavy ANFO, permitted explosives, testing of permitted explosives, bulk explosive systems-PMS, SMS, substitutes for explosives and their applications- hydrox, cardox, airdox.

UNIT-III: Firing of Explosives and blasting methods
A: Firing of Explosives: Safety fuse, detonating cord and accessories, detonators, Exploders, Electric firing and non-electric firing, electronic detonators, NONEL blasting.
B: Blasting methods**:** Preparation of charge, stemming and shot firing, choice and economical use of explosives, misfires, blown out shots, incomplete detonation, their causes, prevention and remedies.

UNIT-IV: Handling of Explosives
Surface and underground transport of explosives, storage and handling of explosives, magazines, accidents due to explosives, precautions and safety measures during transportation.

UNIT-V: Mechanics of blasting and effects of blasting
Mechanics of blasting: Factors affecting rock breakage using explosives, theory of shaped charge, detonation pressure, coupling, shock waves impedance, critical diameter.
Effects of blasting: Vibrations due to blasting and damage criteria, fly rocks, dust, fumes, water pollution and controlled blasting.

Course Outcomes:
At the end of the course, students will be able to
1:Understand Principles of drilling and various types of drill bits.
2:Understand different types of Explosives.
3:Apply different methods of Blasting according to the conditions.
4:Deal with the Explosives.
5:Understand Mechanics of blasting and effects of blasting

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TEXT BOOKS:

1. Blasting in ground excavations and mines, Roy Pijush Pal, Oxford and IBH, 1st ed 1993
2. Drilling technology handbook, C.P. Chugh, Oxford and IBH, 1st ed, 1977 .

REFERENCES:

1. Rock blasting effect and operation, Roy Pijush Pal, A.A. Balkema, 1st ed, 2005
2. Elements of mining technology, Vol-1, D.J. Deshmukh
3. Blasting operations, B.Hemphill Gary, Mc-graw Hill, 1st ed 1981
4. Explosive and blasting practices in mines, S.K.Das, Lovely prakashan, 1st ed, 1993.

E RESOURCES:

1. http://technology.infomine.com/reviews/blasting/welcome.asp?view=full
2. https://miningandblasting.wordpress.com/list-of-technical-papers/
3. Science direct

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II Year - II Semester		L	T	P	C
		3	0	0	3
MECHANICS OF SOLIDS					

Course Objectives:
The objective of this subject is to provide the basic concepts of mechanical behaviour of the materials under various loads, provides knowledge on shear force and bending moment diagrams of beams and knowledge about stress distribution across various cross sections of beams.

UNIT I: Simple Stresses & Strains
Elasticity and plasticity – Types of stresses & strains – Hooke's law – stress–strain diagram for ductile and brittle material–Working stress–Factor of safety–Lateral strain, Poisson's ratio & volumetric strain.
Elastic Module & the relationship between them–Bars of varying section–composite bars–Temperature stresses. Strain energy – Resilience–Gradual, sudden, impact and shock loadings

UNIT II: Shear Force and Bending Moment
Definition of beam –Types of beams–Concept of shear force and bending moment–SF and BM diagrams for cantilever, simply supported and overhanging beams subjected to point loads, UDL, UVL and combination of these loads–Point of contra flexure–Relation between SF and BM and rate of loading at section of a beam

UNIT III: Bending Stresses & Shear Stresses
A: Bending Stresses: Theory of simple bending– Assumptions– Neutral axis – Derivation of bending equation: M/I=f/y=E/R –Determination bending stresses– section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections–Design of simple beam sections.
B: Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections – rectangular, circular, triangular, I, T and angle sections.

UNIT IV: Deflection of Beams &Torsion
Deflection of Beams**:** Bending into a circular arc–slope, deflection and radius of curvature – Differential equation for the elastic line of a beam– Double integration and Macaulay's methods– Determination of slope and deflection for cantilever and simply supported beams subjected to point loads- UDL – uniformly varying load.
Torsion: Theory of pure torsion – Assumptions – Derivation of torsion equation, polar section modulus – power transmitted by shafts – combined bending and torsion.

UNIT V: Analysis of Pin Jointed Plane Frames & Thin Cylinders
Analysis of Pin- Jointed Plane Frames**:** Determination of forces in the members of various types of cantilever & simply supported trusses using (i) Method of Joints (ii) Method of Sections.
Thin Cylinders**:** Thin seamless cylindrical shells–Derivation of formula for longitudinal and circumferential stresses– hoop, longitudinal and volumetric strains– changes in diameter and volume of thin cylinder

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Course Outcomes:

1)to understand the theory of elasticity including strain/displacement and Hooke's law relationships.
2) to analyze solid mechanics problems using classical methods and energy methods.
3) to solve torsion problems in bars and thin walled members.
4) to solve for stresses and deflections of beams under unsymmetrical loading.
5) to locate the shear center of thin wall beams.
6) to obtain stresses and deflections of beams on elastic foundations.
7) to obtain solutions to column buckling and plate problems.
8) to apply various failure criteria for general stress states at points.

TEXT BOOKS

1. S.Timshenko **"**Strength of Materials**",** D. Van Nostr and Company, inc., 3rd edition,1983
2. Ramamrutham **"**Strength of materials**",** Dhanpat Rai Publishing, 18th edition, 2014

REFERENCES

1. R..K. Rajput, **"**Strength of Materials" S. Chand company Pvt, 5th edition, 2014
2. R K Bansal "Strength of Materials" Lakshmi – publications, 6th edition, 2015
3. Bhavikatti "Strength of materials" Lakshmi publications, 4th edition, 2014.
4. R S Khurmi, "Strength of Materials" S Chand, revised edition, 2013.
5. D. S. Kumar, "Strength of Materials, S K Kataria & Sons, Reprint 2013.

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II Year - II Semester		L	T	P	C
		3	0	0	3
MINING GEOLOGY-II					

Course Objectives: To impart the knowledge of the forces acting in the earth's crust, deformation caused by them, different economic minerals and emphasizes their distribution in India. students will know the basic principles of stratigraphy and procedure to be adopted in sampling and mineral wealth of India and Andhra Pradesh

UNIT – I

Structural Geology – Stratified rocks and their structures - Attitude of beds – Strike and dip – Thickness of beds – Folds – genesis, classification, identification in field, impact on landscape, mineral deposits and mining – Unconformities – Types, importance and identification – Faults – Definition, mechanism of faulting, classification, impact of faulting on topography, significance of faults in mining – Joints – definition and characteristics, classification, occurrence of joints in igneous, sedimentary and metamorphic rocks – Differences between joints and faults – Overlap – Inlier and outlier, their importance.

UNIT – II

Economic Geology – Ore minerals and gangue minerals – Syngenetic and epigenetic deposits – Processes of ore formation – Magmatic concentration, Sublimation, Contact metasomatism, Hydrothermal processes, Sedimentation, Evaporation, Residual and mechanical concentration, Oxidation and supergene enrichment, Metamorphism

UNIT – III

Origin, occurrence, distribution and uses of minerals of coal, Iron, lime stone, Lead, Zinc, Copper Manganese, Chromite, , Beach sands, Rock Phosphate, Clay and Graphite.

UNIT – IV

Stratigraphy – Definition principles of Stratigraphic correlation – Geological time scale - Indian stratigraphic scale physiographic divisions Economic minerals occurring in different systems, metallogenic epochs and provinces - Fossils – Conditions, mode of preservation and uses.

UNIT – V

Estimation of Ore reserves– Definition, classification and importance – Sampling – Definition, types, preservation of core samples and importance. Mineral wealth of India – Mineral wealth of Andhra Pradesh – Industrial uses of different minerals.

Introduction to different methods of prospecting for mineral deposits – geological, geophysical, geochemical, geobotanical, aerial photography and remote sensing.

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Course Outcomes: Students can understand the distribution of various minerals in India and abroad.Knowledge gained in stratigraphy,and structural geology will help in better evaluation of geo-mining conditions for design of appropriate excavation process

TEXT BOOKS:

1. Principles of Engineering Geology – Parbin Singh kataria , s.k and sons publishers
2. Principles of Engineering Geology – K.M.Bangar

REFERENCE BOOKS:

3. A text book of Geology – G.B.Mahapathra
4. Mining geology- Arogya Swamy

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II Year II Semester		L	T	P	C
		3	0	0	3
MINE SURVEYING –II					

Course Objectives: To Understand correlation and stope survey methods and know and limitations of photogrammetry and modern survey methods. To be Familiar with dip and strike problems and surveyor responsibility in underground

UNIT I:
Correlation survey: Principles, Classification, Methods, Shaft Plumbing, Assumed Bearing, Weisback Triangle, Co-planning, Weis-back quadrilateral, Problems on correlation survey etc. and degree of accuracy. Orientation of underground net through adits, inclines and shafts. Depth of shaft. Magnetic and gyroscopic orientation

UNIT II:
Opencast, stope & subsidence survey: Opencast:Principles, methods and survey network, Calculation of areas and volumes, mid ordinate and average ordinate, trapezoidal method, Simpson method, contour method.
Subsidence survey: Principles, method and degree of accuracy, underground traversing, setting out gradients in tunnels and adits
Stope surveying**:** Definition, purpose, methods: Tape triangulation, Ray, steeply dipping ore bodies, moderately dipping ore bodies, degree of accuracy.

UNIT – III .
Curve setting:Types of curves, simple and compound curves by linear and angular methods on surface and in the underground. Requirements and functions of a super elevation and transition curve.

UNIT IV
Modern survey: Special Mine surveys-survey of installations of Mine, EDM & ITS Application, GPS, total station, survey for connecting national grid. Field Astronomical terms and definitions. Determination of the meridian Longitude and latitude of a place.

Photogrammetry: Generalprinciples, Elements of photogrametry; orientation of photographs, finding heights and distances of ground points from photographs. Gyrotheodolite survey. Elements of Photogrammetry, field astonomy: Principles & Definitions, Determination of true Meridian, Latitude & Longitude & Time

UNIT V:
Problems in mine surveying. Dip & fault problems. Mine plans & sections, Types of plans, preparation and preservation of plans and sections. Regulations pertaining to mine plans and sections and mine surveying. duties and responsibilities of surveyors care and precaution in storage statutory responsibilities.

Course outcomes:
Ready to do curve setting in surface and underground, able to do latest surveying by total station.

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TEXT BOOKS:

1. Dr.B.C.Punimia "Surveying" Vol II & III
2. Kanetakar& Kulkarni "Surveying and Leveling" Vol – II

REFERENCES:

1 JJ.HollandK.Wardell "Coal mines series editor E.Mason". Vol – II
2 Statham "Coal Mining Practice" Vol- IV
3 Basak "Surveying & Levelling"
4 Ghatak "Mine Surveying and Levelling"

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II Year II Semester		L	T	P	C
		3	0	0	3
SURFACE MINING					

Course Objectives: To impart the knowledge of Opencast Mining, Ground Water control, use of drilling machines,Smooth Blasting and Pre- splitting, Mining methods and selection of high angle conveyor and In-Pit Crusher Conveyor System

UNIT-I:
Introduction: General consideration for the applicability of opencast mining, limits of open cast mining and its advantages and disadvantages. Method of opening box cut, selection of site for box cut.

UNIT-II:
Open Pit Layout and Design: Planning the layout and open pit mine with special reference to large mechanized mines. Optimum dimensions of open pit mines. Removal of over burden and disposal, open cast bench- number, height, width and slope angle of the bench. Factors affecting the stability of the slope. Various types of slope failures, problems on slope failures. Ground water control.

UNIT-III:
Drilling and Blasting: Drillability, mechanics of drilling, major types of drilling machines, basics of mechanics of blasting, principles of fragmentation.

of blasting: with special reference to heavy blasting, air blasting, ground vibrations, fly rocks novel methods of drilling, smooth blasting and pre-splitting.

UNIT-IV:
Surface Mining Methods: Casting, strip, quarrying and Placer Mining, and Modern Methods Excavation and loading: Shovels, Dragline, Front-end loader, Stackers, Graders. Non-Cyclic Surface Mining: Bucket Wheel Excavators and Continuous surface miners.

UNIT-V:
Transport Equipments: Dumpers, Aerial ropeways-monocable and bicable types and their constructional details. Shovel – dumper combination, high angle conveyor and in-pit crusher. Selection of equipments.

Course Outcomes: Detailed knowledge on various unit operations sich as drilling,blasting, transportation equipment helps the students in preparation of layouts for surface mines for required production of minerals

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TEXT BOOKS:

1. Surface Mining Technology by S. K. Das, Lovely Prakashan, Dhanbad, 1994.
2. Surface Mining by G. B. Mishra, Dhanbad Publishers, 1978.

REFERENCE BOOKS:

1. Elements of Mining Technology, Vol. – I, D. J. Deshmukh, 6th Edition, Central Techno Publications, Nagpur, 1998.
2. Opencast Mining – R. T. Deshmukh, M. Publications, Nagpur, 1996.
3. Latest Development of Heavy Earth Moving Machinery Amithosh De, Annapurna Publishers, Dhanbad, 1995.
4. Rock Slope Engineering, Hoek and Bray, the Institution of Mining and Metallurgy, 1981.
5. Introductory Mining Engineering, Hartman, John Wiley and Sons, 1987.

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		3	0	0	3
MINE ENVIRONMENTAL ENGINEERING-I					

Course objectives: To Understand atmosphere and mine atmosphere conditions, heat and humidity levels in mines and controlling method. To know the necessity of ventilation in mines and quantity and quality levels. To know about ventilation standards planning and layout.

UNIT - I

Mine air**:** Atmospheric air composition, mine air composition and comparison, Mine gases-origin, occurrence, physiological effects, detection, monitoring and control. Methane layering, degasification of coal seams, production, assessment, physiological effects and control. Sampling and testing of different gases using different detectors including multi-gas detector.

UNIT - II

Mine climate: Sources of heat in mines, effects of heat and humidity in mines, testing methods and devices::psychometry, kata thermometer, control methods or improving of cooling power of mine air: Air conditioning basic vapor cycle, representative layout.

UNIT - III

Ventilation:necessity of ventilation, , different ventilation systems, principles on different basis and its related calculations, factors effecting selection ventilation system, mechanism of airflow through mine openings, Laws of air flow, resistance of airways, equivalent orifice, Distribution of air flow and control devices. Natural ventilation calculation of NVP, thermodynamic aspects, artificial aids to natural ventilation

UNIT - IV

Mechanical ventilation: different types of mine fans installation, operation details, applicability, limitations, efficiencies and characteristic, factors for effecting selection of mine fan, testing and output control of fans, operation of mine fans (Series and parallel). Fan laws, drives, Evasee, diffusers, booster fans, auxiliary ventilation. Reversal of air currents and controlled recirculation.

UNIT – V

Ventilation planning and design:.ventilation survey both quantity and pressure and related calculations. Mine ventilation design criteria and factors, Accenssional, descensional, homotropal, anti – tropal ventilation plan. Central and boundary ventilation systems – layouts and comparisons. Standard of ventilation including permissible air velocities

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. Case study

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Course Outcomes: Familiar with mine ventilation systems, quantity and quality requirements, decide ventilation system and method and develop mine ventilation plan and layout for any given mine.

TEXT BOOKS:

1. Elements of Mining Technology - Vol II- D. J. Deshmukh, 9th Edition, Central Techno Publication
2. Mine Environment and Ventilation – G. B. Mishra, Oxford University Press, 1994.

REFERENCE BOOKS:

1. Mine ventilation and air conditioning – Howard L. Hartman. Wiley International, 1976.
2. Environmental Engineering in Mines – Vutukuri& Lama, Cambridge University Press, Cambridge,
3. Legislation in Indian mines a critical appraisal Vol. I and Vol. II – Prasad and Rakesh. Vivek Publications, Varanasi 1999.
4. Mine Ventilation Vol. – II, S. Ghatak, Coalfield Publishers, 1993.

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II Year - II Semester		L	T	P	C
		0	0	3	1.5
GEOLOGY LAB					

Objectives: To impart exposure on properties of minerals, faults and economic minerals

List of Experiments

1. Study of Physical properties minerals.
2. Demonstration of Crystal models
3. Demonstration of Optical properties of minerals
4. Study of important Igneous, sedimentary and metamorphic rocks.
5. Recognition of folds, faults, unconformities from maps.
6. Simple problems on strike and dip.

Course Outcomes: To Identify Mega-scopic minerals Mega-scopic rocks ,their properties and their site parameters such as contour, slope and aspect for topography and to know the occurrence of materials using the strike & dip problems.

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II Year - II Semester		L	T	P	C
		0	0	3	1.5
MECHANICS OF SOLIDS LAB					

Course Objectives: Student will be able to learn and understand the various basic concept and principles of properties of materials like young's modulus and rigidity modulus.

LIST OF EXPERIMENTS:

1. Compression test by using UTM
2. Tensile test by using UTM
3. Bending test on simply supported beam
4. Bending test on cantilever beam
5. Torsion test
6. Hardness test usingBrinnel hardness tester
7. Hardness test using Rockwell hardness tester
8. Test on springs a) compression spring b) tension spring
9. Impact test using Izod
10. Impact test using Charpy
11. Fatigue test
12. Hoop stress andstrain relationship for the Thin Cylinder

Course Outcomes:

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

1. Find out the hardness of different engineering materials.
2. Find out the Young's modulus of materials using deflection of beams
3. Determine the toughness of materials using Charpy and Izod test.
4. Understand the working principle of heavy machines like UTM, Hardness testers
5. Find out the Rigidity modulus of shafts using torsion test.

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II Year - II Semester		L	T	P	C
		0	3	0	0
PROFESSIONAL ETHICS AND HUMAN VALUES					

Course Objectives: To give basic insights and inputs to the student to inculcate Human values to grow as a responsible human beings with proper personality.Professional Ethics instills the student to maintain ethical conduct and discharge their professional duties.

UNIT I: Human Values:
Morals, Values and Ethics – Integrity –Trustworthiness - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.
Principles for Harmony:
Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT II: Engineering Ethics and Social Experimentation:
History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism —Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg's Theory - Gilligan's Argument –Heinz's Dilemma - Comparison with Standard Experiments — Learning from the Past –Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

UNIT III: Engineers' Responsibilities towards Safety and Risk:
Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/sInvoluntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/sImmediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT IV: Engineers' Duties and Rights:
Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality – Senses of Loyalty - Consensus and Controversy - Professional and Individual Rights –Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving-Occupational Crimes- Industrial Espionage-Price Fixing-Whistle Blowing.

UNIT V: Global Issues:
Globalization and MNCs –Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics - Intellectual Property Rights.

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- Related Cases Shall be dealt where ever necessary.

Course Outcomes: It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties.It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively.

TEXT BOOKS:

1. Professional Ethics by R. Subramaniam – Oxford Publications, New Delhi.
2. Ethics in Engineering by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill – 2003.

REFERENCE BOOKS:

3. Professional Ethics and Morals by Prof.A.R.Aryasri, DharanikotaSuyodhana - Maruthi Publications.
4. Engineering Ethics by Harris, Pritchard and Rabins, Cengage Learning, New Delhi.
5. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
6. Engineering Ethics & Human Values by M.Govindarajan, S.Natarajan and V.S.SenthilKumar- PHI Learning Pvt. Ltd – 2009.
7. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press.
8. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill – 2013
9. Human Values And Professional Ethics by Jayshree Suresh and B. S. Raghavan, S.Chand Publication