

| PROGRAM | | BI | E- Mining Engi | neering | | |
|------------------|--|--|---|---|------------------|----------|
| Course Code: | | | L | Т | Р | С |
| UCLEC01 | Cours | e Name: | 2 | 0 | 0 | 2 |
| | TECHNICA | L ENGLISH-I | | | | |
| Year and | I Year (I S | EMESTER) | | Contact | t hours per week | • |
| Semester | | | | | (2Hrs) | |
| Prerequisite | N | IIL | | | | |
| course | | | | | | |
| Course category | Humanities and Social Sciences | Management courses | Profession | al Core | Professional | Elective |
| | \ <u>\</u> | | | | | |
| | Basic Science | Engineering Science | Open El | ective | Mandat | ory |
| | | | | | | |
| Course Objective | Identify th Use Voca Read and Learn to v Application | e process of commun bulary & English Gra understand the langua write technical drafts. on of imperative passi | nication and fo mmar in comm age. ve. | ocus on lang munication | guage | |
| Course Outcome | The student will be 1. Outline th 2. Illustrate t 3. Distinguis 4. Infer the s 5. Develop g 6. Apply the | able to e importance of comr echnical and general h different tenses and kill for writing forma good listening and spe skills to speak and w | nunication ski vocabulary. l identificatior l and informa aking skills vrite English g | ill. n of commo l letters grammatica | n errors lly | |

| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO 5 | PO 6 | PO 7 | PO8 | PO9 | PO10 | PO11 | PO 12 | PS O1 | PSO2 | PS O 3 |
|-------------|-----------|----------|------------|-----------|---------|---------|----------|-------------------------------|---------|-----------------|----------|----------|----------|------|--------------|
| CO1 | - | - | - | - | 2 | 3 | 2 | - | 3 | 3 | - | 3 | - | - | - |
| CO2 | - | - | - | - | - | 3 | 2 | - | 2 | 2 | - | 3 | - | - | - |
| CO3 | - | - | - | - | 2 | 2 | 2 | - | 2 | 2 | - | 2 | - | - | - |
| CO4 | - | - | - | - | 2 | 2 | 2 | - | 3 | 3 | - | 3 | - | - | - |
| CO5 | - | - | - | - | 2 | 2 | 2 | $\frac{1}{2}$ - $\frac{3}{3}$ | | | | 3 | - | - | - |
| CO6 | - | - | - | - | 2 | 3 | 3 | - | 3 | 3 | - | 3 | - | - | - |
| Average | - | - | - | - | 2 | 2.5 | 2.2 | - | 2.7 | 2.7 | - | 3 | - | - | - |
| Correlation | Levels | | • | 1.Slig | ht(Lo | | 2.Mc | derate | e(Mediu | ^{1m} 3 | .Substa | antial(| High) | | |
| KL-Knowledg | e Level:K | 1-Remer | nber, K2— | -Understa | and ,K3 | -Apply | , K4-A1 | nalyse, F | K5-Eval | uate, K6- | Create ; | | | | |
| PO-Programm | e Outcor | ne; CO-(| Course Out | come ;PS | O-Prog | gramme | e Specif | ic Outco | ome | | | | | | |
| UNIT I | CC |)MMU | NICATIO |)N & F | OCUS | 5 ON I | LANG | UAGE | C | | | | | 6Hrs | |



Process of Communication -Language as a tool of Communication-Importance of Technical Communication

UNIT II VOCABULARY & ENGLISH GRAMMAR

General Vocabulary-Dictionary-Word Formation: Prefix and Suffix-Synonyms and antonyms-Idioms and Phrases-Homophones -Parts of Speech-Subject Verb Agreement-Tenses, Articles, Prepositions-Common errors in English

UNIT III READING SKILL

Intensive Reading-Skimming the text-Scanning-Topic sentence and Its Role-Reading and Interpretations-Critical Reading

UNIT IV WRITING SKILL

Descriptive Writing –Paragraph-Technical descriptions-Essays-Letter Writing – Formal and Informal-Business Letters-Job Application Letter-Types of reports-Instructions and Checklists

UNIT V LISTENING AND SPEAKING

Types of Listening -Listening and note taking-Pronunciations-Stress and Intonation-Conversation technique-Dialogue Writing -Professional Communication-Interview-Group Discussion –Power Point Presentation-Lab

> Total : 30 Hours

TEXT BOOKS:

1. Cambridge Advanced Learner's Dictionary (Latest Edition)

2. English and Communication Skill for Students of Science and Engineering by S.P.Dhanavel.(Orient Blackswan)

Designed by " Department of English"

6Hrs

6 Hrs

6Hrs

6Hrs

DEPT OF MINING ENGINEERING



| PROG | RAM | | | | | | | BE- Mi | ning Eng | zineering | r | | | | | | |
|--------------|----------------|--|---------------------|--|-----------|----------------------|--------------|--------------------|----------|-----------|---------------|-----------|----------|-----------|----------|--|--|
| 1100 | | | Cours | e Name | • | | | | I. | | • | Р | | | C | | |
| Cours UBM | e Code TC01 | | ENGI – I | NEERII | NG MA | THEM | ATICS | | 3 | 1 | | 0 | | | 4 | | |
| Year a | ind | |] | Year | (I SEM | IESTE | R) | | | Co | ntact h | ours pe | r week | | | | |
| Semes | ter | | | | | | | | | | (4 | 4Hrs) | | | | | |
| Prereq | uisite | | | | NIL | | | | | | | | | | | | |
| course | • | | | | | | | | | | | | | | | | |
| Course | e categ | gory | Huma | nities an | d | Manag | ement | P | rofessio | nal Cor | e | Pro | fessiona | l Electiv | /e | | |
| | | - | Social | Science | S | cour | ses | | | | | | | | | | |
| | | - | Basic | Science | | Engine Scie | ering nce | | Open E | lective | | | Manda | atory | | | |
| | | | | | | | | | | | | | | | | | |
| Course | e Obje | ctive | 1. | Identif | y the pr | ocess o | t mecha | anics | | | | | | | | | |
| | | | 2. | Use the | e calcul | us richles | | | | | | | | | | | |
| | | | 3. 4 | Learn | to integ | rals | | | | | | | | | | | |
| | | | | Applic | ation of | f integra | als. | | | | | | | | | | |
| | | | | rr · | | 0 | | | | | | | | | | | |
| | | | The stu | The student will be able to 1 Solve problems on Laplace Transform | | | | | | | | | | | | | |
| Course | e Outco | Dutcome 1. Solve problems on Laplace Transform | | | | | | | | | | | | | | | |
| | | | 2. | Demor | istrate t | he use of | of Four | ier Trar | storms | in solvi | ing phy | sical pro | oblems | | | | |
| | | | 5. ⊿ | Evalua Apply | nrobak | instorm | of phys | sical sys | stems | avetome | | | | | | | |
| | | | 4. 5 | Evalua | te Sam | nling d | istributi | ions of r | hysical | l system | s | | | | | | |
| | | | 5. 6. | Apply | the kno | wledge | of Lar | blace tra | nsform | . Fourie | er trans | form, p | robabili | tv and | | | |
| | | | | sampli | ng distr | ibution | s in eng | ineering | g applic | ations | | 1 | | 5 | | | |
| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 | | |
| CO1 | 3 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 | 2 | | |
| CO2 | 3 | 2 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 2 | 3 | | |
| CO3 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | - | 2 | | |
| CO4 | 3 | 2 | 3 | 3 | 2 | - | - | - | - | - | - | 2 | 2 | 3 | 3 | | |
| CO5 | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | 2 | 3 | 3 | 3 | | |
| CO6 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | 2 | 3 | 3 | 2 | | |
| Ave | | | | | | - | - | - | - | - | - | | | 2.40 | 2.17 | | |
| rage | 2.83 | 2.50 | 2.83 | 2.50 | 1.67 | Ļ | | 2.14 | | | Ļ | 2.00 | 2.33 | 1/11' 1 | | | |
| Corre | elation I | Levels | 1 Domon | I.Slig | ht(Lov | V) | 2 Annler | 2.Mo | derate(| Mediui | $\frac{m}{K}$ | 3.Sut | ostantia | l(High) |) | | |
| PO-Pr | ogramme | e Outcon | 1-Kemen ne; CO-C | liver, K2- | itcome :l | Stanu ,K. PSO-Pro | gramme | Specific | outcome | Evaluate | , NU-Ure | ale; | | | | | |
| | _ | | , | _ | - ,- | | | • ^ | | | | | | | | | |
| UNIT | I | C 1 | | TRIC | GONON | 1ETRY | | | 0 | 1.01 | 0 | 0.11 | 1 1. | 12 Hrs | 5 | | |
| De M | ovier's 7 | heorer | n and its | s applica | ations - | Expans | 10n of S | $\sin n\theta$, c | osnθ, a | nd Sinn | θ, cosn | і ⊎. Нур | erbolic | function | 18 - | | |
| Separ | ation inf | to real p | oarts and | ı ımagır | ary Par | us - sim | pie pro | diems. S | summat | lion of s | eries us | sing C + | is meth | 100. | | | |
| UNIT | II | | | DIFF | ERENT | TIAL CA | ALCUL | US I | | | | | | | | | |



| | 12 Hrs |
|--|-----------------------------------|
| Successive Differentiation of Standard forms -Leibnitz's theorem (Statement only)- simple problems. Le tangent and Subnormal. tangent and normal in Cartesian and polar form. Curvature, radius and centre of Cartesian and polar form - Evolutes and Envelopes | ngth of Sub curvature in |
| UNIT III DIFFERENTIAL CALCULUS II Functions of two variables - Partial derivatives - Euler's theorem on homogeneous functions and its gene total differentials Jacobian- Taylor's series in the case of two variables - Maxima /Minima of Two variab Lagrange's method of undetermined multipliers. | 12 Hrs eralization - bles - |
| UNIT IV INTEGRAL CALCULUS I Integration by trigonometric substitution, by parts, Bernoulli's rule. Reduction formulae - Properties of d integrals - beta and gamma Functions and problems. | 12 Hrs lefinite |
| UNIT V INTEGRAL CALCULUS II Operations under the sign of integration - multiple integrals - change of order coordinates -Area, Volume and Surface area of solids using multiple integrals of integration - Transform | 12 Hrs nation of |
| Text BOOKS: | 60 Hours |
| 1. Dr. B.S. Grewal, "Higher Engineering Mathematics", 40th edition, Khanna Publishers, New Del | lhi, 2007. |
| REFERENCES: 1. H.K.DASS "Advanced Engineering Mathematics", 15th Revised edition, S.Chand & Co. Ltd., N 2006. | Jew Delhi, |



| PROGRAM | | | | | | | BE-Mi | ining E | ngineerii | ng | | | | |
|---------------------|----------|--|--|--|---|---|---|---|---|--------------------------|----------------------|----------|----------|-----|
| Course Code: | | N | | | | | | L | | T | I | | | С |
| UBPHC01 | Cot | irse N | ame: | | | | | 3 | | 1 | (|) | | 4 |
| | EN | GINE | ERIN | G PHY | YSICS | 5 I | | | | | | | | |
| Year and Semester | ΙY | ear (I | SEME | STER |) | | | | C | Contac | t hours p | er weel | K | |
| Prerequisite course | | |] | NIL | | | | | | | (4Hrs) | | | |
| Course category | Hu So | manitie cial Sci | es and ences | Μ | lanage cours | ment es |] | Profess | ional Co | ore | Pr | ofession | al Elect | ive |
| | Ba | asic Sci | ence | E | nginee Scien | ering ce | | Open | Elective | е | | Mand | latory | |
| | | V | | | | | | | | | | | | |
| Course Objective | At t | De De To To To To | monsti termin study estima enhan of the | the con the elas the the b the conc course f | actic line astic line basic here the stude | of fluic mit of it of di eat law f electr dent w | at rest different off | t and m ent mater t mater behavio etic inc ble to: | otion. erials ials or of lig duction | ht. and th | eir applica | ations | | |
| Course Outcome | | 1. Su 2. Ex 3. Illu 4. De 5. Ou 6. Ap | mmariz plain tl ustrate monstr tline th ply the | ze the la he conc the prop rate the he basic fundai | aws an epts of perties basic princi mental | d prind f hydro of ma princip ples of s of ele | ciples of statics tter les of l celectr ectroma | of basic and hy neat an icity an agnetic | e mecha vdrodyn d light nd electr inducti | nics amics rical m | achines engineeri | ng appl | ications | |
| POS/ PO | РО | PO | PO | PO5 | РО | PO | PO | PO | PO1 | PO1 | PO12 | PSO | PSO | PSO |
| COS 1 | 2 | 3 | 4 | 105 | 6 | 7 | 8 | 9 | 0 | 1 | 1012 | 1 | 2 | 3 |
| CO1 2 | 2 | - | - | 2 | - | - | - | - | - | - | 2 | 3 | 2 | 3 |
| CO2 2 | - | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 3 | 3 | 3 |
| CO3 2 | 2 | - | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| CO4 2 | 2 | 2 | - | 2 | - | - | - | - | - | - | 2 | - | 2 | - |
| CO5 3 | - | - | - | - | - | 2 | 2 | 3 | 2 | | | | | |
| CO6 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | 3 | 2 | 3 | 2 | |
| Average 2.3 | 2.4 | 2.3 | 2 | 2.3 | - | - | - | - | 2.2 | 2.5 | 2.6 | 2.5 | | |
| Correlation Levels | 2.Mc | oderate | (Mediu | m) 3 | Substant | ial(Hig | h) | | | | | | | |

PO-Programme Outcome; CO-Course Outcome ;PSO-Programme Specific Outcome

Unit I: Mechanics

(9Hours)

Force-inertia-Newton's laws of motion- impulse and impact - Friction- cause of friction- types of frictionlaws of friction-coefficient of friction- angle of friction. Motion-types of motion- simple harmonic motionsimple pendulum- circular motion-centripetal and centrifugal force- *conical pendulum-working of a steam engine governor based on the principle of conical pendulam. Newton's law of universal gravitation-*Satellite-



principle of launching of satellite- orbital velocity-time period- escape velocity. Planetary motion and Kepler's Laws-Deduction of Kepler's third law-Law of gravitation from Kepler's third law.

Unit II: Hydrostatics and Hydrodynamics

(9Hours)

Fluid-Pascal's law-Archimedes principle-Laws of floatation- centre of buoyancy – stability of equilibrium of a floating body-metacentre - metacentric height of a ship – experiment*. Hydrostatic pressure, differential manometer - Centre of pressure- Centre of pressure of a rectangular lamina immersed in a homogenous liquid at rest - Centre of pressure of a triangular lamina with one side parallel to the surface-Surface tension- angle of contact-capillarity- derivation of surface tension. Viscosity-Viscous force-Stokes Law-coefficient of viscosity- experiment to find coefficient of viscosity. Bernoullis Theorem - Venturimeter - Plimsol lines (9 Hours)

Unit III: Properties of matter

Elasticity- stress and strain- -Hooke's law -modulus of elasticity* -different types - Poisson ratio Torsiontorque per unit twist – work done in twisting- Torsion pendulum- theory and experiment-bending of beams-bending moment- Cantilevers- depression of a cantilever- non uniform bending and uniform bending- theory and experiment.

Unit IV: Heat and Light

(9 Hours) Laws of thermodynamics-Specific heat capacity - Specific heat capacity of gases - CP and CV - Relation between them-Transmission of heat – conduction- coefficient of thermal conductivity – Lee,s disc experiment- cylindrical flow of heat-convection- radiation-Black body radiation - distribution of energy-Wien's displacement law-Rayleigh Jeans law. Interference*- Double slit experiment- Diffraction* due to single slit and circular aperture. Limit of resolution, Resolving power of optical instruments. (9 Hours)

UNIT V: Electricity

Heating effect of current-Joules law of heating-Applications-fuse- thermopile. Ampere's Law, Biot Savart law. Magnetic field at a point due to straight conductor carrying current-Kirchoff's current and voltage laws – Wheatstone's network -Electromagnetic induction - Faraday's laws of Electromagnetic induction - Lenz law -Self induction-Mutual induction . DC Generator* - principle, construction and working- AC Generator*principle, construction and working. Transformer- principle, construction and working -Losses in transformer- methods to reduce the losses.

TOTAL 45 HRS

TEXT BOOKS:

- 1. A Nelson, "Engineering Mechanics" Tata McGRaw Hill, 2009.
- 2. M. Narayanamurthi, M. Nagarathnam, "Statics, Hydrostatics and Hydrodynamics", The National Publishing Company, 8th Edition, 2008.
- 3. R. Murugeshan, Properties of matter and acoustics, S. Chand & Co, New Delhi 2012.
- 4. D.S. Mathur, Elements of properties of matter, S.Chand & Company Ltd., New Delhi 2010.
- 5. Brijlal, N. Subramanyam and P.S. Hemne "Heat and thermodynamics", S.Chand & Co,

6. N. Subramaniyam, Brijlal and M.N. Avadhanulu, A text book of Optics, S. Chand & Co, New Delhi, 2012. **REFERENCES:**

- R Feynmann, R Leighton, M Sands, "The Feynmann Lectures on Physics", Volume 1, Pearson 1. Education; 1st edition 2012.
- 2. D Halliday, R Resenic and J Walker "Fundamentals of Physics", Wiley India, 6th edition, 2006.
- 3. Brijlal and Subramaniyam, "Properties of matter", S. Chand & Co, New Delhi, Revised edition, 2008.
- R W. Fox, A T. McDonald, P J. Pritchard John, "Introduction to Fluid Mechanics", Wiley & Sons, 6th 4. edition, 2008.
- E M. Purcell and Morin, "Electricity and Magnetism", 3rd Edition, Cambridge University Press, 2011 5.
- A Ghatak, "Optics", McGraw-Hill Education; 1st Edition, 2009 6.



| PROG | RAM | | BE-Min | ing Engi | neering | | | | | | | | | | |
|---------|--------------------|--------|-----------|--------------|-----------|-------------------|------------|-------------------------|---------------------|-----------|----------|-----------|-----------|----------|---------|
| Ca | | 0. | | 2 0 | ~ | | | | L | Т | | Р | | | С |
| | | 1 | Course | e Name | : | | | | 2 | 0 | | 0 | | | 2 |
| | beneo | 1 | Engineer | ring Che | mistry | | | | 3 | 0 | | 0 | | | 3 |
| Year | and Sem | ester | I Year (I | Semeste | er) | | | | | C | ontact h | ours per | week | | |
| Prerec | quisite co | ourse | NIL | | | | | | | | (3 | 3Hrs) | | | |
| | | | Huma | nities an | d | Manag | gement | I | Professio | nal Core | | Prof | essional | Elective | ; |
| Cour | rea antar | 0 | Social | Science | S | cou | rses | | | | | | | | |
| Cour | ise caleg | ,or y | Basic | Science | E | ngineerii | ng Scien | ce | Open F | lective | | | Mandat | orv | |
| | | | 2001 | ✓ | | | | | open 2 | | | | | .01) | |
| | | | 1 | L agent d | | 1 | f | Tuesta | ant fan i | | 1 | | | | |
| Course | e Obiecti | ve | 1. 2 | Discuss | | $rac{1000}{1000}$ | n water | of crud | ent for i | ndustria | i purpos | se | | | |
| 000000 | | | 2. | Discuss | ine the | technold | ogy of w | vater Tr | e on eatment | for indu | strial n | irnose | | | |
| | | | 3. 4 | To stud | v the C | oncept o | ogy of w | tical tecl | hnique a | and the i | mportai | nce of fr | iels | | |
| | | | 5. | To kno | w the pi | rinciple | involve | d in cor | rosion c | ontrol, t | he conc | ept of e | nergy st | orage de | evices. |
| | | | | | I | 1 | | | | , | | 1 | 05 | U | |
| | _ | | At the er | nd of the | course t | he studer | nt will be | e able to: | | | | | | | |
| Course | Outcom | le | 1. | Illustra | te the fu | indamer | itals of p | phase ru | le and r | educed j | phase ru | ıle | | | |
| | | | 2. | Outline | the cor | icepts of | t water t | reatmer | it techni | ques | | | | | |
| | | | 3. 4 | Identify | the typ | bes of fu | leis and | characte | erizatior | 1 OI Vari | ous con | stituents | s | ~ | |
| | | | 4. 5 | Disting | uish the | asic prin | tion tecl | hnologi | ochemic as of me | al reacti | ons and | netallic | materia | 5 1c | |
| | | | 5. 6 | Apply c | orrosion | Control | techniqu | linologic les in on- | - board s | hins | lu non-i | netanic | materia | 15 | |
| POS/ | DO1 | DOD | | | DO5 | DOC | DO7 | | DOO | DO10 | DO11 | DO12 | PSO | PSO | PSO |
| COS | POI | PO2 | P05 | P04 | POS | POo | PO/ | P08 | PO9 | P010 | POIT | POIZ | 1 | 2 | 3 |
| CO1 | 2 | - | - | - | - | - | 2 | - | - | - | - | 2 | 2 | 2 | 2 |
| CO2 | 2 | 2 | - | - | - | - | 3 | - | - | - | - | - | - | - | - |
| CO3 | 2 | 2 | - | - | - | - | 3 | - | - | - | - | - | - | - | - |
| CO4 | 2 | 2 | - | - | - | - | 3 | - | - | - | - | - | - | - | - |
| CO5 | 3 | 2 | - | - | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| CO6 | 3 | 2 | 3 | - | 2 | - | 3 | - | - | - | - | - | 2 | 2 | 3 |
| Aver | 22 | 2 | 2 | _ | 2 | - | 28 | - | - | - | - | 2 | 2 | 2 | 2.3 |
| Correla | 1 2.5 ation Lev | vels 2 | 3 | - 1.Sligh | t(Low) | l | 2.0 | 2.Mod | erate(Me | dium) | | 3.Subs | tantial(H | igh) | |
| | 2 | | | 8 | | | | | | | | | | 0 / | |

KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome

UNIT I PHASE RULE

| Terminology, Phase rule - one component system, reduced phase rule - application of rule - appli | bhase rule to binary alloy system. |
|--|--------------------------------------|
| Hazard of Inorganic, Organic cargos carried on board vessels with respect to flammability, toxic | ity, reactivity and solubility. |
| UNIT II WATER & IT TREATMENTS | 9 Hrs |
| Sources of water, hard and soft water, determination of hardness, Softening of water- lime soda | process Ion exchange process. Boiler |
| feed water, removal of oil - blow down operation, Caustic embrittlement, internal conditioning. | Water for domestic purposes |
| screening, aeration, sedimentation, chlorination, break point chlorination. Disinfection with ozor | ne, desalination. Waste water |
| treatment-marine sediments. | |
| UNIT III FUEL & COMBUSTION | 9Hrs |

9Hrs



Conventional & non-conventional energy resources and energy conversion, classification and properties of fuel, calorific value determination using bomb calorimeter. - Solid fuels -Analysis-proximate and ultimate analysis, hydrogenation & carbonization of coal.

Liquid fuels- characterization of various constituents viz petrol diesel with regard to their application in IC engine (knocking)Gaseous fuels- coal gas, producer gas, biogas, water gas and flue gas analysis using Orsat apparatus. Toxic and other ill effects of cargoes on human and environment.

UNIT IV ELECTROCHEMISTRY

Electrodes, Standard & single electrode potential, Nernst equation, Cell terminology, cell reaction Galvanic cells, fuel cells, Lead acid battery, Nickel cadmium battery. Electrochemical Reaction: Electrolysis- electroplating – galvanizing

CORROSION CONTROL ON BOARD SHIP: Thermodynamics & Kinetics of corrosion, various forms of corrosion, corrosion prevention methods.

LUBRICANTS: Classification and properties of lubricating oils (Viscosity, flash, fire point & cloud and pour points) Effects of pressure on melting & boiling point. Relevance of gas laws to LPG carrier and reefer ships.

PHYSICAL AND CHEMICAL PROPERTIES OF FUELS AND LUBRICANTS: Production of Oils from Crude Oil, Properties and characteristics of fuels and lubricants, Shore side and shipboard sampling and testing, Interpretation of test results, Contaminants including microbiological infection, Treatments of fuels and lubricants including storage, centrifuging, blending, pretreatment and handling.

UNIT VSTEEL, CEMENT AND ORGANIC COMPOUNDS

Production of steel - Bessemer converter process. Open hearth process, Chemical addition to steels production of non-ferrous alloys, brass, bronze, aluminum alloys. Special reference to ship building (ship propellers etc) Cement – manufacturing of cement, setting & hardening of cement; concrete, reinforced concretes Basic Metallurgy, Metals and Processes, Properties and Uses, Non-Metallic Materials. Characteristics and limitations of process used for fabrication and repair - Process, Heat Treatment of Carbon Steel.

ORGANIC COMPOUNDS: Hydrocarbon- petroleum & its fractionated products, extraction of aromatic compounds from petroleum. Aromatic compounds - Benzene; polycyclic hydrocarbons- Naphthalene, anthracene, naphthacene. Fibre and Reinforced plastics

TEXT BOOK:

- 1. Engineering Chemistry. Dr. V. Balasubramanian et. al., CARS Publishers
- 2. Engineering Chemistry Laboratory Manual. Dr. V. Balasubramanian et.al., CARS Publishers

References

- 1. Engineering Chemistry. Rajesh. Saras Publication
- 2. Environmental Chemistry A K Dey

Designed by : " Department of Chemistry"

9Hrs

9Hrs

Total: 45 Hrs



| Course Code: | | | | | | | | | L | | T | Р | | | С |
|------------------------|-----|--|--|---|---|---|---|---|-----------------------------|---------------------------|----------|---------------------|----------|-----------|----------|
| UBMCC03 | | Cours | se Nar | ne: | | | | | 3 | | 1 | 0 | | | 3 |
| | | ENGIN | JEERIN | IG ME | CHANIO | CS | | | | | | | | | |
| XZ 1 | | | 1.37 | · (T | C | | | | | 0 | | 1 | 1 | | |
| Year and Semester | | | ΙΥ | ear (I | Semest | ter) | | | | C | ontact | nours pe (4Hrs.) | r week | | |
| Prerequisite course | | | | N | IL | | | | | | | (1115) | | | |
| Course catego | ory | Hum Soci | anities al Sciei | and ices | Ma | anagen course | nent s | P | rofessio | onal Co | re | Pro | fessiona | l Electiv | ve |
| | | Bas | ic Scier | nce | Eı | ngineer Scienc | ing e | | Open I | Elective | | | Manda | atory | |
| Course Objective | | 1. 2. 3. 4. 5. | Unde To le Unde Unde Unde | erstand earn sta erstand erstand erstand | of force tic equi friction momen dynam | e and r libriur and it and it its in v ic equi | und rigi oodies rticles | d bodie and rig | es id body | | | | | | |
| Course Outco | me | Studen 1. F 2. A 3. U 4. A 5. A 6. U | its will Resolve Analyze Jnderst Analyze Analyze Jnderst | be able of for static and Fr mom dyna and the | e to ces and equilib iction a ents in mic equ e conce | mome rium o nd its various ilibrius pt of m | ents f partic effects s solid m of pa echani | cle and bodies articles cs in ri | rigid b and ri gid bo | oodies. gid bod dy. | ly. | | | | |
| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 0 | PO1 1 | PO12 | PSO 1 | PSO 2 | PSO 3 |
| CO1 | | 2 | 3 | 2 | | | | | | | | | 1 | 2 | |
| CO2 | 2 | 2 | 3 | 2 | | | 2 | 3 | 2 | | | | 2 | 1 | |
| CO3 | 1 | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | | | 2 | 3 | 2 | | | | 3 | 3 | 1 |
| <u> </u> | 1 | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | | | | 3 | 3 | | | | 3 | 2 | 2 |
| | 1 | 1 | 2 | 2 | | 1 | 1 | 5 | 5 | | | | 5 | 2 | <i>2</i> |
| CO5 | | | 2 | 2 | | 1 | 1 | 2 | 1 | | | | 2 | 2 | |
| CO6 | 1 | 1 | 1 | 1 | | | | | | | | | 2 | 1 | |



| Average | 1.5 | 1.33 | 2.33 | 1.83 | | | | | | | | | 2.16 | 1.83 | 1.5 |
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| Correlation I | Levels | 1 | I | 1.Sli | ght(Lo | w) | 1 | 2.Mc m) | derat | e(Medi | u | 3.Substa | ntial(Hi | gh) | 1 |
| KL-Knowledge | Level:K | K1-Rem | ember, | K2—U1 | nderstan | d ,K3-A | Apply, K | 4-Analy | se, K5-] | Evaluate, | , K6-C | reate ; | | | |
| PO-Programme | Outcon | ne; CO | -Course | Outcor | ne ;PSO | -Progra | amme Sp | ecific O | utcome | • | | | | | |
| UNIT – I | BAS | SICS & | STAT | ICS O | F PART | TICLE | S | | | | | | 12 Hour | s | |
| Introduction - Un forces – Polygon Equilibrium of p UNIT – II | hits and law of articles EQU | l Dimer forces – Mon ILIBR | nsions – – Resol nent and IUM O | Forces lution a l couple F RIG | – Syste nd comj e – Scal I D BOD | em of fo position ar comp DIES | orces – l n of forc ponents | Resultar es – Pri of morr | nt force inciples nent – V | s – Paral s of trans Varigon': | llelogr missit s Thec | ram law of oility. Sing orem | forces – ' le equiva 12 He | Triangul lent forc ours | ar law of e - |
| Equilibrium of forces – Law of mechanics - Lami's theorem Free body diagram – Requirement of Stable Equilibrium – Equilibrium of rigid bodies in 2D – Examples. Type of supports and their support reactions. UNIT – III FRICTION Static and Dynamic Friction – Laws of friction - Equilibrium of a body on a rough Horizontal plane, inclined Plane and inclined | | | | | | | | | | | | | | | |
| UNIT - III FKICHON Static and Dynamic Friction - Laws of friction - Equilibrium of a body on a rough Horizontal plane, inclined Plane and inclined plane subjected to a force acting along the inclined plane. Applications of friction - Simple contact friction (Ladder friction) - Screw friction - weight lifted by screw jack - Belt friction - Rolling Resistance. UNIT - IV PROPERTIES OF SURFACES AND SOLIDS | | | | | | | | | | | | | | | |
| Screw friction – weight lifted by screw jack - Belt friction – Rolling Resistance. UNIT – IV PROPERTIES OF SURFACES AND SOLIDS Determination of Areas and Volumes-First moments of area and the Centroid of sections-Rectangle, circle, triangle from integration- | | | | | | | | | | | | | | | |
| T section, I section | on, Ang | gle section | ion, Ho | llow se | ction y | using st | tandard | formula | - Secon | nd and p | roduct | t moments | of plane | area- Re | ctangle, |
| and perpendicula | axis t | heorem | - Mass | momei | nt of Ine | rtia. | | | section | by using | g stanc | 101111 | | | eorem |
| UNII - V | DYNA | | OF PA | AKTIC | LES AI | ND KI | GIDBC | DIES | | | | 12 | Hours | | _ |
| Dynamics of Par law – work-energ Types of collisio Bodies – Genera Plane motion. | ticles - gy equa n - Col l plane | Displac ation of lision o motion | cement, particle f Elasti – Velo | velocit es - Imp c Bodie city and | ty and a oulse and es – Nev d Accele | ccelera d Mom vton's l eration | tion, the entum – aw of co – Absol | ir relati Law of ollision ute and | onship f conse of bod relativ | - Relativ rvation c ies - co-e e motion | ve mot of mon efficien metho | tion-Curvil nentum – I nt of restit od – Equil | linear mo D'Alembo ution. Dy ibrium of | tion – No ert's Prin namics o Rigid b | ewton's nciple – of Rigid odies in |
| | | | | | | | | | | | ТО | TAL: 60 | Hours | | |
| TEXT BOOK: 1.K.V. Natara2.R.S Khurmi | jan, "Ei , "A Te | ngineer xtbook | ing Me of Eng | chanics ineering | ". g Mecha | anics". | | | | | | | | | |
| REFERENCE : 1. S.S. Bhavik | atti, "E | ngineer | ing Me | chanics | ,,, | | | | | | | | | | |
| Palanicham S. Rajasekar | y & Na ran, G. | gan, "E Sankara | ngineer a Subra | ring Me mania, | chanics "Funda | Statics mentals | s & Dyn s of Eng | amics" ineering | g Mech | anics". | | | | | |
| 4. Beer, F.P a McGraw-Hi | and Joh 11 Inter " Dep | nson Jr nationa artmen | . E.R, " <u>l Editio</u> t of Me | Vector n. chanica | Mechar | nics for | Engine | ers", Vo | ol. (1) S | Statics an | d Vol | . (2). Dyna | amics, | | |
| 2 congridu wj | 2 . p | | | | - Lingini | B | | | | | | | | | |



| PROGRA | М | | В | BE-Mini | ng Eng | ineering | 5 | | | | | | | | | |
|-----------|----------|---------|---------|----------|------------|-----------|----------------------|------------------|----------|----------|-----------|-----------|-----------------|------------|----------------|-----------|
| Course C | ode | | C | Course N | lame : | | | | | | | L |] | [| P | С |
| UBBTC0 | 1 | | E | nvironr | nental S | tudies | | | | | | 0 | (|) | 2 | 2 |
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| Year and | Semest | er | I | Year (] | [Semest | ter) | | | C | Contact | hours p | per week | C C | | | |
| Prerequis | ite cour | se | N | ΠL | | | | | (| 2 Hrs) | | | | | | |
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| Course | antag | ~ *** * | T | Iumoni | tios and | Social | | Ionog | mont | t D | rofossi | onal Ca | ro | Drofoss | ional E | loctivo |
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| | | | B | asic Sc | ience | | F | Ingine | ering | 0 | pen El | ective | | Manda | tory | |
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| Course O | bjective | e | Т | he obje | ctive of | this cou | irse is t | o provi | ide kn | nowledg | ge on | | | | | |
| | | | 1 | | Environ | montor | d rana | wohlo | POG 0117 | | | | | | | |
| | | | 2 | | Ecosyst | em and | their fi | inction | s | les | | | | | | |
| | | | 3 | | Biodive | rsity an | $\frac{d}{d}$ its im | portan | ce | | | | | | | |
| | | | 4 | | Social i | mpact o | n envir | onmen | t | | | | | | | |
| | | | 5 | | Human | populat | ion and | l adver | se eff | ects | | | | | | |
| | | | A | t the en | d of the | course, | the stu | ıdent w | ill be | able to |) | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | 1. | Summa | rize Nat | ural Re | esource | es sucl | h as Fo | rest, wa | ater, mir | neral, E | Energy, | land an | d Natural |
| | | | | 2. | Identify | the inte | errelation | onship | betwe | en livi | ng orga | inism ar | id envi | ronmen | t | |
| Course O | utcome | | | 3. | Illustrat | e the in | portan | ce of e | nviror | iment t | by asses | ssing its | impac | t on the | human | world |
| | | | | 4. | Demons | strate di | nerent | type of | r polit | ation at | formily | azards | 0 pr 001 | om ond | D olo o | f |
| | | | | 5. | Explain | tion Te | chnolog | ponun av in F | nviro | nment | , failing | y wellal | e progr lth | ann anu | Kole 0 | 1 |
| | | | | 6. | Classify | the int | egrated | theme | s such | n as bio | diversi | tv natur | al reso | urces. p | ollutior | n control |
| | | | | | and was | ste mana | agemen | t | | | | | | , F | | |
| POS/ | DO 1 | DOD | DO2 | | DOS | DOC | D07 | PO | PO | PO | PO | PO1 | PS | PSO | DEO | 2 |
| COS | POI | PO2 | POS | P04 | POS | PU0 | PU/ | 8 | 9 | 10 | 11 | 2 | 01 | 2 | P50. | 5 |
| CO1 | - | - | - | - | - | 2 | 1 | 2 | 2 | - | - | 2 | - | - | - | |
| CO2 | - | - | - | - | - | 2 | 1 | 2 | 2 | - | - | 2 | - | - | - | |
| CO3 | - | - | - | - | - | 2 | 2 | 2 | 2 | - | - | 2 | - | - | - | |
| CO4 | _ | - | _ | - | - | 2 | 3 | 1 | 2 | - | - | 2 | - | - | - | |
| CO5 | - | - | _ | - | - | 3 | 2 | 3 | 2 | - | - | 2 | - | - | - | |
| C06 | - | - | _ | - | - | 2 | 3 | 2 | 2 | - | 1_ | 2 | - | - | - | |
| Avera | | | | | | | 5 | | | - | - | 2 | - | | - | |
| ge | - | - | - | - | - | 2.2 | 2 | 2 | 2 | | - | 2 | | - | | |
| Correlat | ion Lev | /els | 1 | 1.Slig | ht (Low | /) | . – | 2.Mo | derat | e (Med | ium) | 3.Sub | stantial | (High) | 1 | |
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| KL-Kno | wledge | Level:K | 1-Reme | ember,K | 2Unde | rstand,I | КЗ-Арр | ly,K4-A | Analys | se,K5-E | valuate | ,K6-Cre | ate : P | O-Prog | rame O | utcome: |
| CO-Cou | rse Out | come :P | 'SO-Pro | grame S | specific (| Jutcome | 9 | | | | | | | | | |
| | | | | | | | | | | | | | | | | |



Unit1:NaturalResources

Environmental studies-terminologies, need for public awareness. Natural resources-Renewable and non-renewable resources; Characteristics, uses and conservation of natural resources-Forest resources, Water resources, Mineral resources, Food resources, Energy resources and Land resources. Role of an individual in conservation of natural resources; equitable use of resources for sustainable lifestyles.

Unit 2: 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 the different ecosystems- Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 3 : Biodiversity and its conservation

Introduction – Definition : genetic, species and ecosystem diversity; Biogeographical classification of India; Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, National and local levels; Inida as a mega-diversity nation; Hot-sports of biodiversity; Threats to biodiversity; Endangered and endemic species of India; Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit 4: Environment and Social Issues

Environmental Pollution; Cause, effects and control measures of different types of pollution; Solid waste Management; Role of an individual in prevention of pollution; Disaster management. Social Issues and the Environment, From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics. Climate change, global warming, nuclear hazards, ill-effects of fireworks. Wasteland reclamation. Laws and acts in India for environment protection, Public awareness.

Unit 5: Human Population and the Environment

Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health- Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health. Field work and Field Visit.

Total: 30 Hours

References

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publications Limited, Bikaner, India

2. Erach Bharucha. 2013. Textbook of Environmental Studies for Undergraduate Courses. University Grants Commission, New Delhi

3. N. Arumugam and V Kumaresan. 2014. Environmental Studies (UGC Syllabus), Saras Publications, Nagarkoil, India

4. D.K. Asthana and Meera Asthana. 2010. A Textbook of Environmental Studies. S. Chand Publishingm, New Delhi

5. B.S. Chauhan. 2015. Environmental Studies. Laxmi Publications, New Delhi.

Designed by "Department of Biotechnology"

6Hrs

6Hrs

6Hrs

6Hrs

6Hrs



| PROG | RAM | | BE-Min | ing Engi | neering | | | | | | | | | | |
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| Course | Code: | | <u> </u> | | | | | | L | Т | | Р | | (| С |
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| Year a | nd Seme | ster | I Year (| I Semest | er) | | | | | C | ontact h | ours per | week | • | |
| Prerequ | uisite cou | ırse | | | NIL | | | | | | (2 | 2Hrs) | | | |
| | | | Huma Socia | nities an | d es | Mana cou | gement Irses | 1 | Professio | nal Core | | Prof | fessional | Elective | |
| Cour | se categ | gory | Basic | Science | E | ngineeri | ng Scien | ce | Open E | lective | | | Mandat | orv | |
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| Course | Objecti | ve | 1. To 2. De 3. Co 4. Un 5. To 6. | underst termina nduct ez derstand create l | and the tion of toperime ting the cnowled | rties of t ters to re l sound. teroscop ng instru | material educe de es. ments. | s. eviation | from sta | andard v | values. | | | | |
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| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
| CO1 | 2 | 2 | 2 | 2 | 1 | - | - | - | 1 | 2 | - | 2 | 2 | 2 | 3 |
| CO2 | 2 | - | 2 | 2 | 2 | - | - | - | 2 | 1 | - | 2 | 2 | 3 | 3 |
| CO3 | 2 | 2 | 3 | 3 | 1 | - | - | - | 2 | 2 | - | - | 2 | - | - |
| CO4 | 2 | 2 | 2 | 3 | 2 | - | - | - | 2 | 2 | - | 2 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 2 | 2 | 3 | - | - | - | 2 | 3 | - | 2 | 2 | 3 | 2 |
| CO6 | 3 | 3 | 3 | 3 | 3 | - | 3 | 2 | 3 | 2 | | | | | |
| Aver age | 2.3 | 2.2 | 2.3 | 2.5 | 2 | - | - | - | 2 | 2 | - | 2.2 | 2 | 2.6 | 2.4 |
| Correla | ation Lev | vels | · | 1.Sligh | t(Low) | | • | 2.Mod | erate(Me | dium) | · | 3.Subs | tantial(H | igh) | |
| KL-Kn CO-Co | owledge urse Out | Level:K come :P | 1-Remem SO-Progr | ber,K2 ame Spec | Understa | nd,K3-A come | opply,K4- | Analyse, | K5-Evalu | ate,K6-C | Create : I | PO-Progr | ame Out | come: | |



LIST OF EXPERIMENTS:

 $1. Calibration \ of \ low \ range \ voltmeter - potentiometer$

2. Torsion pendulum – Rigidity modulus of elasticity

3.Spectrometer- Grating - wavelength of mercury spectral lines

4. Newton's rings - Radius of curvature of a convex lens

5. Air wedge - Thickness of a wire

6. Surface tension of water -Capillary rise method

7. Uniform bending – Young's modulus of elasticity of a bar

8. Coefficient of viscosity of water - graduated burette

9. Non uniform bending - Young's modulus of elasticity of a bar

10. Field along the axis of a coil

erence

D Halliday, R Resenic and J Walker "Fundamentals of Physics", Wiley India, 6th edition, 2006 **DESIGNED BY** :Department of Physics



| Course | e Code: | | | | | | | | L | Т | | Р | | | С |
|----------------|------------------------|--------------------|----------------------|---------------------|-----------------------|-----------------|---------------------------------------|------------------------|--------------|------------------|----------------|-------------|-----------|-----------|----------|
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| Year a | ınd | | | I Yea | r (I Sen | nester) | | | | Coi | ntact ho | ours per | week | | |
| Semes | ster | | | | | | | | | | (2 | Hrs) | | | |
| Prereq | uisite | | | | NIL | | | | | | | | | | |
| course | ; | | | | | | | | | | | | | | |
| Course | e categ | ory | Human | nities an | d | Manag | gement | P | rofessio | nal Core | | Prof | essional | Elective | e |
| | | - | Social | Science | > | cou | 1 505 | | | | | | | | |
| | | | Basic | Science | | Engin Scie | eering ence | | Open E | lective | | | Manda | tory | |
| | | | | \bigvee | | | | | | | | | | | |
| | | | | | | , | 1. Determin | ne different | parameters o | of tachometry | , of fu | 1 | | | |
| Course | e | | | | | - | 2. Dete 3 Dete | ermine t | he therr | mal prop | erties of | t f fuel | | | |
| Object | tive | | | | | - | Den To s | tudy the | e variou | s proper | tv of fu | el | | | |
| | | | 5. To stu | idy the o | calorific | value o | of fuel | | | ~ FF | ., | | | | |
| | | | Students | will be | able to | | | | | | | | | | |
| Course | e Outco | ome | | | 1. | Illustra | ate how | to estim | ate Bica | arbonate | and Hy | droxide | Alkalir | nity | |
| | | | | | 2. | Explai | n how t | o calcul | late Tota | al Hardn | ess and | Chlorid | le Conte | ent of wa | ater |
| | | | | | 5. | BOD | Istrate II | $10 \times 10^{\circ}$ | TSS of | v Tempo water | rary and | u Perma | пент п | aruness, | COD, |
| | | | | | 4. | Compa | are the ti | tration | methods | s of acid | , base a | nd Ferro | ous ion | | |
| | | | | | 5. | Detern | nine Sir | ngle El | ectrode | potenti | al of C | Galvanic | cell a | and Mo | lecular |
| | | | | | _ | weigh | nt and de | egree of | dissocia | ation of | a polym | ner | | . ~ | |
| | | | | | 6. | Explai | n how | to deter | mine P | roximat | e analy | sis of f | uel and | its C | alorific |
| POS/ | DOI | DOO | DOG | DOL | D0 # | Value | 202 | DOG | DOG | D010 | DOII | DOID | PSO | PSO | PSO |
| COS | POI | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | POIO | POIT | PO12 | 1 | 2 | 3 |
| CO1 | 2 | - | - | 2 | - | - | - | - | 2 | 3 | - | 2 | 1 | 2 | 2 |
| CO2 | 2 | 2 | - | 1 | - | - | 2 | - | 3 | 2 | - | - | - | - | - |
| CO3 | 2 | 1 | - | 2 | 2 | - | 2 | - | 2 | 3 | - | - | - | - | - |
| CO4 | 2 | 1 | - | 3 | 2 | - | 3 | - | 3 | 2 | - | - | - | - | - |
| CO5 | 3 | 2 | - | 2 | 2 | - | - | - | 2 | 3 | - | - | 2 | 2 | 2 |
| CO6 | 3 | 2 | 3 | 2 | 2 | - | 3 | - | 3 | 2 | - | - | 2 | 2 | 3 |
| Aver | 2.3 | 16 | 3 | 2 | 2 | - | 2.5 | - | 25 | 25 | - | - | 1.7 | 2 | 2.3 |
| Correla | ation Lev | els | | 1.Sligh | t(Low) | | 2.0 | 2.Mod | erate(Me | edium) | | 3.Subs | tantial(H | igh) | |
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| KL-Kn CO-Co | owledge] urse Outo | Level:K come :P | A-Remem SO-Progra | ber,K2U ame Spec | Understa ific Outo | nd,K3-A come | pply,K4- | Analyse,I | K5-Evalu | ate,K6-C | reate : P | O-Progra | ame Out | come: | |
| LIST | OF EX | PERI | MENTS | pv | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |



- 1. Estimation of Bicarbonate Alkalinity
- 2. Estimation of Hydroxyl Alkalinity
- 3. Estimation of Chloride Content of water
- 4. Estimation of Total Hardness of water
- 5. Estimation of Temporary and permanent Hardness of water
- 6. Determination of salinity of water
- 7. Conductometric Titration of a Strong Acid and a Strong Base
- 8. pH Titration of a Strong Acid and a Strong Base
- 9. Potentiometric Estimation of Ferrous Ion
- 10. Determination of Total dissolved solid by TDS meter
- 11. Determination of Calorific value of a solid fuel
- 12. Determination of Cloud and pour point of oil
- 13. Determination of Flash and fire point of oil
- 14. Proximate Analysis of a solid Fuel / Liquid Fuel

TEXT BOOK:

- 1. Engineering Chemistry. Dr. V. Balasubramanian et.al., CARS Publishers
- 2. Engineering Chemistry Laboratory Manual. Dr. V. Balasubramanian et.al., CARS Publishers

References

1. Engineering Chemistry. Rajesh. Saras Publication

2. Environmental Chemistry A K Dey

Designed by "Department Chemistry"

30 hrs



| Cours | e Code | : | Course | Name | : | | | | L | | Т | | Р | | C |
|--|----------------------|--------------------|-----------------------|--------------------|--|---|---|--|---|--|--|--|--------------------------------|--------------|------|
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| Prerec | quisite | | | | NI | L | | | | | | \ - <i>)</i> | | | |
| Cours | e cate | gory | Huma Social | nities a Scienc | ind ces | Mana co | igemer urses | nt | Profe | essional (| Core | Р | rofessior | nal Electivo | е |
| | | | Basic | Scienc | e | Engineer | ing Sci | ence | Оре | en Electi | ve | | Mano | latory | |
| Cours | e | | To provi | de stud | lents wit | th knowle | dge of | basic ski | lls | | | | | | |
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| POS/ COS | PO1 | PO2 | PO3 | PO 4 | PO5 | PO6 | PO 7 | PO8 | PO 9 | PO10 | PO11 | PO12 | PSO 1 | PSO2 | PSO3 |
| 201 | 2 | - | 2 | - | 2 | - | - | - | 2 | 2 | - | _ | - | - | - |
| 202 | 2 | - | 2 | - | 2 | - | - | - | 2 | 2 | - | - | - | - | - |
| CO3 | 2 | - | 2 | - | 2 | - | - | - | 2 | 2 | - | - | - | - | - |
| 204 | 2 | - | 2 | - | 2 | - | - | - | 2 | 2 | - | - | - | - | - |
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| KI Knowledge Level K1 Bernember K2, Understand K2, And K4, A | | | | | | | uerate | | m) W(a | 3.SUDSI | lantiai(F | ngn) | | | |
| KL-Knov PO-Progi | viedge Lo ramme C | evel:K1 Jutcome | -Remembe e; CO-Cou | r, K2— rse Out | -Underst come ;P | tand ,K3-A SO-Progra | Apply, l amme S | K4-Analy Specific C | rse, K5-l Jutcome | Evaluate, | K6-Crea | ite; | | | |

UNIT –I FITTING WORKSHOP



Hands on experience in preparation of V- Joint, Dove tail Joint, T-Joint and Square Joint.

UNIT -- II GAS WELDING

Hands on experience in preparation of Butt Joint, Lap Joint, T-Joint and Fillet Joint.

UNIT –III PIPE FITTING SHOP

Hands on experience in preparation of Pipe fitting, Pipe Joints, overhauling valves and pressure testing of

valves.

UNIT -IV CARPENTRY

Hands on experience in preparation of Square Joint, T-Joint and Dove tail Joint.

UNIT -V FOUNDARY

Process of foundry for different objects and shape

TEXT BOOK:

- 2. K.V. Natarajan, "Engineering Mechanics".
- 3. R.S Khurmi, "A Textbook of Engineering Mechanics".

REFERENCE :

- 5. S.S. Bhavikatti, "Engineering Mechanics"
- 6. Palanichamy & Nagan, "Engineering Mechanics Statics & Dynamics"
- 7. S. Rajasekaran, G. Sankara Subramania, "Fundamentals of Engineering Mechanics".

| PROGRAM | BE - Mining Engineering | | | | |
|-------------|-------------------------|---|---|---|---|
| Course Code | Course Name : | L | Т | Р | С |



| UBLECPB | Soft Skills-I | 0 | 0 | 4 | 2 | | | | | | | | | |
|---------------------------------------|---|--|----------------|---------------|----------------|--|--|--|--|--|--|--|--|--|
| | | I Year (I Semester) Contact hours per week | | | | | | | | | | | | |
| Year and | I Year (I Semester) | Contact hou | irs per week | | | | | | | | | | | |
| Semester | | (4 Hrs) | | | | | | | | | | | | |
| Prerequisite | NIL | | | | | | | | | | | | | |
| course | | | | | | | | | | | | | | |
| Course | To help learners develop | their listeni | ng skills, w | hich will, er | hable them | | | | | | | | | |
| Objective | listen to lectures and co | omprehend | them by as | sking quest | ions, seek | | | | | | | | | |
| , , , , , , , , , , , , , , , , , , , | Clarifications. | - | - | | | | | | | | | | | |
| | To help learners develop their speaking skills and speak fluently in real | | | | | | | | | | | | | |
| | Contexts. | | | | | | | | | | | | | |
| | Making them realise the | importance | of English a | s Global lar | nguage and | | | | | | | | | |
| | its importance in today's | scenario. | | | | | | | | | | | | |
| Course Outcome | Students will be able to understand | | | | | | | | | | | | | |
| | 1. Develop skills in informal co grammatical errors | onversation; o | comprehend t | heir views w | vithout making | | | | | | | | | |
| | 2. Define their perspective mor | e operational | ly | | | | | | | | | | | |
| | 3. Infer the delicacy of using the linguistics skills | | | | | | | | | | | | | |
| | 4. Develop listening and speak | ing skills for | effective pres | sentation | | | | | | | | | | |
| | 5. Develop good attitude and behavior | | | | | | | | | | | | | |
| | 6. Build interview skills and pe | ersonality dev | velopment | | | | | | | | | | | |

| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
|--------------------|-----|-----|-----|---------|---------|-----|-----|--------------------|-----|----------|----------|---------------------|----------|----------|----------|
| CO1 | - | - | - | - | - | 2 | 2 | 2 | 2 | 2 | - | 2 | - | - | - |
| CO2 | - | - | - | - | - | 2 | 1 | 2 | 2 | 3 | - | 2 | - | - | - |
| CO3 | - | - | - | - | - | 2 | 1 | 2 | 2 | 2 | - | 3 | - | - | - |
| CO4 | - | - | - | - | - | 2 | 2 | 2 | 2 | 1 | - | 3 | - | - | - |
| CO5 | - | - | - | - | - | 3 | 2 | 2 | 3 | 2 | - | 1 | - | - | - |
| CO6 | - | - | - | - | - | 3 | 1 | 2 | 1 | 2 | - | 2 | - | - | - |
| Aver | _ | _ | _ | _ | - | | | | | | _ | | _ | _ | _ |
| age | - | - | - | - | | 2.3 | 1.5 | 2 | 2 | 2 | - | 2.2 | - | - | - |
| Correlation Levels | | | | 1.Sligh | nt(Low) | | | 2.Moderate(Medium) | | | | 3.Substantial(High) | | | |

KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome

UNIT 1: GRAMMAR AND FOUNDATON

18 Hrs

Training the students on basic grammar and foundation and laying the standard platform. A complete standard syllabus of Cambridge is used. The main part of the 1st semester is to cover the major tenses (Present tense, Present Continuous, Past Tense, Past Continuous, Present Perfect, and Present Perfect continuous.



UNIT II: FOCUS ON LANGUAGE - VOCABULARY

General Vocabulary-Dictionary-Word Formation: Prefix and Suffix-Synonyms and antonyms-Idioms and Phrases- Diplomatic Phrases – Food Phrases- Vocabulary-Words commonly misspelt –Lab-Test.

UNIT III: INTERACTIVE ENGLISH

The main objective is English for International communication. It course contains conversations, snapshots, readings, activities, a greater variety and amount of listening materials and more visuals to introduce vocabulary, more opportunities to build fluency, and up-to-date art and design. The course covers the fours skills of listening, speaking, reading and writing, as well as improving pronunciation and building vocabulary.

UNIT IV: LISTENING AND SPEAKING

Types of Listening -Listening and note taking-Pronunciations-Stress and Intonation-Conversation technique-Dialogue Writing -Professional Communication-Interview-Group Discussion –Power point Presentation- Debate , Oratorical Lab

UNIT V: INTERVIEW SKILLS AND PERSONALITY DEVELOPMENT 14 Hrs

Out of box thinking -Lateral Thinking- Intrinsic and Extrinsic Motivators- Factors influencing Attitude- Challenges and lessons from Attitude- Etiquette-Value of time- Diagnosing Time Management- Weekly Planner To do list- Prioritizing work.

TOTAL: 60 PERIODS

4 Hrs

14 Hrs



| PROGRAM | | BE- Min | ing Engineering | 5 | | | | | | | |
|---------------------|--|------------------------|---------------------------------------|-----------|--------------|-----|--|--|--|--|--|
| Course Code: | | | L | Т | Р | С | | | | | |
| UBLEC02 | Course | Name: | 2 | 0 | 0 | 2 | | | | | |
| | TECHNICAL | ENGLISH-II | | | | | | | | | |
| Year and Semester | I Year (II S | EMESTER) | Co | ontact ho | urs per week | | | | | | |
| Prerequisite course | N | IL | (2Hrs) | | | | | | | | |
| Course category | Humanities and Social Sciences | Management courses | Professional Core Professional Electi | | | | | | | | |
| | \sim | | | | | | | | | | |
| | Basic Science | Engineering Science | Open El | ective | Mandat | ory | | | | | |
| | | | | | | | | | | | |
| Course Objective | Identify the process of confinance and rocus on language Use Vocabulary & English Grammar in communication Read and understand the language. Learn to write technical drafts. Application of imperative passive. | | | | | | | | | | |

| | Students will be able to 1. Identify the importance of technical English 2. Apply good communication skill for enhancing vocabulary |
|----------------|--|
| Course Outcome | Apply good communication skill for channeling vocabulary Develop skills in reading Build knowledge on writing letters and descriptive writings Develop speaking and listening skills Apply the correct pause and pronunciation |

| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO 5 | PO 6 | PO 7 | PO8 | PO9 | PO1 0 | PO11 | PO 12 | PS O1 | PSO 2 | PSO3 |
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| CO1 | - | - | - | - | - | 2 | 2 | - | 2 | 2 | - | 2 | - | - | - |
| CO2 | - | - | - | - | - | 3 | 2 | - | 2 | 2 | - | 2 | - | - | - |
| CO3 | - | - | - | - | - | 2 | 1 | - | 2 | 2 | - | 2 | - | - | - |
| CO4 | - | - | - | - | - | 2 | 2 | - | 2 | 2 | - | 2 | - | - | - |
| CO5 | - | - | - | - | - | 2 | 2 | - | 2 | 2 | - | 2 | - | - | - |
| CO6 | - | - | - | - | - | 1 | 3 | - | 2 | 2 | - | 2 | - | - | - |
| Aver | - | - | - | - | - | | | | | | | | - | - | - |
| age | | | | | | 2 | 2 | - | 2 | 2 | - | 2 | | | |
| Correla | ation L | avale | | 1 Slig | ht(I o | W) | | 2.Mc | derate | e(Medi | u 3 | Subet | ntial(| High) | |
| Coneia | | 20015 | | 1.5hg | III(LO | w) | | m) | | | 5 | Subsid | initiai | Ingil) | |
| KL-Knov | KL-Knowledge Level:K1-Remember, K2—Understand ,K3-Apply, K4-Analyse, K5-Evaluate, K6-Create ; | | | | | | | | | | | | | | |
| PO-Prog | ramme (| Outcome; | CO-Cour | se Outco | me ;PS | O-Prog | gramme | e Specifi | c Outco | ome | | | | | |



UNIT I COMMUNICATION SKILL & READING SKILL

Process of Communication - Language as a tool of Communication- Importance of Technical Communication-Lab Intensive Reading-Skimming the text- Scanning- Topic sentence and Its Role-Reading and Interpretations-Critical Reading -Creative and Critical Thinking- Note Making -Transfer of Information-Visual Aids-Graphics-Lab

UNIT II FOCUS ON LANGUAGE – VOCABULARY

General Vocabulary-Dictionary-Word Formation: Prefix and Suffix-Synonyms and antonyms-Idioms and Phrases-Homophones-Technical Vocabulary-Words commonly miss spelt -Lab-Test **6Hrs**

UNIT III ENGLISH GRAMMAR

Parts of Speech-Subject Verb Agreement-Tenses, Articles, Prepositions-Common errors in English-Lab-Test **UNIT IV WRITING SKILL**

Descriptive Writing – Paragraph-Technical descriptions-Essays-Letter Writing – Formal and Informal-Business Letters-Job Application Letter-Types of reports-Instructions and Checklists-Lab-Test

UNIT V LISTENING AND SPEAKING

Types of Listening - Listening and note taking- Pronunciations- Stress and Intonation- Conversation technique-Dialogue Writing - Professional Communication- Interview- Group Discussion - PowerPoint Presentation

Total : 30

6 Hrs

6Hrs

6Hrs

6Hrs

Hours

REFERENCES:

1. Anderson, Paul V. Technical Communication: A Reader-Centered Approach. Cengage. New Delhi. 2008

2. Muralikrishna, & Sunita Mishra. Communication Skills for Engineers. Pearson, New Delhi. 2011

3. Riordan, Daniel. G. Technical Communication. Cengage Learning, New Delhi. 2005

4. Sharma, Sangeetha & Binod Mishra. Communication Skills for Engineers and Scientists. PHI Learning, New Delhi. 2009

5. Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason USA. 2007

Designed by Department of English"



| PROGRAM BE. MINING ENGINEERIN Course Code Course Name | | | | | | | | | | | | | | | |
|--|----------|----------------------|---------|---|---|---|--|---|---|--|--|--|---|--|--|
| | Cours | e Code | | Cours | e Name | | | | | L | | Т | | Р | С |
| | UBM | ITC02 | | Engin | eering N | lathema | tics-II | | | 3 | | 1 | | 0 | 4 |
| | Year and | l Semest | er | I Year | r&IISe | emester | | | | | Cont | act hours | per wee | .k | |
| | Prerequi | site cour | se | Nil | | | | | | | | (4Hrs | s) | | |
| | | | | Hur Soc | nanities ial Scien | and | Man co | agemen ourses | t | Professio | onal Cor | e | Professi | ional Ele | ctive |
| | Course | category | y | Ba | sic Scier | ice | Eng So | ineering cience | 5 | Open 1 | Elective | | Ma | andatory | |
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| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
| CO1 | 3 | 2 | 3 | 2 | | - | - | - | - | - | - | - | 2 | 2 | 2 |
| CO2 | 3 | 2 | 3 | 2 | | - | - | - | - | - | - | 3 | 2 | 2 | 2 |
| CO3 | 2 | 3 | 2 | 2 | 2 | _ | - | - | - | - | - | - | 2 | - | 2 |
| CO4 3 2 3 2 | | | | | | | | | - | - | - | 2 | 2 | 2 | 2 |
| CO5 | 2 | 3 | 2 | 3 | 1 | - | - | - | - | - | - | 2 | 3 | 2 | 3 |
| CO6 | 3 | 2 | 3 | 2 | 2 | - | - | - | - | - | _ | 2 | 3 | 2 | 2 |
| Aver | 2.7 | 2.3 | 2.7 | 2.2 | 2 | - | - | - | - | - | - | 2.3 | 2.3 | 2 | 2.2 |
| Correla | tion Lev | vels | | 1.Slight(Low) 2.Mod | | | | 2.Moderate(Medium) 3.Substantial(High) | | | | | | | |
| | | | | . 0 | . / | | | | | | | | | | |

KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome



UNIT I ORDINARY DIFFERENTIAL EQUATION

First order Linear differential equation – Bernoulli's Equation – Exact differential equation – Equations of first order higher degree – Solvable for p, x, y – Clairaut's equation – Application to engineering problems. Higher order equations with constant coefficient – Method of variation of parameters.

UNIT II PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equation – Solution of PDE by direct Integration- Solution of equations of First order – Four types -

UNIT III ALGEBRA OF MATRICES

Rank of a matrix – Gauss Jordan method to find the inverse – Consistency and inconsistency of system of linear equations – solution of system of linear equations- characteristic equation – Eigen values and Eigen vectors – Cayley Hamilton theorem.

UNIT-IV DIFFERENTIATION OF VECTORS

Vector differentiation – Velocity and acceleration – Vector operator del, gradient, divergence and curl – Physical interpretation of divergence of F and Curl F – del applied twice to point function and del applied product of point functions.

UNIT V INTEGRATION OF VECTORS 12Hrs

Line integrals – work - surface integrals- Flux- Green's theorem in the plane – Stoke's theorem- Volume integral – Gauss Divergence theorem – Simple problems. Total: 60 hours

TEXT BOOKS:

- 1. Dr. B.S. Grewal, "Higher Engineering Mathematics", 40th edition, Khanna Publishers, New Delhi, 2007.
- 2. T. Veerarajan, "Engineering Mathematics for First Year", 1st edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2008.

REFERENCES:

- 1. H.K.DASS "Advanced Engineering Mathematics", 15th Revised edition, S.Chand& Co. Ltd., New of variables in double and triple integrals with simple examples.
- 2. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice HallIndia, 1995.
- 3. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
- 4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.

Designed by "Department of Mathematics"

12Hrs

12Hrs



| PROGRAM | BE. MINING ENG | INEERING | | | | | | | | |
|---------------------|--|--|---|--------------------------------------|---------------|-----------------|--|--|--|--|
| Course Code | Course Name: | | L | Т | Р | С | | | | |
| UBPHC02 | Engineering Physics | s- II | 2 | 0 | 0 | 2 | | | | |
| Year and Semester | I Year (II Semester | ·) | | Contact h | ours per week | | | | | |
| Prerequisite course | Higher Secondary S Education; Fundam of Physics | School ental concepts | | 3 | Hours | | | | | |
| | Humanities and Social Sciences | Management courses | Pro | ofessional Core | Profes | sional Elective | | | | |
| Course category | | | | | | | | | | |
| | Basic Science | Engineering Science | Open l | Elective | Mandator | у | | | | |
| | \checkmark | | | | | | | | | |
| Course Objective | Students should a To know the bas To familiarize the To determine the To know about set | acquire knowledge ic concepts of Elec e Quantum physics e crystal structures emiconductors and | of electrom tromagnetic of solids supercondu | agnetic theory c theory actors | | | | | | |
| Course Outcome | Demonstrate the applications of sound waves Explain the principles of laser and its applications Illustrate miller indices and X-Ray power defraction method to identify crystal structure Compare the electrical conductivity in semiconductors and superconductors Contrast dielectric and magnetic materials Infer the principles of light and sound waves in various applications | | | | | | | | | |



| POS | | | | | | | | | | | | | | | |
|------|-----|-----|-----|-----|-----|---|---|---|---|----|----|----|----|----|----|
| / | Р | Р | Р | Р | Р | Р | Р | Р | Р | Р | | Р | | PS | PS |
| CO | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Ο | 0 | PO | 0 | PS | 0 | 0 |
| S | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 01 | 2 | 3 |
| CO1 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | | 2 | 2 | 2 |
| CO2 | 2 | 1 | 2 | 2 | - | - | - | - | - | - | - | | 2 | 2 | 2 |
| CO3 | 3 | 2 | 1 | 2 | - | - | - | - | - | - | - | - | 2 | - | - |
| CO4 | 2 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | | 2 | 2 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 | 2 |
| CO6 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | 2 | 2 | 2 | 2 |
| Ave | | | | | | - | - | - | - | | - | | | | |
| rage | 2.5 | 2.2 | 1.7 | 1.6 | 1.5 | | | | | - | | 2 | 2 | 2 | 2 |

Correlation Levels 1.Slight(Low) 2.Moderate(Medium) 3.Substantial(High)

KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome

UNIT – I: Acoustics and Ultrasonics

musical sound. Loudness – Weber Fechner law – Decibel – Reverberation – Reverberation time – Sound absorption coefficient- Sabine's formula for determining reverberation time (Rate of Growth and Rate of Decay) – determination of sound absorption coefficient – ***Factors affecting acoustics of buildings** (Optimum reverberation time, loudness, focusing, eco, echelon effect, resonance and noise) and their remedies. Ultrasonics- production- piezo-electric method – SONAR-Ultrasonic flaw detector as non-destructive testing technique.

UNIT-II: Laser and Fibre Optics:

(9 Hours)

Laser-principle-properties-Einstein coefficient (A and B)-Nd-YAG laser- CO₂ laser-Applications of laser-***Holography-construction and reconstruction of a hologram**. Principle and propagation of light in an optical fibre-types of optical fibres-applications-fibre optic communication system (block diagram)-fibre optic sensors.

UNIT-III: Crystal Physics:

Lattice-unit cell-Bravais lattice-lattice planes-Miller indices-'d' spacing in cubic latticecalculation of number of atoms per unit cell-atomic radius-coordination number-packing factor for ***SC, BCC, FCC and HCP structures**-Diamond and graphite structures (qualitative treatment). X-ray - Powder diffraction method to identify crystal structure parameters.

UNIT-IV: Semiconductors and superconductors

Semiconductors- intrinsic and extrinsic semiconductor. Fermi level-Variation of Fermi level with temperatureelectrical conductivity. Band gap determination-Hall effect-Determination of Hall coefficient –Applications. Superconductivity: Properties-Type I and Type II superconductors-BCS theory of superconductivity-High T_c superconductors- ***Applications of superconductors-SQUID, cryotron, magnetic levitation**.

UNIT-V: Dielectric, Magnetic and New engineering materials (9 Hours)

Electrical susceptibility-dielectric constant-electronic, ionic, orientational and space charge

(9 Hours)

(9 Hours)



polarizations-frequency and temperature dependence on polarization-internal field-Claussius-Mosotti relationuses of dielectric materials. Magnetic properties-diamagnetic-paramagnetic- -ferromagnetic materials- super paramagnetism-Transducers. ***Properties and applications of metallic glasses- nano materials-shape memory alloys-bio materials**.

TOTAL: 45 PERIODS

1. S. O Pillai "Solid State Physics", New Age International Pvt Ltd; 7th edition, 2015.

2. Ajoy Ghatak, "Optics", McGraw-Hill Education; 1st edition 2009.

3. Ajoy Ghatak, "Introduction to Fiber optics", Foundation Books, 2002.

References:

1. Charles Kittel," Introduction to Solid state physics", Wiley; Eighth edition 2012.

2. Ghatak and Thyagarajan, "Laser Fundamentals and Applications", Springer, 2011.

3. Richard Feynmann, Robert Leighton and Matthew Sands,"The Feynmann Lectures on Physics", Volume 1, Student Edition, Narosa Publishing house, 2003.

4. Richard Feynmann, Robert Leighton and Matthew Sands "The Feynmann Lectures" on Physics, Volume 2, Student Edition, Narosa Publishing house, 2003.

Designed by Department of Physics



| PROGRA | AM | | | | | | BE | -Mining | Engineer | ring | | | | | |
|----------------|-----------------------|----------------------------|---|---|--|--|---|--|---|-----------------------------------|---------------------|-----------------|-----------|----------------|-----|
| Course C | ode: | | | | | | | L | Τ | I | | | С | | |
| UBEEC0 | 1 | 0 | Course l | Name: | | | | 3 | 0 | (|) | | 3 | | |
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| Year and | Semest | er | ΙY | ear (II | Semest | ter) | | | Co | ontact h | ours pe | r week | | | |
| Prerequis | ite cour | se | | N | L | , | | | | (3 | B Hrs) | | | | |
| Course c | ategory | H | lumaniti Social Sci | es and iences | Mana | agement urses | Pro | fessiona | l Core | ``` | Profe | ssional I | Elective | | |
| | | | Basic Sc | ience | Engi | neering | 0 | pen Ele | ctive | | Ν | /landato | ory | | |
| | | | | | Sc | ience | | | | | | | · · | | |
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| POS/ | | | 6. Ap | ply the l | knowledg | ge of elec | ctric circ | uits and | electroni | c devices | for engi | neering | applicati | ons PSO | P |
| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | 1 | 2 | 3 |
| CO1 | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | 3 | 3 | 2 | (1) |
| CO2 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 | (1) |
| CO3 | 2 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 | |
| CO4 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 | 2 | 3 |
| CO5 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 | |
| CO6 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 3 | 3 | 2 | |
| Aver | | - | - | - | - | _ | - | 2.5 | 2.5 | 2 | 3 | | | | |
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| Correla | ation Lev | eis | | 1.5lig | nt(Low) | | | 2.MO | derate(M | edium) | | 3.Subs | tantial(F | 11gn) | |
| KL-Kn CO-Co | owledge ourse Out | Level:K come :P FI F | 1-Remen SO-Prog | nber,K2 rame Spe | -Understa ecific Out | and,K3-A tcome S | .pply,K4 | -Analyse | ,K5-Evalı 0 Hrs | uate,K6-C | Freate : F | O-Progr | ame Out | come: | |
| Ohm and I | 's Law RMS Va | – Kirc Ilue – I | hhoff's Power ar | Laws – nd Powe | Steady r factor | State So – Single | olution e Phase | of DC and Th | Circuits ree Phas | – Introd e Balanc | uction t ed Circ | o AC C uits. | circuits | – Wave | efo |



UNIT II ELECTRICAL MECHANICS

9 Hrs

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, Single phase induction Motor.

UNIT III SEMICONDUCTOR DEVICES

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics–Voltage regulation Bipola Junction Transistor – CB, CE, CC Configurations and Characteristics

UNIT IV DIGITAL ELECTRONICS

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion

UNIT V RECTIFIERS AND FILTERS

Half wave and Full wave Rectifiers – Capacitor filter – inductor filter- LC filter- CLC Filter.

TEXT BOOKS:

1. Mittle N., "Basic Electrical Engineering", Tata McGraw Hill Edition, New Delhi, 1990.

2. Sedha R.S., "Applied Electronics", S. Chand & Co., 2006.

REFERENCES:

- 1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition, (2006).
- 2. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press (2005).
- 3. Mehta V K, "Principles of Electronics", S.Chand& Company Ltd, (1994).

4. MahmoodNahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, (2002).

5. Premkumar N, "Basic Electrical Engineering", Anuradha Publishers, (2003).

Designed by "Department of Electrical and Electronics Engineering

9 Hrs

9 Hrs

Total: 45 Hours

9 Hrs



| PROGR | AM | | BE - 1 | Mining Er | gineering | | | | | | | | | | | |
|--|---------------------------|------------|-------------------|-------------------------|---------------------------|---|----------|----------|----------|----------|-----------|-----------------|-----------|------------|-------|------|
| Course C | Code | | Cours | e Name : | | | | | | | | | L | Τ | Р | С |
| UBITC0 | 1 | | Fund | amentals | of Comp | uter P | rograr | nming | 5 | | | | 3 | 0 | 0 | 3 |
| (Commo | n to BE – | Me | chanic | al Marine | , BE – EE | EM, B | E –PE | , BE – | HE, B | E - NA | &OE) | | | | | |
| Year | ; | and | I Year | : (II Seme | ester) | | | | Conta | ct hour | s per we | eek | | | | |
| Semester | • | | | | | | | | (3 Hrs | 5) | | | | | | |
| Prerequis | site | | NIL | | | | | | | | | | | | | |
| course | | | | | | | | | | | | | | | | |
| Course | Object | ive | Learn | to Progra | mming in | C lang | guage. | Studer | nts will | be gai | n the kr | nowledg | ge in usa | age of ar | rays, | |
| | | | string | s, functior | ns, pointer | s, stru | ctures a | and un | ions in | C lang | guage. | | | | | |
| | | | Stude | nt will be | able to | | | | | | | | | | | |
| 1. Learn the organization of a digital com | | | | | | | | | | r | | | | | | |
| | | | 2. | Learn t | o think lo | gically | and w | rite ps | eudo c | ode or | draw flo | ow cha | rts for p | roblems | | |
| Course C | Outcome | | 3. | Use arr | ays and fu | unctior | is in pr | ogram | ming | | | | | | | |
| | | | 4. | Unders | tand the f | unction | n and p | ointer | S | | | | | | | |
| | | | 5. | Familia | ar with fur | with functions of structure and unions | | | | | | | | | | |
| | | | 6. | Summa | arize the u | rize the usage of pointers and structures in C language | | | | | | | | | | |
| POS/ COS | PO1 | PC | 02 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 3 | | 3 | 3 | - | - | | - | - | - | - | - | 3 | 2 | - |
| CO2 | 2 | 3 | | 2 | 3 | - | - | 2 | 3 | 2 | 3 | - | - | 2 | 3 | |
| CO3 | 2 | 2 | | 2 | 2 | - | - | 2 | 2 | 2 | 2 | - | - | 3 | 3 | 2 |
| CO4 | 1 | 1 | | 2 | 1 | - | - | | | | | - | - | 3 | 2 | 3 |
| CO5 | 1 | 1 | | 1 | 3 | - | - | | 2 | 3 | 2 | 3 | | 2 | 2 | - |
| CO6 | 1 | 1 | | 1 | 1 | - | - | | 2 | 2 | 2 | 2 | | 2 | 1 | - |
| Average | 1.66667 | 1.8 | 83333 | 1.83333 | 2.16667 | - | - | - | | | | 2.5 2.16667 2.5 | | | | |
| Correlatio | on Levels | | _ | | 1.Slight(I | Low) | | | 2.Mo | lerate(1 | Medium) | | 3.Subs | stantial(H | ligh) | |
| KL-Know CO-Cours | ledge Level se Outcome | :K1 :PS | -Remen O-Progi | iber,K2Ui ame Specif | iderstand,k ic Outcome | 3-Appl | у,К4-А | nalyse,l | ≤5-Eval | uate,K6 | -Create : | : PO-Pr | ograme (| Jutcome: | | |

UNIT I INTRODUCTION

Generation and Classification of Computers - Basic Organization of a Computer - Input and Output Devices - Number System -Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart

UNIT II **C PROGRAMMING BASICS**

Problem formulation - Problem Solving - Introduction to "C" programming - fundamentals - structure of a "C" program compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in "C" – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III **ARRAYS AND FUNCTIONS** Arrays – Initialization – Declaration – One dimensional and two dimensional arrays. String - String operations – String Arrays -

UNIT IV **FUNCTION AND POINTERS**

Simple Programs - sorting and searching - matrix operation

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – pointers – definition - initialization - pointer arithmetic - pointers and arrays - examples

UNIT V STRUCTURES AND UNIONS

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure – Union – program using structures and Unions – storage classes, pre-processors directives.

TEXTBOOKS:

Balagurusamy E, "Programming in ANSI C", Sixth Edition, TATA McGraw Hill. 1.

REFERENCES:

- 1. Computer Fundamentals Concepts, Systems and Applications- D.P.Nagpal (Wheeler Publishing)
- 2. A.N.Kanthane Programming with ANSI and TURBO C, Pearson Education, New Delhi 2004.
- 3. Y.Kanetkar Let Us C 4th Edition BPB Publications, New Delhi 2004.
- 4. Foundations Of Information Technology- Chanchal Mittal & PragatiPrakashan " Department of Information Technology"

Total: 45 Hours

D TRAINING DEEMED TO BE UNIVERSITY (Under Section 3 of UGC Act 1956) SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY **B.E – MINING ENGINEERING**

ACADEMIC YEAR 2016-2020 (BATCH - I)

9Hrs

9Hrs

9Hrs

9Hrs

9Hrs



| PROGRAM | BE- Mining Engineering | | | | | | | | | | | | |
|--|--|--------------|------------|----------|-----------|-----------|-------|----------|--------------|-----------|-----|--|--|
| Course Code: | | | | | L | | Г | Р | | | С | | |
| UBMCCPA | Course Name: | | | | 0 | | 2 | 1 | | | 3 | | |
| | ENGINEERIN | GRAPHI | CS | | | | | | | | | | |
| Year and Semester | I Year (II | SEMEST | ER) | | | Co | ntact | hours pe | r week | | | | |
| Prerequisite course | | NIL | | | | | | (4Hrs) | | | | | |
| Course category | Humanities and | Mana | gement | ; 1 | Professio | onal Co | re | Pro | fessiona | l Electiv | 'e | | |
| | Social Sciences | | | | | | | | | | | | |
| | | | | | | | | | \checkmark | | | | |
| | Basic Science | | Open] | Elective | | Mandatory | | | | | | | |
| | | Sc | ience | | | | | | | | | | |
| Course Objective | Understanding th | e course for | r | | | | | | | | | | |
| | 1. Solid str | ictures and | shapes | | | | | | | | | | |
| | 2. Gain kno | wledge on | planes a | nd proj | ections | | | | | | | | |
| | 3. Projectio | n of solids | | | | | | | | | | | |
| | 4. To impro | ve the skill | s on soli | id deve | lopment | ts | | | | | | | |
| | 5. Knowled | ge on isom | etric pla | nes | | | | | | | | | |
| | At the end of the | course the | student v | will be | able to: | | | | | | | | |
| Course Outcome | 1. Identify the three Dimensional objects in two-dimensional media | | | | | | | | | | | | |
| | 2. Construct the projection of points, straight lines and determination of true length and | | | | | | | | | | | | |
| | true inclination | | | | | | | | | | | | |
| | 3. Illustrate | the simple | solid on | plain s | surface | | | сс | | | | | |
| | 4. Demonstrate the projection of solids and development of surfaces | | | | | | | | | | | | |
| 5. Construct the isometric projection of simple solids | | | | | | | | | | | | | |
| | 0. Examine | | it isoille | | ws and | projecti | | | | | | | |
| POS/ PO1 PO2 | PO3 PO4 PO | 5 PO6 | PO7 | PO8 | PO9 | PO1 | PO1 | PO1 | PSO | PSO | PSO | | |

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | 0 | 1 | 2 | 1 | 2 | 3 |
|-------|----------|--------|-----|--------|--------|-----|-----|------------------------------------|-----|---|---|---|---------|---|---|
| CO1 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | 1 | - | - | - | - | - |
| CO2 | 3 | 3 | 2 | 3 | 1 | - | - | - | - | 2 | - | - | - | 2 | - |
| CO3 | 2 | 2 | 3 | 2 | 2 | - | - | - | - | 3 | - | - | - | 2 | - |
| CO4 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | 1 | - | - | 3 | - | - |
| CO5 | 3 | 2 | 2 | 3 | 3 | - | - | - | - | 2 | - | - | 2 | - | 2 |
| CO6 | 3 | 3 | 2 | 2 | 3 | - | - | - | - | 3 | - | 2 | - | - | 2 |
| Ave | | | | | | | | | | | | 2 | 2.5 | 2 | 2 |
| rage | 2.7 | 2.5 | 2.2 | 2.3 | 2 | - | - | - | - | 2 | - | 2 | 2.5 | 2 | 2 |
| Corre | lation I | Levels | | 1.Slig | ht(Low | v) | | 2.Moderate(Medium) 3.Substantial(H | | | | | l(High) | | |
| | | | | | | | | | | | | | | | |

KL-Knowledge Level:K1-Remember, K2—Understand ,K3-Apply, K4-Analyse, K5-Evaluate, K6-Create ; PO-Programme Outcome; CO-Course Outcome ;PSO-Programme Specific Outcome



UNIT I : PLANE CURVES AND ORTHOGRAPHIC VIEWS

Introduction-Use of drafting instruments-Drawing conventions-size-Line types-Lettering and dimensioning Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves Visualization concepts: Representation of Three Dimensional objects in two dimensional media-Visualization of objects from pictorial views to orthographic views

UNIT II: PROJECTION OF POINTS, LINES AND PLANE SURFACES

Orthographic projection: Principal views and principal planes of projection-First angle projection-Third angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes -Determination of true lengths and true inclinations by rotating line method-Projection of plane surfaces

UNIT III: PROJECTION OF SOLIDS

Projection of simple solids placed in Different positions-perpendicular to HP or VP-parallel to either HP or VP and inclined to the other-Inclined to both VP and HP

UNIT IV: PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES Sectioning of simple solids in simple vertical position when the cutting plane is inclined to the one of the principal planes-Development of lateral surfaces of simple solids by Parallel line method and radial line method

UNIT V: ISOMETRIC PROJECTION AND ISOMETRIC VIEWS

Principles of isometric projection-isometric projection of simple solids-Guide lines to read the isometric view visualizing of plane surfaces inclined to the direction of view.

TOTAL : 60 Hours

TEXT BOOK:

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008. **REFERENCES**:

- 1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010
- 2. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009. **Designed by**" Department of mechanical Engineering



| PROGRA | M | BE- N | Mining | Engin | eering | | | | | | | | | | |
|---|------|-------------------|--------------------------------------|--------------|-----------------------|--------------|--------|----------|--------------|---------|------------|-----------|-----------|------|-----|
| Course Co | ode: | | | | | | | L | | Г | Р | | С | | |
| UBEECP | A | Course Name | | | urse Name: | | | | |) | 2 | | 1 | | |
| | | BAS ELE LAB | IC ELI CTRO | ECTR NICS | ICAL A ENGIN | AND NEERI | NG | | | | | | | | |
| | | 1 | | | | | | | | | | | | | _ |
| Year and Semester | | I Yea | ar (II S | SEMES | STER) | | | Contact | t hours) | per wee | ek | | | | |
| Prerequisi course | ite | NIL | | | | | | | | | | | | | |
| Course category | | Hum Socia | anities Il Scier | and nces | Management courses | | | Profess | sional (| Core | Professi | onal Ele | ective | | _ |
| | | Basic | Basic Science Engineering Science | | | | | Open H | Electiv | е | Mandat | ory | | | |
| | | | | | | \mathbf{x} | | | | | | | | | |
| Course Objective1. To provide exposure to the students with hands on experience on various electrical engineering practices.2. To familiarize the students with the design, analyze and application of electronic devices.3. To provide knowledge on circuits. 4. To enrich knowledge on measuring devices.5. Providing subject knowledge on troubleshooting on electrical equipment.Course Outcome0n completion of this LAB course, the students will be able to 1. Demonstrate instruments such as ammeter and voltmeter for measuring resistance, power and power factor 2. Compare the vector diagrams of series and parallel R,L and C circuits 3. Explain how to measure power input to three phase induction motor using watt meters 4. Illustrate the characteristics of PN diode, Zener diode and JFET | | | | | | | | | | | - | | | | |
| | | 6 | . Con | nbine r | neasuri | ng inst | rument | s for di | fferent | parame | ters in er | ngineerir | ng applic | at | |
| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO |
| CO1 | 2 | 2 | 2 | 1 | - | - | - | - | 2 | - | - | - | 2 | 2 | - |
| CO2 | 2 | 2 | 3 | 2 | - | - | - | - | 1 | 2 | - | 2 | 3 | 1 | 2 |
| CO3 | 2 | 2 | 2 | 2 | 1 | - | - | - | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO4 | 2 | 2 | 2 | 2 | 1 | - | - | - | 1 | 2 | - | 1 | 3 | 1 | 2 |
| CO5 | 2 | 2 | 2 | 2 | 2 | - | - | - | 3 | 1 | 3 | 3 | 3 | 2 | 2 |
| CO6 | 2 | 2 | 3 | 2 | 3 | - | - | - | 2 | 3 | 3 | 3 | 3 | 1 | 2 |
| Average | 2 | 2 | 2.3 | 1.8 | 1.8 | - | - | - | 1.8 | 2 | 2.7 | 2.2 | 2.7 | 1.5 | 1. |



| Correlation Levels | 1.Slight(Low) | 2.Moderate(Medium) | 3.Substantial(High) | | | | | | | | | | |
|---|---|-----------------------------|-------------------------------|--|--|--|--|--|--|--|--|--|--|
| KL-Knowledge Level:K1-Remember, K2—Understand ,K3-Apply, K4-Analyse, K5-Evaluate, K6-Create ; | | | | | | | | | | | | | |
| PO-Programme Outcome; Co | PO-Programme Outcome; CO-Course Outcome ;PSO-Programme Specific Outcome | | | | | | | | | | | | |
| | 1 | x 1, 1 , 1 | | | | | | | | | | | |
| 1. Experimental verification of Kirchhoff's voltage and current laws | | | | | | | | | | | | | |
| 2. Study of CRO and measurement of sinusoidal voltage, frequency and power factor. | | | | | | | | | | | | | |
| 3. Experiment | 3. Experimental determination of time constant of series R-C electric circuits. | | | | | | | | | | | | |
| 4. Experiment | 4. Experimental determination of frequency response of RLC circuits. | | | | | | | | | | | | |
| 5. Characterist | tics of Semiconductor diode | and Zener diode. | | | | | | | | | | | |
| 6. Characterist | tics of a NPN Transistor un | der common emitter, comm | non collector and common base | | | | | | | | | | |
| Configuration | ons. | | | | | | | | | | | | |
| 7. Characterist | tics of JFET. | | | | | | | | | | | | |
| 8. Realization | 8. Realization of passive filters. | | | | | | | | | | | | |
| 9. Single Phase half-wave | and full wave rectifiers wi | th inductive and capacitive | filters. | | | | | | | | | | |
| _ | | * | Total : 30 Hours | | | | | | | | | | |
| Designed by Department of I | Electrical and Electronics E | ngineering" | | | | | | | | | | | |



| PRO | GRAM | | | BE | - Minin | ıg Engir | neering | | | | | | | | | | |
|---------|---------|--------|-----|--------------|---|-------------|----------|----------|-----------|------------------|-----------|---------|----------|--------|---------|--|--|
| Cours | e Code | | | Cou | ırse Nai | me : | 0 | | | L | Т | | Р | С | | | |
| UBITCPA | | | | | Fundamentals of Computer Programming Lab | | | | | | | 0 | | 2 | 1 | | |
| | | | | | | | | | | | | | | | | | |
| Year | | | | ΙY | 'ear (II | Semeste | er) | | Co | ontact ho eek | ours per | | | | | | |
| Semes | ster | | | | | | | | | (2 | Hrs) | | | | | | |
| Prerec | luisite | | | NI | L | | | | | | | | | | | | |
| course | e | | | | | | | | | | | | | | | | |
| Cours | e | | | To | To learn, write and execute program in C language. | | | | | | | | | | | | |
| Objec | tive | | | | | | | | | | | | | | | | |
| | | | | Sti | Student will | | | | | | | | | | | | |
| | | | | 1 | | | Learn th | ie organ | ization | of a digi | ital | | | | | | |
| | | | | 2 | | | Re expo | sed to t | he numb | or suste | me | | | | | | |
| | | | | | | | Learn to | think l | orically | and wr | ite pseud | do code | or drav | / flow | charts | | |
| Cours | e Outco | me | | 3 | 3 for | | | | | | | | | | | | |
| | | | | | problems | | | | | | | | | | | | |
| | | | | 2 | 4 Be exposed to the syntax of C | | | | | | | | | | | | |
| | | | | 4 | 5 Be familiar with programming in C | | | | | | | | | | | | |
| | Cours | e Outc | ome | | After completion of the course, the students will be able | | | | | | | | | | | | |
| | | | | | 1. Develop logics to swap two numbers, finding largest of given | | | | | | | | | | | | |
| | | | | | numbers and roots of quadratic equation | | | | | | | | | | | | |
| | | | | | 2. Develop logic to print Fibonacci Series and sum of odd numbers and | | | | | | | | | | | | |
| | | | | | to find the area and Perimeter of the Circle, Triangle, and Square | | | | | | | | | | | | |
| | | | | | 3. Determine maximum, minimum, Sum and average of elements of an | | | | | | | | | | | | |
| | | | | | array | | | | | | | | | | | | |
| | | | | | 4. Determine the sum and multiplication of two matrices | | | | | | | | | | | | |
| | | | | | | 5. I | Determir | ne whetl | ner a str | ing is p | alindro | me or n | ot and f | ind nu | mber of | | |
| | | | | | vowels and of consonants in a given string | | | | | | | | | | | | |
| | | | | | | 6. 1 | Develop | logic to | perform | n the op | erations | using f | unction | and p | ointer | | |
| POS/ | DO1 | DOJ | DO2 | | DO5 | DOG | DO7 | DO9 | DOO | DO10 | DO11 | DO12 | PSO | PSC | PSO | | |
| COS | FUI | FU2 | 105 | г U 4 | FUS | 100 | FU/ | 100 | гUУ | FUIU | FUII | F012 | 1 | 2 | 3 | | |
| CO1 | 2 | 2 | 2 | 1 | | _ | - | - | _ | 2 | - | 1 | _ | - | - | | |


| CO2 | 3 | 2 | 3 | 2 | - | - | - | - | - | 2 | - | 2 | - | - | - |
|--|--|---|--|--|--|--|--|--|---|---------------------------------|------------------------|-------------|-------------|--------------|----------|
| CO3 | 3 | 2 | 3 | 2 | 2 | - | - | - | - | 1 | - | 2 | - | - | - |
| CO4 | 2 | 2 | 2 | 1 | 2 | - | - | - | - | 1 | - | 2 | - | - | - |
| CO5 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | 2 | - | 2 | - | - | - |
| CO6 | 2 | 3 | 3 | 2 | 3 | - | - | - | - | 2 | - | 2 | - | - | - |
| AVE RAG E COR | 2.3 RELATI | 2.2 ION LEV | 2.5 ELS | 1.7 | 2.3 1.SLIGH | - T(LOW) | - | - 2.M | - ODERAT | 1.7 E(MEDI | - UM) | 1.8 3.SU | - UBSTAN | - TIAL(HI | - GH) |
| K | L-Knowl | ledge Lev | el:K1-Re | emember | K2Und | lerstand, | K3-Apply | ,K4-Ana | lyse,K5-E | Valuate, l | K6-Creat | e: PO-F | Programe | Outcom | e: |
| | | | | C | CO-Cours | e Outcor | ne :PSO- | Program | e Specific | Outcom | e | | | | |
| LIST | OF EX | PERIN | IENTS | | | | | | | | | | | | |
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| Desig | ned by | | | | | | | " Depar technolo | tment of ogy" | f Inform | ation | | | | |
| | | | | | | | | | | | | | | | |



| PROGRA | M | В | E - Miı | ning Ei | ngineer | ring | | | | | | | | | |
|--|---------------|--------|--|--|---|--|--|---|---|--|--|------------------------------------|---------------------------------|----------|-----------------|
| Course Co | ode | С | ourse N | Name : | | | | | | | | L | Τ | | С |
| UBWSCP | В | E | ngineer | ring Pr | actice | Praction | cal-II | | | | | 0 | 0 | | 2 |
| Year Semester Prerequisi course Course | te categor | y | IL Huma Socia | nities a l Science | nd ces | M | I Yea | r (II So L ment es | emester P | r) rofession | Cor per (4 I al Core | ntact hor week Hrs) Prof | urs čessional | Electi | ve |
| | | S | cience | Basic | | Engin | ieering | Science | Ele | ctive | en | | Man | idatory | 7 |
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| CO3 | 2 | - | 2 | - | 2 | - | - | - | 2 | 2 | - | - | - | - | - |
| CO4 | 2 | - | 2 | - | 2 | - | - | - | 2 | 2 | - | - | - | - | - |



| CO5 | 2 | - | 2 | - | 2 | - | - | - | 2 | 2 | - | 2 | - | - | - |
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| UNIT V O | CARPE | NTRY | | | | | Hands | on exp | erience | in nren | aration | of | | | |
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| PROG | RAM | | BE-Mir | ning Eng | gineerin | g | | | | | | | | | |
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| Course | e Objec | tive | English | • | | | | | | | | | | | |
| | | | 2. Stren | gthen E | nglish c | ommun | ication s | skills. | | | | | | | |
| | | | 3. Enric | h the vo | ocabular | y for be | st comn | nunicati | on. | | | | | | |
| | | | 4. Creat | te know | ledge or | n synony | ms and | antony | ns. | | | | | | |
| | | | 5. To b | uilt time | managi | ng skill | s. | | | | | | | | |
| | | | At the e | end of th | e course | e the stu | dent wi | ll be abl | e to: | | | | | | |
| Course | e Outco | me | | | 1. Ap | ply Art | icles, P | repositio | ons, Pro | nouns, | Adjectiv | ves and | Adverb | os in the | eir speaking |
| | | | | | and | 1 writing | g skills | | | | | | | | |
| | | | | | 2. Inf | er the k | nowledg | ge on pu | blic spe | aking a | nd cond | uct of m | neetings | | |
| | | | | | 3. De | velop sl | cills on | interacti | ve Engl | ish | | | | | |
| | | | | | 4. De | velop li | stening | and spe | aking sk | tills for | effectiv | e presen | tation | | |
| | | | | | 5. De | velop g | ood attit | ude , be | havior a | and com | imunica | tion skil | ls | | |
| 7001 | | | | 1 | 6. Bu | ild inter | view sk | ills and | persona | lity dev | elopme | nt. | 200 | | |
| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO 1 | PSO 2 | PSO3 |
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| CO2 | - | - | - | - | - | 2 | 1 | 2 | 2 | 3 | - | - | - | - | - |
| CO3 | - | - | - | - | - | 2 | 1 | 2 | 1 | 2 | - | 2 | - | - | - |
| C04 | - | - | - | - | - | 2 | 2 | 3 | 2 | 3 | - | 2 | - | - | - |
| C05 | - | - | - | - | - | 3 | 2 | | 3 | 2 | - | 2 | - | - | - |
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| KL-Kn | owledge | Level:K | 1-Remem | ber,K2 | Understa | nd,K3-Aj | pply,K4-4 | Analyse,F | K5-Evalu | ate,K6-C | reate : P | O-Progra | ame Out | come: | |
| CO-Co | urse Out | come :P | SO-Progr | ame Spec | cific Outo | ome | | | | | | | | | |
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Parts of Speech, Adjectives and Adverbs)

UNIT II: INTRO TO PROFESSIONAL ETHICHS

Stepping the students to advanced learning resource and introducing them about International standards How to conduct meetings, huddle, public speaking, free speech. Dress code.

UNIT III: INTERACTIVE ENGLISH (Unit 9 to Unit 16)

10 Hrs

The main objective is English for International communication. It course contains conversations, snapshots, readings, activities, a greater variety and amount of listening materials and more visuals to introduce vocabulary, more opportunities to build fluency, and up-to-date art and design.

UNIT IV: LISTENING AND SPEAKING

Types of Listening –Introduction to International Standards of listening skills. Presentation skills: delivery (emphasis and phrasing) / making it interesting / body language / referring to visual aids

UNIT V: INTERVIEW SKILLS AND PERSONALITY DEVELOPMENT

Familiarize the students with types of Interviews such as mock interviews, campus Interview, skype interview, telephonic Interview, Panel Interview,

TEXT BOOKS:

1. Essential Grammar in use- Raymond Murphy, Cambridge, New Third Edition

REFERENCE BOOKS:

1. New Interchange (English for International Communication) Jack C. Richards

"AMET CENTRE FOR IELTS" **Designed by**

(TOTAL: 60 Hrs)

14 Hrs

14 Hrs

8 Hrs



| PROGR | RAM | | | | | | | BE-Min | ing Engi | neering | | | | | | | | |
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| Fleleq | luisite | | | | INIL | | | | | | | | | | | | | |
| Course | e cateo | ory | Huma | nities an | d | Manac | rement | P | Professio | nal Cor | • | Prof | essional | Electiv | ρ | | | |
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| | | | | \checkmark | | | | | | | | | | | | | | |
| Course Object | e tive e Outco | me | Dask Science Engineering Science Of Science 1. To introduce Fourier series and its applicat 2. To introduce the effective mathematical to Equations that model several physical proces 3. To Solve the boundary value problems in 4. To expose the statistical methods designed judgments in the face of uncertainty and varia o make a decision about the value of a popula At the end of the course the student will be able to: 1. Analyze the Partial Differential Equation 2. Infer about the Fourier Series 3. Classify the Boundary Value Problems 4. Analyze the Fourier Transform 5. Infer the Z -Transform And Difference Fourier | | | | | | cations tools f cesses. in one and to c ariation ulation tions tions | in engi or the s and two ontribu parame | ineering olution o dimen te the p | g fields s of par sional. orocess ed on si | rtial dif of mak ample c | ferentia | ll entific | | | |
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| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 | | | |
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| 3 | 3 | 3 | 2 | To introduce the effective mathematical tools for the solutions of partial differential puations that model several physical processes. To Solve the boundary value problems in one and two dimensional. To expose the statistical methods designed to contribute the process of making scientific lgments in the face of uncertainty and variation. Take a decision about the value of a population parameter based on sample data the end of the course the student will be able to: 1. Analyze the Partial Differential Equations 2. Infer about the Fourier Series 3. Classify the Boundary Value Problems 4. Analyze the Fourier Transform 5. Infer the Z -Transform And Difference Equations 5. Apply the PDE in engineering calculations 5. Apply the PDE in engineering calculations 7. PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02 PS03 7. 2 2 2 2 2 3 7. 2 2 2 3 3 2 2 7. 2 2 2 3 3 3 3 7. 2 2 2 3 3 3 3 3 7. 2 2 2 3 3 3 3 3 7. 2 2 2 3 3 3 3 3 7. 2 2 2 2 3 3 3 3 3 7. 2 2 | | | | | | | | | 3 | | | | | |
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| Correlati | on Levels | | • | 1.Slight(I | Low) | · | | 2.Moder | ate(Medium |) | | 3.Substar | ntial(High) | | · | | | |

(Under Section 3 of UGC Act 1956) SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY **B.E – MINING ENGINEERING** ACADEMIC YEAR 2016-2020 (BATCH - I)

KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create: PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome

UNIT I PARTIAL DIFFERENTIAL EQUATIONS Formation of partial differential equation - Solution of PDE by direct Integration- Solution of

Qq R Nonlinear equations First Pp of order Four

f(p,q) = 0, f(z, p, q)0, fx, p f y, q and zхp yqf(p,q)

UNIT II FOURIER SERIES

Definition of Fourier's series - Fourier Coefficients - Expansion of functions in Fourier series - Even and odd functions - Half

range Fourier series for any interval l, l. Harmonic analysis – Estimation of Fourier coefficients given values of function in it domain.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation - One dimensional equation of heat conduction - Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

NIT IVFOURIER TRANSFORMS

Definition-Fourier Integral Theorem-Fourier Transform-Properties of Fourier transform (Without proof)-Convolution-Relation between Fourier and Laplace transforms.

UNIT V **Z – TRANSFORMS**

Definition- standard Z-transforms- Standard results- properties of Z- transform (Without proof)-Initial value and Final value theorem- Inverse Z-transform -Convolution theorem-Convergence-Evaluation of Z-transform

TEXT BOOKS:

- 1. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt.Ltd., New Delhi, Second reprint, 2012.
- 2. Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.
- 3. Narayanan.S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 1998.

REFERENCES:

- 1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd, 2007.
- 2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company Limited, NewDelhi, 2008.
- 3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education,
 - 2007.
 - 4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India, 2007.
 - Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt Ltd, Sixth Edition, 5. New Delhi, 2012.

Datta.K.B., "Mathematical Methods of Science and Engineering", Cengage Learning India Pvt Ltd, Delhi

Designed by " Department of Mathematics" types

12

12

equation

12

12 Hrs

12 Hrs

Total 60 Hrs





| PROC | GRAN | [| | | | | | BE-Mi | ning Eng | gineerin | g | | | | |
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| Cours | e | | | 1. T | 'o know | the kno | wledge | about N | lineral r | esources | s of Indi | a. | | | |
| Object | tive | | | 2. T | 'o know | about s | surface 1 | mining | | | | | | | |
| 5 | | | | 3. U | Indersta | nd abou | t underg | ground r | nining | • | | | | | |
| | | | | 4. II 5 I | ntroduct Indersta | 101 abound the e | ut mach | ineries i nental in | ised in r nnacts d | nines lue to mi | nino | | | | |
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| Cours | e Outc | ome | 1. | Descr | ibe abou | ıt Minin | g indust | ry | | | | | | | |
| 00000 | • • • • • • | 01110 | 2. | Expla | in about | Surface | e mining | g | | | | | | | |
| | | | 3. | Sumn | narize al | oout Un ut machi | dergrou | nd minii 1 in min | ng ing indu | etry | | | | | |
| | | | 5. | Identify | the pote | ential en | vironme | ental im | pacts | suy | | | | | |
| | | | 6. | Describ | e the rol | e of mir | ning in e | economy | y of a co | ountry. | | | | | |
| | | | | | | | | | | | | | | | |
| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 2 | 1 | | 2 | | 3 | | 1 | | 2 | | 3 | 2 | | 3 |
| CO2 | 1 | | 2 | | 2 | | 3 | 2 | | 2 | 1 | | 3 | 2 | |
| CO3 | | 2 | | 3 | 2 | | 1 | | 2 | | 3 | 2 | 1 | | 3 |
| CO4 | 2 | | 3 | | 2 | | 3 | | 2 | | 3 | | 2 | 2 | |
| CO5 | 1 | 2 | | 3 | | 2 | | 2 | | 3 | | 2 | 3 | | 2 |
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 Correlation Levels
 1.Slight(Low)
 2.Moderate(Medium)
 3.Substantial(High)

 KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome:
 CO-Course Outcome : PSO-Programe Specific Outcome

UNIT I INTRODUCTION

Mining definition – Historical overview – Role of the industry – Economic importance and impact on society – Mineral resources of India

UNIT II SURFACE MINING

Overview - Types of surface mines - Planning & Selection of sites - Unit operations Basic bench geometry – Applicability and Limitations – Advantages and Disadvantages.

UNIT III UNDERGROUND MINING

Overview - Coal mining methods - applicability and limitations- advantages and Disadvantages - Metal mining Methods-Applicability - Limitations - Advantages and Disadvantages.

UNIT IV MINING MACHINERY

Drilling machines for coal and metals mining – Dewatering pumps – Hydraulic escalators – aerial ropeways – crushers – breakers and feeders.

UNIT V ENVIRONMENT AND SAFETY

Environmental impact of mining and associated activities – Pollution – air, water, noise – Mine safety systems - Mining laws and regulations

Text Books: H.L.Hartman "Introduction to Mining Engineering", John Wiley and Sons, Second 1.

Edition, 1999

2. D.J.Deshmukh "Elements of Mining Technology", Vol.1, Vidyaseva Prakashan, Nagpur,1994

Reference Books

1. Introduction to Mining Engineering - H.L.Hartman – 4th Edition

Designed by: "Department of Mining Engineering

09 Hrs

09 Hrs

09 Hrs

09 Hrs

Total:50 Hrs





| PROGR | AM | | | | | | В | E-Minir | ıg Engiı | neering | | | | | |
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| Course of | category | / H S | umaniti ocial Sci | es and ences | N | fanaş cou | gement rses | Pr | ofessio | nal Core | 2 | P | rofession | al Electi | ve |
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| | |] | Basic Sci | ience | I | Engin Scie | eering ence | | Open E | lective | | | Mand | latory | |
| | | | | | | | | | | | | | | | |
| | | | | 1. | Illust | rate a | bout the g | geologi | e struct | ures | | | | | |
| Course | | | | 2. | Desci | ibe a | bout the s | stratigra | iphy | | | | | | |
| Objective | e | | | 3. | Class | ify th | e mineral | S a atmati | ~~~ h ~~ | | | | | | |
| | | | | 4. 5 | Unde | rstan | d about th | e strati | grapny | letures | | | | | |
| | | | | 5. | onde | istan | | | gie sui | uctures | | | | | |
| | | At t | he end o | f the cour | rse the | stude | nt will be a | ble to: | | | | | | | |
| Course C | Outcome | | 1. | | | Exp | lain detail | s of Mi | neral e | xplorati | on | | | | |
| | | | 2. | | | Dist | inguish th | e types | of Roc | - ks | | | | | |
| | | | 3. | | | Clas | sify the n | ninerals | | | | | | | |
| | | | 4. | | | Sum | marize th | e stratig | graphy | | | | | | |
| | | | 5. | Evelo | in abo | Exp | lain detail | s of geo | ologic s | structur | es | | | | |
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Earth and its interiors – Composition – Scope of economic geology and exploration geology – Mineral exploration - Concepts and methods - Stages of exploration - Strategy and design – Resources and Reserves



UNIT II PETROLOGY

Rocks and their classification - Formation of igneous, metamorphic and sedimentary rocks - mode of occurrence -Common rocks and composition

UNIT III MINERALOGY

Physical and Chemical properties - Crystal classes and systems - Properties of common silicate minerals – Quartz, feldspar, pyroxene, amphibole, garnet, olivine, mica – Sulphides – Pyrite, chalcopyrite, Galena, Sphalerite and Oxides - Haematite, Magnetite, Chromite, Pyrolesite, Psilomelane - Atomic minerals - Beach sands

UNIT IV STRATIGRAPHY

Geological time scale – distribution of mineral resources – economic importance of Archaean, Paleozoic, Mesozoic and Cenozoic rocks of India.

UNIT V STRUCTURAL GEOLOGY

Topographic maps - Aerial photographs and Satellite imageries - Attitude of planar and linear structures

- Strike, dip, foliation - Geological structures - folds, faults, unconformities and joints - Igneous intrusions - dykes, sills, batholiths - Principles of stereographic projections of linear and planar features

Text Books:

- Parbin Singh. Geology for Engineers, IBH Publications, N. Delhi. 1991. 1.
- 2. Arthur Holemess, Principles of Physical Geology, Thomas Nelson and Sons, USA, 1964.

Reference Books

- 1. Blyth F.G.H. and de Freitas M.H. Geology for Engineers, 7th edition, Elsevier Publications, 2006.
- 2. Bell F.G. Engineering Geology, Elsevier Publications, 2007.
- 3. Ford, W.E. Dana's Textbook of Minerology (4th edition), Wiley Eastern Ltd., N. Delhi, 1989.
- 4. Winter, J.D. An Introduction to Igneous and Metamorphic Petrology, Prentice Hall, N. Delhi, 2001.
- 5. Billings, M.P. Structural Geology, Prentice Hall Ino., N. Jersey, USA, 1972.

Designed by " Department of Mining Engineering

10 Hrs

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UNIT IV DIMENSIONAL ANALYSIS

Introduction – Need for dimensional analysis – Methods of dimensional analysis – Dimensions of physical quantities – Dimensional groups – Buckingham π theorem – group method – Rayleigh's method of indices – Dimensionless numbers – Applications of dimensional method – Similitude – Types of similitude.

UNIT V PUMPS & TURBINES

Centrifugal pumps - Working principle – Reciprocating pump - Working principle - Indicator diagram – Rotary pumps - Classification - Comparison of working principle with other pumps - Advantages – Classification of turbines - heads and efficiencies - velocity triangles - axial, radial and mixed flow turbines - pelton wheels and francis turbine.

Text Book:

(Total: 50 Hrs)

10 Hrs

1. Streeter, V. L. and Wylie E. B., Fluid Mechanics, McGraw Hill Publishing Co.(2010)

2. Kumar K. L., Engineering Fluid Mechanics, Eurasia Publishing House (p) Ltd. New Delhi(2004)

References Books:

1. Robert .Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery", ISBN 978-0-470-54755-7, 2011.

Designed by "Department of Mining Engineering".



| PROGR | AM | | | | | | | BE-M | ining En | gineering | 3 | | | | |
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UNIT III SINKING OPERATIONS

Ground bearing and muck disposal - tools and equipment, lining, ventilation, lighting and dewatering – Sinking in difficult and water-bearing ground – Insets - Design, excavation and lining – Mechanised Sinking - Simultaneous sinking and lining - slip-form method of lining - high speed sinking.

UNIT IV SHAFT BORING

Methods and equipment - Special Attributes - Widening and deepening of inclined and vertical shafts - staple shafts - raised shafts.

UNIT V DRIFTING & TUNNELLING

Purpose, shape, size and location – Excavation – ground breaking, muck disposal, ventilation and supporting – High speed Drifting & Tunnelling – Application of mechanised methods – roadheaders and tunnel boring machines.

TEXT BOOKS: 1. Hartman, H.L., Introduction to Mining Engineering, John Wiley and Sons, Second Edition, 1999.

2. Deshmukh, D.J., Elements of Mining Technology, Vol.I, Vidyaseva Prakashan, Nagpur, 1994.

REFERENCES:

1. Hartman, H. L. (Editor), SME Mining Engineering Handbook, 3rd edition, Vol I & II, Society of Mining Engineers, New York, 2011.

Designed by "Department of Mining Engineering"

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(Total: 50 Hrs)





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(Under Section 3 of UGC Act 1956) SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY **B.E – MINING ENGINEERING** ACADEMIC YEAR 2016-2020 (BATCH - I)

UNIT I: Materials Science and Engineering

Introduction, Developments in materials, engineering profession and materials, classification of materials, criteria for selection of materials for petroleum industries.

Ferrous materials: Cast iron, Steel, Stainless Steel, Prominent alloy steel.

Non-Ferrous materials: Copper, Brass, Bronze, Aluminium, Lead, Tin.

Materials for High and Low temperature service, classification of heat resistant materials

UNIT II: Properties of materials

Mechanical Properties: Hardness, Strength, Toughness, Stiffness, Ductility, Malleability, Harden ability, creep and fatigue

Electrical properties: Conduction, Semiconductors and insulators

Optical properties: Absorption, Reflection, Transmission and Refraction optical fibers and lasers. Magnetic properties: Various types of magnetic materials, Diamagnetic, Paramagnetic, Ferromagnetic, Anti

ferronmagnetic and ferromagnetic materials, hard and soft materials

Thermal properties: Thermal expansion, Heat capacity, Thermal conduction, Thermal Stresses

UNIT III: Composite Materials

Classification of composites, Reinforcing phase, Matrix phase, Fiber reinforced plastics, Metal matrix composites, General and practical composite systems, Tribological behavior of composite, special composites. Concrete, Asphalt concrete, reinforced concrete, prestressed concrete, concrete polymer composite, fiber reinforced cements.Nanostructures materials, Powder processing

UNIT IV: Heat Treatment and Material Testings

Heat treatment: Annealing, Normalizing, Hardening, Tempering

Case Hardening – Carburizing, Nitriding, Cyaniding and carbon nitriding, Flame hardening, induction Hardening, Surface treatmentStudy of fractures of engineering materialsDestructive testing, Tensile testing, compression testing, Impact Testing, Hardness test, Jominy endquench test for hardenability of steel.Non destructive testing. 9 Hrs

UNIT V: Materials environment interactions

Principles of corrosion, Electrochemical corrosion direct dissolution mechanisms, Dry and wet corrosion, Galvanic corrosion.

Methods of corrosion control, cathodic and anodic protection, corrosion inhibitors. Surface coatings, corrosion monitoring, Polarization corrosion prevention.

Reference Books:

1. Schaeffer J.P: Saxena A, Antolovich S.D, Sanders T.H. Jr., Warner S.B., The Science & Design of Engineeing Materials, McGraw-Hill International.

2. Askeland Donald R. and Phule P.P. The science and engineering materials, Thomson learning.

3. Callister william D.Jr Material Science and Engineering an Introduction, John Wiley & sons inc.

Designed by "Department of Mechanical Engineering

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- 6. Measurement of dip using Brunton compass and Clinometer
- 7. Stereographic projections
- 8. Contour Maps

TOTAL 24 Hrs

TEXT BOOKS:

Bateman, A.M., Economic Mineral Deposits, John Wiley and Sons, 1956.

Krishnaswamy, S. Indian Mineral Resources, Oxford and IBH Publication Company, New

Bell F.G., Engineering Geology, Elsevier Publications, 2007.

Designed by "Department of Mining Engineering"



| PROGRAM | | | | | | В | E-Minin | g Engine | eering | | | | | |
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| Correlation Levels | | | 1.Slight(| Low) | | | 2.Moder | rate(Medium | ı) | | 3.Substa | ntial(High) | | 1 |
| KL-Knowledge Lev CO-Course Outcon LIST OF EXI 1. Flow Meas | el:K1-Rer le :PSO-P PERIM | nember,K21 rograme Spec ENTS: | Understand, cific Outcom | K3-Apply,I ie | K4-Analyse, | K5-Evaluat | e,K6-Create | e: PO-Prog | rame Outcor | ne: | | | | |



| i) a. Calibration of Rotometer b. Flow through Venturimeter ii) Flow through a circular Orifice iii) Determination of mean velocity by Pitot tube iv) Verification of Bernoulli's Theorem v) a. Flow through a Triangular Notch b. Flow through a Rectangular Notch | |
|---|---|
| 2. Losses in Pipes | 6 Hrs |
| Determination of friction coefficient in pipes | |
| Determination of losses due to bends, fittings and elbows | |
| 3. Pumps | 6 Hrs |
| i. Characteristics of Centrifugal pumps | |
| 11. Characteristics of Submersible pump | |
| III. Characteristics of Recipiocating pump | |
| 4. Determination of Metacentric height Demonstration Only | 4 Hrs |
| | (Total : 24 hrs) |
| TEXT BOOKS: 1. Hydraulic Laboratory Manual, Centre for Water Resources, Anna Universi 2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book | ty, Chennai. 2004. A House, New Delhi, 2000. |
| REFERENCES: | |
| Subramanya, K. Flow in open channels, Tata McGraw - Hill pub. Co.1992 Subramanya, K. Fluid mechanics, Tata McGraw- Hill Pub. Co., New Delhi | i, 1992. |
| | (Total: 24 Hrs) |
| Designed by "Department of Mining Engineering" | |



| PRO | GRAM | | BE - M | ining Eı | ngineeri | ng | | | | | | | | | | | |
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| Year a | and Sem | lester | II Year | (III Ser | mester) | | | Co | ntact ho | urs per v | week | | | | | | |
| Prerec | quisite c | ourse | SOFT | SKILL | S-III | | | (4 | Hrs) | | | | | | | | |
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| | | | Pre | pare th | em for | campus | s Interv | iew | | | | | | | | | |
| | | | The stu | dent wil | l be abl | e to | | | | | | | | | | | |
| | | | 1 | Constr | ructivis | m : Cor | nceptua | lizing t | he nuar | nces of | the tens | ses in si | ituatior | nal usag | ge | | |
| | | | 2 | Learni | ng The | eory : | Enhanc | ing ve | rbal an | d colla | aboratir | ng othe | er com | munica | tive | | |
| C | 0 | | | activit | ies | | | | | | | | | | | | |
| Cours | e Outco | me | 3 | Critica | l think | ing: coo | ordinati | ng and | buildin | g fluen | cy in th | e indiv | iduals | lexical | | | |
| | | | 4 | Coope | rative l | earning | : Inter | active p | particip | ation of | f the sel | f with o | other ir | ndividu | als | | |
| | | | 5 | Active | Partici | pation: | to cont | fidently | step in | to and | comma | nd situ | ations | with Cl | air. | | |
| | | | 6 | Enhances the versatility of the students on all skills. student will be able to | | | | | | | | | | | | | |
| | | | The stuc | Enhances the versatility of the students on all skills. student will be able to Apply listening sharply and reading keenly to understand and act apply | | | | | | | | | | | | | |
| | | | | student will be able to 1. Apply listening sharply and reading keenly to understand and act aptly. | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | 2. | Take _l | part in p | presenta | tions a | nd in G | roup D | iscussio | ons. | | | | | |
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| | | | | 3. | Build | skills to | o write | interna | itional c | competi | itive ex | aminati | ions | | | | |
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| Course | Outcom | ie | | 4. | Comm | | | лрісвы | on and | lamma | iny wn | | lology | enabled | 1 | | |
| | | | | | Comm | iumcati | on | | | | | | | | | | |
| | | | | 5 | Analy | se disti | inouish | and Pr | enare th | neir ow | n resum | ne and r | enort | | | | |
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| | | | | 6. | Apply | skills t | o succ | essfully | get jol | os by er | nhancin | g the C | Overall | Person | alitv | | |
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| POS/ | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO | PSO | PSO | | |
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| CO_2 | | | | | | 2 | | 2 | 2 | 3 | | 2 | | | | | |
| C03 | | | | | | 2 | | 2 | 2 | <u></u> २ | | 2 | | | | | |
| C05 | | | | | | 2 | | 2 | 2 | 3 | | 2 | | | | | |
| CO6 | | | | | | 2 | | 2 | 2 | 3 | | 2 | | | | | |
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| rage | | | | | | | | | | | | | | |
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| Correlation I | Levels | | 1.Slig | ht(Low | ') | | 2.Mo | derate(I | Mediun | 1) | 3.Sub | stantial | l(High) | |
| KL-Knowledge Course Outcom | Correlation Levels 1.Slight(Low) 2.Moderate(Medium) 3.Substantial(High) KL-Knowledge Level:K1-Remember,K2Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome | | | | | | | | | | | | | |
| UNIT 1: GF | RAMM | AR AN | ND FO | UNDA | TON | | | | | | | | 10 H | rs |

Training the students on basic grammar and foundation and laying the standard platform. A complete standard syllabus of Cambridge is used. The main part of the 1st semester is to cover the major tenses (Present tense, Present Continuous, Past Tense, Past Continuous, Present Perfect, and Present Perfect continuous.

UNIT II: BODY LANGUAGE AND LEXICAL RESOURCE WITH BASIC WRITTEN SKILLS 8hrs

Posture, eye contact, gestures with hands and arms, speech, tone of the voice One word substitutes, E-mail communication, creating blogs, free writing on any given topic, writing definitions.

UNIT III: INTERACTIVE ENGLISH

(Unit 1 to 8)

6 Hrs



The main objective is English for International communication. It course contains conversations, snapshots, readings, activities, a greater variety and amount of listening materials and more visuals to introduce vocabulary, more opportunities to build fluency, and up-to-date art and design. The course covers the fours skills of listening, speaking, reading and writing, as well as improving pronunciation and building vocabulary.

UNIT IV: LISTENING AND SPEAKING Hrs

Types of Listening -Listening and note taking-Pronunciations-Stress and Intonation-Conversation technique-Dialogue Writing -Professional Communication-Interview-Group Discussion –Power point Presentation-Lab.

UNIT V: INTERVIEW SKILLS AND PERSONALITY DEVELOPMENT 8 Hrs

Personality development – Self motivation, Self-actualization, Stress management, Interview skills,

Negotiation skills, familiarization and strategies of telephonic, skype, one on one, panel, exit interviews

TOTAL: 40 PERIOD S

TEXT BOOKS:

- 1. Essential Grammar in use- Raymond Murphy ,Cambridge , New Third Edition
- 2. Communication skills

1. New Interchange (English for International Communication) Jack C. Richards **Designed by**"AMET CENTRE FOR IELTS



| PROGRAM | 1 | | | | | | | BE- | Mining | Engine | ering | | | | |
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| CO4 | 2 | 2 | 3 | 2 | | | 3 | | | | | | 2 | 3 | 2 |
| CO5 | 2 | | 3 | | 2 | 1 | | 2 | | | 1 | | 3 | 1 | 2 |
| CO6 | 1 | 1 | 2 | 2 | | 1 | | | | 2 | 1 | 3 | 2 | 2 | 2 |
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| Correlation | Levels | _1 | 1 | 1.Sligh | t(Low) | 2 | .Moderate | e(Mediun | n) | 1 | 3.Sub | stantial(| High) | L | |
| KL-Knowl CO-Course | edge Leve e Outcom | el:K1-Re le :PSO-P | member, Programe | K2Und Specific | erstand Outcon | ,K3-Apj ne | ply,K4-Ar | nalyse,K | 5-Evalua | ate,K6-C | Create : | PO-Pr | ograme O | utcome: | |



UNITI RANDOM VARIABLES

Discrete and continuous random variables - Properties- Moments - Moment generating functions and their properties. Binomial, Poisson, Geometric, Negative binomial, Uniform, Exponential, Gamma, and Weibull distributions. **UNIT II TWO DIMENSIONAL RANDOM VARIABLES 12 Hrs**

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and Regression - function of a random variable-Transformation of random variables - Central limit theorem. 12

12 Hrs

UNIT III TESTING OF HYPOTHESIS

Sampling distributions - Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit. UNIT IV DESIGN OF EXPERIMENTS 12

Hrs

Analysis of variance – One way classification – CRD - Two – way classification – RBD - Latin square. **UNIT V RELIABILTY AND QUALITY CONTROL 12 Hrs**

Concepts of reliability-hazard functions-Reliability of series and parallel systems- control charts for measurements (x and R charts) – control charts for attributes (p, c and np charts)

TOTAL :60Hrs

TEXT BOOKS

1. J. S. Milton and J.C. Arnold, "Introduction to Probability and Statistics", Tata McGraw Hill, 4th edition, 2007. (For units 1 and 2) 2. R.A. Johnson and C.B. Gupta, "Miller and Freund"s Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, (2007) REFERENCES 1. Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, "Probability and Statistics for Engineers and Scientists", Seventh Edition, Pearsons Education, Delhi, 2002.

2. Navidi, W, "Statistics for Engineers and Scientists", Special Indian Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.

3. Spiegel, M.R, Schiller, J and Alu Srinivasan, R, "Schaum"s Outlines Probability and Statistics", Tata McGraw-Hill Publishing Company Ltd. New Delhi, 2007.

Designed by "Department of Mathematics"



| PROG | RAM | | | | | |] | BE-Mini | ng Engir | neering | | | | | | |
|-------------|--------|-----|------------------|--|--------------------|-----------------|--------------|----------|-----------|----------|----------|-----------|-----------|----------|--------|--|
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| Course | • | | •] | listen t | to lect | ures a | nd co | mprehe | nd P | ropertie | es of m | naterials | s them | by a | asking | |
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| | | | • | To help learners Developments in materials, engineering profession and materials king them realize the importance of Ferrous materials: Cast iron, Steel, Stainless Steel, | | | | | | | | | | | | |
| | | | Makin | king them realize the importance of Ferrous materials: Cast iron, Steel, Stainless Steel, | | | | | | | | | | | | |
| | | | Promine | king them realize the importance of Ferrous materials: Cast iron, Steel, Stainless Steel, minent alloy steel. | | | | | | | | | | | | |
| | | | At the end | d of the c | ourse th | e studen | t will be | able to: | | | | | | | | |
| Course | Outco | me | | 1. | Apply | the co | ncept of | of stres | s-strain | relatio | onship | on the | bars w | vith dif | ferent | |
| | | | | | loading | g condit | ions. | | | | - | | | | | |
| | | | | 2. | Analys | e the i | mpact | of stre | sses or | n thin | and thi | ick sh | ells du | e to in | ternal | |
| | | | | | pressur | e | | | | | | | | | | |
| | | | | 3. | Constr | uct she | ar for | e and | bendin | ig mor | nent di | iagrams | s of va | rious l | beams | |
| | | | | | under v | arious | load co | onditior | ns. | | | | | | | |
| | | | | 4. | Analys | e the be | ending | stress c | of vario | us sect | ion of t | beams. | · 1- ·· 1 | 0 - 1: 1 | -16 | |
| | | | | 5. | Catego | rise the | maxin | num po | wer an | a torqu | le trans | mitted | through | i Solid | snafts | |
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| CO4 | 3 | 3 | 3 | | | | | | | | | 3 | 3 | | | |
| CO5 | 3 | 3 | 3 | | | | | | | | | 3 | 3 | | | |
| CO6 | 3 | 2 | 2 | | | 3 | | 3 | | | | 3 | 2 | | | |
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(Under Section 3 of UGC Act 1956) SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY **B.E – MINING ENGINEERING** ACADEMIC YEAR 2016-2020 (BATCH - I)

2.Moderate(Medium)

KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create: PO-Programe Outcome: **CO-Course Outcome : PSO-Programe Specific Outcome** STRESS, STRAIN AND DEFORMATION OF SOLIDS UNIT I (10 Hrs) Rigid bodies and deformable solids – Tension, Compression and Shear stresses – Deformation of simple and compound bars - Thermal stresses - Elastic constants - Volumetric strains - Stresses on inclined planes - principal stresses and principal planes - Mohr's circle of stress.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM (10Hrs) Beams – types transverse loading on beams - Shear force and bending moment in beams -

Cantilevers - Simply supported beams and over - hanging beams. Theory of simple bending - bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

UNIT III TORSION

ge

Correlation Levels

Torsion formulation stresses and deformation in circular and hollow shafts - Stopped shafts - Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs. **UNIT IV DEFLECTION OF BEAMS** (10 Hrs)

Double Integration method - Macaulay's method - Area moment theorems for computation of slopes and deflections in beams – Conjugate beam and strain energy – Maxwell's reciprocal theorems.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS (10 Hrs)

1.Slight(Low)

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame's theory – Application of theories of failure.

(Total: 50 Hrs)

Text Books :

- 1. Bansal.R.K., Strength of Materials, Laxmi publications (P) Ltd., 2007
- 2. Jindal U.C., Strength of Materials, Asian Books Pvt.Ltd., New Delhi, 2007

Reference Books :

- 1. Egor. P.Popov "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2001.
- Hibbeler.R.C., "Mechanics of Materials", Pearson Education, Low Price Edition, 2007 2.
- **Designed by** " Department of Mechanical Engineering

ACADEMY OF N AND TRAINING DEEMED TO BE UNIVERSITY

(10 Hrs)

3.Substantial(High)



| PROGRAM | | BE | - Mining Engir | neering | | |
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| Course Code: | | | L | Т | Р | С |
| UBMN401 | Course Name: | | 4 | 0 | 0 | 3 |
| | MINING GEOLO | GY | | | | |
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| Year and | II Year (IV S | SEMESTER) | | Contact | hours per week | |
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| course | 111 | IL | | | | |
| Course category | Humanities and | Management | Profession | al Core | Professional | Elective |
| | Social Sciences | courses | | | | |
| | Basia Sajanga | Engineering | Open Fl | | Manda | tory |
| | Dasic Science | Science | Open Ei | ecuve | Ivianua | tor y |
| | | | | | | |
| Course Objective | 1. Describe th | e physical geology | | | | |
| objective | 2. Explain the | mineral deposits in | n India | | | |
| | 3. Differentiat | te coal and petroleu | m geology | | | |
| | 4. Describe th | e role of geophysic | al prospectir | ng methods | | |
| | 5 D' | | 1 1 | C | | |
| | 5. Discuss geo | biogical investigatio | on. | | | |
| | | | | | | |
| | At the end of the c | ourse the student w | ill be able to | : | | |
| Course Outcome | I. Explain the | physical geology | T 1' | | | |
| | 2. Analyze the | e mineral deposits i | n India | | | |
| | 5. Explain the | vladga patrology | n geology | | | |
| | 4. Apply Knov | ote sensing and CIS | | | | |
| | 6. Discuss rem | ote sensing and GIS | | | | |
| | | 6 | | | | |

| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
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| CO1 | 3 | | 3 | | 1 | | 2 | | | | | 1 | 2 | | 1 |
| CO2 | 2 | | | | 2 | | 1 | 3 | | | | | 3 | 2 | |
| CO3 | 3 | | 3 | | | | 2 | | | 2 | | 1 | | | 3 |
| CO4 | 2 | | | | 2 | | 1 | 3 | | | | | 3 | 2 | |



| CO5 | 3 | | 3 | | 1 | | 2 | | | | | 1 | 1 | | 2 |
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| CO6 | | 2 | | 3 | | 1 | | 2 | | 3 | 2 | | 1 | | 1 |
| Aver | | | | | | | | | | | | | | | |
| age | 2.17 | 0.33 | 1.50 | 0.50 | 1.00 | 0.17 | 1.33 | 1.33 | 0.00 | 0.83 | 0.33 | 0.50 | 1.67 | 0.67 | 1.17 |
| Correla | age 2.17 0.33 1.50 0.50 1.00 0.17 Correlation Levels 1 Slight(Low) | | | | | | | 2.Mo | derate | (Mediu | m) 3. | Substant | ial(Hig | h) | |

KL-Knowledge Level:K1-Remember, K2—Understand ,K3-Apply, K4-Analyse, K5-Evaluate, K6-Create ;

PO-Programme Outcome; CO-Course Outcome ;PSO-Programme Specific Outcome

UNIT I INTRODUCTION

Introduction and scope of Economic geology – Process of Ore formation – Mineral deposits formed from magmatic, hydrothermal and volcanic process.

UNIT II ECONOMIC MINERAL DEPOSITS IN INDIA

Metallic – Non-metallic deposits – Study of Graphite, copper, zinc, gold, lead, iron, manganese, radioactive minerals, asbestos, mica, gemstone – Origin, mode of occurrence and distribution in India – Origin and occurrence of industrial minerals – ceramic, refractory, abrasive, glass and paint industry.

UNIT III COAL AND PETROLEUM GEOLOGY

Origin – Physical properties – Processes – Occurrence of coal and its types – Petroleum deposits – Fossil fuel distribution in sedimentary basins of India.

UNIT IV GEOPHYSICS

Geophysical prospecting methods – Seismic, electrical, magnetic and gravity methods of mineral prospecting – Location of ore body, coal and petroleum reserves, subsurface litho- $\log - 3D$ models.

UNIT V REMOTE SENSING AND GIS

Introduction to aerial and satellite remote sensing – Identification of photo recognition elements – Applications of remote sensing and GIS in geological mapping and mineral exploration.

(Total: 50 Hrs)

Text Books:

1. Bateman, A.M., Economic Mineral Deposits, John Wiley and Sons, 1956

(10 Hrs)

(10 Hrs)

(10 Hrs)

(10 Hrs)

(10 Hrs)



| PROG | RAM | | | | | | E | BE-Minin | g Engin | eering | | | | | |
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| Semest | ter | | - | | (1 - 20 | | | | | Com | (34H | Hrs) | | | |
| Prerequ | uisite | | | | NIL | | | | | | | , | | | |
| course | | | | | | | | | | | | | | | |
| Course | e categ | ory | Human Social | ities and Sciences | 1 | Manage cours | ement ses | Pro | ofession | al Core | | Profes | sional E | lective | |
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| | | | Basic | Science | | Engine Scier | ering Ice | C |)pen El | ective | | N | Iandato | ry | |
| | | | | | | | | | | | | | | | |
| _ | | | 1. Disc | uss types | s of exp | loratory | drills a | nd their a | applical | oility | | | | | |
| Course | | | 2. Expl | ain type | s of dril | ling in s | surface i | mines | | | | | | | |
| Object | Objective3. Define blasting in surface mir4. Understand the explosives an | | | | | | | | ethods | | | | | | |
| | | | 5. Unde | erstand c | drilling | and blas | ting in i | undergro | ound mi | nes | | | | | |
| | | | At the end | d of the c | ourse th | e student | will be | able to: | | | | | | | |
| Course | Outco | me | 1. (| Classify | the type | es of exp | loratory | drills a | nd their | applical | oility | | | | |
| | | | 2. I | Explain (| the expl | osives a | nd deto | nating m | ethods | | | | | | |
| | | | 3. 1 | Distingu | ish type | s of dril | ling in s | urface m | nines | | | | | | |
| | | | 4. 1 | Explain (| drilling | and blas | ting in i | undergro | und mi | nes | | | | | |
| | | | 6. 1 | Discuss 1 | the met | hods to c | trill a m | ineral re | serve. | nes | | | | | |
| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 2 | 1 | | 2 | | 3 | | 1 | | 2 | | 3 | 2 | | 2 |
| CO2 | 1 | | 2 | | 2 | | 3 | 2 | | 2 | 1 | | 3 | 2 | |
| CO3 | | 2 | | 3 | 2 | | 1 | | 22 | | 3 | 2 | 1 | | 2 |
| CO4 | 2 | | 3 | | 2 | | 3 | | 22 | | 3 | | 2 | 2 | |
| CO5 | 1 | 2 | | 3 | | 2 | | 2 | | | | 2 | 3 | | 2 |
| CO6 | | | 1 | | 3 | | | 2 | | 3 | | 2 | 2 | 2 | 2 |
| Avera | 2 | 1.6 | 2 | 2.6 | 2.2 | 2.5 | 2.3 | 2.3 | 2 | 2.5 | 2.3 | 2.2 | 2.2 | 2 | 2 |
| Correlati | ion Levels | | | 1.Slight | (Low) | | | 2.Moder | rate(Mediu | ım) | | 3.Substa | ntial(High |) | 1 |
| KL-Kno CO-Cou | owledge L arse Outco | evel:K ome :P | 1-Remember, SO-Programe | K2Under Specific O | rstand,K3 Jutcome | -Apply,K4 | -Analyse, | K5-Evalua | te,K6-Cre | eate : PO-l | Programe | Outcome: | | | |
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| UNIT I | INT | ROD | UCTION | | | | | (09 | Hrs) | | | | | | |
| | | | . . | | | | | | | | | | ~ | | |
| 0.1 | Boring | g for e | exploration | ı – Vario | ous type | es of exp | loratory | drills and | nd their | applical | bility – . | Auger - | Cable-to | ool - | |

(Under Section 3 of UGC Act 1956) SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY B.E – MINING ENGINEERING ACADEMIC YEAR 2016-2020 (BATCH - I)

Interpretation of borehole data.

UNIT II EXPLOSIVES AND ACCESSORIES

Types of explosives – Composition, properties, classification – Selection of explosives – manufacture, transport, storage and handling of explosives, testing of explosives - Types of initiating systems – electrical detonators - detonating fuse - detonating relays - NONEL – Blasting accessories –exploders..

UNIT III DRILLING IN SURFACE MINES

Blasthole drills – types, classes, classification, applicability and limitations - Mechanics of drilling – performance parameters – drilling cost – compressed air requirement for hole cleaning – selection of drilling systems – drilling errors – organization of drilling.

UNIT IV BLASTING IN SURFACE MINES

Mechanics of rock fragmentation – Livingstone theory of crater formation – factors affecting blasting – blast design – estimation of burden and spacing – estimation of charge requirement – initiation patterns – secondary blasting – pop and plaster shooting – problems associated with blasting – ground vibration and air over pressure – blast instrumentation

UNITV:DRILLING&BLASTINGINUNDERGROUNDMINES

Coal mines - drilling systems and their applicability – blasting-off-solid – different Blasting cuts – ring hole blasting – calculation of specific charge – specific drilling and detonator factor – initiation patterns Metal mines - drilling systems and their applicability – blast design for horizontal drives different blasting cuts – long hole blasting – vertical crater retreat blasting.

Text Book:

- 1. Rao, K.U.M, and Misra, B., (1998), Principles of Rock Drilling, Oxford & IBH Publications, New Delhi, p.265.
- 2. Jimeno, C.L., Jimeno, E.L, Carcedo, E.J. Drilling and Blasting of Rocks, A. A. Balkema, Rotterdam
 - 1. Clark, G.B., Principles of Rock fragmentation, Wiley Interscience Publication, 1987.
 - 2. Konya, C.J. and Walter, E.J. Surface Blast Design, New Jersey, 1990.
 - 3. Bhandari, Sushil, Engineering Rock Blasting Operations, A. A. Balkema, Rotterdam, 1997.
 - 4. Per-Anders Persson, Roger Holmberg, and Jaimin Lee. Rock Blasting and Explosives Engineering, CRC Press, 1994.
 - 5. Hustrulid, W. A. Blasting Principles of Open Pit Mining, Vol. 1- General Design Concept, A.A. Balkema, Rotterdam, 1999.
 - 6. Singh, B and Pal Roy, P., (1993), Blasting in Ground Excavations and Mines, Oxford & IBH Publications, New Delhi, p.177.
 - 7. Chugh, C.P., (1999), Diamond Drilling, Oxford & IBH Publications New Delhi.
 - 8. Pradhan, G.K., and Sandhu, G.S., Manual of Rock Blasting, IME Publications, 1996.
 - 9. Janusz Reś, Krzysztof Wladzielczyk and Ajoy K. Ghose., Environment-friendly Techniques of rock breaking, CRC Press, 2003.
 - 10. Langefors, U., and Kihlstrom, (1973), B., The Modern Techniques of Rock Blasting, URMO Publications

Designed By:Department of Mining Engineering

TOTAL: 45 Hrs

09 Hrs

(09Hrs)

09 Hrs

09 Hrs





| PROGRAM | | | | | | | BE-M | lining E | Inginee | ring | | | | | |
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| Year and Semester | | II Ye | ar (IV | Sen | nest | er) | | | | Conta | ct hou | rs per v | veek | | |
| Prerequisite course | | | NI | L | | , | | | | | (4 H | Irs) | | | |
| Course category | Hum | anities a | nd | N | Mana | agem | ent | Pr | ofessio | onal Cor | e | Profes | sional l | Elective | |
| | Soci | al Scienc | es | | co | ourses | | | | | | | | | |
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| | Bas | ic Scienc | e |] | Engi | ineeri | ng | | Open H | Elective | | Ν | landato | ory | |
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| Course Objective | 1 | Toun | dersta | nd f | he r | nath | ematic | rs in ci | irvevi | no to c | alcula | te areas | and v | olumes | |
| course objective | 1. | for di | fforont | nu i | ine i | ha Ta | idan | tify fo | ur ve yr | ing to c | | nrohlon | na in t | ba field | |
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| | | or adv | anced | i sur | vey | ing. | | | | | | | | | |
| | 2 | 2. Ability to analyze survey data and design mining engineering projects. | | | | | | | | | | | | | |
| | 2. Ability to analyze survey data and design mining engineering projects. | | | | | | | | | | | | | | |
| | 3. | To en | gage i | n lif | e- lo | ong l | learnir | ng wit | h the a | advance | es in si | urvey te | chnig | ues. | |
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| | 4. | Under | stand | the | prin | nciple | es of t | riangu | lation | survey | | | | | |
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| Course Outcome | | Surve | ying a | nd I | Dist | ance | and D | Directi | ons in | real m | ining l | lease su | rveyin | ıg | |
| | 2. | Illustr | ate dif | ffere | ent t | ypes | of Le | veling | g Instru | uments | and n | nethods | of lev | eling | |
| | 3. | Expla | in to u | ise tl | he c | conto | uring | and T | heodo | lite Su | veyin | g in mi | ning a | rea | |
| | 4. | Apply | Princ | ciple | s of | f Tra | versin | g | | | | | | | |
| | 5. | Apply | Princ | ciple | s of | f triai | ngulat | ion su | rvey. | | | | | | |
| | 6. | Descr | ibe ov | veral | l co | nven | tional | meth | ods of | survey | ing | | 1 | | |
| POS/ COS PO1 PC | 02 PO3 | PO4 | PO5 | РОС | 6 | РО 7 | PO8 | PO9 | PO1 0 | PO11 | PO1 2 | PSO1 | PSO 2 | PSO3 | |
| CO1 ² | 1 | 3 | | | | | | 2 | | | | 2 | 1 | 3 | |
| CO2 2 | 2 | | 1 | | | 3 | | | 2 | | 2 | | 2 | 2 | |
| CO3 2 1 | | 3 | | 2 | | | 3 | | 2 | 1 | | 2 | | 1 | |
| CO4 2 1 | | 2 | 3 | | | 2 | | 3 | | 1 | | 2 | 3 | | |
| CO5 1 3 | | 2 | | 3 | | | 2 | | 1 | | 2 | 1 | 2 | 3 | |
| CO6 1 2 | | 3 | 2 | 1 | | | | 2 | | 2 | | 2 | 2 | 1 | T |
| Average 1.6 1.8 | 1.5 | 2.6 | 2 | 2.3 | | 2.6 | 2.5 | 2.3 | 1.6 | 1.3 | 2 | 1.8 | 2 | 2 | \uparrow |
| Correlation Levels | | 1.Slight | (Low) | | 2.M | Ioderat | e(Mediui | m) | | 3.Substa | ntial(Hig | h) | | | |

KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: **CO-Course Outcome : PSO-Programe Specific Outcome**

UNIT I INTRODUCTION

Definition – Objective – Classification and principles of surveying

UNIT II LINEAR MEASUREMENT

Instruments for measuring distances - Chains - tapes - electronic distance measurement - total station - ranging and taping survey lines - Chain surveying - principle- field work-offsets- booking and planning- obstacles in taping - Total station construction & working with total stations.

UNIT III ANGULAR MEASUREMENT

Bearing of lines - Rectangular coordinate system - Essentials of the micro-optic theodolite - Measurement of horizontal and vertical angles - temporary and permanent adjustments - theodolite traversing - computation of co-ordinates adjustment of traverse - temporary and permanent adjustments.

UNIT IV LEVELLING (10 Hrs) Definition & terminology – Levelling instruments - Types - tilting, autoset and digital levels

levelling stares - different types of levelling - differential, profile, cross-sectional and reciprocal levelling - booking and reduction methods - underground levelling - temporary and permanent adjustments of levels. **UNIT V CONTOURS**

(10 Hrs)

Concepts - characteristics of contour - contour interval - methods of contouring - plane

table contouring - Uses of contours.

Text Books:

- 1. Punmia, B.C., Surveying Vol I and II, Laxmi Publication, New Delhi, 1991
- 2. Kenetkar, T.P., Surveying and Levelling, Vol I and Vol II, United Book Corporation, Poona, 1991.

Reference Books:

- 1. Winniberg, F., Metalliferous Mine Surveying
- 2. Mason, E., Coal Mining Series, Surveying , Vol I And Vol II, Virtue And Company Limited, London.
- 3. Clark, D., Plane And Geodetic Surveying, Vol I And Vol II, CBS Publishing Co., 1986.
- 4. Borshch, V., Komponiets, A., Navitny, G.AndKnysh., Mine Surveying, MIR Publishers, Moscow, 1989.

Designed by " Department of Mining Engineering"

(10 Hrs)

(10 Hrs)

(10 Hrs)

(Total: 50 Hrs)





| PROG | RAM | | | | | | | BE-Mini | ing Engi | neering | | | | | |
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| UBMN4 | 404 | | Disaster | manage | ement | | | 3 | | 0 | | 0 | | 3 | |
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| Course Objecti | ive | | 1. U 2. D 3. D 4. E 5. D | Understar Discuss ti Describe Explain ti Discuss ti | nd the ty he meth the imp he conti he lesso | ypes of l ods to p acts of o ngency ns leam | hazards prevent 1 disaster plan of t from v | risk on deve disaster various d | lopmen manage lisasters | t ement | | | | | |
| Course | Outco | At the end of the course the student will be able to: 1. Explain the disaster management 2. Analyze the method of prevention 3. Explain the impacts of disaster on development 4. Apply contingency plan of disaster management 5. Create the prevention chart for various disasters 6. Explain the overall prevention and mitigation measures | | | | | | | | | | | | | |
| POS/ | PO1 | PO | 2 PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | PO1 | PO1 | PSO 1 | PSO | PSO 3 |
| C01 | 2 | 1 | | 2 | | 3 | | 1 | | 2 | 1 | 3 | 2 | 4 | 2 |
| CO2 | 1 | | 2 | | 2 | | 3 | 2 | | 2 | 1 | | 3 | 2 | |
| CO3 | | 2 | | 3 | 2 | | 1 | | 2 | | 3 | 2 | 1 | | 2 |
| CO4 | 2 | | 3 | | 2 | | 3 | | 2 | | 3 | | 2 | 2 | |
| CO5 | 1 | 2 | | 3 | | 22 | | 2 | | 3 | | 2 | 3 | | 2 |
| CO6 | | | 1 | | 3 | | | 2 | | 3 | | 2 | 2 | 2 | 2 |
| Aver | 2 | 1.6 | 2 | 2.6 | 2.2 | 2.5 | 2.3 | 2.3 | 2 | 2.5 | 2.3 | 2.2 | 2.2 | 2 | 2 |
| age | | Ļ | | 1 01: 1 | | | | | | | | | | | |
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ACADEMY OF MARITIME EDUCATION AND TRAINING DEEMED TO BE UNIVERSITY (Under Section 3 of UGC Act 1956)

SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY B.E – MINING ENGINEERING ACADEMIC YEAR 2016-2020 (BATCH - I)

-Earthquake, Landslide, Flood, Drought, Fire – Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)

Disaster cycle – Phases, Culture of safety, prevention, mitigation and preparedness of community based DRR, structural – non-structural measures, Roles and responsibilities of community, Panchayat Raj Institutions/Urban Local Bodies (PRI/ULB), States, Centre and other stake-holders – Institutional Processes and Framework at State and Central level – State Disaster Management Authority (SDMA).

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT (9 Hrs)

Factors affecting Vulnerabilities, differential impacts, impact of development projects such as dams, embankments, changes in Land-use – Climate change adaptation – IPCC scenario and Scenarios in the context of India.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA (9 Hrs) Hazard and Vulnerability profile of India, Components of Disaster relief – Water, Food, Sanitation, Shelter, Health, Waste management – Role of GIS and Information technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT:

APPLICATIONS AND CASE STUDIES AND FIELDWORKS

Landslide Hazard Zone - Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure – Drought Assessment - Case studies – Coastal Flooding – Storm Surge Assessment – Floods - Fluvial and Pluvial Flooding - Case studies – Forest Fire - Case studies – Man Made Disasters - Case studies.

(TOTAL: 45Hrs)

Text Books

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13:978-9380386423

2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education

Pvt.Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361

3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

References:

- 1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
- 2. Government of India, National Disaster Management Policy,2009.

Designed by: "Department of Mining Engineering

DEPT OF MINING ENGINEERING

(9 Hrs)

(9 Hrs)


| PROG | RAM | | | | | | | BE-M | ining Er | gineerin | g | | | | |
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| Prereq | uisite c | ourse | | | l | NIL | | | 1 | | | (3 Hrs |) | | |
| Course | e categ | ory | H | umaniti | es and | N | lanagen | nent | Pro | ofessiona | al Core | P | rofessio | nal Elec | etive |
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| | | | | Basic Sc | ience | Ľ | ingineei Scienc | ring | U | pen Ele | ctive | | Mar | idatory | |
| | | | | | | | Juin | .c | | | | | | | |
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| Course | e Obje | ctive | | 1. Ex | plain th | e physic | cal and | chemic | al prope | erties of | oil | | | | |
| | 5 | | | 2. De | scribe tl | he types | s of wel | ls and i | ts limita | ations | | | | | |
| | | | | 3. Illu | strate t | he rock | propert | ies obta | ined fr | om core | sample | es for oi | 1 | | |
| | | | | 4. D18 | cuss the | e metho | ods used | l to pro | duce oil | from w | vell | | | | |
| | | | | $\begin{array}{ccc} 5, & \mathbf{Ex} \\ 5, & \mathbf{Da} \end{array}$ | plain the | e non-te | echnica. | l operat | 10ns per | formeu | in wei | recorno | | | |
| | | | Δt f | $\frac{0}{100} \text{ De}$ | f the cou | rse the | oration | uill be a | ble to | n or per | roleum | reserve | | | |
| Course | Outor | mo | Fit u | 1. De | scribe a | hout oil | indust | viii oc u V | 010 10. | | | | | | |
| Course | 2 Outco | | | 2. Ex | olain ab | out Sur | face str | uctures | | | | | | | |
| | | | | 3. Sui | nmarize | e about | Underg | round c | oil | | | | | | |
| | | | | 4. Illu | strate a | bout ma | achines | used in | oil indu | ıstry | | | | | |
| | | | | 5. Ide | ntify the | e potent | ial envi | ironmen | ital imp | acts of o | oil Indu | stry | | | |
| | | | | 6. De | scribe th | ne role o | of oil pr | oductio | n in eco | onomy o | of a cou | ntry. | | | |
| DOG | T | 1 | | 1 | | | T | 1 | T | T | 1 | | 1 | | 1 |
| POS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | POS | POQ | PO1 | PO1 | PO1 | PSO | PSO | PSO |
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| CO1 | 2 | 1 | | 2 | | 3 | | 1 | | 2 | | 3 | 2 | | 3 |
| CO2 | 1 | | 2 | | 2 | | 3 | 2 | | 2 | 1 | | 3 | 2 | |
| CO3 | | 2 | | 3 | 2 | | 1 | | 2 | | 3 | 2 | 1 | | 3 |
| CO4 | 2 | | 3 | | 2 | | | 2 | | 3 | | 2 | 2 | | |
| CO5 | 1 | 2 | | 3 | | 2 | 2 | | 3 | | 2 | 3 | | 2 | |
| CO6 | 2 | | 1 | | 3 | | 2 | | 3 | | 2 | 2 | 2 | | |
| Aver | 2 | 1.6 | 2 | 2.6 | 2.2 | 2.5 | 2.3 | 2.3 | 2 | 2.5 | 2.3 | 2.2 | 2.2 | 2 | |
| age | <u> </u> | | | 1 (1) 1 | | | | | | | | 2.5.1 | | | l |
| Correla | ation Le | vels | 174 D | 1.Sligh | nt(Low) | 1 4 | 1172 4 | 2.Mod | lerate(M | edium) | | 3.Subs | stantial(H | High) | |
| KL-Ki | nowledg | ge Level | :K1-Re | member | ,K2U1 | iderstai | 1d,K3-A | Apply,K4 | 4-Analy | se,K5-E | valuate | ,K6-Cre | ate : Po | J-Progra | ame |
| | nne: ourse O | utcome | ·PSO-P | Program | e Snecif | ic Outco | ome | | | | | | | | |
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UNIT-I INTRODUCTION

Chemistry of petroleum. Structure of petroleum compounds. Types – alkanes, Naphthenes, paraffins, aromatics. Physical and chemical properties of oil, gas and formation water.

UNIT II DRILLING A WELL

Drilling – History, types of drilling –cable tool, rotary, drilling rigs and components. Types of wells – exploratory, delineation, development wells. Vertical, deviated, inclined, horizontal and ERD wells. Drilling fluids, casing and cementation. Planning – GTO.

UNIT III FORMATION EVALUATION (10 Hrs) Formation Evaluation – cutting, cores, mud logging unit. Well logging, types of well logs their use. Sub surface correlation.

UNIT IV WELL ACTIVATION

Well Testing, perforation, testing methods, well completion production. Stimulation methods, recovery methods, Material balance, reserves estimation

UNIT V WELL SITE OPERATIONS

Wellsite operations, roles of drilling, reservoir and production hazards, environmental concerns transportation of oil and gas, oil pollution and control, petroleum economics

(TOTAL: 50 Hrs)

(10 Hrs)

TEXT BOOKS:

Geology of Petroleum – Leverson, A.L Formation Evaluation – Lynch Drilling Manual – ONGC Principles of oil Production – T.E.W. Wind

REFERENCES

Introduction to Petroleum Engineering – Geltin Designed by "Department of Petroleum Engineering"

(10 Hrs)



(**10 Hrs**) anes. Napht

(10 Hrs)



| PROG | RAM | | | | | | | BE-Min | ing Engi | ineering | | | | | | |
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| Prerequ | uisite | | | | | | | | NIL | | | | | | | |
| course | | | | | | | | | | | | | | | | |
| Cours | se cate | gory | | Hun | nanities | and | Mar | agemen | t | Profess | sional C | ore | Professi | onal El | ective | |
| | | | | Soci | ial Scien | ices | C | ourses | | | | | | | | |
| | | | | Ra | sic Scier | | Fno | incoring | | Oper | V Floctiv | 0 | Me | ndator | 7 | |
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| | | | | | | | | | | | | | | | | |
| | | | 1. I | dentifica | ation of | minera | ls | | | | | | | | | |
| Course | e | | 2. | Identific Descent | cation of | f ores | folda an | diainta | | | | | | | | |
| Object | ive | | 5. 4 | Measura | ment of | f din an | 1010s and | u joints | | | | | | | | |
| | | | | Stereog | raphic p | roiectio | ons and | contour | maps | | | | | | | |
| | | | At the en | d of the | course th | ne stude | nt will be | able to: | .1 | | | | | | | |
| Course | e Outco | me | 1. Cla | 1. Classification of minerals | | | | | | | | | | | | |
| | | | 2. Di | scussion | 1 of roc | ks | | | | | | | | | | |
| | | | 5. Cla 4 Re | cognitic | aion of fai | ores ilts fol | ds and i | oints | | | | | | | | |
| | | | 5. Me | asurem | ent of d | ip and s | strike ep | lanation | | | | | | | | |
| | | | 6. Pro | eparation | nof Ster | eograp | hic proje | ections a | and con | tour ma | ps | | | | | |
| POS/ | PO1 | PO2 | 2 PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | PO1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 | |
| CO1 | 1 | 2 | | 2 | | 3 | | | 2 | • | | 1 | 2 | | 2 | |
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| CO5 | 1 | 3 | | 1 | | 2 | | 1 | | 2 | | 22 | | 2 | 2 | |
| CO6 | 2 | | 1 | | 2 | | 3 | | 22 | | 1 | | 2 | | 2 | |
| Aver | 1.8 | 2.3 | 1.6 | 1.6 | 2.5 | 2.3 | 2.6 | 2 | 2 | 2.5 | 1.3 | 1.6 | 1.8 | 2 | 2 | |
| Correl | ation Le | vels | | 1 Slive | t(Low) | | | 2 Mod | erate(M | edium) | | 3 Sub | | l Iigh) | | |
| KL-K | nowledg | e Lev | el:K1-Ren | nember, | K2Un | derstan | d.K3-Ap | ply,K4- | Analyse | K5-Eva | luate,K | 6-Creat | e: PO-F | rogram | e | |
| Outco | me: | | | , | | | / I | 1 57 | · | , | , | | | 8 | | |
| | ourse O | utcom | ne :PSO-P | rograme | Specifi | c Outco | me | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| List of l | Experim | ents | | | | | | | | | | | | | | |



- 1. Identification of minerals
- 2. Identification of rocks
- 3. Identification of ores
- 4. Recognition of faults, folds, joints etc
- 5. Measurement of strike using Brunton compass and Clinometer
- 6. Measurement of dip using Brunton compass and Clinometer
- 7. Stereographic projections
- **8.** Contour Maps

TOTAL 24 Hrs

TEXT BOOKS:

Bateman, A.M., Economic Mineral Deposits, John Wiley and Sons, 1956.

Krishnaswamy, S. Indian Mineral Resources, Oxford and IBH Publication Company, New

Bell F.G., Engineering Geology, Elsevier Publications, 2007.



| PROC | GRAM | [| | | | | | BE-Mir | ning Eng | gineerin | g | | | | |
|------------|-----------|-------|--------|---------------|----------|-----------|--------------------|------------|--------------|-----------|-----------|---------------|---------------|-----------|----------|
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| Semes | ter | | | | • • • • | т | | | | | | (2 Hrs |) | | |
| Prereq | uisite | | | | NI | L | | | | | | | | | |
| course | ; | | | | _ | | | | | | | | | | |
| Course | e categ | gory | Hum | anities | and | Ma | nageme | ent | Prof | essiona | l Core | P | rofessio | onal Ele | ctive |
| | | | Soci | al Scien | ces | | courses | | | | | | | | |
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| Course | - | | | 1 E | vnloin | Compr | ossion t | ost | | | | | | | |
| Object | 5 | | | 1. L 2 L | iscuss | various | test on | wood | | | | | | | |
| Object | live | | | 2. D | escribe | Hardn | ess test | on met | ale | | | | | | |
| | | | | 5. D 4 F | xnlain | double | shear <i>&</i> | torsio | n | | | | | | |
| | | | | 5 D | escribe | the de | flection | limit c | n of beam | | | | | | |
| | | | At the | end of th | ne cours | e the stu | ident wi | ll be abl | e to: | | | | | | |
| Course | e Outco | ome | 1. | Deter | mine th | e value | es of yi | eld stre | ss, brea | king st | ress and | d ultima | ate stres | ss of the | e given |
| Course | e Outer | JIIIC | | specii | nen un | der tens | sion tes | t. | | e | | | | | C |
| | | | 2. | Expla | in the | procedu | ure to p | erform | Hardne | ess test | and fin | nding h | ardness | numbe | er with |
| | | | | variou | is speci | mens | | | | | | | | | |
| | | | 3. | Exper | riment | with D | eflection | on test | on Mi | ld Stee | l, Alur | ninium | to fin | d the y | oung's |
| | | | | modu | lus. | | | | | | | | | | |
| | | | 4. | Deter | mine th | e modu | ilus of i | rigidity | of Mile | l steel ı | ising to | rsion te | st | | |
| | | | 5. | Identi | fy the s | stiffnes | s of the | open co | oil and | closed | coil spr | ing and | grade | hem. | |
| | | | 6. | Expe | iment v | with giv | ven spec | cimen t | o find t | he com | pression | n streng | gth and | fatigue | |
| | | | | streng | gth and | impact | strengt | h of ma | terials | | | | | | |
| DOGY | | | | | | | - | | | DO1 | DO1 | DO1 | DCO | DCO | DEC |
| POS/ | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | | 1 POI | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
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| <u>CO2</u> | 2 | 2 | 2 | 2 | | | | | 2 | | | 2 | 2 | 2 | |
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| age | 2.7 | 2.5 | 2.5 | 2.5 | | | | | 3 | | | 3 | 3 | 2.3 | |
| Correla | ation Lev | rels | | 1.Sligh | t(Low) | | | 2.Mode | erate(Me | dium) | | 3.Subs | tantial(H | igh) | |



KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create: PO-Programe **Outcome:**

CO-Course Outcome : PSO-Programe Specific Outcome

LIST OF EXPERIMENTS

- Tension test on mild steel rod 1.
- 2. Compression test on wood
- 3. Double shear test on wood
- 4. Torsion test on mild steel rod
- Impact test on metal specimen (Izod and Charpy) 5.
- 6. Hardness test on metals (Rockwell and Brinell Hardness Tests)
- 7. Deflection test on metal beam
- 8. Compression test on helical spring
- 9. Deflection test on carriage spring

REFERENCES

1. IS 432(Part I) – 1992 – Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.

| Designed by | " Department of Mining Engineering" |
|-------------|-------------------------------------|
| | |

(24 Hrs)



| PROGRAM | BE - 1 | Mining Er | ngineerin | g | | | | | | | | | | | |
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| Year and Semester | II Yea | r (IV Sei | nester) | | | C_{C} | o <mark>ntact h</mark> o 2 Hrs) | ours per | week | | | | | | |
| Prerequisite | SOFT | SKILL-I | II | | | (- | | | | | | | | | |
| course | 2011 | | | | | | | | | | | | | | |
| Course category | (| General | Fo | oundation | n | | Core | / | | Ele | ctive | | | | |
| | | | | | | | Professi | onal | | | | | | | |
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| Learning | a | b | с | d | e | | f | g | h | 1 | j | k | | | |
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| Mapping of | | | | | | | | | | | | | | | |
| Instructional | 15 | | | | 1 | 5 | | | | 15 | | | | | |
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| Outcome | | | | | | | | | | | | | | | |
| Aim / Purnose | | Toms | ke the s | tudents | to le | arn | the cor | norate | culture | and ma | ster the | <u>ــــــــــــــــــــــــــــــــــــ</u> | | | |
| Affin / Turpose | | profes | cional a | thiog | | am | | porate | culture | | Ster th | | | | |
| of the course | Б | protes | sional e | unes obiovo (| hain | ~ ** ~ | onizoti | | | | | | | | |
| Instructional | P Stude | Prepare them to achieve their organizational goals dents will be able to | | | | | | | | | | | | | |
| instructional objective of the | | lents will be able to Improvise on the usage of grammar and vocabulary in all circumstances | | | | | | | | | | | | | |
| objective of the | 1 | lents will be able to Improvise on the usage of grammar and vocabulary in all circumstances | | | | | | | | | | | | | |
| course | 2 | To carry | / onesen | r expres | sing | bei | navioral | etnics | | • | | | | | |
| | 3 | To colla | borate v | with ind | 1V1du | | such as | to impi | rove pr | onuncia | t10n | | | | |
| | 4 | To disti | nguish t | between | stand | dar | ds and 1 | illustrat | e a cha | inge in l | istening | g and | | | |
| | | speaking | g skills. | | | | | | | | | | | | |
| | 5 | Formula | ating and | d applyi | ng va | aric | ous forn | ns of w | ritten c | ommuni | ications | s that | | | |
| | | are learn | nt. | | | | | | | | | | | | |
| | 6 | Actively | / partici | pate in t | the cl | lass | s and un | derstan | id conc | epts. W | ill be re | eady | | | |
| | | to hand | e large | groups | witho | out | any fea | r | | | | | | | |
| | At the e | end of the o | course the | student | will be | e ab | le to: | 1 • | 11 1 | | • | | | | |
| | | 1. | Develop | vocabi | ulary | an | d langu | age ski | lls rele | vant to e | enginee | ering as | | | |
| | | | a profes | sion | | | <u>.</u> | | | | C 1 | | | | |
| | | 2. | Analyze | e, interp | ret ar | nd e | effectiv | ely sum | imarize | e a varie | ty of te | extual | | | |
| Course | | | content | | | | | _ | | | | | | | |
| Outcome | | 3. | Organiz | e a giv | en te | chr | nical/no | n-techn | ical to | pic in a g | group s | setting | | | |
| | | | and arri | ve at ge | neral | ıza | tions/co | onsensu | IS | | | | | | |
| | | 4. | Illustrat | e the E ort | ngıne | eeri | ing activ | vities w | ith effe | ective pr | esentat | tion | | | |
| | | 5. | Develor | varioi | is nei | rso | nality sl | kills to | groon | n in pro | fessior | n | | | |
| | | 6. | Analvze | e profes | sion | al a | and tech | nical de | ocume | nts that a | are clea | r and | | | |
| | | 0. | adhering | p to all t | the ne | ece | ssarv de | ocumen | ts | | | | | | |
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| POS/ | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO | PSO | PSO |
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| COS | 101 | 102 | 105 | 104 | 105 | 100 | 107 | 100 | 10) | 1010 | 1011 | 1012 | 1 | 2 | 3 |
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| CO3 | | | | | | 3 | | 2 | 2 | 3 | | 3 | | | |
| CO4 | | | | | | 3 | | 2 | 2 | 3 | | 3 | | | |
| CO5 | | | | | | 2 | | 2 | 1 | 2 | | 2 | | | |
| CO6 | | | | | | 3 | | 2 | 2 | 3 | | 3 | | | |
| Aver | | | | | | | | | | | | | | | |
| age | | | | | | 2.5 | | 2 | 1.5 | 2.5 | | 2.5 | | | |
| Correla | ation Lev | vels | | 1.Sligh | t(Low) | | | 2.Mode | erate(Me | dium) | | 3.Subs | tantial(H | ligh) | |
| | | | | | | | | | | | | | | | |

KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome

Training the students on basic grammar and foundation and laying the standard platform. A complete standard syllabus of Cambridge is used. The main part of the 1st semester is to cover the major tenses (Present tense, Present Continuous, Past Tense, Past Continuous, Present Perfect, and Present Perfect continuous.

UNIT II: PROFESSIONAL ETHICS

How to address the gathering, people, authorities, open forum, how to conduct the meetings, huddle, calibration. Learning about organizational behaviors, achieving organizational goals, nurturing professional integrity.

UNIT III: INTERACTIVE ENGLISH

(Unit 9 to Unit 16)

Second level: The main objective is English for International communication. It course contains conversations, snapshots, readings, activities, a greater variety and amount of listening materials and more visuals to introduce vocabulary, more opportunities to build fluency, and up-to-date art and design. The course covers the fours skills of listening, speaking, reading and writing, as well as improving pronunciation and building vocabulary.

UNIT IV: LISTENING AND SPEAKING

Basics of International listening, reading, writing and speaking skills.

UNIT V: WRITTEN ENGLISH

How to write memos, emails, short notes, drafting of letters, requesting leave, permission, reports, requisitions, approvals and indents.

TEXT BOOKS:

- 1. Essential Grammar in use- Raymond Murphy ,Cambridge , New Third Edition
- 2. Communication Skills

REFERENCE BOOKS:

1. New Interchange (English for International Communication) Jack C. Richards

Designed by "AMET CENTRE FOR IELTS"

DEPT OF MINING ENGINEERING

8 Hrs

8 Hrs

8 Hrs

TOTAL: 40 PERIODS

10 Hrs



| PROGR | AM | | | | | | | BE-M | ining E | Inginee | ering | | | | |
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| Prerequi | site | | | N | JIL | | | | | | | (51 | 115) | | |
| Course Course category | , | Hu So | maniti cial Sc | es and iences | Μ | anage cours | ement | Pro | fessio | nal Co | re | | Profess | ional H | Elective |
| | | В | asic Sc | ience | E | ngine Scier | ering Ice | C | pen E | lective | | | Ma | andato | ry |
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| POS/ COS | PO1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | P 01 2 | PSO1 | PS O2 | PSO3 |
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| CO2 | 1 | | 2 | | 3 | | | | | | | | 2 | 3 | 1 |
| CO3 | 1 | 2 | | 3 | | 2 | 2 | | | | | | 1 | 2 | 3 |
| CO4 | 2 | 2 | 3 | 2 | | | 3 | | | | | | 2 | 3 | 2 |
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UNIT I INTRODUCTION

Definition of some important terms used in rock mechanics – Application of rock mechanics in mining – Introduction to stress analysis - stresses in 2D & 3D – Mohr's circle

UNIT II PHYSICAL PROPERTIES OF ROCKS AND ROCK INDICES 12 Hrs

Physical properties of rocks – Density, porosity, moisture content, permeability, water absorption – Various indices of rocks like swell index, slake durability index, impact strength index, protodynakov index, thermal conductivity, hardness, durability – Rock mass classification

UNIT III MECHANICAL PROPERTIES OF ROCKS

Preparation of test specimens, laboratory determination of mechanical properties of rocks – compressive strength, tensile strength, flexural strength, shear and triaxial strength, modulus of elasticity, Poisson's ratio, Mohr's envelope – Effect of various parameters on the strength of rocks, in-situ strength, post failure behavior of rocks

UNIT: IV ROCK MASS CLASSIFICATION

Engineering Rock Mass Classification: Tirzah's rock mass classification; Stand up Mine. Rock Quality Designation, Rock structure rating (RSR): Geo Mechanical Classification: Modifications to RMR for Mining: Uses of Rock Mass Classification Systems.

UNIT: V INDUCED STRESS

Stress around Undergoing openings, displaced caused by undergoing openings. Stress around circular openings, Radical Stress, Tangential stress, Radial Displacement, Tangential Displacement, Stress around semi circular Openings. **TEXT BOOKS: TOTAL: 60 Hrs**

Vutukuri, V.S., and Lama, R.D., Handbook on Mechanical Properties of Rocks, Vol. I, II, III and IV, Transtech Publication, Berlin, 1974/78.

1. Peng, S.S., Ground Control, Wiley Interscience, New York, 1987.

REFERENCES:

Obert, L. and Duvall, W.I., Rock Mechanics and Design of Structure in Rock John Wiley and Sons Inc., New York, 1967.

Designed by "Department of Mining Engineering"

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determination of major dimensions and main parameters – Annual production and life of mine – Surface mining methods - Scope, applicability and limitations.

UNIT II BASIC LAYOUTS

Layout planning for horizontal, inclined and steep deposits – Factors influencing the choice of layouts – Design of benches

UNIT III OPENING UP OF DEPOSITS

Box cut - Objective, types, parameters, methods – Factors affecting selection of box cut site – Production benches - formation, parameters and factors affecting their selection

UNIT IV PREPARATION FOR EXCAVATION

Ripper - Types, classification, applicability and limitations – Method and cycle of operation – Estimation of output – Concept of rippability – Estimation of number of drills required for a given mine production

UNIT V SPECIAL MINING SITUATION

Quarrying of dimensional stones – Hydraulicking – Dredging of placers – Mining over old underground workings.

(Total: 50 Hrs)

Text Books :

- 1. Kennedy, B.A., Surface Mining 2nd Edition, SME, New York, 1990.
- 2. Hartman H.L., Introductory Mining Engineering, John Wiley and Sons, 2002.

Reference Books :

- Hartman, H.L. (Ed.), SME Mining Engg. Handbook Vol. I and II, Society for Mining, Metallurgy, and Exploration, Inc., 3rd edition, 2011.
- 2. Mishra G.B., Surface Mining, Dhanbad Publishers, Dhanbad, 1990.
- 3. Pfleider, E. P, Surface Mining, 1st Edition, New York, 1968.
- 4. Rzhevsky V., Open pit Mining Operations, Mir Publications, 1971.
- 5. Das, S.K., Surface Mining Technology, Lovely Prakashan, Dhanbad, 1994.

Designed by: Department of Mining Engineering



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UNIT I INTRODUCTION

History of coal mining – Coal resource and their geographical distributions – Coalification and factors affecting coalification process – Modes of accumulation of coal – Formation of coal – Occurrence and distribution of coal in various stratigraphic horizons – Coal seam structure and abnormalities – geological and other features of Indian coalfields.

UNIT II BORD AND PILLAR METHOD - DEVELOPMENT

Design and development of a district/panel - sizes and shapes of galleries and pillars

- bord and pillar, room and pillar methods - with conventional and continuous mining techniques with various equipment.

UNIT III BORD AND PILLAR METHOD - EXTRACTION

Pillar extraction – Caving and stowing methods – Mechanized extraction of pillars – shaft pillar extraction – systematic supports – surface, underground and face arrangements for stowing – Partial extraction.

UNIT IV LONGWALL METHOD (10 Hrs) Advance and retreat methods – continuous and cyclic systems – extraction with different

machines – ploughs, shearers – design of longwall workings – optimum length of face, size of panel, gates, support system, personnel, organisation and safety measures, salvaging and relocations of equipment – Punch longwall.

UNIT V SPECIAL METHODS OF WORKING

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

(TOTAL: 50 Hrs)

TEXT BOOKS:

- 1. Singh, R.D. Principles and Practices of Modern Coal Mining, New Age International (P) Ltd., Chennai, 1994.
- 2. Peng S.S., and Chiang, H.S., Longwall Mining, John Willey and Sons, New York, 1992.

REFERENCES

Singh, T.N. Singh, Underground Winning of Coal – Oxford & IBH Publishing Co. Ltd., 1992.
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UNIT I INTRODUCTION

Metal mining Terminology - Typical modern metal mine features - Exploration - estimation of block wise and mine wise reserves and actual production - typical pre-stoping ore block constructional features - classification of mining/stoping methods.

(9 Hrs)

UNIT II GENERAL MINE DESIGN

Mode of mine and stope entry - Layouts - Determination of optimum production level - sequence of extraction production scheduling – Basic design – Level Intervals, ore pass, common ore pass, size of blocks ore handling in stope and other openings - overview of constructional features - X cuts, Raises, Winzes.

UNIT III STOPING - GENERAL CONCEPTS

Techno-economic characteristics impacting choice of method - typical unit cost parameters - Optimum size of a mine and slope - stope layout, design, equipment selection - preparing a stoping block - organization - production cycle - unit cost calculation - comparison of methods and costs.

UNIT IV STOPING METHODS

Unsupported methods - Stope and pillar, room and pillar, shrinkage, sublevel stoping - Supported stoping - cut and fill, stull, square set - Caving methods - Top slicing, sublevel caving, block caving, case studies of indian and foreign underground metal mines - Comparison of various methods of stoping and costs.

. UNIT V ADVANCEMENTS AND SPECIAL APPLICATION

Hydraulic mining – slurry mining – solution mining – nuclear mining – Rapid excavation – Radial – axial splitter – Thermal fragmentation – shock wave breaking – Deep mining – narrow contiguous veins – Shaft and remnant pillars – VCR – Ring drilling – Large Blast hole stoping.

TEXT BOOKS:

- 7. Hartman, H.L., Introductory Mining Engineering, John Wiley and Sons, New York, 1987.
- 8. Hustrulid, W.A. Ed., Underground Mining Methods Handbook Society of Mining Engineering, AMIE, New York. 1990.

REFERENCES:

1. BICCARD J C, Gold mining in Witwatersrand, The Transvaal chamber of mines, Volume I, II, 1946

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KL-Knowledge Level:K1-Remember, K2—Understand,K3-Apply, K4-Analyse, K5-Evaluate, K6-Create; PO-Programme Outcome; CO-Course Outcome ;PSO-Programme Specific Outcome

UNIT -I: Pit Planning

Development of economic block model; Pit cut-off grade and its estimation; Ultimate pit configuration and its determination – hand method, floating cone technique, Lerchs-Grossmann algorithm, and computer assisted hand method. Addition of haul road on pit plan; Pit layouts. Open-pit optimization techniques for mine geometry and output, mine development phases, quality control Output and manpower planning; calendar planning, mine scheduling, production scheduling, truck dispatch system; Feasibility Report, DPR-contents and preparation. (9 Hrs)

UNIT -II: Geotechnical Parameters

Influence of pit slope on mine economics; High wall slope stability analysis and design methodology; stability analysis and design methodology for waste dumps; Application of geotechnical investigation for design of ultimate pit slope and other design parameters. Numerical problems on slope stability analysis including mine waste rock dumps and tailing dumps.

UNIT -III: Production and Equipment Planning

Determination of mine size and sequencing by nested pits; Cash flow calculations; mine and mill plant sizing; Production scheduling. Stockpiling and blending, Spreaders and Reclaimers; computerized truck dispatch.

Selection of mining system vis-à-vis equipment system; Computations for the capacity and number of machines vis-à-vis mine production. Machine availability, productivity, maintenance scheduling, preventive maintenance, control and monitoring inventory. Workshops for HEMM. Power supply arrangements in opencast mines.

UNIT -IV: Health, Safety and Environmental Management

Occupational health hazards due to mine dust, poor lighting and ventilation, noise and vibration, radioactive emission; Impact of surface subsidence; Accidents in Surface mining and their prevention; Sources of water, assessment of drainage requirements, sump design and drainage patterns - pumping systems. Pre-drainage through diversion channels and boreholes; Water pollution, Methods of reclamation of mined out areas, dumps and tailing ponds, environmental audit. Socio-economic factors in surface mines.

UNIT -V: Modern Trends in Opencast Mines

Recent developments in mining methods and layouts. In pit crushing & conveying, continuous surface mining. Selective extraction and dumping. Extraction of seams developed/extracted by underground methods. Deep Open pit Mining; Placer mining and solution mining – scope of applicability, sequence of development and machinery; Closure of surface mines. **TEXT BOOKS :**

- 1. W. Hustrulid, M. Kuchta and R. Martin, Open Pit Mine Planning & Design.
- 2. Fundamentals of Open Pit Mine Planning & Design: Hustrulid, W. and Kuchta, M.
- 3. Surface Mining : Kennedy, B.A., 2nd Edition, SME, New York, 1990.
- 4. Surface Mining Technology, : Das, S.K., Lovely Prakashan, Dhanbad, 1994.
- 5. SME Mining Engg. Hand book Vol.I and II: Cummings, A.B. and Given, I.V., New York

REFERENCES:

- 1. SME Mining hand book I,II
- 2. S. k. Das Surface mining technology.

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| C | | | 1 Defi | ne the tu | mes of t | ransnort | ation of | mineral | ore | | | | | | |
| Course |) | | 2. Desc | ribe the | batch p | rocess o | f excava | ation of | a rock | | | | | | |
| Objecti | ive | | 3. Expla | in the m | nethods | used in o | channel | ing of ro | ck | | | | | | |
| | | | 4. Discu | iss the ca | alculatio | on of pro | oduction | by vari | ous met | hods | | | | | |
| | 5.Describe the step-wise process | | | | | | | sportati | on of m | ineral | | | | | |
| | At the end of the course the stude | | | | | | | able to: | | | | | | | |
| Course | Outco | me | | xplain th | ne Term | inologie | s Used | in Surfa | ce M1n1 | ng | | | | | |
| | | | 2. E | xpiain tr | le Desig | gning & rs Affec | Plannin ting the | g of Lay | oul | | | | | | |
| | | | 3. D 4. D | escribe | the Exc | avate the | e Mine l | Reserve | | | | | | | |
| | | | 5. E | xplain th | ne Opera | ations N | eeded in | n Specia | l Condi | tions | | | | | |
| | r | - | 6.Illusti | rate the s | urface m | ining ope | erationS | _ | n | | 1 | 1 | 1 | 1 | |
| POS/ COS | PO1 | PO | 2 PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
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| CO3 | | 2 | | 3 | 2 | | 1 | | 2 | | 3 | 2 | 1 | | 2 |
| CO4 | 2 | | 3 | | 2 | | 3 | | 2 | | 3 | | 2 | 2 | |
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| CO6 | 2 | | 1 | | 3 | | | 2 | - | 3 | | 2 | 22 | 2 | 2 |
| Aver | 2 | 1.6 | 2 | 2.6 | 2.2 | 2.5 | 2.3 | 2.3 | 2 | 2.5 | 2.3 | 2.2 | 2.2 | 2 | 2 |
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| KL-K | nowledg | e Lev | el:K1-Rem | ember. | X2Und | erstand. | K3-Apn | lv.K4-A | nalyse.K | 5-Evalu | ate.K6- | Create : | PO-Pro | grame | |
| Outco | me: | ,• • | | | | , | | | | | | | 10110 | 8 | |
| CO-Co | ourse O | utcom | ne :PSO-Pr | ograme | Specific | Outcom | e | | | | | | | | |
| UNIT | Γ Ι ΙΝΤΙ | RODI | UCTION | | | | | | | (10 |) Hrs) | | | | |
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| -doz | ers – co | IVEVO | 18. | | | | | | | | | | | | |



UNIT II CYCLIC METHODS OF EXCAVATION (10 Hrs) Shovel-dumper operation – Applicability and limitations of electric shovel – hydraulic

excavators and dumpers – Cycle time and productivity calculation for shovel and dumper – Estimation for equipment required for a given mine production – Dragline operation - Applicability and limitations

- different modes of operation - Side cast diagram and calculation of reach - Cycle time and productivity calculation -

Calculation of required bucket capacity for a given handling requirement.

UNIT III CYCLIC METHODS OF TRANSPORT

Scrapers, Dozers, Front-end-loaders – Applicabilit And limitations Types and classification – Method and cycle of operation. (10 Hrs

UNIT IV CONTINUOUS METHODS OF EXCAVATION & TRANSPORT

Bucket wheel excavators – Applications and limitations – Types and principles of operation – Operational methods – half block method, full block method – Calculation of productivity – Continuous surface miners – Types, Applications and limitations, principles of operation – Operational methods – full bench method, block mining method, stepped cut method, empty travel back method, continuous mining method – Conveyors – Shiftable and high angle conveyors – Mode of operation – applicability and limitations – Merits and demerits of conveyor as a system of transportation.

UNIT V SEMI-CONTINUOUS METHODS OF EXCAVATION & TRANSPORT (10 Hrs) Continuous excavation and partly/fully cyclic transport system – Different methods and

applicability & limitations – Cyclic excavation and partly/fully continuous transport system – Different in-pit crushing and conveying and their respective applicability & limitations.

(TOTAL: 50 Hrs)

TEXT BOOKS:

- 1. Kennedy, B.A., Surface Mining 2nd Edition, SME, New York, 1990.
- 2. Hartman H.L., Introductory Mining Engineering, John Wiley and Sons, 2002.

REFERENCES:

1. Hartman, H.L. (Ed.), SME Mining Engg. Handbook Vol. I and II, Society for Mining, Metallurgy, and Exploration, Inc., 3rd edition, 2011.

Designed by Department of mining engineering

(10 Hrs)



| PROGR | AM | | | | | | | F | BE-Min | ing Engi | neering | | | | |
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| Course | _ | | | | 2. 1 | Discus | s the P | SU an | d its ro | le in mi | ning | | | | |
| Objectiv | e | | | | 4. 1 | Unders | tand t | he reg | ulatory | frame c | of miner | al author | rity in | India | |
| | | | | | 5. I | Unders | tand th | ne disti | ribution | n of min | eral reso | ources in | India | | |
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| KL-Kno Outcome CO-Cou | wledge e: rse Ou | e Level:K tcome :F | X1-Rem PSO-Pr | nember rogram | ;,K2U e Speci | Inderst | and,K tcome | 3-Appl | y,K4-A | nalyse,K | K5-Evalu | ate,K6-0 | Create | : PO-] | Programe |
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| UNIT IV Occurren Industria pyrophyl UNIT V | MINI Ace - M I Miner lite – N META | ERAL R lineral fu als – Bar ⁄lica. AL MINI | ESOU iels - C ytes - H ERAL | RCES Coal & Kyanite RESO | lignite , andalı URCES | – Petro usite & | oleum - sillima | - Metal nite – I | lic Min Magnes | erals – B ite - Apa (09 I | auxite (tite & roo Hrs) | (0 Chromite ck phospl | 9 Hrs) - Iron hate - T | ore - N °alc/ste | langanese ore - atite/ |
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Designed by "Department of Mining Engineering"



| PROG | RAM | | | | | | | BEM | ning Eng | ineering | | | | | |
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| | | | | 1 | Analy | ze the Ha | rdness | of Rock | | | | | | | |
| Course | Objec | tive | | 2. | Deterr | nine the l | Porosity | of rock | S | | | | | | |
| 3. Illustrate the Impact S 4. The Water Absorption | | | | | | | | | ndex of | rocks | | | | | |
| | | | | 4. | The W | ater Abs | orption | In Rock | KS . | | | | | | |
| | | | | Э. | The T | ensne Su | ength n | I KOCKS | | | | | | | |
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| Course | Outco | me | | 1. | Discus | s the Ha | ardness | Of Rock | K | | | | | | |
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| | | | | <i>3</i> . 4. | Explai | n the Ter | nsile Str | ength I | n Rocks | 10 | | | | | |
| | | | | 5. | Discus | s the Ve | elocities | Using | Non-Des | structive | e Testing | 3 | | | |
| DOC/ | | 1 | | 6. | Discus | s the Im | pact St | ength I | ndex of 1 | rocks | DO1 | DO1 | DCO | DCO | DCO |
| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | 0 | 1 | 2 | PSO 1 | PSO 2 | PSO 3 |
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| List of I | Experim | ents | | | | | | | | | | | | | |



DETERMINATION OF

- 1. RQD of rocks
- 2. Protodyaknov index of rocks
- 3. Point load index strength of rock
- 4. Porosity of rocks
- 5. Water abosorption of rocks
- 6. Impact strength index.
- 7. Hardness of rocks by different methods
- 8. Uni-axial compressive strength of dry and water saturated rock samples
- 9. Tensile strength of rock using Brazilian test method
- 10. Flextural Strength of rocks
- 11. Tri-axial strength of rock and drawing of Mohr's envelope
- 12. Determination of longitudinal wave velocities of rocks using NDT
- 13. Determination of longitudinal wave velocities of rocks using NDT

Reference Books

- Vutukuri, V.S., and Lama, R.D., Handbook on Mechanical Properties of Rocks, Vol. I, II, III and IV, Transtech Publication, Berlin, 1974/78.
- 2) Peng, S.S., Ground Control, Wiley Interscience, New York, 1987.
- Hoek, E and Brown, E.T., Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980.



| PROG | RAM | | | | | | | BE | -Mining | Enginee | ring | | | | |
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| ~ | | | | | | 1. Det | fine the | proble | m | | | | | | |
| Course | • | | | | | 2. Dis | cuss th | e facto | s influe | encing it | | | | | |
| Objecti | ive | | | | | 3. Un | dersta | nd the p | principa | ls involv | ved | | | | |
| 4. Underst | | | | | | | | | problem | solving | procedu | ure | | | |
| | | | | | | 5. Un | dersta | nd the r | remedia | 1 metho | ds. | | | | |
| | _ | | After c | ompleti | on of th | e portion | 1 studen | ts will b | e able to | o underst | and | | | | |
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| | | | | | ч. 5 | Explain | the rei | medial | method | s | ic | | | | |
| | | | | | 6. | Explain | the res | sult of t | he mini | project | | | | | |
| POS/ | | | | | | | | | | | | | | | |
| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
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| Design | ed By: 1 | Departr | nent of] | Mining | Engine | ering | | | | | | | | | |



| PROC | GRAM | | BE-Mining Engineering | | | | | | | | | | | | | |
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| | | | Basi | c Sciei | nce | Engin | eering | g C |)pen E | lectiv | e | | Ma | ndato | ry | |
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| G | | | | | 1. | Discu | ss the | various | s failui | e mod | e analy | ysis | | | | |
| Cours | e | | | | 2. | Expla | in the o | design | param | ieters 1 | n unde | rgrour | nd min | es | | |
| Objec | tive | | | | <i>3</i> . | Descr | ibe the | metho | ds & a | applica | ition o | f stowi | ing | | | |
| | | | | | 4. | Under | rstand | the bas | SICS OF | hydrai | llic roo | ck mec | chanics | S Salama | ahania | <i>.</i> |
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| | | | | | 2. 3 | Descr | ihe the | metho | ods & : | annlica | ntion of | f stowi | ing | 05 | | |
| | | | | | 4. | Briefl | v expl | ain the | basics | s of hv | draulic | rock | mecha | nics | | |
| | | | | | 5. | Expla | in the | metho | ds & a | pplicat | ion of | stowi | ng | | | |
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KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create: PO-**Programe Outcome:**

CO-Course Outcome :PSO-Programe Specific Outcome

UNIT I INTRODUCTION

Convergence indicators - load cells - strain gauges - flat jacks – LVDT - dial gauges - pressure cells and recorder - anchorage testing equipment - laboratory and in situ measurements - hydraulic fracturing rock mechanics instrumentation for B & P and longwall workings.

UNIT II PIT SLOPE STABILITY & SUBSIDENCE

(10 Hrs) Approach to slope stability – slope measurements – different types of slope failures – factors affecting slope stability - introduction to methods of failure, analysis, determination of factor of safety - introduction to different rock slope stabilisation techniques – Theories of subsidence – factors affecting subsidence – subsidence surveys - subsidence prediction techniques - subsidence control - surface and underground measures, pseudo-mining damage.

UNIT III THEORIES OF FAILURE OF ROCKS & PILLAR DESIGN AND ROCK BURST 10Hrs)

Different theories of failure of rocks – modes of failure – Griffith, Coulumb-Navier, Mohr's, Hoek-Brown, empirical criteria and their field of applications - Strength of pillars, barrier and shaft pillar design - load estimation, factor of safety, various formulae, rock burst and bumps - phenomena, causes, prediction, monitoring and control, gas outbursts.

UNIT IV DESIGN OF UNDERGROUND WORKINGS

Stress distribution in underground workings including bord and pillar and longwall workings – rock load assessment – introduction to numerical methods of geomechanics – scaled model studies – principles of modelling.

UNIT V STOWING

Selection and preparation of stowing materials - principal methods of stowing - collection - fields of application and limitations – preparation and transport of materials – surface, underground and face arrangements - design of stowing plants.

TEXT BOOKS:

1. Obert, L. and Duvall, W.I., Rock Mechanics and Design of Structure in Rock John Wiley and Sons Inc., New York, 1967.

2. Vutukuri, V.S. and Lama, R.D., Handbook on Mechanical Properties of Rocks, Vol.I, II, III and IV, Transtech Publication Berlin, 1974/78.

REFERENCES:

- 1. Brady, B.H.G. and Brown, S.T., Rock Mechanics, Wiley Interscience, 1985.
- Hoek, E and Brown, E.T., Underground Excavations in Rocks, 2. Institute of Mining Metallurgy, London, 1980.
- Peng, S.S. Ground Control, Wiley Interscience, New York, 1987. 3. Jumkis, A.R. Rock Mechanics, Transtech Publications, Berlin,

Designed By: Department of Mining Engineering

(10 Hrs)

(10 Hrs)

(10 Hrs)

(Total: 50 Hrs)



| PROGRAM | | | BE- | Mining Engin | eering | | | | | | | |
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| | SURFA | CE MINE PLA | NNING AND DESIGN | | | | | | | | | |
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| Year and Semester |] | II Year (VI | SEMESTER) | | Contac | t hours per week | | | | | | |
| Prerequisite course | | N | IL | | | (4Hrs) | | | | | | |
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| Course Objective | 1. | To understand | the fundamental princip | las of mina nl | nu nines | losian | | | | | | |
| | 2. | To study abor | t affective equipment uti | lization | | iesigii. | | | | | | |
| | 3. 4 | To study pro | ect implementation and r | nonitoring | | | | | | | | |
| | 5 | To enhance k | nowledge on designing of | f high wall wa | aste dumn a | nd haul roads | | | | | | |
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| | At the e | nd of the cours | e the student will be able | to: | | | | | | | | |
| Course Outcome | 1. | Describe the | steps involved in min | ing | | | | | | | | |
| | 2. | Discuss the e | estimation of ore in a g | iven location | | | | | | | | |
| | 3. | Design a lay | out for mining. | | | | | | | | | |
| | 4. | 4. Describe the production projection of a mine | | | | | | | | | | |
| | 5. | 5. Discuss the facilities required to fasten the project | | | | | | | | | | |
| | 6. | Explain the | parameters involved in | planning a m | nine | | | | | | | |

| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
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KL-Knowledge Level:K1-Remember, K2—Understand ,K3-Apply, K4-Analyse, K5-Evaluate, K6-Create ; PO-Programme Outcome; CO-Course Outcome ;PSO-Programme Specific Outcome

UNIT I INTRODUCTION

(12 Hrs)

Stages of mine life – Preliminary evaluation of surface mining prospects – Mine planning and its importance – Mining revenues and costs and their estimation – Mine planning components – Planning steps and planning inputs.

(Under Section 3 of UGC Act 1956) SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY **B.E – MINING ENGINEERING** ACADEMIC YEAR 2016-2020 (BATCH - I)

UNIT II ORE RESERVE ESTIMATION

Ore zone and bench compositing - Objectives and principles of ore reserve estimation - Estimation of grade at unknown point -Methods of ore reserve estimation - vertical cross section method, horizontal cross section method and 3-D geological block method - Stripping ratio - Concept of stripping ratio - Types of stripping ratios and their significance - Choice between surface and underground mining.

UNIT III GEOMETRICAL CONSIDERATIONS AND PIT PLANNING

Basic bench geometry – Ore access – pit slope geometry – addition of haul road on pit plan – pit layouts – Pit Planning – Development of economic block model - Pit Cut-off grade and its estimation - Ultimate pit configuration and its determination hand method, floating cone technique, Lerchs-Grossmann algorithm and computer assisted hand method.

UNIT IV PRODUCTION PLANNING

Determination of optimum mine size and Taylor's mine life rule - Sequencing by nested pits - Cash flow calculations - Mine and mill plant sizing – Lanes algorithm for estimation of optimum mill cut of grade – Introduction to production scheduling.

UNIT V DESIGN OF HIGHWALL SLOPES, WASTE DUMPS AND HAUL ROADS

Influence of pit slope on mine economics – Highwall slope stability analysis and design methodology – Stability analysis and design methodology for waste dumps – Design of road cross section – Design of road width, curves and gradient – Haul road safety features and their design.

Text Books:

1. Jayanth Bhattacharya, Principles of Mine Planning-Allied Publishers, Delhi 2003.

2. Hustrulid, W. and Kuchta, M., (eds), Fundamentals of Open pit Mine Planning and Design, Elsevier, 1995.

REFERENCES

- 1. Ehrenburger, V and Fajkos, A., Mining Modelling, Elsevier, 1995.
- Bawden, W.F., and Archibald., J.F., Innovative Mine Design for the 21st Century 2.
- 3. Christoper J. Bise, Mining Engineering Analysis, 2nd Edition, Society for Mining, Metallurgy, and Exploration, 2003.
- 4. Pazdziora, J., Design of Underground Hard Coal Mines, Elsevier, 1988.
- 5. Swilski, and Richards, Underground Hard Coal Mines, Elsevier, 1986.
- 6. Singh, B. and Pal Roy, P., Blasting in Underground excavations and mines, CMRS Dhanbad, 1993.
- 7. Peng, S.S. and Chaing, H.S., Longwall Mining, John Wiley & Sons, New York, 1984.

Designed by" Department of Mining Engineering"

(Total: 60 Hrs)

(12 Hrs)

(12 Hrs)

(12 Hrs)

ACADEMY OF ION AND TRAINING DEEMED TO BE UNIVERSITY

(12 Hrs)



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(Under Section 3 of UGC Act 1956) SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY **B.E – MINING ENGINEERING** ACADEMIC YEAR 2016-2020 (BATCH - I)

DEEMED TO BE UNIVERSITY

ION AND TRAINING

ACADEMY OF N

UNIT-I INTRODUCTION

Basic principles in material handling exclusive to mining industry and its benefits. Classification of material handling equipments. Current state of art of bulk handling materials in mining in the world and Indian scenario; Selection of suitable types of systems for application. Stacking, blending, reclaiming and wagon loading, machinery and systems used at the stack yards; stock piles, silos, bunkers – their design, reclamation from them, various types of weigh bridges. Segregation - size wise and grade wise, Railway sidings.

UNIT II CONVEYORS HAULAGE SYSTEMS

Roller conveyor, overhead conveyor, screw conveyor, auger conveyor, apron feeder, bucket elevators, scraper haulage, conveyors in steep gradient, Armoured face conveyor, Off-highway Trucks, haul roads, In-pit crushers and modular conveyors, electric trolley assisted haulage, shuttle cars, skip hoist, winders, pneumatic conveying, hydraulic transport.

UNIT III ROPE HAULAGE SYSTEM

Rail track and tubs - gauge, layout, curves, turnouts and cross-over - track maintenance - main features of rolling stock like tubs, mine cars, man riding cars and tripplers – Types of rope haulages – merits, demerits and fields of application, constructional features, safety appliances and rope haulage

UNIT IV AERIAL ROPEWAY SYSTEMS

Curved conveyors, cable belts, pipe conveyors, rock belts – mine-run-rock conveyor, steel belt conveyors, steel slot conveyor, chain belt conveyors, etc., and other new developments, stackers and reclaimers, High Angle Conveyors (HAC); New inventions in HAC, Mobile or fixed installations; Woven wire belts, En Masse conveyor, Vibrating conveyor, gravity bucket conveyor.

UNIT V MATERIAL HANDLING IN MINES, PLANTS AND WORKSHOPS (10 Hrs)

Locomotives - diesel, trolley-wire, battery locomotives, constructional features and safety devices and comparison of different types – underground and surface battery charging stations and safety measures – locomotive calculations – shuttle cars, underground trucks, load-haul dumpers, SDL vehicles, aerial rope ways, gravity transport, principles of hydraulic & pneumatic transportation and their field of application, electric layouts, man-riding systems.

TEXT BOOKS:

Allegri (Sr.), T.H., Material Handling – Principles and Practices, CBS Publishers and Distributors, Delhi, 1. 1987.

2 Hustrulid, W., and Kuchta, M. Open Pit Mine Planning & Design, Vol. 1, Fundamentals, Balkema, Rotterdam, 1998.

REFERENCES:

Kennedy, B.A., Surface Mining - 2nd Edition, SME, New York, 1990. 1.

2. Deshmukh, D.J., Elements of Mining Technology, Vol.I, II and III, EMDEE Publishers, Nagpur, 1979.

3. Peng, S.S., and Chiang, H.S., Longwall Mining, John Wiley and Sons, New York, 1984.

Designed by "Department of Mining Engineering"

(10 Hrs)

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(10 Hrs)

(Total: 50 Hrs)



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| | | | 5. To ur | Iderstan | d the | electric | al layou | ts and p | ower di | stributi | on in min | e | | | |
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| | | | 5 | . Exp | olain t | the min | e comr | nunicat | tion sys | stem | | | | | |
| | | | 6 | 5. Sur | nmari | ize the | mechar | nical & | electri | cal ma | chineries | involve | d in mini | ng | |
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UNIT I INTRODUCTION

Compressed air – transmission and distribution in mines – compressed air drills – Elements of the transport system – Classification and techno-economic indices – Wire ropes - classification, construction, fields of application, rope capping and splicing, deterioration of rope in use and its prevention.

UNIT II ROPE HAULAGE

Rail track and tubs – gauge, layout, curves, turnouts and cross-over – track maintenance – main features of rolling stock like tubs, mine cars, man riding cars and tripplers – Types of rope haulages – merits, demerits and fields of application, constructional features, safety appliances and rope haulage calculations.

UNIT III TRANSPORT SYSTEMS

Locomotives – diesel, trolley-wire, battery locomotives, constructional features and safety devices and comparison of different types – underground and surface battery charging stations and safety measures– locomotive calculations – shuttle cars, underground trucks, load-haul dumpers, SDL vehicles, aerial rope ways, gravity transport, principles of hydraulic & pneumatic transportation and their field of application, electric layouts, man-riding systems.

UNIT IV PUMPING & CONVEYING

Different types of drives – installation and maintenance of pumps and pipes in shafts and roadways, electrical layouts, various sources of water in mines, design of sumps – Face haulage and conveyors – Various types of conveyors – Scraper chain conveyors, AFCs, belt conveyor, cable belt conveyor, shaking and vibrating conveyors, armoured flexible conveyors, high angle conveying, electrical layouts.

UNIT V MINE ELECTRICAL ENGINEERING

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

(Total: 60 Hrs)

TEXT BOOKS

- 1. Cherkassky, B.M., Pumps, Fans, Compressors, MIR Publishers, 1980.
- 2. Walker, S.C., Mine Winding and Transport, Elsevier, 1988.

REFERENCES:

1. Karelin N.T., Mine Transport, Orient Longmans, N. Delhi. Mining, Vol. I, II, III and IV, Caxton Eastern Agencies, Calcutta

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| PROG | RAM | | | | | | | BE-Mi | ning Eng | gineering | g | | | | |
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| | | | | aspec | cts in r | nining | operati | on | | | | | | | |
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UNIT I INTRODUCTION

General principles of mining laws- development of mining legislation of India – Enactment of various statues and by- laws

UNIT II MINE LIGISLATION

The Mines Act, 1952 – The Coal Mines Regulations, 1957 – The Metalliferous Mines Regulations, 1961 – The Mine Rules, 1955

UNIT III LAWS APPLICABLE TO MINING

Indian electricity rules – coal mines conservation and development act – Workman's compensation act – General provisions of Mines and Mineral Regulation and Development Act – Mineral Concession rules – Vocational training rules – Creche rules – Maternity benefit Act – Payment of Wages Act – Gratuity and P.F. Rules – Explosives act – Rescue Rules – Factories Act.

UNIT IV ACCIDENTS AND DISEASES

Accidents – classification, causes and prevention – Statistics of fatal and serious accidents – Frequency and severity rates of accidents – Place-wise and Cause-wise analysis – Investigations into accidents and accident reports – Cost of accidents - Occupational hazards of mining and miner's diseases and their social effects.

UNIT V MINE SAFETY

Role of management – labour and government – Safety audit – Instrumentation – Safety management system – Risk identification and management – Organisation for disaster Management in mines Safety measures.

TEXT BOOKS:

- 1. Coal Mines Regulations, 1961, Lovely Prakashan, Dhanbad, 1995.
- 2. Metal Mines Regulations, 1961, Lovely Prakashan, Dhanbad, 1995.

REFERENCES

- 1. Mines Act 1952, Lovely Prakashan, Dhanbad, 1995.
- 2. DGMS Circulars, By National Council of Safety in Mines, Dhanbad, 1995.
- 3. Mines rules, 1955, Lovely Prakashan, Dhanbad, 1995.
- 4. The Mines Rescue Rules, 1986, Lovely Prakashan, Dhanbad, 1995.
- 5. The Indian Electricity Rules, 1995, Lovely Prakashan, Dhanbad, 1995.
- 6. The Payment of Wages Act, 1936, Ram Narain Lal Beni Prasad, 1995.
- 7. Vocational Training Rules, Lovely Prakashan, Dhanbad, 1995.
- 8. The Workmen's compensation Act, 1923, Ram Narainlal Beni Prasad, Allahabad, 1995.

Designed by: Department of Mining Engineering

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| PROGRAM | | | | BE-Mining Engineering | | | | | | | | | | | | |
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| | | | | 4. Ez | xplain tl | ne tool | s empl | oyed in | n exca | vation p | process | | | | | |
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DEEMED TO BE UNIVERSITY (Under Section 3 of UGC Act 1956) SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY **B.E – MINING ENGINEERING**

ACADEMIC YEAR 2016-2020 (BATCH - I)

UNIT I EXPLOSIVES AND ACCESSORIES

Emerging trends in explosives, initiating system and blasting techniques; Bulk Blasting agents & Mode of Bulk Delivery S Performance testing of explosives and accessories; Scattering in Delay timing of delay detonator.

UNIT II TRENDS IN SURFACE AND UNDERGROUND BLASTING TECHNIQUES (10 Hrs) Theories of rock breaka Mechanics of rock fragmentation due to blasting; Recent advances in blasting techniques in both underground and surface min Cast blasting for improved mine economics; Blast optimization in surface mines. Blasting in opencast coal mines of developed galleries. Economic evaluation of blasting operations. Tunnel blast designs, Tunnel breakthrough under water.

UNIT III INSTRUMENTATION FOR BLAST PERFORMANCE MONITORING

Fragmentation prediction and assessment, Instrumentation and software application for design of blast round, Deep hole blasti Hot hole blasting. Instrumentation in Blasting - V.O.D probe, Laser Profiler, Vibration monitoring, High speed video ca Stemming plug etc.

UNIT IV ENVIRONMENTAL CONTROL AND SAFETY IN BLASTING

Blasting damages – Micro and macro level damages due to blasting; Ground vibrations, flyrock and air over pressure. Influe Blasting on surface structures and underground workings; Safety during blasting

UNIT V EMERGING BLASTING TECHNIQUES

Special Blasting techniques – Road Construction, Dimension stone blasting, Underwater Blasting; Air-Decking & Babytechniques; Novel Blasting Techniques in Surface and underground construction; Demolition blasting; Shaft sinking in Popula (City), Underground storage construction. Intelligent blast design, blast economics, computer applications in blasting.

(TOTAL: 50 Hrs)

TEXT BOOKS:

Pal Roy, Piyush,(2015), Rock Blasting: Effects and Operations, CRC Press, 380p, 3rd Edition, 1 2015.

Johansen, John and Mathiesen, C.F., (2000), Modern Trends in Tunnelling and Blast Design, AA Balkema, 154p, 2000 2.

REFERENCES:

- William A, Hustrulid, (1999), Blasting Principles for Open pit mining, A.A.Balkema. 1.
- Bhandari S., (1997), Engineering Rock Blasting Operations, AA Balkema Rotterdam, Netherlands, p.375. 2.
- Per-Anders Persson, Roger Holmberg, Jaimin Lee, (1993), Rock blasting and explosives Engineering, CRC Press, p.560. 3.
- Ghose, A.K and Joshi, A (Ed), (2013), Blasting in Mining New Trends, CRC Press, 2013. 4

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| | | | | 5. 4 | Disci | iss the | method | ls used | to prod | luce oil | from w | / sampro vell | 23 | | |
| | | | | 5 | Expl | in the | non-tec | hnical | operati | ons per | formed | in well | 1 | | |
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UNIT I INTRODUCTION

Chemistry of petroleum. Structure of petroleum compounds. Types – alkanes, Naphthenes, paraffi aromatics. Physical and chemical properties of oil, gas and formation water.

UNIT II DRILLING A WELL

Drilling – History, types of drilling –cable tool, rotary, drilling rigs and components. Types of well: exploratory, delineation, development wells. Vertical, deviated, inclined, horizontal and ERD wells. Drilling flui casing and cementation. Planning - GTO.

UNIT III FORMATION EVALUATION (10 Hrs) Formation Evaluation – cutting, cores, mud logging unit. logging, types of well logs their use. Sub surface correlation.

and

UNIT IV WELL ACTIVATION

(10 Hrs)

Well Testing, perforation, testing methods, well completion production. Stimulation methods, recovery methods, Material balance, reserves estimation

UNIT V WELL SITE OPERATIONS (10 Hrs) Wellsite operations, roles of drilling, reservoir and production hazards, environmental concerns, transportation of oil and gas, oil pollution and control, petroleum economics. (TOTAL: 50 Hrs)

TEXT BOOKS:

- 1. Geology of Petroleum - Leverson, A.L
- 2. Formation Evaluation – Lynch
- 3. Drilling Manual - ONGC
- 4. Principles of oil Production – T.E.W. Wind

REFERENCES

1. Introduction to Petroleum Engineering – Geltin

Designed by " Department of Petroleum Engineering"

(10 Hrs)



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| Year Semester and III Year (VI Semester) Contact hours per week (3 Hrs) Prerequisite course NIL Course category Humanities and Social Sciences Management courses Professional Core Professional E Basic Science Engineering Science Open Elective Mandato Course Outcome At the end of the course the student will be able to: 1. Understand the laws imposed by government on mining in sea 2. Understand the laws imposed to wards coal & amp; metal mining at sea 3. Understand the laws which passed towards the befits of workers at sea 4. Understand the possibilities of accidents & amp; diseases caused to mining 5. Describe the safety procedure for safe mining Illustrate the legal & amp; sa aspects in mining operation at sea Students will be able to 1. Briefly explain the ocean sedimentology & physical parameters of s 2. Describe the safety procedure for safe mining Illustrate the legal & amp; sa aspects in mining operation at sea Students will be able to 1. Briefly explain the ocean sedimentology & physical parameters of s 4. Describe the sedimentation process of ocean 5. Explain the role of sea in climate change 6. Illustrate the marine environment and bathymetry POS/ COS PO1 PO2 PO3 PO4 PO PO7 PO8 PO9 PO1< | | | | | | 2 | 33 | | | | | | | | |
| Course Code UBMN608 Course Name : MARINE GEOLOGY L I P Year and III Year (VI Semester) 3 0 0 Year and III Year (VI Semester) Contact hours per week (3 Hrs) Contact hours per week (3 Hrs) Prerequisite course NIL Professional Core Professional Social Sciences Professional Core Professional Course Course Second Se | | | | | | | 2 | 3 | 22 | | | | | | |
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KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome

UNIT I INTRODUCTION

Overview of physical ocean environment, geotechnical aspect – sea floor marine soils - Sea Level, Near-sh Processes.

UNIT II PROPERTIES OF MARINE ENVIRONMENT

(10 Hrs)

(Under Section 3 of UGC Act 1956) SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY B.E – MINING ENGINEERING ACADEMIC YEAR 2016-2020 (BATCH - I)

Physical and chemical properties of seawater – overview of marine mineral deposits – deep-sea bed mineral resou – polymetallic nodules – sulphate nodules – chemicals from the ocean – dissolved and undissolved mineral deposite sea water as resource and beach placers.

UNIT III OCEAN BASIN MORPHOLOGY

Continental drift – Sea floor Spreading – plate tectonics – tectonic history of oceans - Oceanic Lithosph Mid-Ocean Ridges - Passive Continental Margins - Active Continental Margins - Continental Shelves.

UNIT IV MARINE SEDIMENTS

Global Cycle of Elements - Sediment Classification, Oceanic Circulation - Seawater Chemistry -Biochemical Processes in Seawater - Biogenic Oceanic Sediments - Biogenic Sediments, CCD -Terrigenous Sediments - Turbidites, Submarine Fans.

UNIT V OCEANOGRAPHY

Paleoceanography - Climate Change - Cenozoic Paleoceanography - Orbital Forcing - Deep Sea Cl Authigenic Sediments - Deep Biosphere, Methane Hydrates.

(TOTAL: 50 Hrs)

(10 Hrs)

TEXT BOOKS:

- 1. Parbin Singh. Geology for Engineers, IBH Publications, N. Delhi. 1991.
- 2. Arthur Holemess, Principles of Physical Geology, Thomas Nelson and Sons, USA, 1964.

REFERENCES:

1. Blyth F.G.H. and de Freitas M.H. Geology for Engineers, 7th edition, Elsevier Publications, 2006.

2. Bell F.G. Engineering Geology, Elsevier Publications, 2007.

3. Ford, W.E. Dana's Textbook of Minerology (4th edition), Wiley Eastern Ltd., N. Delhi,

1989.

4. Winter, J.D. An Introduction to Igneous and Metamorphic Petrology, Prentice Hall, N. Delhi, 2001.

5. Billings, M.P. Structural Geology, Prentice Hall Ino., N. Jersey, USA, 1972.

Krishnan M.S. Geology of India and Burma, 3rd Edition, IBH Publishers, N. Delhi, 1984.

Designed by "Department of Mining Engineering"

(10 Hrs)





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| Correla | tion Le | evels | | 1.Slig | ht(Low | /) | | 2.Mo | derate(| Mediur | n) 3. | Substant | ial(High | 1) | |
| KL-Knov PO-Progi | vledge L ramme (| evel:K1 Dutcom | l-Remem e; CO-Co | ber, K2- ourse Ou | —Unde rs itcome ;F | stand ,K3 PSO-Prog | 3-Apply, gramme | K4-Ana Specific | alyse, K5 2 Outcom | -Evaluat e | e, K6-Cre | eate ; | | | |



| UNIT I: Introduction | (9 Hrs) |
|---|--|
| Introduction to Remote Sensing, Mineral, structural, geomorphic Anomaly Mappir | ng, Resource Estimation |
| UNIT II: Survey of mines Remote Sensing survey for Mine planning, Mine Monitoring, Identification of Illeg environmental Mapping and monitoring. | (9 Hrs) gal mining and Mining |
| UNIT III : GIS Creation of Mining maps thru GIS, creation of resource analysis thru GIS software. updation and Modification of mine plans and sections. | (9 Hrs) Systematic retrieval, |
| UNIT IV : Mineral Corridor Mining Information system and its utility, introduction to Mineral Corridor. | (9 Hrs) |
| UNIT V : Transportation Planning Transport planning, effective mine productivity MIS system creation through infor systems; ICT Linking of various intra and inter mining companies, central repositor | (9 Hrs) mation and communication ry system |
| | Total :(45 Hrs) |
| | |
| TEXT BOOKS | |

- 1. Satheesh Gopi, Rasathishkumar, N.Madhu, Advanced Surveying, Total Station GPS and Remote Sensing Pearson education, 2007 ISBN: 978-81317 00679 52.
- 2. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 3rd Edition, 2004.
- Jie Shan and Charles K. Toth, Topographic Laser Ranging and Scanning Principles and Processing, CRC Press, Taylor & Francis Group, 2009.

REFERENCES:

- 1. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1996.
- 2. Michael Renslow, Manual of Airborne Topographic LiDAR, The American Society for Photogrammetry and Remote Sensing , 2013.
- 3. R.Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.



| PROG | RAM | | | | | | BE | -MINI | NG En | gineeri | ng | | | | |
|----------------|-----------------|--------|-----------|------------|--------------------|-------------------|-----------------------|-----------------|--------------|---------------------|-----------------|----------|--------------|----------|----------|
| Course UBMN | e Code: N6PA | | COURS | SE NAN | ME: | | | Co Ho | ntact urs | Γ | | Р | | | С |
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| | | | RUCK | MECH | ANICS | SLAD- | 11 | | | | | | | | |
| Year a | nd | | III | Year | (VI SE | MESTI | ER) | | | Со | ntact h | ours pe | r week | | |
| Semest | ter | | | | | | | | | | () | 2Hrs) | | | |
| Prereq | uisite | | | | NIL | | | | | | | | | | |
| Course | e cateo | orv | Humar | nities a | nd | Manac | rement | Pr | ofessio | nal Co | re | Profe | essiona | l Flecti | Ve |
| Course | caleg | ory | Social | Scienc | es | COU | rses | | 0105510 | | | 11010 | c551011a | I LACCO | |
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| | | | Basic | Scienc | e | Engin Scie | eering ence | | Open F | Elective | | | Manda | tory | |
| | | | | | | | | | | | | | | | |
| C | | | | 1. | Explai | n the pl | hysical | and che | emical | propert | ies of v | vater | | | |
| Object | ive | | | 2. 3 | Descri Illustra | be the t | cypes of or cock pro- | wells a | and its i | limitati ed from | ons 1 core s | amnles | | | |
| object | 110 | | At the e | nd of tl | he cou | rse the s | student | will be | able to |): | | umpies | | | |
| Course | e Outco | me | 1. | Explain | the the | ne prop | erties of | f rock | | | | | | | |
| | | | 2. | Illustrat | te you | ng's mo | odulus a | and poi | sson's i | ratio | | | | | |
| | | | 3. | Describ | be the t | ypes of | wells a | nd its l | imitatio | ons | | | | | |
| | | | 4. | Explain | inter | al frict | ion and | -axiai s ·le | trength | | | | | | |
| | | | 6. | Describ | be the | ground | control | instru | nents. | | | | | | |
| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
| CO1 | 2 | 1 | | 2 | 1 | | | | | | | | 1 | 2 | 2 |
| CO2 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | | | | | | 2 | 3 | 1 |
| CO3 | 1 | 2 | 3 | 3 | | 2 | 2 | | | | | | 1 | 2 | 3 |
| C04 | 2 | 2 | 3 | 2 | 2 | | 5 | 2 | | | | | 3 | 1 | 2 |
| CO6 | 1 | 1 | 2 | 2 | | | | | | 2 | | 3 | 2 | 2 | 2 |
| Aver | 1.5 | 1.5 | 2 | 2.2 | 2 | 2 | 3 | 2 | | 2 | | 3 | 1.8 | 2.1 | 2 |
| age Correl: | ation Lev | vels | | 1 Slive | nt(Low) | | | 2 Mod | erate(Me | edium) | | 3 Subs | tantial(F | ligh) | |
| KL-K | nowledg | e Leve | el:K1-Ren | nember,l | K2Un | derstand | ,K3-App | oly,K4-A | nalyse, | K5-Eval | uate,K6 | -Create | : PO-Pr | ograme | |
| Outco | me: | | • .DCO D- | | S- asif: | • Ot • • • | ••• | | | | | | | | |
| 0-0 | ourse O | utcom | e :F50-FI | ograme | Specific | COulcon | ne | | | | | | | | |
| | | | | | | | | | | | | | | | |
| List of | f Exper | imen | its: | <i>.</i> . | C 1 | | | | | | | | | | |
| 1. | Time c | lepen | aent prot | herties (| nt rock | c | | | | | | | | | |
| · · · | Drilla | hility | index of | rocks | JI IOCK | 5 | | | | | | | | | |



- 4. Young's Modulus of Elasticity and Poisson's ratio.
- 5. Rock anchorage capacity of a rock bolt
- 6. Roof convergence and other ground control instruments
- 7. Post Failure Behaviour of Rocks
- 8. Angle of Internal Friction
- 9. Measurement of vibration generated by blasting and operation of machines
- 10. Stowing/ shrinkage Characteristics
- 11. Study of flat Jack.
- 12. Study of creep of rocks.
- 13. Study of strata monitoring instruments.
- 14. Determination of shear strength of soil
- Determination of tri-axial strength of soil

TEXT BOOKS:

Geology of Petroleum – Leverson, A. Formation Evaluation – Lynch Drilling Manual – ONGC Principles of oil Production – T.E.W. Wind

REFERENCES:

1. Vutukuri, V.S., and Lama, R.D., Handbook on Mechanical Properties of Rocks, Vol. I, II, III and IV, Transtech Publication, Berlin, 1974/78.

2. Peng, S.S., Ground Control, Wiley Interscience, New York, 1987.

3. Hoek, E ., Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980 **Designed by**" Department of Mining Engineering"



| PROGRAM | | BE- | Mining Engine | eering | | |
|---------------------|-----------------------------------|-----------------------------|-----------------|--------------|------------------|------------|
| Course Code: | COURSE NAME: | | L | Т | Р | С |
| UBMN6PB | | | 0 | 0 | 2 | 1 |
| | MINING MACH | INERY LAB-1 | | | | |
| | | | | | | |
| Year and Semester | III Year (V) | SEMESTER) | | Contact | t hours per week | |
| Prerequisite course | 1 | JIL | | | (2Hrs) | |
| Course category | Humanities and Social Sciences | Management courses | Profession | al Core | Professiona | l Elective |
| | | | \checkmark | / | | |
| | Basic Science | Engineering Science | Open Ele | ective | Manda | itory |
| | 1. Explain vari | ous types of wire ropes | | | | |
| Course Objective | 2. Illustrate ty | bes of gear | | | | |
| j | 3. Describe the | e safety procedure in mi | ning | | | |
| | 4. Learn about | the power consumption | n & distributi | on in minir | ig industry | |
| | 5. Study rope | ways used in transportat | tion of minera | als | | |
| | 6. Learn about | the safety devices impl | anted in trans | sportation e | equipment | |
| | At the end of the cours | se the student will be able | to: | | | |
| Course Outcome | 1. Explain van | ious types of wire ropes | 3 | | | |
| | 2. Explain Illu | strate types of gear | | | | |
| | 3. Explain the | safety procedure in min | ning | | | |
| | 4. Explain the | power consumption & c | distribution ir | n mining in | dustry | |
| | 5. Explain ro | pe ways used in transpo | rtation of min | nerals | | |
| | 6. Explain the | safety devices implante | d in transpor | tation equip | oment | |

| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|-------------|---------|--------|------------|---------|-----------|--------|------|---------|----------|----------|---------|----------|---------|------|------|
| CO1 | 1 | | 2 | | | 3 | | | | 1 | | | 3 | 1 | 2 |
| CO2 | | 2 | | | 2 | | | 3 | | | 2 | | 2 | | 1 |
| CO3 | 1 | | 2 | | 2 | | 1 | | 2 | | 3 | | 3 | | 1 |
| CO4 | | 1 | | | | | | | | 2 | | | 2 | 2 | 1 |
| CO5 | | | 2 | | 2 | | 1 | | 3 | | | | 3 | | 1 |
| CO6 | | 2 | | | 2 | | 2 | 2 | 2 | | | 2 | | 1 | |
| Averag | | | | | | | | | | | | | | | |
| e | 0.33 | 0.83 | 3 1.00 | 0.00 | 1.33 | 0.50 | 0.67 | 0.83 | 1.17 | 0.50 | 0.83 | 0.33 | 2.17 | 0.67 | 1.00 |
| Correlat | tion Le | evels | · | 1.Sligh | nt(Low) | | | 2.Mod | lerate(] | Medium | i) 3.S | ubstanti | al(High |) | |
| TZT TZ | 1. J T | 1-TZ 1 | Dame area' | han V2 | I In dama | and V2 | A | VA Amai | June VE | Englande | V(Cmar | 4.0.4 | | | |

KL-Knowledge Level:K1-Remember, K2—Understand ,K3-Apply, K4-Analyse, K5-Evaluate, K6-Create ; PO-Programme Outcome; CO-Course Outcome ;PSO-Programme Specific Outcome

OF EXPERIMENTS

Study and construction of different types of wire ropes and types of rope carpels used for rope haulages& winding, safety hooks used in winding.

Construction of compressed air operated drill

Tensioning arrangement in endless haulage and different types of haulage clips and other means



achment of tubs to the rope.

Study of haulage track, curves, diamond crossing, construction of mine tubs and cars along with couplings.

Study of safety devices provided on rope haulage roads and locomotives, roadways. Exhaust conditioner and flame traps & underground battery charging station layout. Electrical power distribution in mines, electrical layout for rope haulages and pumps,

rical and hydraulic layouts for longwall faces.

Study of aerial rope ways – driving/tensioning/loading/unloading and angle stations carriages and tightness.

Study of various types of head gear, fleet angle, study of shaft fittings, suspension gear Safety dogs and protective roofing, study of arrangements.

Text Books:

Jayanth Bhattacharya, Principles of Mine Planning-Allied Publishers, Delhi 2003.
 Hustrulid, W. and Kuchta, M., (eds)., Fundamentals of Open pit Mine Planning and Design, Elsevier, 1995.

Designed by" Department of Mining Engineering"



| PROGRAM | | | | | | | BE-N | IININ | G Engi | neerin | g | | | | |
|--------------------------|----------|------------|--|--|---|--|---|--|---|---------------------------------------|-------------------------------|-------------|----------|----------|--------|
| Course Code UBMN6PC | : | COUR | RSE NA | ME: | | | | Conta Hour | act s | Т | | | Р | | С |
| | | MINE | DESIG | N PRA | CTICA | ٩L | | | 2 | 0 | | | 2 | | 1 |
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| Year and | | Ι | II Yea | r (VI S | EMES | STEI | R) | | | Cor | ntact h | ours p | er week | [| |
| Semester | | | | | | | | | | | (| 2Hrs) |) | | |
| Prerequisite | | | | NI | Ĺ | | | | | | | | | | |
| course | | | | | | | | | | | | | | | |
| Course categ | gory | Huma | nities | and | Mai | nage | ment | Prof | essiona | al Cor | e | Pro | fessiona | al Elec | tive |
| | | Socia | l Scien | ces | С | ours | ses | | | , | | | | | |
| | | | | | | | | | | \bigvee | | | | | |
| | | Basi | c Scien | ice | Enş S | ginee Scien | ering .ce | Op | oen Ele | ective | | | Mand | atory | |
| | | | | | | | | | | | | | | | |
| Course Objective | | 1. sche | Unde eme | rstand | ding t | he r | nathem | atical | and c | lesigr | i part | s of r | nining | planni | ng and |
| Course Outco | ome | At the | end of . Uno 2. Un 3. Pr 4. Ap 5. Un 6. Ap | the co derstand repare the pply the inderstance pplying | urse the ding the nding re- he min e know nd and the co | ne stu ne min reserv e pla vledgo prep oncep | ident wi ning reso ve estima nning sch e to prep are the pi t of cash | I be at irce est ion by eme are the t design flow ca | ole to: imation 3-D ge design n layour ilculatio | n ologica of was t on and | al bloc te slop profits | k meth e | od | | |
| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO 5 | PO | 6 PO7 | PO 8 | PO9 | PO1 0 | PO 11 | PO 12 | PSO1 | PSO 2 | PSO3 |
| CO1 | 2 | 1 | | 2 | 1 | | | | | | | | 1 | 2 | 2 |
| CO2 | 1 | | 2 | | 3 | | | | | | | | 2 | 3 | 1 |
| CO3 | | 2 | 2 | | | | | | 1 | 2 | 3 | | | | |
| CO4 | | 3 | | | | | | 2 | 3 | 2 | | | | | |
| CO5 | 2 | | 3 | | 2 | | | 2 | | | | | 3 | 1 | 2 |
| CO6 | 1 | 1 | 2 | 2 | | | | | | 2 | | 3 | 2 | 2 | 2 |
| Average | 1.5 | 1.5 | 2 | 2.2 | 2 | 2 | 3 | 2 | | 2 | | 3 | 1.8 | 2.1 | 2 |
| Correlation Lev | rels | | | 1.Slig | nt(Low |) | 2.Modera | te(Med | ium) | | 3.Sut | ostantia | l(High) | | |
| KL-Knowledge Outcome: | e Level: | :K1-Ren | nember, | K2Un | derstai | nd,K3 | 3-Apply,K | 4-Anal | yse,K5- | Evalua | te,K6-(| Create | : PO-Pro | ograme | |

CO-Course Outcome :PSO-Programe Specific Outcome

LIST OF EXPERIMENTS

- 1. Vertical cross section method of ore reserve estimation
- 2. Ore reserve estimation by 3-D geological block method
- 3. Development of economic block model
- 4. Design of Pit layout
- 5. Cash flow calculations



- 6. Design of road width
- 7. Design of drainage system in surface mines
- 8. Design of waste dumps storage

(Total: 24 Hrs)

Reference books:

- 1. Walker, S.C., Mine Winding and Transport, Elsevier, 1988.
- 2. Statham, I.C.F., Coal Mining, Vol. I, II, III and IV, Caxton Eastern Agencies, Calcutta.
- 3. Deshmukh, D.J., Elements of Mining Technology, Vol. I, II and III, EMDEEE Publishers, Nagpur, 1979.

Designed by "Department of Mining Engineering"



| Course Code UBMN701 Year an Semester Prerequisite course Course category Learning outcome Mapping c instructional Objectives with learning Outcome Aim / Purpose of the course Instructional objective of th course | C N E N N f f | ourse I IINE NGINI V Year IIL Gen 1-5 | Name : EN EERIN (VII So heral - b | VIR(G emest | ONMI er) Found | lation | L ((| I Cont (3 Hi (2 Pr | act ho rs) Core / | T 0 urs per onal | week | P 0 Elect | ive | C 3 | | | | |
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| UBMN701 Year an Semester Prerequisite course Course category Learning outcome Mapping c instructional Objectives with learning Outcome Aim / Purpose of the course Instructional objective of th course | M E N N f f | IINE NGIN V Year IIL Gen 1-5 | ERIN EERIN (VII So heral - b | emest | Found | lation | L ((| Cont (3 Hi (2 Pr | act ho rs) Core / | 0 urs per onal | week | 0 Elect | ive | 3 | | | | |
| Year an Semester Prerequisite course Course category Learning outcome Mapping of instructional Objectives with learning Outcome Aim / Purpose of the course Instructional objective of th course for the course Cour | f T S | V Year IIL Gen 1-5 o study | · (VII Someral | emest | er) Found | lation - d | e | Cont (3 Hi (3 Pr | act ho rs) Core / ofessi | urs per onal | week | Elect | ive | | | | | |
| Year an Semester Prerequisite course Course Course category Learning outcome Mapping constructional Objectives with learning Outcome Aim / Purpose of the course Instructional objective of th course Course | I IV N I I I I I I I I I I I I I I I I I I | V Year IIL Gen 1-5 o study | reral - b | emest | er) Found | lation - d | e | Cont (3 Hi (Pr | act ho rs) Core / ofessio | urs per onal | week | Elect | ive | | | | | |
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| Learning outcome Mapping c instructional Objectives with learning Outcome Aim / Purpose of the course Instructional objective of th course | f T st | a 1-5 o study | b | c | | d r | Learning a b c d e f g H i j | | | | | | | | | | | |
| outcome Mapping or instructional Objectives with learning Outcome Aim / Purpose of the course Instructional objective of th course | f T st | 1-5 o study | | | | outcome | | | | | | | | | | | | |
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| Objectives with learning Outcome Aim / Purpose of the course Instructional objective of th course | T st S | 1-5 o study | | | | | | | | | | | | | | | | |
| learning Outcome Aim / Purpose of the course Instructional objective of th course | T st | o study | | learning | | | | | | | | | | | | | | |
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| Instructional objective of th course | S | udv ah | y about | spon ne res | aneou cue fi | s neat rst aic | ling, i 1 and | inne illini | minati | , munua on | tion and | explosi | ons an | u to | | | | |
| objective of th course | _ | tudents | s will be | e able | to | ist an | <u>a una</u> | * 11101 | minuti | .011. | | | | | | | | |
| course | e 1 | 1 D | escribe | the an | reas pi | one to | o fire | e and | its pr | eventive | measu | res | | | | | | |
| POS/ | | 2 D: | iscuss t | he exp | plosio | ns in a | a min | ne an | d its r | eport | | | | | | | | |
| 205/ | | 3 Ill | lustrate | the w | vater st | toring | struc | cture | s in m | ines | | | | | | | | |
| 208/ | 4 | 4 Ez | xplain t | he res | scue e | quipm | ents | used | l durin | g emerg | gency si | tuations | | | | | | |
| POS/ | | 5 D | escribe | the li | ghtnin | g sou | rce ir | n unc | lergro | und mir | nes | | | | | | | |
| | (| b Ex | xplain t | he fire | e prev | entior | n met | thods | s in mi | ining in | dustry | | | | | | | |
| COS PO1 PC | 2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO | 08 | PO9 | PO10 | PO11 | PO12 | PSO1 | | PSO2 | PS | | |
| CO1 3 3 | | 3 | 3 | | | | | | | | | | 3 | | 2 | - | | |
| CO2 2 3 | | 2 | 3 | | | | | | | | | | 2 | r | 3 | 1 | | |
| CO3 2 2 | | 2 | 2 | | | 1 | | | | | | | 3 | | 3 | 2 | | |
| CO4 1 1 | | 2 | 1 | | | 1 | | | | | | | 3 | | 2 | 3 | | |
| CO5 1 1 | | 1 | 3 | | | | | | | | | | 2 | | 2 | | | |
| CO6 1 1 | | 1 | 1 | 1 | İ | 1 | | | | | | | 2 | | 1 | 1 | | |
| Average 1.66 1.8 | 3 | 1.83 | 2.16 | | | | | | | | | | 2.5 | | 2.16 | 2.5 | | |
| Correlation Levels | | • | 1.Slig | ght(Lo | ow) | - | 2. | .Mo | derate | e(Mediu | ım) | 3.Sul | ostanti | al(High) |) | | | |
| KL-Knowledge Level:K1-J PO-Programme Outcome; | Rem CO- | ember, I •Course | K2—Un Outcom | dersta ne ;PSC | nd ,K 3 -)-Prog | Apply ramme | , K4- e Spec | Analy cific C | zse, K5- Outcom | -Evaluate e | e, K6-Cre | eate ; | | | | | | |

Mine fires - Causes and classification of mine fires - Spontaneous combustion - mechanism, stages of

(Under Section 3 of UGC Act 1956) SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY B.E – MINING ENGINEERING ACADEMIC YEAR 2016-2020 (BATCH - I)

spontaneous combustion – susceptibility indices – factors affecting spontaneous combustion – detection and prevention of spontaneous heating and accidental fires – dealing with mine fires – direct and indirect methods, fire stopping – Re-opening of sealed-off areas – Fires in quarries – Coal stacks and waste dumps.

UNIT II MINE EXPLOSIONS

Fire damp and coal dust explosions – causes and prevention, explosive limits – Stone- dust and water barriers – Explosion in quarries over developed pillars – Investigation after an explosion.

UNIT III INUNDATION

Causes and prevention – Precautions and techniques of approaching old workings – Dewatering of waterlogged working – safety boring apparatus – pattern of holes – Design and construction of water dams and barriers.

UNIT IV RESCUE AND RECOVERY

Rescue equipment and their uses - Classification of rescue apparatus - Resuscitation

- Rescue stations and rescue rooms - Organization of rescue work - Emergency preparedness and response system.

UNIT V – ILLUMINATION

Cap lamps – Layout and organization of lamp rooms – Standards of illumination – Photometry and illumination survey – Lighting from main and other sources.

TEXT BOOKS:

1. Kaku L.C., Fires in Coal Mines, Oriental Publishers, II Edition, 1985.

2. Ramlu, M.A., Mine Disasters and Mine Rescue, Oxford and IBH Publishers, 1991.

REFERENCES:

1. Ramlu, M.A., Mines Fires, Explosion, Rescue, Recovery and Inundations, Mukhertu Publishers, Kharagpur, 1989

2. Misra, G.B., Mine Environment and Ventilation, Oxford University Press, 1993.

- 3. McPherson, M.J., Subsurface Ventilation and Environmental Engineering, Chapman & Hall
- 4. Publication, London, 1993.

5. Sarkar, S.K. and Sarkar, S., State of Environment and Development in Indian Coalfields, Oxford and IBH, 1996.

6. Classified Circulars by D.G.M.S., Dhanbad.

Designed by "Department of Mining Engineering"

(10 Hrs)

(10 Hrs)



(10 Hrs)

(TOTAL: 50 Hrs)





| PRO | GRAM | | BE | - Min | ing En | gineerii | ng | | | | | | | | | |
|---|--|----------|--------|-----------------|--------------------|-----------|-----------|---------|----------|----------------|----------|----------|----------|------------|---------|-------------------|
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| Year | | a | nd IV | Year (| VII Se | mester |) | | Co | ntact h | ours pe | r week | | | | |
| Semes | ster | | | | | | | | (4 | Hrs) | | | | | | |
| Prerec | quisite | | MIN | VING | MAC | HINER | ΥI | | | | | | | | | |
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| Cours | e categ | ory | | Gene | eral | F | oundatio | n | | Core | / | |] | Elective | • | |
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| instru | ctional | | | | | | | | | | | | | | | |
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| learni | ng | | | | | | | | | | | | | | | |
| Outco | me | | | | | | | | | | | | | | | |
| Aim | / Purp | ose | Tou | under | stand the | ne funct | ioning o | f win | ding | g engin | es, win | ding ac | cessorie | es, surfa | ice and | |
| of the | course | 9 | pit t | ottor | n layou | its, vari | ous coal | tace 1 | mac | hinery, | , design | and co | nstructi | on deta | ils of | |
| T (| | | Exc | avatıı | <u>1g & tr</u> | ansport | ing equip | oment | t use | ed in su | irface n | nines. | | | | |
| InstructionalStudents will be able toobjective ofthe1Describe the various types of engines used in mining | | | | | | | | | | | | | | | | |
| object | objective of Coursethe1Describe the various types of engines used in mining 2Discuss the auxiliary equipment used in engines | | | | | | | | | | | | | | | |
| Cours | Course 2Discuss the auxiliary equipment used in engines 3Explain the machineries involved in coal mining | | | | | | | | | | | | | | | |
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| | | | 6 E | xplair | the m | achiner | ies & au | xiliary | y equ | uipmer | nt used | in mini | ng | | | |
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| POS | | | | | | | | | | | PO1 | PO1 | PO1 | PSO | PSO | PSO |
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UNIT I INTRODUCTION

Winding Engines – Winding systems – drum winders – drives – mechanical braking of winders – safety devices in winding – overwind and overspeed protection – Koepe and multi-rope friction winding – electrical layouts – Duty cycles of drum winders of different drum cross-sections – Special problems of deep shaft winding.

UNIT II WINDING ACCESSORIES AND LAYOUTS

Head gear and its design – head sheave – cages and skips – suspension gear – shaft fittings and appliances – guides - keps – signalling systems – winding calculations relating to rope size & numbers – capacity & power requirement for cages, skips, drum and Koepe winding systems

UNIT III COAL FACE MACHINERY

Construction – salient electrical and mechanical features and operations of coal drills and their control panels – coal cutters – different types of mechanical loaders – coal ploughs, cutter loaders, continuous miners – development road headers in face mechanization – longwall mining equipment – electrical and hydraulic layouts – modern concepts in underground mine mechanization.

UNIT IV EXCAVATION AND LOADING MACHINERY IN SURFACE MINES (10 Hrs)

Classification – hydraulic system diagram – under carriage – design and constructional details of front end loaders – hydraulic excavators and electric rope shovel – backhoe – dragline – bucket wheel excavator – bucket chain excavator and surface miners.

UNIT V OTHER MACHINERY IN SURFACE MINES

Classification of transport equipments – Understanding of construction and technical specifications of dumpers of different types including multi-axial dumpers – Tractors – trailers – dump trucks – rippers – motor graders – bull dozers – rock breakers – road compactors – water tankers.

TEXT BOOKS:

- 1. Amitosh Dey, Heavy Earth Moving Machinery, Lovely Prakashan Publications, Dhanbad, 2000.
- 2. Walker, S.C., Mine Winding and Transport, Elsevier, 1988.
- 3. Ramlu, M.A. Mine Hoisting, CRC Press, 1996

REFERENCES:

Hartman, H. L. (Editor), SME Mining Engineering Handbook, 3rd edition, Vol I & II, Society of Mining 1. Engineers, New York, 2011.

Cherkassy, B.M., Pumps, Fans, Compressors, MIR Publishers, 1980.



SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY **B.E – MINING ENGINEERING** ACADEMIC YEAR 2016-2020 (BATCH - I)

(10 Hrs)

(10 Hrs)

(10 Hrs)

(10 Hrs)

(TOTAL: 50 Hrs)



| PROGRAM | BE - 1 | Mining Engineering L T P C SEA MINERAL 3 1 0 4 LORATION 3 1 0 4 ear (VII Semester) Contact hours per week (4 Hrs) Contact hours per week General Foundation Core / Professional Elective Professional - - E-11 b c d e f g h i j k Image: second | | | | | | | | | | | | | |
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| Aim / Purpose | To int | roduce th | e marin | e geolog | v, ex | ploit | tation to | echnique | es and e | equipmer | nt's invo | lved in | | | |
| of the course | marin | e explora | tion. | 0 0 | | • | | 1 | | 1 1 | | | | | |
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| objective of the | 1 | Define th | e types | of marin | e env | viron | ment | | | | | | | | |
| course | 2 | Discuss the | he statu | s of subs | ea mi | ining | g in Ind | lia | | | | | | | |
| | 3 | Different | iate the | physical | and c | chen | nical pr | roperties | of seav | water | | | | | |
| | 4 | Describe | the rese | rve estin | natior | n of | marine | sedimer | nts | | | | | | |
| | 5 | Discuss t | he techr | nologies | used | to u | nearth t | the marii | ne mine | erals | | | | | |
| | 6 | Explain t | he estim | nation & | produ | uctio | on of m | inerals f | rom oc | ean envi | ronment | t | | | |

UNIT 1 INTRODUCTION

Marine Environment – Bathymetry, isobaths – Marine sediments – terrigenous, pelagic – Lithogenous, Biogenous, Hydrogenous, Cosmogenous.

UNIT II STATUS OF INDIAN MARINE RESOURCES

Development and status of ocean resources of mining in India and other parts of the world – Ocean profile – ocean floor topography – economic exclusive zone – fundamentals of law of the sea – coastal zone & its characteristics.

UNIT III MARINE GEOLOGY AND RESOURCES

Physical and chemical properties of seawater – overview of marine mineral deposits – deep-sea bed mineral resources – polymetallic nodules – sulphate nodules – chemicals from the ocean – dissolved and undissolved mineral deposits – sea water as resource and beach placers.

UNIT IV EXPLORATION OF MARINE DEPOSITS

Shallow and deep sea bed – Oceanographic instruments – ocean bottom samplers – ocean bathymetry – temperature measurement systems – water samplers - ocean dynamic analysis – beach placer

(**10 Hrs**)

(10 Hrs)

(10 Hrs)



mining – underwater photographs.

UNIT V EXPLOITATION OF MARINE DEPOSITS

(10 Hrs)

Deep sea drilling methods – drag buckets – grab buckets – coring systems – beach placer mining – vehicles and transportation – offshore oil platform.

(TOTAL: 50 Hrs)

TEXT BOOKS:

1) Chatterjee, S.K., An Introduction to Mineral Resources, Wiley Eastern Ltd., 1983.

REFERENCES

- 1) Shepherd, F.P., Sub-marine Geology, Harper and Row, New York, 1963.
- 2) Graff, W.J., Introduction to Offshore Structures: Design, Fabrication and Installation, Gulf Publishing Company, London, 1961.
- 3) Herbich, J.B., Coastal and Deep Ocean Dredging, Gulf Publishing Co. Houston, 1975.
- 4) Murthy, T.K.S., Mining the Ocean, CSIR Golden Jubilee Series, CSIR Publications, New Delhi, 1995.

Designed by "Department of Mining Engineering"



| PROGRAM | BE - M | lining Er | gineeri | ng | | | | | | | |
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| | 3 Illust | rate the | project i | is viable | or no | ot by using | economi | c calcu | lations | | |
| | - 4Desc | ribe the | cash flo | w in mi | ning | industry | | | | | |
| | - 5Disci | uss the s | ource of | fund to | deve | lop a minin | g | | | | |
| | 6 Expla | ain the fi | nance n | nanagem | ent i | n mining in | dustry | | | | |
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| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | РО 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 | PSO3 |
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UNIT I INTRODUCTION

Mineral Economics – Special features of mineral and mining industry – statistics of important and strategic minerals of India – Grading and pricing of coal, limestone, bauxite and iron ore – Pricing of metals – concentrates and ores – Conservation of minerals – National mineral policy – Global mineral marketing.

UNIT II SAMPLING AND ESTIMATION OF RESERVES

Methods of sampling during exploration – mining and dispatch – Records and analysis of core sampling data – Tenor, grade and specification – Classification of reserves – Estimation of reserves – Applications of geostatistics.

UNIT III ECONOMIC EVALUATION

Break-even analysis- Economic appraisal of capital investments by NPV and IRR methods-Comparison of investment alternatives- Feasibility studies- Critical variables, price forecasting and sensitivity analysis.

UNIT IV ORGANISATIONAL AND FINANCIAL MANAGEMENT

Forms of business organizations- Sources of finance- Winding up of companies- Wage systems and incentives- Cost accounting and budgetary control.

UNIT V FINANCE AND ACCOUNTING

Source of mine funds – shares, debentures, fixed deposits, sinking fund, capital gearing, P&L account, balance sheet, typical case studies of mine feasibility – Cost estimation of individual mining operations and overall mining cost – cost control methods.

(Total: 50 Hrs)

TEXT BOOKS:

- 1. Deshmukh, R.T., Mineral and Mine Economics, Mira Publications, Nagpur, 1986.
- 2. Arogyaswamy, R.N.P. Courses in Mining Geology, Oxford and IBH Publishing Co., 1994.

(10 Hrs)

(**10 Hrs**)

(10 Hrs)

(10 Hrs)



REFERENCES

- 1) Sloan, D.A., Mine Management, Chapman and Hall, London, 1983.
- 2) Chatterjee, K.K., Mineral economics, Wiley Eastern, 1992.
- 3) Park, R.J., Examination and Valuation of mineral property
- 4) How to read a balance sheet ILO 1992.
- 5) Indian Mining Year Book 1994 MMRD Act and Mineral Concession Rules.

Designed by "Department of Mining Engineering"



| PROG | RAM | | BE | - Minin | g Engi | neering | | | | | | | | | | |
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| | | | 2. D | escribe | various | s metho | ds of tu | nneling | g techni | ques | | | | | | |
| | | | 3. Ez | xplain t | he metl | nods of | drilling | and bl | asting o | of subsu | rface | | | | | |
| | | | 4. D | iscuss t | he mac | hineries | s used fo | or conv | venience | e of min | e work | ers | | | | |
| | | | 5. D | escribe | the equ | ipment | 's empl | oyed ir | n suppor | rting the | e tunnel | ls | | | | |
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(Under Section 3 of UGC Act 1956) SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY **B.E – MINING ENGINEERING** ACADEMIC YEAR 2016-2020 (BATCH - I)

DEEMED TO BE UNIVERSITY

ACADEMY OF

1.Slight(Low)

ON AND TRAINING

2.Moderate(Medium)

| KL-Knowledge Level:K1-Remember, K2—Understand ,K3-Apply, K4-Analys PO-Programme Outcome; CO-Course Outcome ;PSO-Programme Specific O | se, K5-Evaluate, K6-Create ; utcome |
|---|--|
| UNIT I INTRODUCTION | |
| Scope and application - historical development - art of tunneling, tun | nel engineering |
| (10 Hrs) | |
| future tunnelling considerations – Types of underground excav parameters influencing – location, shape and size, geological aspec | vations – Tunnel, adit, decline, shaft, ets – planning and site investigations. |
| UNIT II UNDERGROUND EXCAVATIONS | (10 Hrs) |
| Tunnelling methods – Types and purpose of tunnels – factors aff | tecting choice of excavation technique – soft |

ground tunnelling, hard rock tunnelling, shallow tunnelling, deep tunnelling – Shallow tunnels- cut and cover, cover and cut, pipe jacking, jacket box excavation – techniques, method of muck disposal, supporting

problems encountered and remedial measures. UNIT III DRILLING AND BLASTING UNDERGROUND SPACE (10 Hrs)

Drilling – drilling principles, drilling equipment, drill selection, specific drilling, rock drillability factors

- Blasting - explosives, initiators, blasting mechanics, types of cuts- fan, wedge and other - blast design, tunnel blast performance - powder factor, parameters influencing, methods of predictions – mucking and transportation equipment selection.

UNIT IV UNDERGROUND SPACE MECHANISATION

Tunnelling by Roadheaders and impact Hammers – Cutting principle – method of excavation, selections, performance, limitations and problems – Tunnelling by tunnel boring machines – Boring principles, method of excavation, selection, performance, limitation and problems – TBM applications.

UNIT V UNDERGROUND SPACE SERVICES

Supports in tunnels – Principle types of supports and applicability – Ground Treatment in Tunnelling – Adverse ground conditions and its effect on tunnelling – Excavations of large and deep tunnels – cavers - Tunnel Services – Ventilation, drainage and pumping – Tunnelling Hazards.

TEXT BOOKS:

Correlation Levels

- 1) Hudson, J.A., Rock Engineering Systems Theory and practice, Ellis Horwood.
- 2) Clark, G.B., (1987), Principles of Rock Fragmentation, John Wiley and Sons, New York.

REFERENCES:

Legget, R.F., Cities and Geology, McGraw-Hill, NewYork, 624 p., 1973. Designed by" Department of Mining Engineering"

(TOTAL: 50 Hrs)

(10 Hrs)

3.Substantial(High)



| PROGRA | AM | | | | | | | BE- | Mining | Enginee | ring | | | | |
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| ~ | | | | 1 | . Desc | cribe th | e metho | ods and | growth | n in rock | excavat | tion system | ems | | |
| Course | | | | 2 | . Desc | cribe th | e prop | erties re | elated to | o rock ex | cavatio | n proces | S | | |
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| | | | | 4 | . Des | cribes t | he tool | s emplo | byed in | excavat | ion proc | ess | | | |
| | | | | 5 | . Desc | cribes ti | ne tools | s emplo | yed in | rock exc | avation | process | | | |
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| | | | 8. | Expla | in abou | it vario | us the g | geotech | nical p | arameter | s role in | slope st | ability | | |
| | | | 9. 10 | Desci | ibe the | produc | tion an | id equip | oment p | lanning | opencas | t mines | · · · · · · · | | |
| | | | 10 | . Kean | ze the | import | ance c | or vario | ous exp | nosives, | initiato | rs and | significa | ince of t | initiation |
| | | | 11 | Discu | ince. | nodern | trends | in oper | ncast m | ines | | | | | |
| | | | Explain | recent | advance | ement in | rock ex | cavatio | n | mes. | | | | | |
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| CO5 | | 1 | | | | | 1 | | | | | | | | |
| CO6 | | | | | | | | | | | | | | | |
| Aver age | 0.1 | 0.3 | 0.3 | 0 | 0.1 | 0.1 | 0.5 | 0.3 | 0.8 | 0 | 0 | 0 | 0 | 0 | 0 |
| Correlat | tion I | Levels | | 1.Slig | ght(Lo | w) | | 2.1 | Aodera | te(Med | ium) | 3 | S.Substa | ntial(Hig | gh) |
| KL-Know | vledge | Level:H | K1-Rem | ember,K | 2Unde | erstand,H | K3-Appl | y,K4-An | alyse,K | 5-Evaluat | e,K6-Crea | ate : PO- | Programe | e Outcome | : |
| CO-Cour | se Out | come : | PSO-Pro | ograme S | Specific | Outcome | <u> </u> | | | | | | | | |

UNIT I INTRODUCTION

Concepts, historical developments in rock excavation systems, factors affecting the rock fragmentation, mechanism of rock breakage and fracture; their application to rock fragmentation methods- explosive action, cutting, ripping and impacts.

UNIT II ROCK PROPERTIES

Rock properties related to excavation process; application of compressive, tensile and tri- axial strengths, index tests and abrasivity, anisotropy, elasticity, porosity, laminations, bedding and jointing in rock fragmentation process.

UNIT III ROCK CUTTING TECHNOLOGY (9 Hrs) Mechanism of drilling - rotary, percussive, rotary percussive, mechanics of rock cutting, theory of single tool rock cutting, crack initiation and propagation, breakage pattern, rock excavation by cutting action - picks, discs, roller cutters, water jet cutting, methods of evaluation of drillability and cuttability

index of rocks.

UNIT IV ROCK CUTTING TOOLS

Rock cutting tool materials, different types, relative applications and their choice, tool shape and size, specific energy consumption, tool wear, effect of operational parameters on tool performance, maintenance and replacement of cutting tools of excavating machines.

UNIT V ROCK EXCAVATING MACHINES

Excavating machines, principles, operation, applicability and technical indices of road headers, TBM'S Coal face machines and bucket wheel excavators.

TEXT BOOKS:

- 1. Hartman, H.L., Introductory Mining Engineering, John Wiley and Sons, New York, 1987.
- 2. Clark, G.B., Principles of Rock Fragmentation, John Wiley and Sons, New York, 1987.

REFERENCES

- Hartman, H. L. (Editor), SME Mining Engineering Handbook, 3rd edition, Vol I & II, Society of Mining 1. Engineers, New York, 2011.
- Chugh, C.P., Diamond Drilling, Oxford-IBH, 1984. 2.

Designed by "Department of Mining Engineering"

SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY **B.E – MINING ENGINEERING** ACADEMIC YEAR 2016-2020 (BATCH - I)

(9 Hrs)

(9 Hrs)

(9 Hrs)

(Total: 45 Hrs)



(9 Hrs)



| PROGRAM | BE - N | aning Eng | gineering | g | | | | | | | | | |
|--------------------------|-----------|--------------|-----------|-------------|---------|--------|--------------------|------------|-----------|-------------|----------|------------|--|
| Course Code | Course | e Name : | |) | | | L |] | Γ | Р | | С | |
| UBMN708 | Advance | ed Surface N | Aining T | echnolog | У | | 3 | (|) | 0 | | 3 | |
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| Year and | IV Yea | ar (VII Ser | nester) | | | Co | ontact ho | ours per | week | | | | |
| Semester | | | | | | (3 | Hrs) | | | | | | |
| Prerequisite | NIL | | | | | | | | | | | | |
| Course | | | | | | | | | | | | | |
| Course | G | eneral | F | oundatio | n | | Core | / | | Elect | tive | | |
| category | | | | | | | Profess | sional | | | | | |
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| Learning | а | b | с | d | e | | f | g | Н | i | j | k | |
| outcome | | | | | | | | | | | | | |
| Mapping of instructional | | | | | | | | | | | | | |
| Objectives with | 1-5 | | | | 1-5 | 5 | | | | 1-5 | | | |
| learning | | | | | | | | | | | | | |
| Outcome | | | | | | | | | | | | | |
| Aim / Purpose | 1. | Study abo | out Ore | and eco | nomi | c bl | ock mo | del and | ultimat | e pit limit | calcul | ations. | |
| of the course | 2. | Students | must l | know ab | out | Ore | reserv | e estim | ation t | echniques | s and | different | |
| | | drilling te | chniqu | es during | g exp | lora | ation. | | | | | | |
| | 3. | Students | should | have bas | sic kr | 10W | ledge al | bout bre | eak eve | n analysis | s and e | conomic | |
| | | appraisal | of mini | ng proje | cts di | urin | ig feasit | oility stu | dies. | | | | |
| | 4. | Students | ennanc | e their k | (now | | ge on di | ifferent | explosi | ives, initi | ators, 1 | initiation | |
| | 5 | Pecent de | and Dia | st design | ll Calc | cula | uons. nining n | athods | and the | vir annlige | hility i | n | |
| | 5. | different | scenario | ons are sti | idied | bri | eflv | lictitous | | n appner | ionity I | 11 | |
| | | | | Jo ure su | | | 011 <i>y</i> . | | | | | | |
| | At the er | nd of the co | urse the | student w | ill be | able | e to: odol in m | | ndoom | nutor mot | ande | | |
| | 1. | Eveloin of | hout was | vious the | DIOCK | . III(| | lanuar a | na com | long stab | 100S | | |
| | 2. | Explain a | dout vai | nous the | geole | · · | ncal para | ameters | role in s | slope stab | mty | | |
| | 3. | Describe | the pro | duction a | ind ec | Juip | ment pla | anning o | pencast | mines | c | ,. ,. | |
| | 4. | Realize th | le impoi | tance of | vario | ous (| explosiv | es, initia | itors and | d significa | ince of | initiation | |
| Instructional | _ | sequence. | | | | | | | | | | | |
| objective of | 5. | Discuss th | ne mode | rn trends | s in op | pend | cast min | es. | | | | | |
| the | 6. | Students 1 | earn ab | out recen | nt adv | anc | ement. | | | | | | |
| course | | | | | | | | | | | | | |



| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO1 | 1 | PO12 | PSO1 | PSO2 | PSO3 | | |
|-------------|---------|-----|------|--------|---------|-----|------|------|----------|---------|-----|----|------------|-------|--|------|--|--|
| CO1 | 2 | - | 1 | - | 2 | 2 | 3 | - | - | 2 | 3 | | 2 | 2 | 1 | 1 | | |
| CO2 | 3 | 2 | 2 | 1 | 2 | - | 2 | - | - | - | 2 | | 1 | 1 | 2 | 1 | | |
| CO3 | - | - | 2 | - | - | - | 2 | - | - | 2 | 2 | | 2 | 2 | 2 | 2 | | |
| CO4 | - | - | - | - | - | 2 | 2 | - | - | - | 3 | | 2 | 2 | 1 | 1 | | |
| CO5 | - | - | 2 | 1 | 1 | 1 | 2 | - | - | 2 | 2 | | 2 | 2 | 1 | 1 | | |
| CO6 | 2 | 1 | 2 | 1 | 2 | 3 | 2 | - | - | 2 | 3 | | 2 | 2 | 2 | 2 | | |
| Average | 1.1 | 1.5 | 2.25 | 1 | 2 | 2 | 2.22 | - | - | 2 | 2.5 | | 2.1 | 1.8 | 1.5 | 1.3 | | |
| Correlatio | on Leve | els | | 1.Slig | ht(Low) | • | | 2 Mo | lerate(N | Medium) | | 35 | ubstantial | High) | 2 2 1 1 1 1 2 2 8 1.5 1.3 2h) | | | |

KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome

UNIT – I- Surface Mining System

Classification of surface mining equipments vis-à-vis unit operation- main components, layout, function and operations

Unit – II – Equipment Selection

Equipment selection criteria and procedures, application and selection

UNIT – III – Equipments utilization

Types, basic operations, maintenance and capacity utilization, applicability and selections

UNIT – IV – surface blast explosives

Types of explosives for surface blast, explosives properties, explosives performance testing, selection criteria UNIT - V - Production planning in surface mine – Round production

Overview of surface blast design, selection of explosives, primer, booster; Types of initiations, selection;

Initiation sequences; blast production calculation; Production and productivity assessment

TEXT BOOKS :

- 6. W. Hustrulid, M. Kuchta and R. Martin, Open Pit Mine Planning & Design.
- 7. Fundamentals of Open Pit Mine Planning & Design: Hustrulid, W. and Kuchta, M.
- 8. Surface Mining : Kennedy, B.A., 2nd Edition, SME, New York, 1990.
- 9. Surface Mining Technology, : Das, S.K., Lovely Prakashan, Dhanbad, 1994.
- 10. SME Mining Engg. Hand book Vol.I and II: Cummings, A.B. and Given, I.V., New York

REFERENCES:

- 3. SME Mining hand book I,II
- 4. S. k. Das Surface mining technology.



| PROG | RAM | | | BE - 1 | Minir | ng Eng | gineeri | ng | | | | | | | | | |
|------------|---------|-----|------|------------|--------|----------------|-----------------------------------|-------------|----------|---------|---------|----------|---------|-----------|----------|-------|------|
| Course | Code | | | Cours | e Nai | me : | | - | | | L | | Г | P | | C | |
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| Prerequ | uisite | | | NIL | | | | | | | | | | | | | |
| course | | | | | | | | | | | | | | | | | |
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| instruct | tional | | | | | | | | | | | | | | | | |
| Objecti | ives | • | with | 1-5 | | | | | 1-5 | 5 | | | | 1- | 5 | | |
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| Aim / | Purp | ose | | To stu | idy th | ne vari | ious m | ining r | nachin | eries, | ropes, | conve | yors an | d diffei | rent typ | es of | |
| Instruc | tional | | | Studo | nes u | $\frac{1}{11}$ | $\frac{1}{2}$ under $\frac{1}{2}$ | ground | 1 mine | s | | | | | | | |
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| course | | | une | 2Ex1 | lain | the di | fferent | types | of con | vevors | s comp | onents | & safe | etv devi | ices | | |
| course | | | | 3Illu | strate | e the c | oal dri | ll and i | ts elect | rical 1 | banel/g | ate en | l box | | | | |
| | | | | 4Des | cribe | e the d | ifferer | t types | of loa | ding 1 | nachin | es, co | ol plou | gh and | shearer | | |
| | | | | 5Exp | lain | the co | ntinuo | us min | er and | road | headers | 5. | • | 2 | | | |
| | | | | 6 | Desig | gn a w | vorking | g mode | l of the | e equi | pment | used in | n minir | ıg | | | |
| DOG/ | | | | | | | | | | | | | | | | | |
| COS | PO1 | PO2 | PC | 03 PC | 4 P | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PC | 011 P | 012 | PSO1 | PSO2 | PSO3 |
| CO1 | - | 1 | 1 | - | 2 | 2 | 2 | 3 | - | - | 2 | 3 | 2 | | 2 | 1 | 1 |
| CO2 | 3 | 2 | 2 | 1 | 2 | 2 | - | 2 | - | - | - | 2 | 3 | | 1 | 2 | 1 |
| CO3 | - | - | 2 | - | - | | - | 2 | - | - | 2 | 2 | 2 | | 2 | 2 | 2 |
| CO4 | - | - | - | - | - | | 2 | 2 | - | - | - | 3 | 2 | | 2 | 1 | 1 |
| CO5 | - | - | 2 | 1 | 2 | 2 | 3 | 2 | - | - | 2 | 2 | 2 | | 2 | 1 | 1 |
| CO6 | 2 | 1 | 2 | 1 | 2 | 2 | 3 | 2 | - | - | 2 | 3 | 2 | | 2 | 2 | 2 |
| Average | 1.1 | 1.5 | 2.2 | 25 1 | 2 | 2 | 2 | 2.22 | - | - | 2 | 2.5 | 2. | 1 | 1.8 | 1.5 | 1.3 |
| Correlatio | on Leve | els | | 1.5 | light | (Low) | | | 2.Mod | lerate(| Mediur | n) | 3.Sub | stantial(| High) | | |



KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome

LIST OF EXPERIMENTS

- 1) Construction of cages, skips & their fittings and brakes of winders & haulers
- 2) Study of different types of conveyors (components & safety devices) like armoured face conveyors, belt conveyors, gate belt conveyors, shaker & vibrating conveyors, high angle conveyors
- 3) Study of coal drill and its electrical panel/gate end box
- 4) Study of pit top & pit bottom layouts in shaft and inclines.
- 5) Study of different types of loading machines
- 6) Study of cool plough and shearer.
- 7) Study of continuous miner and road headers.

(Total: 24 Periods)

REFERENCES:

- 1) Walker, S.C., Mine Winding and Transport, Elsevier, 1988.
- 2) Statham, I.C.F., Coal Mining, Vol. I, II, III and IV, Caxton Eastern Agencies, Calcutta.
- 3) Deshmukh, D.J., Elements of Mining Technology, Vol. I, II and III, EMDEEE Publishers, Nagpur, 1979.

Designed by "Department of Mining Engineering"



| PROGR | AM | | BE - | Minir | ng Eng | ineering | g | | | | | | | | | |
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| Prerequi | site | | NIL | | | | | | | | | | | | | |
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| outcome | • | | | | | | | | _ | | | | | | | |
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| instruction | onal | | | | | | | 1 - | | | | | | | | |
| Objectiv | ves | with | 1-5 | | | | | 1-5 | | | | | 1-5 | | | |
| learning | | | | | | | | | | | | | | | | |
| Outcome Image: Control of the solution of the mining industry. Aim / Purpose To carry out a study or to solve a problem of the mining industry. | | | | | | | | | | | | | | | | |
| Alm / I | Aim / Purpose To carry out a study or to solve a problem of the mining industry. of the course To carry out a study or to solve a problem of the mining industry. | | | | | | | | | | | | | | | |
| of the course Instructional Students will be able to understand | | | | | | | | | | | | | | | | |
| objective | onar | tha | Stud | | III De a | ho proh | lom | anu | | | | | | | | |
| objective | e or | the | 1 | | | the foot | ore infl | uonoin | ait | | | | | | | |
| course | | | 2 | 111 | scuss | the fact | ors IIII | involu | ig it | | | | | | | |
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| | | | 4 | | nlain | the rem | adial m | orving | , proceu | ure | | | | | | |
| | | | 5 | 1.27 | plain | | | lethous | 5. | | | | | | | |
| | | | 6 | Di | scuss | the resu | lt of th | e proje | ect | 1 | | | | | | |
| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO1 | .1 P | PO12 | PSO1 | PSO2 | PSO3 |
| - | 2 | - | 1 | - | - | 2 | 1 | - | - | 2 | 3 | 2 | | 2 | 1 | 1 |
| CO2 | 1 | 2 | 2 | 1 | 2 | - | 2 | - | - | - | 2 | 3 | | 1 | 2 | 1 |
| CO3 | - | - | 2 | - | - | - | 2 | - | - | 2 | 2 | 2 | | 2 | 2 | 2 |
| C04 C05 | - | - | - | - | 1 | 1 | 2 | - | - | - 2 | 3 | 2 | | 2 | 1 | 1 |
| CO6 | 2 | - 1 | 2 | 1 | 2 | 3 | 2 | - | - | 2 | 3 | 2 | | 2 | 2 | 1 2 |
| Average | 1.1 | 1.5 | 2.25 | 1 | 2 | 2 | 2.22 | - | - | 2 | 2.5 | 2 | .1 | 1.8 | 1.5 | 1.3 |
| Correlatio | on Leve | els | | 1.Slig | ght(Lov | v) | · | 2.Mc | oderate(N | Medium) | | 3.Sub | stantial(| High) | · | · |
| KL-Know CO-Cours | vledge L se Outc | .evel:K1 ome :PS | -Remen O-Prog | nber,K2 rame S | 2Unde pecific (| erstand,F Outcome | K3-Apply | y,K4-A1 | nalyse,K | 5-Evalua | te,K6-(| Create | e: PO-P | rograme | Outcome | 2: |
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| course | | | | | | | | | | | | | | | |
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| | | - | Soci | al Scier | ices | (| courses | | | | / | | | | |
| | | - | Rad | sic Scier | nce | En | gineeri | nσ | 0 | v nen Elect | ive | | Mar | datory | |
| | | | Da | | icc | | Science | ng | U | pen Eleci | 110 | | Wiai | idator y | |
| | | | | | | | | | | | | | | | |
| | | | | | V | Vill lear | rn abou | t the up | ostream | and dov | vnstrean | n related | compan | y works | |
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| | | | | | | | | | | | | | | | |
| | | | | 3. C | lategori | ze the j | princip | les invo | olved | | | | | | |
| | | | | 4. I | llustrate | e the pro | oblem s | solving | proced | ure | | | | | |
| | | | | | | , and bu | | , | procee | | | | | | |
| | | | | 5. E | Explain | the rem | edial n | nethod | | | | | | | |
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| CO3 | 2 | 1 | | 2 | | 3 | | 1 | | 2 | | 3 | 2 | | 2 |
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| CO2 | 1 | 2 | - | 3 | 2 | | 1 | - | 2 | - | 3 | 2 | 1 | - | 2 |
| C03 | 2 | - | 3 | 5 | 2 | | 3 | | 2 | | 3 | - | 2 | 2 | |
| C04 | 1 | 2 | 5 | 3 | 2 | 22 | 5 | 2 | 2 | 3 | 5 | 2 | 2 | 2 | 2 |
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| CO6 | | 1.6 | 1 | 2.5 | 3 | 2.7 | | 2 | | 3 | 2.2 | 2 | 2 | ² | 2 |
| Avera ge | 2 | 1.6 | 2 | 2.6 | 2.2 | 2.5 | 2.5 | 2.3 | 2 | 2.5 | 2.5 | 2.2 | 2.2 | 2 | 2 |
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| KL-Kr | nowleds | ge Le | vel:K1- | Remem | ber.K2 | Under | stand.H | X3-App | ly,K4-A | nalyse.K | | ate,K6-C | reate : | PO-F | rograme |
| Outcor | me: | , | | | ····· | | | rr | <i>,</i> | | | | • | | -9 |
| CO-Co | ourse O | utcom | e :PSO- | Progra | me Spe | cific Ou | tcome | | | | | | | | |



| PROG | RAM | | | BE - M | ining En | gineerin | g | | | | | | | |] |
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| Prereq | uisite | | | NIL | | | | | | | | | | | |
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| Course | o obioo | times | | To deve | elop mod | lern cond | cepts of | Industr | hal Mana | gement | | | | | |
| Cours | e objec | uves | | Student | a will be | abla to | | | | | | | | | - |
| | | | | 1 | Describ | e the M | anagem | ent theo | ory and s | vstem an | nroach | | | | - |
| Course | outcom | es | | 2 | Explain | the Oro | anagem | onal ma | nagemen | t process | s | | | | - |
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| | | | | 4 | Explain | the pers | sonal m | anagem | ent and i | ndustria | l relatio | ns | | | |
| | | | | 5 | Describ | be the fir | ancial r | nanage | ment and | its analy | ysis | | | | 1 |
| | | | | 6 | Discuss | s the role | of man | agemei | nt in mini | ing indus | stry | | | | |
| | | | | | | | | | | | | | | | |
| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO: |
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| CO4 - 1 - 1 1 3 | | | | | | | | - | - | - | 1 | 3 | - | 1 | 1 |
| CO5 | - | - | 2 | 1 | 2 | 1 | 2 | - | - | 2 | - | 2 | 2 | 1 | 1 |
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(Under Section 3 of UGC Act 1956) SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY B.E – MINING ENGINEERING ACADEMIC YEAR 2016-2020 (BATCH - I)

KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome

UNIT I INTRODUCTION

Evolution of management theory – Classical theory – Scientific Management Administrative theory – Behavioral approach – Neo classical theory – Modern theory – Systems approach

UNIT II CHARACTERISTICS AND IMPORTANCE OF MANAGEMENT

Meaning of management, Definition of management, Nature of management, Productivity concept of Management, Attaining Objectives

UNIT III MANAGEMENT PROCESS

Planning – Organizing – Directing – Motivating – Controlling – Coordinating and communicating – Staffing – Manpower planning and recruitment – Performance appraisal – Human resource development and planning.

UNIT IV MANAGEMENT PLANNING

Planning process, Types of planning, procedures of planning, programming for planning, advantages of planning, importance of Planning, projet and budjecting, importance of planning

UNIT V SKILLS AND ROLES OF MANAGAMENT PROFESSIONALS (10 Hrs)

Tasks of professionals' managers, managing survival and growth, challenges, building human organization, balance maintaining between creativity and conformity

(10 Hrs)

(10 Hrs)

(TOTAL: 50 Hrs)

TEXT BOOKS

1. Herald Koontz and Heinz Weihrich, 'Essentials of Management', McGraw Hill Publishing Company, Singapore International Edition, 1980.

2. M.Govindarajan and S.Natarajan, Principles of Management, Prentice Hall of India Pvt.Ltd. New Delhi 2007

REFERENCES

1. S.Chandran, Organizational Behaviors, Vikas Publishing House Pvt., Ltd, 1994

2. Ties, AF,Stoner and R.Edward Freeman, 'Management' Prentice Hall of India Pvt. Ltd. New Delhi 110011, 1992

3. Joseph J, Massie, 'Essentials of Management' Prentice Hall of India. Ltd. 1985

Designed by "Department of Mining Engineering"





| PROC | GRAM | | BE - | Minin | g Engir | neering | | | | | | | | | | |
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| objective of the 1 Define the operating systems, servers, MIS and data analysis | | | | | | | | | | | | | | | | |
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Concepts – Cloud computing / grid computing in mining, Big Data analytics.

UNIT II PROGRAMMING & DBMS CONCEPTS

Algorithm – Flow charts and Programming of mining application like pillar design – blast design – subsidence – Database and Relational database – development of software packages for mining companies – forms, queries and reports – Enterprise resource planning for material managements.

UNIT III COMPUTERISED MINE PLANNING

Introduction of Geostatistics – Reserve Estimation – kriging – block modelling and ore body modelling – Optimization and mine design – mine scheduling.

UNIT IV PROBLEM SOLVING - APPLICATIONS IN MINING

Ventilation network analysis – Support design – Application of CAD in mining – GIS in mining – online and offline monitoring and control – TDS, FEM and CFD concepts and basics of modelling and simulation. UNIT V RECENT TRENDS IN MINING SOFTWARE (10 Hrs)

Artificial intelligence – expert system – neural networks – robotics and its application in mining – Functionalities of mine planning software – fragmentation software and numerical software applicable to mining – Case studies of mining applications.

(TOTAL: 50 Hrs)

TEXT BOOKS:

1. KadriDagdelen, Editor, Computer Applications in the Minerals Industries, Colorado School of Mines, 1999.

2. Ramani R.V., et al. Computers in Mineral Industry, Oxford and IBH Publishers, 1994.

REFERENCES:

1. R.V.Ramani – Editor, APCOM Proceedings Application of Computers and Operations Research in the Mineral Industry, The Society of Mining, Metallurgy and Exploration, Inc., 1996.

Designed by "Department of Mining Engineering

(10 Hrs)

(10 Hrs)


SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY B.E – MINING ENGINEERING ACADEMIC YEAR 2016-2020 (BATCH - I)

| PROG | RAM | | BE - M | lining En | gineeri | ng | | | | | | | | | | |
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| UBMN | N803 | | MINE | SYSTEM | A ENG | INEERII | NG | 3 | | 0 | 0 |) | 3 | | | |
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| Prereq | uisite | | NIL | | | | | | | | | | | | | |
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| Objectives with | | 1-5 | | | | 1-5 | | | | 1-5 | | | | | | |
| learning | | | | | | | | | | | | | | | | |
| Outcon | me | | | | | | | | | | | | | | | |
| Aim / | Purpo | se | To kno | w basic o | of syste | m engin | eering | concept a | and anal | lysis and | to stud | y the var | rious | | | |
| of the | course | | techniq | ues of op | peration | is resear | ch, sir | nulation a | nd netw | ork ana | lysis. | | | | | |
| Instructional Students will be able to | | | | | | | | | | | | | | | | |
| objecti | ive of | the | 1 | Explain the basics of system engineering | | | | | | | | | | | | |
| course | | | 2 | Determine the solution of mining problems using Linear Programming | | | | | | | | | | | | |
| | | | 3 | Explain the Project Management with DEPT & CDM | | | | | | | | | | | | |
| | | | 4 | Explain Infor th | n the Pro | oject Ma | inagei | Mining S | PERI (| <u>x CPM</u> | | | | | | |
| | | | 5 | Describe the application of softwares in mining industry | | | | | | | | | | | | |
| | 1 | | 0 | | | | | | | | | | | | | |
| POS/ COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSC | 02 | PSO3 |
| CO1 | 1 | 1 | 1 | - | - | 2 | 1 | - | - | 2 | - | 2 | 2 | 1 | | 1 |
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| CO3 | - | - | 1 | - | - | - | 2 | - | - | 2 | 2 | 1 | 2 | 2 | | 2 |
| CO4 | - | 1 | - | - | 1 | 2 | 2 | - | - | - | 1 | 2 | - | 1 | | 1 |
| CO5 | - | - | 2 | 1 | 2 | 1 | 2 | - | - | 2 | 2 | 2 | 2 | 1 | | 1 |
| CO6 | 2 | 1 | 2 | 1 | 2 | 3 | 2 | - | - | 2 | 3 | 2 | 2 | 2 | | 2 |
| Avera ge | 1.1 | 1.5 | 2.21 | 1 | 2 | 2 | 2.22 | - | - | 2 | 2.5 | 2.1 | 1.8 | 1.5 | | 1.3 |
| Correla | tion Lev | rels | | 1.Slight(Low)2.Moderate(Medium)3.Substantial(High | | | | | | | | igh) | | | | |
| KL-Knowledge Level:K1-Remember,K2Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome | | | | | | | | | | | | | | | | |

UNIT I INTRODUCTION

10 Hrs

SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY B.E – MINING ENGINEERING ACADEMIC YEAR 2016-2020 (BATCH - I)

System Engineering – Concept of system, sub-system and system environment – Classification of system – System analysis – Creative aspects of planning and design – Factors influencing creativity, techniques and alternative solutions.

UNIT II LINEAR PROGRAMMING

Linear Programming models – Assumptions of Linear Programming, Graphical and simple method of solving Linear Programming problems – Basic and Basic feasible solutions, optimal solutions, interpretation of SIMPLEX table. Primal and Dual problem – Application of Linear programming for solutions of mining related problems of production planning, scheduling and blending.

UNIT III TRANSPORTATION AND ASSIGNMENT PROBLEMS

Transportation models – Variations on Classical Transportation models, Solution – Algorithm for Transportation problem – Assignment model, Variations on Classical Assignment model – Solution algorithm for assignment problems – Application to mining problems.

UNIT IV PROJECT MANAGEMENT WITH PERT & CPM

Assignment of PERT & CPM – Methods of drawing network – Redundancy and identification of redundant jobs – Critical path calculation – Criticality index – Statistics related to PERT – Probability of completing a project by a due date – Lowest cost Schedule – Case studies.

UNIT V NETWORK MODELS & SIMULATION

Introduction and concept – shortest route and minimal spannial tree problems – application to mining problems – Simulation – Introduction and concept – scope and limitation – System type versus simulation technique – Generating input data – Monte-Carlo simulation – Simulation of equipment maintenance and inventory systems in mines.

(TOTAL: 50 Hrs)

TEXT BOOKS:

Zambo, J., and Kiado, A., Optimum Location of Mining facilities, Springer Verlag, Budapest, 1968.

REFERENCES

Syal, I.C., and Gupta, B.P., Computer Programming and Engineering Analysis, A.B., Wheeler and Company, Madras 1986.

Designed by "Department of Mining Engineering"

10 Hrs

10 Hrs

10 Hrs

10 Hrs





SYLLABUS FOR UNDER GRADUATE IN ENGINEERING AND TECHNOLOGY B.E – MINING ENGINEERING ACADEMIC YEAR 2016-2020 (BATCH - I)

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| Aim / | / Purp | ose | | To car | ry out a s | tudy or | to solve | a pro | blem of | the minin | ng indus | try. | | | | | |
| of the | course | | | Studen | te will be | able to | underst | and | | | | | | | | | |
| | | | | 1 Define the problem | | | | | | | | | | | | | |
| | | | | 2 Discuss the factors influencing it | | | | | | | | | | | | | |
| | | | | 3 Illustrate the principles involved | | | | | | | | | | | | | |
| | | | | 4 | Describe the problem solving procedure | | | | | | | | | | | | |
| | | | | 5 | Explain the remedial methods. | | | | | | | | | | | | |
| COURS | SE OU | ГСОМ | ES | 6 | Discuss the result of the project | | | | | | | | | | | | |
| POS/ COS | PO1 | PO2 | PO | 3 PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO: | | |
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| CO3 | - | - | 2 | - | - | - | 2 | - | - | 2 | 2 | 2 | 2 | 2 | 2 | | |
| CO4 | - | - | - | - | 1 | 2 | 2 | - | - | - | 3 | 2 | 2 | 1 | 1 | | |
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| Desig | ned by | | | "Depart | tment of l | Mining | Enginee | ring" | | | | | | | | | |