SCHOOL OF ENGINEERING

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Outcome based Curriculum for

Undergraduate Degree Courses in Engineering & Technology

Department of Mining Engineering

(1) Vision: To produce quality human resource of high standard in Mining engineering who can contribute favourably to the technological and socio-economic development of the nation.

(2) Mission: Accomplish excellence in curricular, co-curricular activities with a committed faculty through teaching and research which creates technically competent and dedicated Mining engineers. We prepare students to understand and safely manage Earth and its resources for the future. To produce solutions for sectorial problems by scientific and industrial project with the cooperation of the mining industries.

(3) Program Educational Preambles (PEO's):

PEO 1: Graduates will be successful in mining engineer professions with creative knowledge.

PEO 2: Graduates will evidence a willingness to give professional and public service.

PEO3: Graduates will demonstrate an understanding of the importance of safety and sustainability in all activities, in the workplace. To demonstrate high standard of ethical conduct, positive attitude and social responsibilities.

(4) Programme Outcomes (PO's):

PO-1.Engineering knowledge: Graduates will demonstrate an ability to apply knowledge of mining engineering, mathematics, probability and statistics as it applies to the field of mining engineering.

PO-2. Problem analysis: Graduates will demonstrate in depth knowledge of topics which are critical to surface and underground mining especially mine planning, method of work, drilling systems, blasting, safety, mine environmental engineering and economics. In addition to these, some mine management, mine computing, etc.

PO-3. Design/development of solutions: Graduates will demonstrate the ability to function as a member of engineering and science laboratory teams, as well as on multidisciplinary design teams.

PO-4. Conduct investigations of complex problems: Graduates will demonstrate the ability to learn and work independently to identify and solve mining engineering related problems.

PO-5.Modern tool usage: An ability to Create, select, and apply appropriate techniques, resources, and modern engineering and modeling to complex engineering activities with an understanding of the limitations.

PO-6. The engineer and society: Graduates will have the confidence and potential to apply engineering solutions in global and social contexts. Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal.

PO-7. Environment and sustainability: Graduates will be truly educated and will have a point of view regarding global scenario of the impact of mining technology on society and especially on environment will demonstrate awareness of contemporary issues at large.

PO-8. Ethics: Graduates will demonstrate an understanding of professional and ethical responsibilities.

PO-9. Individual and team work: An ability to work effectively, as an individual and as a member or leader in teams, and inmultidisciplinary settings.

PO-10. Communication: Graduates will posses effective communication skills both orally and in writing. Make effective presentations, and give and receive clear instructions.

PO-11. Project management and finance: Ability to demonstrate management skills and apply engineering principles to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

PO-12. Life-long learning: An ability to recognize the need for, and pursue life-long learning in the broadest context of technological change.

(5) Program Specific Outcomes (PSOs):

PSO1: Analyze, design, operate, maintenance and evaluate various components, methods and system using state –of-art technology in Mineral extraction and process up.

PSO2: Effectively practice as professional engineers, managers, and leaders in the mining Industries and/or a wide variety of other fields as engineers.

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(06) Programme PO's and PSO's Mapping:

			PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		
S. No	**Program**	**Courses Category**	Engineering Knowledge	Problem Analysis	Design/ Development of Solution	Investigation	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team Work	Communication	Project Management	Life-Long Learning	**PSO 1**	**PSO 2**
1	BE(MINING)	Humanities and Social Sciences including Management courses	*	*			*	*		*		*		*		
2		Basic Science courses	*	*	*	*	*		*							
3		Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	*	*	*		*							*		
4		Professional core courses	*	*	*	*										
5		Professional Elective courses relevant to chosen specialization/branch	*	*	*	*	*	*		*	*					

6		Open subjects – Electives from other technical and /or emerging *subjects	*	*	*	*	*	*	*	*	*			*	*	*
7		Project work, seminar and internship in industry or elsewhere		*	*	*		*	*	*	*	*	*	*		*
8		Specific core subject		*	*	*										
9		Mandatory Course (Non credit)						*	*	*	*	*		*		

(07) Semester wise PO's and PSO's Mapping

Semester	Name of the Courses/POs(Basic, Core, Electives, Projects, Internships etc.)	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO 1	PSO 2
		Engineering Knowledge	Problem Analysis	Design/Development of Solution	Investigation	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team Work	Communication	Project Management	Life-Long Learning		
Semester-Ist	Mathematics-I	*	*	*	*								*		
	Engineering Physics	*	*		*								*		
	Basic Computer Engineering	*	*	*	*	*			*		*		*		
	Basic Mechanical Engineering	*	*	*	*	*									
	Basic Civil Engineering & Mechanics	*	*	*				*						*	
	Language Lab					*			*	*	*		*		
	Self Study / GD Seminar	*	*	*	*	*			*	*		*	*		
Semester-IInd	Mathematics-II	*	*	*	*								*		
	Engineering Chemistry	*	*	*	*										
	English for Communication	*									*			*	
	Basic Electrical & Electronics Engineering	*	*	*	*										
	Engineering Graphics	*	*	*	*										*
	Manufacturing Practices					*			*	*	*	*	*		
	Industrial Training			*	*		*	*	*	*		*	*	*	
Semester-IIIrd	Mathematics -III	*	*	*	*										
	Mining Environment-I		*	*		*	*	*						*	
	Mining Surveying-I	*	*	*	*	*								*	
	Rock Mechanics		*	*	*	*								*	
	Geology-I		*	*	*								*		
	Computer Programming	*	*	*	*	*									
	Self study /GD Seminar		*	*		*	*	*	*		*	*	*		
Semester-IVth	Energy, Ecology, Environment & Society						*	*		*				*	
	Drilling and Blasting		*			*	*							*	
	Underground Coal Mining		*			*		*							
	Mining Machinery-I		*		*	*									
	Geology-II		*	*	*									*	
	Computer Programming(Java)			*	*	*							*		
	Industrial Training-I		*	*		*	*	*	*	*		*	*		
Seme	Mining Surveying-II	*	*	*	*	*								*	

ster-Vth	Mineral Processing			*		*									
	Mining Machinery-II		*		*	*									
	Pollution Control Eng.					*	*	*							
	Computer Application in Mining	*	*	*	*	*								*	
	Mine Legislation						*	*							
	Mine Management								*	*	*	*			
	Industrial Training-II		*	*	*	*	*	*	*	*		*	*		
Semester VIth	Mine Environment-II		*	*		*	*	*						*	
	Underground Metal Mining		*	*	*	*	*	*					*	*	
	Surface Mining		*	*	*	*	*	*					*	*	
	Mine Ventilation and Climate eng.		*	*		*	*	*						*	
	Ground Control	*	*	*	*		*	*	*						
	Mine Safety Eng.	*	*	*	*	*	*	*							
	Mine Development	*	*	*	*	*	*	*	*				*	*	
	Mine Reclamation		*	*	*	*	*	*						*	
	Minor Project		*	*	*	*	*	*	*	*		*	*		
Semester VIIth	Mine Machinery-III	*	*		*	*		*						*	
	Strata Control			*	*	*								*	
	Operation Research in Mining		*	*	*	*	*	*							
	Mine Disasters		*	*	*	*	*	*							
	Mine Induced Subsidence Eng.		*	*	*	*	*	*							
	Mine Economics								*			*			
	Mine Hazards and Rescue		*	*	*	*	*	*							
	Project Stage-I		*	*	*	*	*	*	*	*		*	*		
	Self study/GD/Seminar		*	*	*		*	*	*	*		*	*		
Semester VIIIth	Mining Surveying-III	*	*	*	*	*								*	
	Mining Environment-III		*	*		*	*	*						*	*
	Rock Slope Engineering		*	*	*	*	*	*						*	
	Mine Planning		*	*	*	*	*							*	
	Rock Excavation eng.		*	*	*	*	*	*						*	
	Project Stage-II		*	*	*	*	*	*	*	*		*	*		
I/III/IV (preferred Semester)	Mandatory Courses							*	*	*	*	*	*		

(08) <u>Structure of Programme</u>: To fulfill the need of development of all the POs/ GAs, as per above mapping, the following semester wise programme structure are as under.

[L= Lecture, T = Tutorials, P = Practical's & C = Credits]

Total Credits*= 160

Structure of Undergraduate Engineering program:

S.No.	Course Category	Credits of the MINING Curriculum
1.	Humanities and Social Sciences including Management	08
2.	Basic Sciences	17
3.	Engineering Sciences including workshop, drawing, basics of electrical/mechanical/computer etc.	20
4.	Professional Core Subjects	68
5.	Professional Subjects: Subjects relevant to chosen specialization/branch	17
6.	Open Subjects: Electives from other technical and/or emerging subjects	13
7.	Project work, seminar and internship in industry or elsewhere	21
8.	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	Non-credit
	Total	**160**

***Definition of Credit:**

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 HoursPractical(Lab)/week	1 Credit

(09) Scheme of Exanimation (Mining Engineering) Academic Year 2019-20

I Semester

S. No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/ Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	BEBSC-101	Mathematics-I	60	30	10	-	-	100	3		-	3
2	BEBSC-202	Engineering Physics	60	30	10	30	20	150	2	1	2	4
3	BEESC-203	Basic Computer Engineering	60	30	10	30	20	150	3	-	2	4
4	BEESC-204	Basic Mechanical Engineering	60	30	10	30	20	150	2	-	2	3
5	BEESC-205	Basic Civil Engineering & Mechanics	60	30	10	30	20	150	3	-	2	4
6	BEHSMC-206	Language Lab	-	-	-	30	10	40	-	-	2	1
7	BELC-107	Self Study / GD Seminar					10	10			2	1
		Total	**300**	**150**	**50**	**150**	**100**	**750**	**13**	**1**	**12**	**20**

II Semester

S. No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/ Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	BEBSC-201	Mathematics-II	60	30	10	-	-	100	3		-	3
2	BEBSC-102	Engineering Chemistry	60	30	10	30	20	150	3		2	4
3	BEHSMC-103	English for Communication	60	30	10	30	20	150	3	-	2	4
4	BEESC-104	Basic Electrical Engineering	60	30	10	30	20	150	2	-	2	3
5	BEESC-105	Engineering Graphics	60	30	10	30	20	150	2	1	2	4
6	BEESC-106	Manufacturing Practices	-	-	-	30	10	40	-	-	2	1
7	BELC-207	Industrial Training					10	**10**	**-**	**-**	**2**	**1**
		Total	**300**	**150**	**50**	**130**	**100**	**750**	**13**	**1**	**12**	**20**

III SEMESTER

S. No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/ Quiz	End Sem. Practical & Viva	Practical Record /Assignment / Quiz / Presentation		L	T	P	
1	BEA-301	Mathematics-III	60	30	10	-	-	100	3		-	3
2	MIA302	Mining Environment-I	60	30	10	-	-	100	3		-	3
3	MIA-303	Mining Surveying – I	60	30	10	30	20	150	2	1	2	4
4	MIA-304	Rock Mechanics	60	30	10	30	20	150	3	-	2	4
5	MIA-305	Geology-I	60	30	10	30	20	150	2	1	2	4
6	MIA-306	Computer Programming (C Language)	-	-	-	30	20	50	-	-	2	1
7	MIA-307	Self Study / GD Seminar	-	-	-	-	50	50	-	-	2	1
TOTAL			**300**	**150**	**50**	**120**	**130**	**750**	**13**	**2**	**10**	**20**

IV SEMESTER

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	BEA-401	Energy, Ecology, Environment & Society	60	30	10	-	-	100	3	-	-	3
2	MIA-402	Drilling & Blasting	60	30	10	30	20	150	2	1	2	4
3	MIA-403	Underground Coal Mining	60	30	10	30	20	150	3		2	4
4	MIA-404	Mining Machinery -I	60	30	10	30	20	150	3	-	2	4
5	MIA-405	Geology –II	60	30	10	30	20	150	2	1	2	4
6	MIA-406	Computer Programming (Java)	-	-	-	30	20	50	-	-	2	1
7	MIA-407	Industrial Training-I	To be completed during fourth semester break. Its evaluation/credit to be added in fifth semester									
	TOTAL		**300**	**150**	**50**	**150**	**100**	**750**	**13**	**2**	**10**	**20**

V SEMESTER

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	MIA-501	Mining Surveying- II	60	30	10	30	20	150	2	1	2	4
2	MIA-502	Mineral Processing	60	30	10	30	20	150	2	1	2	4
3	MIA-503	Mining Machinery –II	60	30	10	30	20	150	2	1	2	4
4	MIA-504	Program Elective-I	60	30	10	-	-	100	3	1	0	4
5	MIA-505	Open Core Elective-I	60	30	10	-	-	100	3	1	0	4
6	MIA-506	Industrial Training-II				150	100	250		0	4	2
	TOTAL		**300**	**150**	**50**	**240**	**160**	**900**	**12**	**5**	**10**	**22**

MIA-504 Program Elective-I	MIA-504(A) Pollution Control Engineering	MIA-504(B) Computer Application in Mining
MIA-505 Open Core Elective-I	MIA-505(A) Mine Legislation	MIA-505(B) Mine Management

VI SEMESTER

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	MIA-601	Mine Environment- II	60	30	10	30	20	150	2	1	2	4
2	MIA-602	Underground Metal Mining	60	30	10	30	20	150	2	1	2	4
3	MIA-603	Program Elective-II	60	30	10	-	-	100	3	1	0	4
4	MIA-604	Program Elective-III	60	30	10	-	-	100	3	0	0	3
5	MIA-605	Open Core Elective-II	60	30	10	-	-	100	3	0	0	3
6	MIA-606	Minor Project	-	-	-	180	120	300	-	-	4	2
	TOTAL		**300**	**150**	**50**	**240**	**160**	**900**	**13**	**3**	**8**	**20**

MIA-603 Program Elective-II	MIA-603 (A) Surface Mining	MIA-603(B) Mine Ventilation and Climate Engineering
MIA-604 Program Elective-III	MIA-604(A) Ground Control	MIA-604(B) Mine Safety Engineering
MIA-605 Open Core Elective-II	MIA-605(A) Mine Development	MIA-605(B) Mine Reclamation

VII SEMESTER

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	MIA-701	Mine Machinery-III	60	30	10	30	20	150	3	0	2	4
2	MIA-702	Strata Control	60	30	10	30	20	150	3	0	2	4
3	MIA-703	Program Elective-IV	60	30	10	-	-	100	3	0	0	3
4	MIA-704	Open Core Elective-III	60	30	10	-	-	100	3	0	0	3
5	MIA-705	Project Stage-I	-	-	-	120	80	200	-	-	10	5
6	MIA-706	Self Study/GD/Seminar					200	200			2	1
	TOTAL		**240**	**120**	**40**	**180**	**320**	**900**	**12**	**0**	**16**	**20**

MIA-703 Program Elective-IV	MIA-703(A) Mine Disasters	MIA-703(B) Mining Induced Subsidence Engg.
MIA-704 Open Core Elective-III	MIA-704(A) Mine Economics	MIA-704(B) Mine Hazards and Rescue

VIII SEMESTER

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/ Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	MIA-801	Mining Surveying III	60	30	10	30	20	150	3	0	2	4
2	MIA-802	Program Elective-V	60	30	10	-	-	100	3	0	0	3
3	MIA-803	Open Core Elective-IV	60	30	10	-	-	100	3	0	0	3
4	MIA-804	Project Stage-II	-	-	-	240	160	400	-	-	16	8
	TOTAL		**180**	**90**	**30**	**270**	**180**	**750**	**9**	**0**	**18**	**18**

* Additional open electives can be provided as per the availability of faculty in the University and student should produce prior permission from Dean with a batch of atleast 5 students.

MIA-802 Program Elective-V	MIA -802(A) Mining Environment-III	MIA-803(B) Rock Slope Engineering
MIA-803 Open Core Elective-IV	MIA -803(A) Mine Planning	MIA-803(B) Rock Excavation Engineering

(10) Course Content

Semester- I

BEBSC-101 Mathematics-I

BEBSC-101	Mathematics-I	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:-

The Preamble of this foundational course is to review mathematical concepts already learnt in higher secondary. This course will also introduce fundamentals of mathematical functions, derivatives and aspects of calculus to students. This course deep understanding of matrix, differential equations, Sequences and series, Vector Space as well as a strong sense of how useful the subject can be in other disciplines of learning.

Course Outcome:-

Course work is designed to provide students the opportunity to learn key concepts of mathematical functions, key concepts of matrix , Vector Spaces as well as fundamentals and applications of integral calculus.

Unit-I Calculus (10Hrs):

Rolle's theorem, Mean Value theorems, Expansion of functions by Mc. Laurin's and Taylor's for one variable; Taylor's theorem for function of two variables, Partial Differentiation, Maxima& Minima (two variables), Method of Lagrange's Multipliers.

Unit-II Integral (6 Hrs):

Definite Integral as a limit of assume and Its application in summation of series ; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas, Multiple Integral, Change the order of the integration, Applications of multiple integral for calculating area and volumes of the curves.

Unit-III Sequences and series (6 Hrs):

Convergence 0f sequence and series, tests for convergence; Power series Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half rangesineandcosineseries,Parseval'stheorem.

Unit-IV Vector Spaces (6 Hrs):

Vector Space, Vector Sub Space, Linear Combination of Vectors, Linearly Dependent, Linearly Independent, Basis of a Vector Space, Linear Transformations.

Unit-V Matrices (10 Hrs):

Rank of a Matrix, Solution of Simultaneous Linear Equations by Elementary Transformation, Consistency of Equation, Eigen Values and Eigen Vectors, Diagonalization of Matrices, Cayley-Hamilton theorem and its applications to find inverse.

References:-

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

BEBSC- 202 Engineering Physics

BEBSC- 202	Engineering Physics	2L:1T:0P	3 credits	3Hrs/Week

Course Preamble:-

- A comprehensive, high-quality education in the physical sciences
- A flexible curriculum with multiple concentrations that allows students to tailor their education according to their specific interests
- The opportunity to experience the excitement of scientific discovery through direct participation in faculty research
- An increased awareness of the physical processes in the surrounding world
- The essential knowledge and analytical, mathematical and computational tools with which to pursue post-graduate education in a variety of physics-related and other fields
- The foundation and practical skill sets for eventual success in any of a broad array of careers
- The motivation for a lifelong love of learning

Course Outcomes:

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to design a system, component, or process to meet desired needs within realistic constraints.
- An ability to function on multidisciplinary teams.
- An ability to identify, formulate, and solve engineering problems.
- An understanding of professional and ethical responsibility.
- An ability to communicate effectively.
- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- A recognition of the need for, and an ability to engage in life-long learning.
- A knowledge of contemporary issues.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Unit I Relativistic Mechanics: (6 Hrs):

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Mass less particle.

Unit II Solid state & Nuclear physics (10 Hrs):

Free electron theory of metals, Qualitative discussion of Kronig -penny model and origin of energy bands. Intrinsic and Extrinsic Semi conductors. V-I Characteristics of PN junction diode, Zener diode, Hall-effect.

Introduction to Nuclear Physics, Static properties of Nucleus, Nuclear liquid drop model, Nuclear Shell Model, Linear particle accelelerator, Cyclotron, Betatron, Bainbridge mass sprectrograph.

Unit III Quantum Mechanics: (6Hrs):

Introduction to Quantum mechanics, Wave particle duality, Matter waves, Particle velocity, Phase velocit , Group velocity and their relation. Heisenberg's Uncertainty Principle. Time-dependent and time-independent Schrodinger wave equation, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Unit IV Wave Optics: (10 Hrs):

Interference :Coherent sources, Interference in uniform and wedge shaped thin films, Newton's Rings and its applications. Fraunh offer diffraction at single slit and at double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power of grating, Rayleigh's criterion of resolution. Resolving power of grating and Prism.

Unit V Fibre Optics & Lasers: Fibre Optics:(10 Hrs):

Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.

Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Reference Books: -

1. Concepts of Modern Physics – Aurthur Beiser (Mc-Graw Hill)

2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)

3. Optics - Brijlal& Subramanian (S. Chand)

4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)

5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)

6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

BEBSC- 202	Engineering Physics	0L:0T:1P	1 credits	2Hrs/Week

List of Experiments: -

1. To determine the wavelength of sodium light by Newton's ring experiment.

2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.

3. To determine the energy band gap of a given semiconductor material.

4. To determine the plank's constant with help of photocell.

5 . Resolving Power of Telescope.

6 .V-I Charecteristics of P-N Junction diode.

7. Zener diode characteristics.

8. To determine the dispersive power of prism.

BTEESC-203 Basic Computer Engineering

BTEESC-203	Basic Computer Engineering	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:-

- Successfully practice computer engineering to serve state and regional industries, government agencies, or national and international industries.
- Work professionally in one or more of the following areas: computer hardware and software design, embedded systems, computer networks and security, system integration, and electronic design automation.
- Achieve personal and professional success with awareness and commitment to their ethical and social responsibilities, both as individuals and in team environments.
- Maintain and improve their technical competence through lifelong learning, including entering and succeeding in an advanced degree program in a field such as engineering, science, or business.

Course Outcome:-

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

Unit –I Computer: (6Hrs):

Definition, Classification, Organization i.e. CPU, register, Memory & Storage Systems, I/O Devices, and System & Application Software. Computer application E-Business, Bio-Informatics, health Care, Remote Sensing & GIS, Meteorology and, Computer Gaming, Multimedia and Animation etc.

Unit –II Introduction to Algorithms (6 Hrs):

Complexities and Flowchart, Introduction to Programming, Categories of Programming Languages, Program Design, Programming Paradigms, Characteristics or Concepts of OOP, Procedure Oriented Programming VS object oriented Programming. Introduction to C, Character Set, Tokens, Precedence and Associativity, Program Structure, Data Types, Variables, Operators, Expressions, Statements and control structures, I/O operations, Array, Functions,

Unit – III Computer System Overview (10 Hrs):

Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-Preambles and functions, Evolution of Operating System. - Computer System Organization- Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

Unit IV Computer Networking (10 Hrs):

Introduction, Goals, OSI Model, Functions of Different Layers. Internetworking Concepts, Devices, TCP/IP Model. Topology, Introduction to Internet, World Wide Web, E• commerce Computer Security Basics: Introduction to viruses, worms, malware, Trojans, Spyware and Anti-Spyware Software, Different types of attacks like Money Laundering,

Information Theft, Cyber Pornography, Email spoofing, Denial of Service (DoS), Cyber Stalking, ,Logic bombs, Hacking Spamming, Cyber Defamation, Security measures Firewall,

Unit V Data base Management System (10 Hrs):

Introduction, File oriented approach and Database approach, Data Models, Architecture of Database System, Data independence, Data dictionary, DBA, Primary Key, Data definition language and Manipulation Languages. Cloud computing: definition, cloud infrastructure, cloud segments or service delivery models (IaaS, PaaS and SaaS), cloud deployment models/ types of cloud (public' private, community and hybrid clouds), Pros and Cons of cloud computing

Reference books:

1. Introduction of computers: Peter Norton, TMH
2. Object oriented programming with c++ :E.Balaguruswamy,TMH
3. Object oriented programming in C++: Rajesh k.shukla ,Wiley India
4. Computer network: Andrew Tananbaum,PHI
5. Data base management system,Korth,TMH
6. Operating system-silberschatz and Galvin-Wiley India

BTEESC-203	Basic Computer Engineering	0L:0T:1P	1 credits	2Hrs/Week

List of Experiment:-

1. Study of input and output devices of computer systems .
2. Write a program of addition, subtract, multiplication and division by using C.
3. Write a program to check weather a number is prime or not.
4. Study of various types of Operating System.
5. Study and practice of basic Linux commands-ls, cp, mv, rm, chmod kill, ps etc.
6. Design color coding of straight & crossover cable.
7. Installation of oracle 10g. Also create a employee table.

BEESC-204 Basic Mechanical Engineering

BEESC-204	**Basic Mechanical Engineering**	**2L:0T:0P**	**2 credits**	**2Hrs/Week**

Course Preamble:

- To provide a comprehensive knowledge of basic mechanical systems.
- Basic concepts from mechanical engineering sciences,
- Basic concepts I.C Engine
- Modern engineering tools (machine-tools, laboratory instrumentation, Working principle of steam Engine), and related subjects to design mechanical engineering components

Course Outcome:

- After successful completion of this course students will able to
- To describe and use basic engineering concepts
- principles and components of mechanical equipment
- measuring & testing method of physical quantities
- Assessment of boiler component.

Unit I Materials (6 Hrs):

Classification of engineering material, Composition of Cast iron and Carbon steels, Iron Carbondiagram. Alloy steels their applications. Mechanical properties like strength, hardness, toughness ductility, brittleness , malleability etc. of materials , Tensile test- Stress-strain diagram of ductile and brittle materials ,

Unit II Measurement (10 Hrs):

Concept of measurements, errors in measurement, Temperature, Pressure, Velocity, Flow strain, Force and torque measurement, Vernier caliper, Micrometer, Dial gauge, Slip gauge, Sine-bar and Combination set. Production Engineering: Elementary theoretical aspects of production processes like casting, carpentry, welding etc Introduction to Lathe and Drilling machines and their various operations.

Unit III Fluids (6Hrs):

Fluid properties pressure, density and viscosity etc. Types of fluids , Newton's law of viscosity ,Pascal's law , Bernoulli's equation for incompressible fluids, Only working principle of Hydraulic machines, pumps, turbines, Reciprocating pumps .

Unit IV Thermodynamics (10Hrs):

Thermodynamic system, properties, state, process, Zeroth, First and second law ofthermodynamics, thermodynamic processes at constant pressure, volume, enthalpy & entropy.

Steam Engineering: Classification and working of boilers, mountings and accessories of boilers, Efficiencyand performance analysis, natural and artificial draught, steam properties, use of steam tables.

Unit V Reciprocating Machines (10 Hrs) :

Working principle of steam Engine, Carnot, Otto, Diesel and Dual cycles P-V & T-S diagrams and its efficiency, working of Two stroke & Four stroke Petrol & Diesel engines. Working principle of compressor.

References : -

1- Kothandaraman & Rudramoorthy, Fluid Mechanics & Machinery, New Age . 2- Nakra &Chaudhary , Instrumentation and Measurements, TMH.

3- Nag P.K, Engineering Thermodynamics , TMH .

4- Ganesan , Internal Combustion Engines, TMH .

5- Agrawal C M, Basic Mechanical Engineering ,Wiley Publication. 6- Achuthan M , , Engineering Thermodynamics ,PHI.

BEESC-204	**Basic Mechanical Engineering**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

List of Experiments: -

1- Study of Universal Testing machines.

2- Linear and Angular measurement using, Micrometer, Slip Gauges, Dial Gauge and

3- Study of Lathe Machine.

4- Study of Drilling Machines.

5- Verification of Bernoulli's Theorem.

6- Study of various types of Boilers.

7- Study of different IC Engines.

8- Study of different types of Boilers Mountings and accessories.

BEESC-205 Basic Civil Engineering & Mechanics

BEESC-205	Basic Civil Engineering & Mechanics	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble: The goal of this Engineering Mechanics course is to expose students to problems in mechanics as applied to plausibly real-world scenarios. Problems of particular types are explored in detail in the hopes that students will gain an inductive understanding of the underlying principles at work; students should then be able to recognize problems of this sort in real-world situations and respond accordingly.

The civil engineering program will serve Connecticut and the nation by providing a quality engineering education that enables students to enter a profession that can improve the civil infrastructure, and economic welfare. Our civil engineering program will maintain a strong emphasis on undergraduate education with the goal that our program will be recognized for quality instruction in civil engineering analysis and design

Course Outcomes:

- Demonstrate knowledge of various surveying methods.
- Conduct a chain survey.
- Conduct a compass survey.
- Conduct levelling survey and be able to do RL calculations.
- Demonstrate knowledge of properties of various building materials.
- Draw free body diagrams and determine the resultant of forces and/or moments.
- Determine the centroid and second moment of area of sections.
- Apply laws of mechanics to determine efficiency of simple machines with consideration of friction.
- Analyse statically determinate planar frames.

Unit I Building Materials & Construction (10 Hrs)

Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing. Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases – types and their suitability

Unit II Surveying & Positioning (10 Hrs):

Introduction to surveying Instruments – levels, theodolites , plane tables and related devices.Electronic surveying instruments etc. Measurement of distances – conventional and EDMmethods, measurement of directions by different methods, measurement of elevations bydifferent methods. Reciprocal levelling .

Unit III Basics of Engineering Mechanics covering (10 Hrs):

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

Unit IV Centroid and Centre of Gravity covering (10 Hrs):

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

Unit V Friction covering (10 Hrs):

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames

Reference Books:

1. S. Ramamrutam & R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.

2. Prasad I.B., Applied Mechanics, Khanna Publication.

3. Punmia, B.C., Surveying, Standard book depot.

4. Shesha Prakash and Mogaveer; Elements of Civil Engg & Engg. Mechanics; PHI

BEESC-205	**Basic Civil Engineering & Mechanics**	**0L:0T:2P**	**1 credits**	**2Hrs/Week**

List of Experiments:-

1. To perform traverse surveying with prismatic compass, check for local attraction anddetermine corrected bearings and to balance the traverse by Bowditch's rule.

2. To perform leveling exercise by height of instrument of Rise and fall method.

3. To measure horizontal and vertical angles in the field by using Theodolite.

4. To determine (a) normal consistency (b) Initial and Final Setting time of a cement Sample.

5. To determine the workability of fresh concrete of given proportions by slump test or compaction factor test.

6. To determine the Compressive Strength of brick .

7. To determine particle size distribution and fineness modulus of course and fine Aggregate.

8. To verify the law of Triangle of forces and Lami's theorem.

9. To verify the law of parallelogram of forces.

10. To verify law of polygon of forces

11. To find the support reactions of a given truss and verify analytically.

12. To determine support reaction and shear force at a given section of a simply Supported beam and verify in analytically using parallel beam apparatus.

13. To determine the moment of inertia of fly wheel by falling weight method.

14. To verify bending moment at a given section of a simply supported beam.

BEHSMC-206 Language Lab and Seminar

BEHSMC-206	**Language Lab and Seminar**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

Course Preamble: This course intends to impart practical training in the use of English Language for

Communicative purposes and aims to develop students' personality through language Laboratory.

Topics to be covered in the Language laboratory sessions:

1. **1.** Introducing oneself, family, social roles.
2. 2.Public Speaking and oral skills with emphasis on conversational practice, extempore speech, JAM(Just a minute sessions), describing objects and situations, giving directions, debate, telephonic etiquette.
3. Reading Comprehension: Intensive reading skills, rapid reading, and reading aloud (Reading material to be selected by the teacher).
4. To write a book review. Standard text must be selected by the teacher.
5. Role plays: preparation and delivery topic to be selected by teacher/faculty.

BELC–207 Self Study / GD Seminar

BELC–207	**Self-Study / GD Seminar**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

Course Preamble:

To improve the mass communication and convincing / understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves. Evaluation will be done by assigned faculty based on group discussion and power point presentation.

Course Outcomes:

- Analytical thinking
- Lateral thinking
- constructive argument
- Communication skill
- Presentation of views

Students will discuss the course related and interdisciplinary topics for problem solving. They will improve the mass communication and convincing / understanding skills about subject and their related problem in a group of students.

BEBSC-201 Mathematics-II

BEBSC-201	Mathematics-II	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

1. To introduce the basic concepts required to understand, construct, solve and interpret differential equations.
2. 2. To teach methods to solve differential equations of various types.
3. 3. To give an ability to apply knowledge of mathematics on engineering problems

Course Outcomes:

The students will be able to :

1. Classify differential equations according to certain features.

2. Solve first order linear equations and nonlinear equations of certain types and interpret the solutions.

3. Understand the conditions for the existence and uniqueness of solutions for linear differential equations

4. Solve second and higher order linear differential equations with constant coefficients and construct all solutions from the linearly independent solutions

5. Find series solutions about ordinary and regular singular points for second order linear differential equations.

6. Solve initial value problems using the Laplace transform.

7. Solve systems of linear differential equations with methods from linear algebra

Unit - I Ordinary Differential EquationsI (6 Hrs):

Differential Equations of First Order and First Degree (Leibnitz linear, Bernoulli's, Exact), Differential Equations of First Order and Higher Degree, Higher order differential equations with constants coefficients, Homogeneous Linear Differential equations, Simultaneous Differential Equations.

UNIT-II Ordinary differential EquationsII (6 Hrs):

Second order linear differential equations with variable coefficients, Method of variation of parameters, Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Unit III Partial Differential Equations (10 Hrs)

Formulation of Partial Differential equations, Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients.

Unit IV Functions of Complex Variable (10 Hrs)

Functions of Complex Variables: Analytic Functions,HarmonicConjugate,Cauchy-RiemannEquations(withoutproof),Line Integral, theorem ,Cauchy Integral formula (without proof), Singular Points, Poles &Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral

Unit V Vector Calculus(10 Hrs)

Differentiation of Vectors, Scalar and vector point function, Gradient, Geometrical meaning of gradient, Directional Derivative, Divergence and Curl, Line Integral, Surface Integral and Volume Integral, Gauss Divergence, Stokes and Green theorems.

References : -

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,

2002.

2. Erwin kreyszig , Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

3. W. E. Boyce and R. C. Dip rima Elementary Differential Equations and Boundary Value Problems, 9th

End., Wiley India, 2009.

4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

5. E. A. Codington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.

6. E. L. Inca, Ordinary Differential Equations, Dover Publications, 1958.

7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill,

2004.

8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

BEBSC-102 Engineering Chemistry

BEBSC-102	Engineering Chemistry	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:

1. To acquire knowledge about hardness of water and importance of water in industrial purpose.
2. To understand the concept of molecular spectroscopy.
3. To gain the knowledge of about polymeric material and biodegradable substances.
4. To understand the mechanism of lubricant and properties of lubricant.

Course Outcomes:

1. Develop innovative methods to produce soft water for industrial use.
2. Identify the structure of unknown / new compounds with the help of spectroscopy.
3. Substitute metal with conducting polymers and produce cheaper biodegradable polymers to reduce environmental pollution.
4. Apply their knowledge for use and protect to industrial and domestic equipment.

UNIT-I Atomic and molecular structure (6Hrs)

Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals .Equations for atomic and molecular orbitals.water treatment- Introduction, hardness of water, Units of hardness, disadvantage of hard water, scale and sludge formation in boilers, boilers troubles.

UNIT-II Spectroscopic techniques and applications (10Hrs)

Principles of spectroscopy and selection rules.Electronic spectroscopy.Fluorescence and itsapplications in medicine.Vibrational and rotational spectroscopy of diatomic molecules. Applications.Nuclear magnetic resonance and magnetic resonance imaging,surface characterisation techniques. Diffraction and scattering.

UNIT-III Intermolecular forces and potential energy surfaces(6Hrs)

Ionic, dipolar and van Der Waals interactions. Lubricant-Introduction, mechanism of lubricant, classification of lubricant, properties of lubricating oils.

UNIT-IV Use of free energy in chemical equilibria (10Hrs)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.High Polymers-Introduction, nomenclature, types of polymerization, classification of polymers, plastics-important, thermo-plastic resins and thermo setting resin,

UNIT-V Periodic properties (10Hrs)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

REFRENCES:

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
   Fundamentals of Molecular Spectroscopy, by C. N. Banwell
3. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.
4. Physical Chemistry, by P. W. Atkins
5. engg. Chemistry jain.jain
6. engg. Chemistry shashi chawla.

BEBSC-102	**Engineering Chemistry**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

LIST OF EXPERIMENTS:

1. Determination of surface tension and viscosity
2. Determination of chloride content of water
3. Determine the change of viscosity of given lubricating oil with change in temperature by Redwood Viscometer No. 1.
4. Determine the change of viscosity of given lubricating oil with change in temperature by Redwood Viscometer No. 2.
5. To determine the flash and fire point of given lubricating oil by Cleveland's open cup apparatus.
6. To determine the flash and fire point of given lubricating oil by Abel's closed cup apparatus.
7. To determine the flash and fire point of given lubricating oil by Pensky Marten's apparatus.
8. To determine the total hardness of given water sample by titrating it against EDTA solution using EBT as an indicator.

(iii) Laboratory Outcomes:

(iv) The students will learn to:

(v) • Estimate rate constants of reactions from concentration of reactants/products as a function of time

(vi) • Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc

(vii) • Synthesize a small drug molecule and analyse a salt sample

BEHSMC-103 English for Communication

BEHSMC-103	English for Communication	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

1. To enhance Professional competence in reading, writing, listening and speaking.
2. To modify the tactic of providing information about the language by using several techniques.
3. To minimize the Grammar Translation Method of ELT by replacing it with Direct Learning Method.
4. To Introduce Communicative Method of ELT and focusing the teaching pedagogy to the student-centered learning rather than the teacher-centered learning.
5. To develop the skills to master three major forms of communications which are vital in academic and professional settings namely professional presentations, interviews and group communications respectively.
6. To provide a deep insight of techniques for delivering effective presentations, appealing job interviews, and actively participating in various forms of group communication.

Course Outcomes (CO):

At the end of this course students will have:

CO1: Ability to design a language component or process to meet desired need within Realistic, Constraints such as economic, environmental, social, political, ethical Scenario.
CO2: Ability to analyze the usage of English words in different contexts.
CO3: An understanding of technical and academic articles' comprehension.
CO4: The ability to present oneself at multinational levels knowing the type of different Standards of English

UNIT-I Identifying Common errors in writing(6 Hrs):

Articles, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Reported Speech: Direct and Indirect, Sentence Structure.

UNIT-II Vocabulary building and Comprehension (6 Hrs)

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, synonyms, antonyms, Reading comprehension.

UNIT-III Communication:(10 Hrs)

Introduction, Meaning and Significance, Process of Communication, Oral and Written Communication, 7 c's of Communication, Barriers to Communication and Ways to overcome them, Importance of Communication for Technical students, nonverbal communication.

UNIT-IV Developing Writing Skills(10 Hrs)

Planning, Drafting and Editing, Precise Writing, Précis, Technical definition and Technical description. Report Writing: Features of writing a good Report, Structure of a Formal Report, Report of Trouble, Laboratory Report, Progress Report.

UNIT-V Business Correspondence (10 Hrs):

Importance of Business Letters, Parts and Layout; Application, Contents of good Resume, guidelines for writing Resume, Calling/ Sending Quotation, Order, Complaint, E-mail and Tender.

References:-

1. 'Technical Communication : Principles and practice', Meenakshi Raman and Sangeeta Sharma (Oxford)
2. 'Effective Business Communication', Krizan and merrier (Cengage learning)
3. 'Communication Skill, Sanjay Kumar and pushlata, OUP2011
4. "Practical English Usage Michael Swan OUP, 1995.
5. "Exercises in spoken English Parts I-III CIEFL, Hyderabad, Oxford University Press
6. On writing well, William Zinsser, Harper Resource Book 2001.
7. Remedial English Grammar, F.T. Wood,Macmillan2007.

BEHSMC-103	**English for Communication**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

List of Experiments:-

1. Listening Comprehension.
2. Pronunciation, Intonation, Rhythm
3. Practicing everyday dialogues in English
4. Interviews.
5. Formal Presentation

BEESC-104 Basic Electrical and Electronics Engineering

BEESC-104	**Basic Electrical and Electronics Engineering**	**2L:0T:0P**	**2 credits**	**2Hrs/Week**

Course Preamble:-

Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context and to provide students the working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.To impart basic knowledge of electronic devices and digital conversion.

Course Outcomes:

- To understand and analyze basic electric and magnetic circuits
- To study the working principles of electrical machines and power converters.
- To introduce the components of low voltage electrical installations and safety devices.
- To introduce with basic electronics devices and logic gates

Unit-I Electrical circuit elements (10 Hrs):

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff‟s laws, Loop and-delta transformation,nodal methods, Superposition of a theorem, Thevenin theorem, Norton theorem.

Unit-II AC Circuits (10 Hrs):

Representation of Sinusoidal waveforms –Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor. Three phase balanced circuits, voltage and current relations in star and delta connections.

Unit-III Magnetic circuit (6Hrs)

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.**Components of LT Switchgear:** Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

Unit-IV (10Hrs):Digital Electronics (10 Hrs): Number systems used in digital electronics, decimal, binary, octal, hexadecimal, their complements, operation and conversion, floating point and signed numbers, Demorgan's theorem, AND, OR, NOT, NOR, NAND, EX-NOR, EX-OR gates and their representation, truth table, half and full adder circuits, R -S flip flop, J-K flip flop.

Unit-VElectronic Components And Circuits- (6Hrs)

Introduction to Semiconductors, Diodes, V -Icharacteristics, amplifiers,transistors,Bipolar junction transistors (BJT) and their working, introduction to CC, CB & CE transistor configurations, different configurations and modes of operation of BJT, DC biasing of BJT

Reference's: -

1. "Basic Electrical Engineering", RituSahdev,
2. "Electrical EngineeringS. Singh, P.V. Prasad,
3. E. Hughes, "Electrical Technology," Pearson Education, 2010.
4. I. J. Nagrath& D. P. Kothari, „Basic Electrical Engineering" TATA McGraw Hill Edu.
5. V. Del Toro, "Electrical Engg Fundamentals," PHI Learning.
6. B. Dwivedi& A. Tripathi "Fundamentals of Electrical Engineering" Wiley India.
7. D. A. Bell, "Electric Circuits," 7th Ed., Oxford Higher Education.
8. Graham Bell: Electronic Devices and Circuits, PHI

BEESC-104	Basic Electrical and Electronics Engineering	0L:0T:1P	1 credits	2Hrs/Week

Laboratory objectives:

1. Read and demonstrate the rating of basic equipments used in electrical engineering
2. Connections of different components as per the rules
3. Application different components in electrical field

Laboratory Outcomes

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.

List of Experiments: -

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.
13. To study the V-I Characteristics of Transistors.
14. To study V-I characteristics of various Diodes.
15. To study running and speed reversal of a three phase induction motor and record speed in both directions.
16. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

BEESC-105 Engineering Graphics and Design

BEESC-105	Engineering Graphics and Design	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

1. Increase ability to communicate with people.
2. Learn to sketch and take field dimensions.
3. Learn to take data and transform it into graphic drawings.
4. Learn basic Auto Cad skills.
5. Learn basic engineering drawing formats.
6. Prepare the student for future Engineering positions.

Course OUTCOMES: -

Student's ability to hand letter will improve.

1. Student's ability to perform basic sketching techniques will improve.
2. Students will be able to draw orthographic projections and sections.
3. Student's ability to use architectural and engineering scales will increase.
4. Students ability to produce engineered drawings will improve
5. Student's ability to convert sketches to engineered drawings will increase.
6. Students will become familiar with office practice and standards.
7. Students will become familiar with Auto Cad two dimensional drawings.
8. Students will develop good communication skills and team work.

UNIT-I Introduction to Engineering Drawing(10 Hrs):

Principles of Engineering Graphics and their significance, usage of Drawing instruments, Lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Venire Scales;

UNIT-II Orthographic Projections (10 Hrs):

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes; Projections of Regular Solids those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale

UNIT-III Sections and Sectional Views of Right Angular Solids (6 Hrs):

Prism, Cylinder, Pyramid, Cone –Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only).

UNIT-IV Isometric Projections: (6 Hrs):

Principles of Isometric projection –Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

UNIT-V Overview of Computer Graphics: (10 Hrs):

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Objects, Isometric Views of lines, Planes, Simple and compound Solids; Customization & CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of Units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance.

References:-

1.Bhatt N.D., Paschal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House

2.Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

3.Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication

4.Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

5.CAD Software Theory and User Manuals

BEESC-105	**Engineering Graphics and Design**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

List of Experiments:-

1. Sketching and drawing of geometries and projections based on above syllabus
2. Term work: A min. of 30 hand drawn sketches (on size A4 graphic sketch Book) plus 5 CAD-printouts on size A4 sheets plus 10 sheets of size A2 or 6 sheets of size A1, (50% marks to be allotted for this record + 25% marks for attendance +25%marks for Teachers Assessment

BEESC-106 Manufacturing Practices

BEESC-106	Manufacturing Practices	0L:0T:1P	1 credits	2Hrs/Week

Course Preambles:

1. To understand process of cutting shaping.
2. To understand working principles for various machining processes.
3. To understand construction, working and applications of various machine tools.
4. To learn basic set up, working and applications of a few important non conventional machining processes to get hand on experience on various machine tools.

Course Outcomes:

1. The students will be able to understand the details about machines used in production.
2. The students will be able to understand the mechanics behind metal cutting.
3. The students will be able to understand the finishing and super finishing processes.
4. The students will be able to understand the Physics of material removal behind the various non-conventional machining processes.

Manufacturing is fundamental to the development of any engineering product. The course on Engineering Workshop Practice is intended to expose engineering students to different types of manufacturing / fabrication processes, dealing with different materials such as metals, ceramics, plastics, wood, glass etc. While the actual practice of fabrication techniques is given more weightage, some lectures and video clips available on different methods of manufacturing are also included.

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools
4. Carpentry
5. Plastic molding, glass cutting
6. Metal casting
7. Welding (arc welding & gas welding), brazing

List of Experiments:-

1. Carpentry Shop Experiment To Make a T-LAP joint with wood Pieces
2. Machine Shop Experiment To Perform Knurling on Iron Rod
3. WELDING SHOP (LAP Joint) , Tools, Accessories, Diagram And Explanation
4. SHEET METAL SHOP (Square Tray) , Parts, Accessories, Diagram And Explanation
5. FITTING SHOP (Make a Joint) , Parts, Accessories, Diagram And Explanation
6. CARPENTRY SHOP (T-Lap Joint) , Cutting Tools, Accessories, Diagram and Explanation
7. MACHINE SHOP (the lathe machine) , Parts, Accessories, Diagram and Explanation

BELC 207 Industrial Training

BELC 207	**Industrial Training**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.

Students will discuss the course related and interdisciplinary topics for problem solving. They will improve the mass communication and convincing / understanding skills about subject and their related problem in a group of students.

SEMESTER -III

BEA-301 Mathematics-III

BEA-301	Mathematics-III	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:
To enable the students to apply the knowledge of Mathematics in various engineering fields by making them

- to understand the method of solving algebraic, transcendental equations and to determine the approximate value of the derivative & definite integral for a given data using numerical techniques.
- able to expand the given periodic function defined in the given range in terms of sine and cosine multiple of terms as a Fourier series and to extremise the functional using integration technique and to solve the partial differential equation using different analytical techniques.

Course outcomes:
On completion of this course, students will be able to

- Solve field problems in Engineering involving PDEs.
- Use the root finding techniques to solve practical engineering problems.
- to apply the concept of numerical analysis to find the relative strengths and weaknesses of each computation method and know which are most applicable for given problem.
- to apply the analytical technique to express periodic function as a Fourier sine and cosine series.
- Estimate Laplace and Fourier transform and z transform.

Unit I: Numerical Methods: (10 hours) Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Unit II: Numerical Methods: **(7 hours)** Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.,

Unit III: Numerical Methods: (10 hours) Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge Kutta method of fourth order for solving first and second order equations, Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poisson equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Unit IV: Transform Calculus: (10 hours) Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

Unit V: Concept of Probability:(5 hours) Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book
8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968. Statistics.

MIA-302 MINING ENVIRONMENT –I

MIA-302	Mining Environment-I	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:

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

Course Outcomes:

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

Unit I: **(10 Hours)**

Introduction Ventilation requirements in mines, natural ventilation and mechanical ventilation. Mine Gases Composition of atmospheric air. Mine gases - occurrences, properties, physiological effects.

Unit II: (8 Hours)

Detection; sampling, analysis, monitoring. Methane layering, methane drainage. Radon and its daughter products - effects and control. Heat and Humidity Sources, effects and control of heat and humidity in mines.

Unit III: **(8 Hours)**

Cooling power of mine air – psychrometry, Kata thermometer, effective temperature. Air conditioning. Spot coolers. Airflow in Mine Workings Reynold's number, laminar and turbulent flow. Square law of mine ventilation.

Unit IV: (8 Hours)

Frictional and shock losses. Equivalent orifice. Resistance in series and parallel. Ventilation control devices. Splitting of air current. Ventilation network analysis – conventional method and scope for computer application. Airborne Respirable Dust Definition – generation, physiological effects, sampling.

Unit V : (8 Hours)

Measurement And Control Measures. Mine Illumination Flame safety lamp – construction, maintenance, gas testing. Cap lamps. Lamp room layout and organization. Underground lighting from mains. Illumination standards. Photometry. Illumination survey. Miners' Diseases.

References:

1.Mishra, G.B. Mine Environment and Ventilation, Oxford University Press, 1992.

2.Hartman, H.L. Mine Ventilation and Air Conditioning, Wiley Interscience publication, 1993.

3.Hall, C.J., Mine Ventilation Engineering, Society of Mining Engineers, New Engineers, New York, Second Edition, 1992.

4.Vutukuri, V.S., Mine Environment Engineering, Trans Tech Publishers, 1986.

5.McPherson, M.J., Subsurface Ventilation and Environmental Engineering, Chapman andHall Publication, London, 1993.

MIA-303 MINING SURVEYING– I

MIA-303	Mining Surveying – I	2L:0T:0P	2 credits	2Hrs/Week

Course Preamble:

· To measure distance and directions by chain, compass and plane table surveying.
· To compute areas and volumes.
· To be familiar with various types of leveling instruments, temporary adjustment of leveling instruments and to learn various methods of determination of RL.
· To use theodolite instrument to measure angle.

Course Outcome-

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

· The students will be able to apply technical knowledge on linear measurements by chain, tape, compass and plane table surveying.
· The students will possess ability to identify, formulate, and solve engineering problems in leveling.
· The students will possess ability to determine angles using theodolite.
· The students will possess ability to use the techniques, skills and modern engineering tools necessary for mine surveying.

Unit I: (10 Hours)

Chain Survey Linear Measurements; Types of chains; Tapes; Errors in chaining and corrections in linear measurements; Direct and indirect Ranging; Principles of chain surveying. Offsets, Limiting length of offsets; Booking field notes; Obstacles in chaining; Instruments for setting out right angles.

Unit II: (10 Hours)

Compass Survey Theory of Magnetism; Dip of Magnetic needle; Prismatic Compass; Surveyor's Compass; Bearings; Designation of Bearings; Calculation of Included Angles; Local Attraction; Magnetic Declination.

Unit III: (6 Hours)

Plane Table Surveying Principles of Plane Tabling; Working operations; Methods of Plane Table Surveying; Two and Three point problems.

Unit IV: (6 Hours)

Miner's Dial Construction, Use, Tests and Adjustments; Loose and fast Needle surveying; Common sources of errors in Dial surveying; Methods of elimination and compensation.

Unit V: (10 Hours)

Levelling Definitions of important terms used in levelling; Development in levelling Instruments; Types and Constructional details of Dumpy Level, Auto Level; Temporary and Permanent Adjustments; Methods of levelling; Straight edge levelling; Fly levelling; Check levelling; Reciprocal levelling; Longitudinal Sections; Cross- Sectioning; Trigonometric levelling; Methods of booking and reduction of levels; Levelling through drifts and shafts (Including steeply inclined shafts) ; Plumbing measurements of depth of shaft and subsidence.

Text Books:

1. Mine surveying by S. Ghatak
2. Surveying & Levelling by B. C. Punamia
3. Bannister, A. and Raymond. S., Surveying, ELBS, 6th Edition 1992.
4. Kennetkar, T.P. Surveying and Levelling, Vols. 1 and 2, United Book Corporation, Pune,
5 Surveying Vol. I, S.K.Duggal ,Tata McGraw Hill Publications, New Delhi,
6. Surveying & Levelling Vols I &IIKanetkar andKulkarni

MIA-303 MINING SURVEYING– I

MIA-303	Mining Surveying – I	0L:0T:1P	1 credits	2Hrs/Week

Course Preamble:-

- Study about different instruments used in surveying
- Study about chain traversing, compass traversing and plane table traversing.
- Study about handling of leveling instrument and determination of RL
- Study about handling of theodolite and to measure the angles.
- To determine co-ordinates of points.

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

- The students will be able to do linear measurements by chain, tape, compass and plane table surveying.
- They will possess the ability to identify, formulate, and solve engineering problems in leveling.

Suggested List of Experiments (Extendable):

1. To survey an open field by chain survey in order to calculate the area of the open field.
2 . To survey an area by chain survey across obstacles and to calculate the obstructed lengths by using different methods.
3. To study components of dumpy level and leveling staff
4 .To find the difference in elevation and calculate the reduced levels of various points by H.I method.
5 .To find the difference in elevation and to calculate the reduced level of various points by Rise and Fall method.
6. To determine the configuration of ground survey by conducting profile leveling.
7. To plot the contour map for a given land by direct method.
8 .To study different parts of theodolite, temporary adjustments and use vernier theodolite
9. To determine horizontal angle by Repetition Method and by Reiteration Method
10 .To determining a height of an object by measuring vertical angle.
11. To study and sketch of Total Station
12. Measurement of angles, distance and determination of coordinates and RL using Total Station.

MIA-304 ROCK MECHANICS

MIA-304	Rock Mechanics	3L:1T:0P	4 credits	4Hrs/Week

Course Preamble:-

- To describe the importance of Rock Mechanics in the field of mining and identify of the physical and mechanical properties of rocks.
- To understand stress and strain in rocks and the physical and mechanical properties of rocks, and failure criteria for rock and rockmass.
- To understand the methods of in-situ strengths of rock mass, rheological models and elastic constants of rocks.

Course outcomes:

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

· Ability to describe the importance of Rock Mechanics in the field of mining and identify of the physical and mechanical properties of rocks.

· Ability to calculate the stress and strain in rocks and rockmass.

· Ability to understand the time dependent behaviour by rheological models and determination of elastic constants of rocks.

Unit-1: (10 Hours)

Application of rock mechanics in mining, Definition of important terms used in Rock mechanics, Classification of rock mass, Parameters of rock mass classification, Importance of rock mass classification, RQD, Q –system and Bieniskiwi's Geomechanics classification of rock mass.

Unit -2: (10 Hours)

Rock properties, Physico-mechanical properties of rock, Preparation and testing of specimen in the laboratory, ISRM standards, Determination of Physico-mechanical properties of rock as per ISRM standard testing procedures, Strength indices and their importance. Point load, Protodyaknov, Impact and Cone Indenter strength Index.

UNIT -3: (6 Hours)

Rock as an elastic medium, Principle of elastic analysis, Rheological properties of rock, Importance of rheological models, Different types of rheological models, Dynamic properties of rocks, Anisotropy and Creep.

UNIT-4: (10 Hours)

Principal stress and Principal plane, Analytical method of determining the magnitudes and directions of normal and shear stress on failure plane, Mohr's circle, Theories of failure of rock, Coulomb Navier theory, Mohr's theory, Griffith's theory, Empirical theories of failure of rock, Different modes of failure of rock.

UNIT -5: (6 Hours)

Earth stresses, Importance of measurements of in situ stress, measurements of insitu stress by Flat jack, Overcoring and Hydraulic fracturing technique. Design of circular and elliptical openings. Determination of safe span of roof.

REFERENCE BOOKS:

1. Rock Mechanics By Obertabd Duvall
2. Rock Mechanics By Goodman
3. Rock Mechanics By Jager& Cook
4. Rock Mechanics by B.S. Verma References :

MIA-304	**Rock Mechanics**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

Course Preamble:-

1. Prepare rock specimen for lab tests.
2. Select suitable lab testing method to determine strength of rock specimen.
3. Analyze discontinuities using hemispherical projection.

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

- Ability to prepare suitable rock specimen for lab tests.
- Ability to select suitable testing methods to determine strength.
- Ability to plot Stereographic Hemispherical projections of Discontinuities.

List of Experiments:-

1. Plotting of Stereographic Hemispherical projections of Discontinuities
2. Determination of Rock Quality Designation of rock.
3. Preparation of rock specimens for laboratory tests.
4. Determination of uniaxial compressive strength of rocks.
5. Determination of tensile strength of rock by Brazilian test.
6. Determination of compressive strength index of rocks by using point load tester.
7. Determination of slake durability index of rocks.
8. Determination of Protodyakanov index of the given rock specimen.
9. Schmidt hammer test.
10. Determination of shear strength by direct test
11. Determination of triaxial strength of rock
12. Determination of Abrasivity of rock

MIA-305 GEOLOGY – I

MIA-305	GEOLOGY – I	2L:0T:0P	2 credits	2Hrs/Week

Course Preamble:-

- To be familiarized with the size, shape, mass & density of earth, age of earth, internal structure of earth, earthquake and volcanism.
- To study physical properties of the mineral.
- To study igneous, sedimentary and metamorphic rocks, To learn the principles of stratigraphy, units of stratigraphy, classification and correlation of stratigraphy.
- To be familiarized with the important geological formations: Archeans, Cuddaphs, Vindhyans, Gondwanas and Tertiaries.

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

- The students will gain technical knowledge on shape, size, mass & density of earth, age of earth, structure of the earth.
- They will be able to identify, formulate, and solve engineering problems related to properties of minerals, structural geology, types of rocks and geological maps.
- They will possess ability to use the techniques, skills and modern engineering tools necessary for Engineering Geology.
- The students will gain technical knowledge on stratigraphy of India and important geological formation of India.

Unit 1: (10 Hours)

The Earth in Space and Time Solar System: - Size, Shape, Mass and Density of Earth; A Brief idea of the origin and the age of the Earth; Interior of the Earth:- seismic data, Density and Pressure within the Earth; The internal structure and composition of Earth; Elementary knowledge of Diastrophism, Earthquakes and volcanism:-Volcanic and Earthquake belts, their relationship with Plate Tectonics.

Unit 2: (8 Hours)

Mineralogy Physical Properties of Minerals; Classification of various Rock forming Minerals; Introduction and preliminary study of principle Rock-Forming Mineral groups:- Garnet, Pyroxene, Amphibole, Mica, Feldspar and Felspethoid, Megascopic Properties of economically important Non-Silicate Minerals.

Unit 3: (10 Hours)

Igneous and Metamorphic Petrology Elementary knowledge of Magma and its Crystallization; Classification of Igneous Rocks; Textures and Structures of Igneous Rocks; Petrographic Description of Common Igneous Rocks; Agents and Types of Metamorphism; Depth zones, Facies and Grades of Metamorphism and Petrographic Description of Common Metamorphic Rocks.

Unit 4: (6 Hours)

Sedimentary Petrology Textures and Structures of Sedimentary Rocks; Sedimentary Processes- Weathering, Transportation and Deposition; Classification and Petrographic Description of Common Sedimentary Rocks.

Unit 5: (8Hours)

Structural Geology Concept of Deformation; Primary and Secondary Planer & Linear Structure of Rocks; Topography and its Representation. Altitude of strata- Dip and strike; Outcrop patterns; Width of Outcrop and Thickness of beds; Structural Contours; Geological Maps; Study of Unconformity; Folds, Joints, Faults and their influence in Mining Operations.

Text Books:

1. Engineering And General Geology : Parbin Singh
2. Physical And Engineering Geology : S.K. Garg
3. Rutley's Elements of Mineralogy : H.H. Read
4. Principles Of Petrolog y : G.W. Tyrell
5. Mining Geology Mckinistry, , Asia Publication. 2nd Ed. 2005
6. Economic Mineral Deposits Bateman A.M John Wiley and sons 2nd Ed. 1999.
7. Structural Geology Marland& Billings, Prentice Hall of India Pvt. Ltd., New Delhi. 2000.

MIA-305	GEOLOGY – I	0L:0T:1P	1 credits	2Hrs/Week

Course Preamble:-

- To be familiar with physical properties of the mineral.
- To be able to identify igneous rock, sedimentary rock and metamorphic rock.

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

- The students will possess ability to identify, formulate, and solve engineering problems in properties of minerals, structural geology, and types of rocks.

List of Experiments:

Study of physical properties of Rock forming minerals

1 Quartz group and Feldspar group of minerals
2 Mica Group and Ferro magnesium minerals
3 Carbonates – Calcite group and magnesite group of minerals

Study of physical properties of Ore minerals

4 Haematite, Magnetite and Chalcopyrite
5 Malachite, Azurite and Chromite
6 Bauxite, Pyrolusite and Psilomelane
7 Sphalerite and Galena

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

8 Igneous Rocks: Granite, Syenite, Gabbro, Basalt, Dolerite, Lamprophyre, Aplite, Pegmatite.
9 Metamorphic Rocks: Slate, Schists, Gneisses, Quartzite, Marble, Amphibolite, Charnockite.
10 Sedimentary Rocks: Conglomerate, Sandstone, Shale, Carbonaceous Shale, Coal, Limestone.

MIA-306 Computer Programming(C Language)

MIA-306	Computer Programming (C Language)	0L:0T:1P	1 credits	2Hrs/Week

UNIT I

Fundamentals of C Programming: History of C; Structure of a C Program; Data types; Constant & Variable, naming variables; Operators & expressions; Control Constructs – if-else, for, while, do-while;
Case switch statement.

UNIT II

Functions; Arguments; Return value; Parameter passing – call by value, call by reference; Return statement; Scope, visibility and life-time rules for various types of variable. static variable; Calling a function; Recursion – basics, comparison with iteration, types of recursion- direct, indirect, tree and tail recursion, when to avoid recursion, examples.

UNIT III

Arrays: Arrays: Introduction to Arrays, Array Declaration, Single and Multidimensional Array, Memory Representation, Strings, String handling functions.
Pointers: Introduction to Pointers, Address operator and pointers, Declaring and Initializing pointers, Assignment through pointers. Pointer v/s array; Pointer to pointer; Array of pointer & its limitation; Function returning pointers; Pointer to function, Function as parameter.

UNIT IV

Structure and Union: Declaration of structure, Accessing structure members, Structure Initialization, Union. Advanced Programming Techniques: Special constructs – Break, continue, exit(), goto & labels; Pointers- & and * operators, pointer expression, pointer arithmetic, dynamic memory management functions like malloc(), calloc(), free();

UNIT V

Miscellaneous Features: File handling and related functions; printf & scanf family;C preprocessor – basics, #Include, #define, #undef, conditional compilation directive like #if, #else, #elif, #endif, #ifdef and #ifndef; Variable argument list functions.

References:

1. Kerninghan & Ritchie “The C programming language”, PHI
2. Schildt “C:The Complete reference” 4th ed TMH.
3. Cooper Mullish “The Spirit of C”, Jaico Publishing House, Delhi
4. Kanetkar Y. “Let us C”, BPB.

List of Experiments:

1. WAP to perform arithmetic operations (Addition, Subtraction, Multiplication, Division) on two numbers.
2. WAP to calculate gross salary of an employee [using formula: gross_sal = basic_sal+hra+da].
3. WAP to calculate area of circle.
4. WAP to evaluate marks of student for 3 subjects, calculate percentage and display their grades.

Marks grades

CASE -1: 90-100 A
CASE -2: 80-89 B
CASE -3: 65-79 C
CASE -4: Otherwise D

5. WAP to determine sum of odd series from 1 to N
6. WAP to calculate factorial of a number.
7. WAP to print Fibonacci series up to N. [E.g. - 0 1 1 2 3 5.....]
8. WAP to identify whether given number is prime or not.
9. WAP to identify whether given number is even or odd.
10. WAP to print whether given year is leap year or not.
11. WAP to check whether the 5 digit number is palindrome or not [A palindrome number or numeral palindrome is a number that remains the same when its digits are reversed. Like 16461, for example, it is "symmetrical".].
12. WAP to check whether 5 number entered is Armstrong number or not.[An Armstrong number is
    an n-digit number that is equal to the sum of the nth powers of its digits. Like 153]
13. WAP to find the sum of the digits of a number.
14. WAP to input 3 sides of triangle and identify the type of triangle.
15. WAP to input 5 digit numbers and find the sum of the first and last digit.
16. WAP to check whether the number is power of 2 or not.
17. WAP to find out GCD of two numbers.
18. WAP to check whether given number is perfect power of any natural number.

MIA – 307 Self study/ GD Seminar

MIA – 307	**Self-study /GD Seminar (Internal Assessment)**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

The main Preamble is to improve the mass communication and convincing/understanding skills of students .And to give the students an opportunity to exercise their rights to express themselves.The evaluation will be done based on their presentation work and group discussion.

Objective of GD and seminar- is to improve the MASS COMMUNICATION and CONVINCING / under standing skills of students and it is to give student an opportunity to exercise their rights to express themselves. Evaluation will be done by assigned faculty base don group discussion and power point presentation.

SEMESTER –IV

BEA-401 Energy , Ecology, Environment& Society

BEA-401	Energy, Ecology, Environment & Society	3L:0T:0P	3 credits	3Hrs/Week

Course objectives:

- To understand basic principles and basic concepts of ecology and environmental issues.
- To understand analysis of a problem or question related to the environment.
- To understand complex relationship between biotic and abiotic components.
- To understand Sources of Energy

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

- CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
- CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
- CO3: Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components.
- CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

Unit 1 Sources of Energy (6 Hrs):
Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydro, nuclear sources.

UNIT-2 Segments of Environment: (6 Hrs):
Atmosphere, hydrosphere, Lithosphere, biosphere.Cycles in Ecosystem – Water, Carbon, Nitrogen. Biodiversity: Threats and conservation

UNIT-3 Air Pollution: (10 Hrs):
Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain. Sound Pollution: Causes, controlling measures, measurement of sound pollution (deciblage), Industrial and non – industrial.

UNIT-4 Water Pollution– (10 Hrs):
Water Pollution: Pollutants in water, adverse effects.Treatment of Domestic & Industrial water effluent.Soil Pollution – Soil Profile, Pollutants in soil, their adverse effects, controlling measures.

UNIT-5 Society, Ethics & Human values– (10 Hrs):
Impact of waste on society .Solid waste management Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, Preambles of ethics and its study . Preliminary studies regarding Environmental Protection Acts , introduction to value education, self exploration, sanyam & swasthya.

References:-

1. Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics"; Cengage Pub.
2. Rana SVS ; "Essentials of Ecology and Environment"; PHI Pub.
3. Raynold, GW "Ethics in information Technology"; Cengage.
4. Svakumar; Energy Environment & Ethics in society; TMH

5. AK De "Environmental Chemistry"; New Age Int. Publ.
6. BK Sharma, "Environmental Chemistry" ; Goel Publ. House.
7. Bala Krishnamoorthy; "Environmental management"; PHI
8. Gerard Kiely, "Environmental Engineering" ; TMH 9. Miller GT JR; living in the Environment Thomson/cengage
9. Cunninghan WP and MA; principles of Environment Sc; TMH
10. Gandhiji M.K.- My experiments with truth

MIA-402 Drilling & Blasting

MIA-402	Drilling & Blasting	2L:0T:0P	2 Credits	2Hrs/Week

Course Preamble:-

- To understand the basic concepts of drilling and blasting.
- To gain knowledge on various types of explosives and accessories, and their applicability in blasting.
- To understand the safety measures that are required for storing and handling of explosives.
- To understand the mechanics of blasting and its effects on environment.

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

- Ability to select drilling equipment for drilling in mines under various conditions.
- Ability to select explosives and accessories for mine specific blasting.
- Ability to handle explosives and other accessories with safety.
- Ability to understand the mechanics of blasting which in turn helps in blasting design.

Unit-1

DRILLING OF ROCKS IN UNDERGROUND AND SURFACE MINES-(10 Hours)

Principles of rock drilling. Classification of drilling system. Rock drilling methods, parameters affecting the choice of drilling system, long hole drilling, ring drilling and rotary drilling methods for underground mines. Drilling bits.

Unit -2

BLASTING IN UNDERGROUND MINES – (10 Hours)

Explosives. Initiation systems and accessories for blasting in the underground mines. Blasting off the solid. Blasting of cut faces. Mass-blasting system for heavy blasting in hard rock mines.

Unit- 3

BLASTING IN SURFACE MINES –-(8 Hours)

Principles of blast round design for single and multi-row. Blast round design in surface mines. Bulk explosives Initiation systems and accessories.

Unit - 4

EVALUATION METHODS--(8 Hours)

Evaluation of drilling and blasting methods for underground and surface mines by use of stateof-art techniques and gadgets.

Unit- 5

NUISANCES AND MITIGATION –-(6 Hours)

Blasting nuisances and their mitigation for underground and surface mines.

REFERENCE BOOKS:

1. Elements of Mining Tech. Vol I,II,III by D. J. Deshmukh
2. Coal Mine Ground Control by Syd S Peng
3. Mining and rock construction technology
4. Explosives and Blasting Practices in Mines,S.K. Das Lovely Prakashan,Dhanbad,1993
5. Explosives and Blasting Techniques, G.K. Pradhan, Minetech Publication 1996
6. Advances in Drilling and Blasting V.R. Sastry Allied Publishers Ltd. 1993
7. Drilling and Blasting of Rocks ,Carlo Lopez Jimeno, A.A. Balkema, Rotterdam, Brookfields 1995

MIA-402	**Drilling & Blasting**	**0L:0T:1P**	**1 Credits**	**2Hrs/Week**

List of Experiments:

1 Study of Rock drilling methods **.**
2 Study of blasting in the underground mines .
3 Study of heavy blasting in hard rock mines.
4 Study Of Drilling Patterns .
5 Study of Various Kinds of Explosives used in Mines.

MIA-403 Underground Coal Mining

MIA-403	Underground Coal Mining	3L:1T:0P	4 Credits	4Hrs/Week

Course Preamble:

· Understand the mode of access to reach coal seams and choice of mine seam
· Gain knowledge of bord and pillar method of mining
· Gain knowledge of longwall method of mining.
· Knowledge of extracting of thick coal seams by special methods **.**

Course outcomes:

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

- Ability to identify mode of access to reach coal seam and choice of mining method
- Ability to design bord and pillar method of mining
- Ability to design longwall method of mining.

Unit- 1

INTRODUCTION (10 Hours)

Origin of Coal, Theories of Coal Formation, Classification of Coal, Coaking Coal, Coal Seam and its Classification, Coal Seam Structures and Abnormalities like Faults, Joints, Cleats, Folds etc., Coal Measuring Rocks and Their Characteristics, Distribution of Coal in India, Indian Coal Mining Industry; Choice of Coal Mining Methods.

Unit -2

BOARD AND PILLAR METHOD (10 Hours)

Important Terminology, Development Size and Shape of The Pillar, Galleries, Panel System and Without Panel System of Development, Size of Panel, Cycle Of Operation, Depillaring, Problems in Depillaring, Preparatory Arrangements, Depillaring by Stowing, Depillaring by Caving Methods, Pillar Extraction Techniques, Dangers Associated With Depillaring.

Unit -3

LONGWALL MINING (8 Hours)

Important Terminology, Types of Longwall Faces and Their Choice, Merits and Demerits of Longwall Mining, Development of Longwall Panels and Faces, Longwall Advancing Method, Longwall Retreating Method, Length of Longwall Faces, Rate of Face Advance, Double Unit Longwall Faces, Face organization and material supply.

Unit -4

THICK SEAM MINING (8 Hours)

Problem in Mining of Thick Seams, Choice of Thick Seam Mining Methods, Inclined Slicing, Horizontal Slicing, Diagonal Slicing, Transverse Slicing, Sublevel Caving, Blasting Gallery Method, Cable-Bolting Method of Thick Seam Extraction.

Unit -5

ROOM AND PILLAR MINING (6 Hours)

Vermelles Method, Slant Method, Sublevel Method, Coal Saw Method, Mining of Contiguous Seams, Mining of Steeply Inclined Seam, Mining Under Water, Mining of Seams Prone to Spontaneous Heating, Bumps, Air blast etc.

REFERENCE BOOKS

1.Wining & working coal – R.T. Deshmukh
2.U/G winning of Coal – T.N. Singh
3.Principle and practices of modem Coal Mining – R.D. Singh
4.Coal Mining in India – S.P. Mathur
5. Longwall Mining S.Peng&H.S. Chang, John Wiley and Sons Inc. 1983
6. Modern Coal Mining Technology S.K. Das Lovely Prakashan Publishers 2 nd edition, 1994
7. Underground Coal Mining Methods G.Singh J, BrajKalpa Publishers, Varnasi, 2000.

MIA-403	**Underground Coal Mining**	**0L:0T:1P**	**1 Credits**	**2Hrs/Week**

LIST OF EXPERIMENT

1.Study of layouts of Board and Pillar development working by without panel system.
2.Study of layouts of Board and Pillar development working by panel system.
3.Study of layout of Logwall Advancing system.
4.Study of layout of Logwall Retreating system.
5.Study of various line of extraction used for pillar extraction.
6.Study of stook extraction method under difficult roof conditions

MIA-404 Mining Machinery – I

MIA-404	Mining Machinery – I	3L:1T:0P	4 Credits	4Hrs/Week

Course Preamble:

- Gain knowledge of various types of pumps, inflow of water into mine working, basic principles of drilling, cutting and ploughing.
- Comprehend the performance and characteristics of the pumps, layouts of underground pumping station, operating parameters of underground mine machinery and maintenance of machinery.
- Know applications of different types of support and underground mine machinery under given conditions.
- Select pumps for underground mines under given conditions.

Different systems of rope haulage, rope haulage calculations, safety devices, tubs, haulage road and manholes, locomotive haulage and calculations based on it, track laying, mine cars.

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

- Familiar with the various types of pumps, inflow of water into mine workings, basic principles of drilling, cutting and ploughing.
- Ability to understand the performance and characteristics of pumps, layouts of underground pumping station, operating parameters of underground mining machinery.
- Ability to select different types of supports and mine machinery under given conditions.
- Capable of choosing pumps for underground mines under given conditions.

Unit-1

WIRE ROPES(8 Hours)

Wire ropes used in Mines and their installation, Application of wire ropes in Mines, Testing of wire Ropes, Factor of safety, Examination of Wire ropes, Care of wire ropes. Ropes splicing:Rope capels.

Unit-2

Conveyors: (8 Hours)

Construction and operation of belt, chain and cable belt conveyors; Conveyor computations; High angle conveyors.

Unit 3

WINDING – I (8 Hours)

Head gear arrangement, shaft fittings, safety devices, cages & skips, their suspension arrangements. Location of winding engine.

Unit- 4

WINDING – II (10 Hours)

Electric winders, winding drums, types of construction, duty cycle, mechanical & electrical breaking, safety devices on winders, Electrical & Electronic methods of speed control, Multilevel winding; automatic winding, Torque- time & power- time diagram; calculation for winding.Pit top and pit bottom arrangements.

Unit-5

PUMPING (8 Hours)

Sources of mine water, types of pumps, design calculations, characteristics, operation,maintenance and

selection, pump fittings, special types of pumps used in mines.

REFERENCE BOOKS:

1. Elements of Mining Tech. Vol I & Vol III by D. J. Deshmukh
2. Mining Machinery By S. C. Walker
3. Coal Mining Practice By Stathum
4. Universal Mining School reports Vol I and Vol II," Cardif, Great Britain 1999.
5. Mine pumps haulage & winding", S. Ghatak, Coalfield Publishers, Asansol, 1st Ed. 1995

MIA-404	**Mining Machinery – I**	**0L:0T:1P**	**1 Credits**	**2Hrs/Week**

List of Experiment:

1. Study of Different types of Rope Capels.
2. Study of Rope Splicing.
3. Study of Clifton pulley.
4. Study of various safety devices on rope haulages
5. Study of Exhaust Conditioner on a diesel locomotive
6. Study of Cage Suspension Gear
7. Study of Detaching Safety Hook
8. Study of Lilly Controller

MIA-405 Geology -II

MIA-405	Geology-II	3L:0T:0P	3 Credits	3Hrs/Week

Course Preamble:

· To be familiar with application of geology in Mining Engineering.

· To gain knowledge of various aspects of Economic Geology &various processes of formation of Mineral Deposits.

· To know the occurrence & distribution of Minerals in India.

· To learn various methods of prospecting.

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

· The students will be able to identify, formulate and solve the problems of economic minerals.

· The students learn to use the techniques, skills, and modern engineering tools necessary for geophysical and geochemical prospecting.

UNIT-I

INDIAN GEOLOGY (8 Hours)

History of geology, major geomorphic division of India, general review of India, stratigraphy, description of important Indian geology formation, Archeans, Vindhyans, Gondwanas and tertiaries.

UNIT-II

STRUCTURAL GEOLOGY (10 Hours)

Study of topographic maps, attitude of planar and linear structures, effects of topography on outcrops, Unconformities, folds, faults and joints – their nomenclature, classification and recognition, Forms of igneous intrusion – dyke, sill and batholith, effect of folds and fractures on strata and their importance in mining operations, principles of stereographic projection of linear and planar features of rocks.

UNIT-III

PETROLEUM GEOLOGY AND COAL (8 Hours)

Rank characteristics and important constituents of coal, classification and origin of coals, geology of the principle coal field of India, concept of organic constituents of petroleum origin, migration, accumulation, concept of traps and important petroliferous basins of India.

UNIT-IV

ECONOMIC GEOLOGY (8 Hours)

Economic geology mode of Occurrence, origin, distribution, association and industrial uses of important Metallic (Au, Al, Cu, Fe, Mn, Sn, Pb And Zn) and Non-Metallic(Diamond, mica, Radioactive Minerals, Gypsum, Dolomite, Fire-clay, Magnesite, talc, asbestos, Graphite, Kyanite, Sillimanite, corundum, Fluorite, phosphorite, Precious and Semi-precious stones)

UNIT-V

(8 Hours)

Exploration and prospecting geology definition and classification of method; elementary method of geology , geophysical ,geochemical prospecting , ringed targets intersection loci.,exploration-minral concept and viz surface and subsurface; exploration strategy and design ; stage exploration ; resource and reserves.

REFERENCE BOOKS:

1. Engineering geology-Prabin singh
2. Engineering geology- P.k. Mukherjee
3. Mineralogy-Dana
4. Courses in mining geology –Arogyaswamy
5. Geology of india and (vol 1and 2) R.Vaidyanadhan and M.Ramakrishnan

MIA-405	**Geology-II**	**0L:0T:1P**	**1 Credits**	**2Hrs/Week**

LIST OF EXPERIMENT:

1. Study of topography maps
2. Study of stenographic projection
3. Standard tensile test on MS and CI Specimen
4. Identification of rocks.
5. Identification of simple rocks forming minerals and important ores
6. Study of topography maps
7. Study of stenographic projection
8. Standard tensile test on MS and CI Specimen
9. Identification of rocks.
10. Identification of simple rocks forming minerals and important ores

MIA-406 Computer Programming(Java)

MIA-406	Computer Programming(Java)	0L:0T:1P	1 Credits	2Hrs/Week

Course Preamble:

• Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
• Acquire knowledge about the basic concept of writing a program.
• Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
• Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
• Role of Functions involving the idea of modularity.

Course Outcomes:

• Apply and practice logical ability to solve the problems.
• Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment
• Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs
• Understand and apply the in-built functions and customized functions for solving the problems.
• Understand and apply the pointers, memory allocation techniques and use of files fordealing with variety of problems.
• Document and present the algorithms, flowcharts and programs in form of user-manuals
•Identification of various computer components, Installation of software

UNIT-I

Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

UNIT-II

Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees,

UNIT-III

Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector.Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

UNIT-IV

Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI,

Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle

UNIT-V

Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:

1. Deitel & Deitel, "JAVA, How to Program"; PHI, Pearson.
2. E. Balaguruswamy, "Programming In Java"; TMH Publications
3. The Complete Reference: Herbert Schildt, TMH
4. Peter Norton, "Peter Norton Guide To Java Programming", Techmedia.
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall

List of Program to be made (Expandable)

1. Installation of J2SDK
2. Write a program to show Concept of CLASS in JAVA
3. Write a program to show Type Casting in JAVA
4. Write a program to show How Exception Handling is in JAVA
5. Write Programs to show Inheritance and Polimorphism.
6. Write a program to show Interfacing between two classes
7. Write a program to Add a Class to a Package
8. Write a program to demonstrate AWT.
9. Write a Program to show Data Base Connectivity Using JAVA
10. Write a Program to show "HELLO JAVA " in Explorer using Applet
11. Write a Program to show Connectivity using JDBC
12. Write a program to demonstrate multithreading using Java.
13. Write a program to demonstrate applet life cycle.

MIA- 407- Industrial Training – I

MIA- 407	**Industrial Training – I**	**0L:0T:1P**	**1 Credits**	**2Hrs/Week**

Duration:- 2 weeks after the IV semester in the summer break, Assessment in V semester. Students must observe following to enrich their learning during industrial training:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.

SEMESTER -V
MIA-501 MINE SURVEYING-II

MIA-501	**MINE SURVEYING-II**	**2L:1T:0P**	**3 credits**	**3Hrs/Week**

Course Preamble:

- Knowledge of distance and elevation using optical means, area and volume of underground and opencast mine, network of triangles, baseline in underground and surface, the duties and responsibilities of surveyor.
- Application of the network of triangles, setting of curve in mine survey, transfer reduced level from surface to underground.
- To evaluate the accuracy of the survey.

Course outcomes:

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

- Ability to use optical means determine distance, elevation, area and volume. To set out baseline according to the rules and responsibilities of surveyor.
- To set out a curve and to locate the underground features through survey.
- Determination of the reduced level in underground.
- Ability to determine the accuracy of the surveyed area.

UNIT 1: THEODOLITE SURVEYING (10 Hours)

Types of Theodolites; Description of various parts of a Vernier Theodolite; Requirements of Mining type Theodolites; Measurements of height and distances of accessible and inaccessible points; Traversing with Theodolite on surface and underground; Checks on Closed and Open traverses; Balancing of traverses; Temporary & Permanent adjustments of Theodolites; Sources of errors and their prevention.

UNIT 2: TACHEOMETRY (6 Hours)

Principles of Stadia Methods; Determination of constants; Theory of anallactic lens; Distance and elevation formulae, Sub tense and Tangential Methods; Auto- Reduction Tacheometer.

UNIT 3: SETTING OUT (8 Hours)

Setting out simple curves on surface and in underground; Elementary knowledge of compound and transition curves; joint boundary survey; Equalization of boundaries; Maintenance of direction and radiant of roadways i.e. marking and checking of center line and grade line, transfer of point from roof to floor and floor to roof.

UNIT 4: ERRORS & PROBLEMS (10 Hours)

Computation of areas and volumes; Earthwork calculation; Problems based on Coordinates, faults, Dip- Strike and boreholes; Sources, classification and relative importance of errors, their prevention and elimination, theory of errors, adjustment of errors.

UNIT 5: PLANS & SECTIONS (8 Hours)

General requirements of mine plans; types of plans; Symbols used in mine plans; preparation of plans & sections; Plotting of traverse; Checking accuracy of old mine plans; Plan meter and its uses; Enlargement & reduction of plans.

REFERENCE BOOKS

1. Surface Mining: G.B. Misra
2. Surface mining equipment: Martin
3. Surface Mining: Pfleider
4. Mining: Boki
5. SME handbook: Hartman.
6. Mine Surveying Vol. I, II, III, Ghatak, Coal Field Publishers, 5th edition, 1996.

MIA-501	Mining Surveying-II	0L:0T:1P	1 Credits	2 Hrs/week

Course Preamble:

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

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

- An ability to measure distance and elevation using optical instruments.
- An ability to set out an curve in underground and surface.
- An ability to connect the baseline from surface to underground.

List of Experiments

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

EQUIPMENT TO BE USED:

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

MIA-502 MINERAL PROCESSING

MIA-502	**MINERAL PROCESSING**	**2L:1T:0P**	**3 Credits**	**3Hrs/Week**

Course Preamble:

- To review all unit operations in mineral processing and fuel technology.
- To understand the importance and principles of materials handling in the mineral processing plant.
- To explain the methods of analysis of comminution theory, selection criteria for crushing, grinding and screening equipment, selection principles for mineral concentration techniques, criteria for mineral concentration equipment selection.

Course outcomes:

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

- Ability to understand the importance and principles of materials handling in the mineral processing plant.
- Ability to explain the methods of analysis of comminution theories, selection criteria for crushing, grinding and screening equipment, selection principles for mineral concentration techniques, criteria for mineral concentration equipment selection.

UNIT 1: COMMINUTION (10 Hours)

Introduction, definition, scope and economic justification, main steps in ore dressing operations, comminution, crushing, principles of crushing , jaw crushers, gyratory crushers, cone crushers, roll crushers, gravity stamps their classifications and applications, grinding principles of grinding, application and classification of ball mills, rod mills, tube mills and Pebble mills.

UNIT 2: SIZING (10 Hours)

Object of sizing, scale of sizing, laboratory sizing, screening and classification, different type of screens, their mode of operations and application and limitation, classification principles of classification, movement of solids through fluids, different types of classifiers, hydraulic and pneumatic classifiers, sampling-importance of sampling and methods used.

UNIT 3: GRAVITY CONCENTRATION (6 Hours)

Jigging, flowing film concentrators like spirals and shaking tables, heavy media separation, applications and limitations of methods.

UNIT 4: FLOTATION (6 Hours)

Physico-chemical principles, function of various flotation reagents, important machines, their principles, and working, flotation of sulphide, oxide and non-sulphide ores.

UNIT 5: PROCESSING METHODS OF SOME COMMON MINERALS (10 Hours)

Electrostatic and Magnetic Separation - Principle operation and field of application, Pelletisation of low grade iron ore, Drying and dewatering - thickening, filtration and drying. Coal washing; Simplified flow sheets for beneficiation of coal and typical ores of copper, lead, zinc, iron and manganese with special reference to Indian deposits.

REFERENCE BOOKS:

1.Ore Dressing by Gaudin

2.Ore Dressing by B. A. Willstion,1991.

3.Ore Processing S.K.Jain, Oxford IBH, 2nd Edition, 1990

4.Fuels and Combustion, Dr. Samir Sarkar, Published by Orient Longman Ltd., 1990.

MIA-502	MINERAL PROCESSING	0L:0T:1P	1 Credits	2 Hrs/week

Course Preamble:

- To study the different types of sampling methods
- To study the laboratory sizing and separation of particles.
- To study the process of comminution
- To study the settling of solids in fluids
- To study the different types of concentration process.

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

- An ability to identify different types of sampling methods, comminution methods and concentration methods.
- An ability to explain laboratory sizing, comminution and concentration methods.
- An ability to interpret laboratory sizing, comminution and concentration methods.

LIST OF EXPERIMENTS:

1. Study of Jaw crusher
2. Study of Roll crusher
3. Study of Grinding mills
4. Study of Akin's classifier
5. Study of Shaking table
6. Study of Mineral jig.
7. Study of Spiral concentrator
8. Study of Floatation cell
9. Study of Thickners
10. Study of Washability curves

MIA-503 MINE MACHINERY- II

MIA-503	MINE MACHINERY-II	2L:1T:0P	3 Credits	3Hrs/Week

Course Preamble:

The students completing this course are expected to understand the nature and role of the kinematics of machinery, the mechanisms and machines.

To understand the functioning of winding engines and other winding accessories.

The course includes velocity and acceleration diagrams, analysis of mechanisms joints, Cams and their applications. It exposes the students to various kinds of power transmission devices like belt, rope, chain and gear drives and their working principles and their merits and demerits.

Course Outcome:

The students will have basic knowledge on motive power used in mines, pumping, rope haulage and face haulage & conveying transport systems**.**

UNIT 1: AERIAL ROPEWAYS (10 Hours)

Different types, their constructions & installation, operation & maintenance, design calculation, their layout including rope-tensioning arrangements.

UNIT 2: CONVEYORS – I (6 Hours)

Different types of belt conveyors, their construction, installation, maintenance & design.

UNIT 3: CONVEYOR – II (10 Hours)

Shaker conveyor, scraper chain conveyor and armored chain conveyor, their installation & construction maintenance. Safety Devices; Pit top and pit bottom arrangements.

UNIT 4: SKIP & KOEPE WINDING (10 Hours)

Skip types & construction, pit top & pit bottom arrangements, advantages and disadvantages, Types of Koepe Winder, Koepe wheel, Floating platforms, Two winders working in the same shaft, Winding with side by side and up and down sheaves, advantages and disadvantages. Multirope winding. Calculation of H.P.

UNIT 5: HYDRAULIC TRANSMISSIONS (6 Hours)

Fundamental of hydrostatic compression, hydraulic fluids, hydraulic pumps, motors, cylinders and accumulators, different types of valves, hydraulic coupling and torque converters, Application in mines, Advantages of hydraulic transmission.

REFERENCE BOOKS:

1. Elements of Mining Tech. Vol I & Vol III by D. J. Deshmukh
2. Mining Machinery by S. C. Walker
3. Coal Mining Practice by Stathum

MIA-503	MINE MACHINERY-II	0L:0T:1P	1 Credits	2 Hrs/week

LIST OF EXPERIMENTS:

1. Study of Monocable aerial Ropeway.
2. Study of Bicable aerial Ropeway.
3. Study of Loop take-up and tensioning arrangement of a belt conveyor.
4. Study of pit top and pit bottom arrangements for a belt conveyor.
5. Study of Belt Conveyor
6. Study of an Armoured face Conveyor.
7. Study of Various Koepe Arrangements

Program Elective - I

MIA -504(A) POLLUTION CONTROL ENGINEERING

MIA - 504(A)	POLLUTION CONTROL ENGINEERING	3L:1T:0P	4 Credits	4Hrs/Week

Course preambles:

- To make student conversant with prevailing environmental legislation in India
- To provide knowledge in details about various sources and control of pollution in surface mines and mitigating measures against each source

Course Outcomes:

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

- CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
- CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
- CO3: Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components.
- CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

UNIT 1: ENVIRONMENTAL POLLUTION (10 Hours)

Introduction and classification of environmental pollution, ecological conservation. Salient features of the environmental laws in India and Occupational disease. Environmental Impact Assessment, Environmental Management Plan, Environmental Audit.

UNIT 2: AIR POLLUTION (8 Hours)

Air pollution due to various gases and suspended particulate materials, causes, consequences, preventive measures, dust measuring equipment.

UNIT 3: NOISE POLLUTION (8 Hours)

Pollution due to noise and its consequences, noise produced by different machinery, control and safety, measurement of noise levels.

UNIT 4: WATER POLLUTION (10 Hours)

Water pollution, its causes and preventive measures, acid-mine drainage, water pollution in mines and mineral beneficiation plants, water purification schemes in brief.

UNIT 5: LAND POLLUTION (6 Hours)

Land pollution and land reclamation, land reclamation techniques, Physical and Biological reclamation, Mine Closure Plan

Reference Books:

1. Air & Water Acts
2. Forest Conservation acts
3. Legislation in Indian Mines - A Critical appraisal by Rakesh and Prasad
4. Environmental Impact of Mining By Down and Stokes

MIA-504(B) COMPUTER APPLICATION IN MINING

MIA-504(B)	COMPUTER APPLICATION IN MINING	3L:1T:0P	4 Credits	4Hrs/Week

Course Preambles:

- To make students conversant with importance of computers in mining engineering
- To make aware about the various software and its application to mine planning and design
- To demonstrate and impart initial training to use the software.

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

- Students will have knowledge about various software application worldwide in the field of mining engineering
- Students will develop some skill to use the software with cases.

UNIT 1: INTRODUCTION TO SOFTWARE PACKAGES APPLICABLE TO MINING (10 Hours)

Computational systems inspired by natural evolution; natural and artificial evolution, evolutionary; chromosome representations; search operators;

UNIT 2: CO-EVOLUTION (8 Hours)

Constraint handling techniques; niching and speciation; genetic programming; classifier systems and theoretical foundations; implementation of selected algorithms.

UNIT 3: DEVELOPMENT OF ALGORITHMS (8 Hours)

Slope stability. Pillar design. Open pit configuration. Design of mine ventilation system. Optimisation of cycle of operations. Blast design.

UNIT 4 : SIMPLEX TECHNIQUE (8 Hours)

Simplex technique for mining. Rock reinforcement design. Modelling of mining pollution phenomena. Management information systems.

UNIT5: DEVELOPMENT OF PROGRAMS (8 Hours)

Simple computer programs based on the above algorithms.

REFERENCE BOOKS:

1. Fundamental of Database Systems by Elmasri & Navathe
2. Introduction to operations research by Hillier/Lieberman
3. CAD/CAM : Computer Aided Design and Manufacturing, Mikell P. Groover, Emory W. Zimmers, Jr. PHI Inida, 1989.

Open Core Elective-I
MIA-505(A) MINE LEGISLATION

MIA-505(A)	MINE LEGISLATION	3L:1T:0P	4 Credits	4Hrs/Week

Course Preambes:
It is very important to all mining engineering students because, it provides an insight to various laws, rules and Acts related to Mines Safety and mining legislation. A separate paper on the above subject is one of the requirements for the DGMS certification for qualifying in the exam of Mines Manager.

Course Outcome:
The student will be benefitted with this course paper as it covers all the mining legislation and statutory Ruls, Acts and amendments made from time to time. This paper is one of the qualifying papers for DGMS exams.

UNIT-1 (10 Hours)

Introduction to Acts, Rules & Regulation applicable to Mining Industry, Development of mining legislation in India.

UNIT-2 (6 Hours)

Mines Act – 1952 & **Mines Rules – 1955**

UNIT-3 (10 Hours)

Coal Mines Regulations –1957, Ventilation, Standard of ventilation, main mechanical ventilator, Installations & Restrictions, Splits and Airways, Introduction to draft CMR-2006 & **Metalliferous Mines Regulation-1961** Ventilation, Explosives, Official Duties

UNIT-4 (6 Hours)

Mine Crèche Rules 1966

UNIT-5 (10 Hours)

Mine Vocational Training Rules- 1966 Application of Rules, General vocational training (scope and standard), training centres, and arrangements for training

Reference Books:

1. Legislation in Indian Mines (A critical Appraisal) Vol. II & I, - S. D. Prasad & Prof. Rakesh
2. CMR-1957 & MMR-1961 - L. C. Kaku
3. Mines Act-1952 & Mines Rules-1955 - L. C. Kaku
4. Vocational Training Rules - L. C. Kaku
5. Mine Accidents - S.J. Kejeriwal
6. CMR-2017- L C Kaku

MIA-505(B) MINE MANAGEMENT

MIA-505(B)	MINE MANAGEMENT	3L:1T:0P	4 Credits	4Hrs/Week

Course Preambes:

- To understand the selection, prioritization and initiation of individual projects and strategic role of project management.
- To understand the work breakdown structure by integrating it with organization.

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

- Understand the selection, prioritization and initiation of individual projects and strategic role of project management.
- Understand the work breakdown structure by integrating it with organization.
- Understand the scheduling and uncertainty in projects.

UNIT 1: EVOLUTION OF MANAGEMENT THEORY (10 Hours)

Principle of Scientific management, Elements of management functions, Planning, Organizing and Control, Levels of Management. Structure and design of organization for mining enterprises.

UNIT 2: PERSONNEL MANAGEMENT (8 Hours)

Selection, training and development of human resources, Job evaluation, job analysis, incentive and theories of motivation, Productivity, its concept and measurement, Leadership and Communication.

UNIT 3: PRODUCTION MANAGEMENT (6 Hours)

Determination of norms and standards of operations by work study, work measurements, production planning, Scheduling and control, Queuing theory, short and long term planning, Quality control, introduction to MIS, Material Management

UNIT 4: INDUSTRIAL PSYCHOLOGY (8 Hours)

Its relation with other branches of knowledge, studies of physical factors and their effect on man, Industrial relations, Human relations, trade union movements in India.

UNIT 5: INDUSTRIAL ACT AND LAWS (10 Hours)

Industrial Dispute Act, Industrial Trade Union Act, Analysis of industrial disputes, Prevention and settlement of industrial disputes, Payment of wages act, Workmen's compensation act, Contract labour laws.

REFERENCE BOOKS:

1. Mine Management : V. N. Singh
2. Management & Administration : S.K.Gupta
3. Introduction to Management: O.P. Khanna
4. Mine Management, Legislation and General Safety ,S. Ghatak Coal Field Publishers ,Asansol 1999.
5. Management Harold Koontz and Heinz Weihrich, Mc Graw Hill Company 1990.
6. Modern Production Management Buffa John Wiley and Sons, 1998.

MIA-506 Industrial Training-I

MIA-506	Industrial Training-I	0L:0T:1P	1 credits	2Hrs/Week

Course Preamble:

1. To expose the students to actual working environment of Mining engineering and enhance their knowledge and skill from what they have learned in the classes.
2. Another purpose of this program is to instill the good qualities of integrity, responsibility and self-confidence.
3. To persue students with the Mining field ethics and rules in terms of the society.

Course Outcomes:

Ability to communicate efficiently. Acquired to be a multi-skilled engineer with good technical knowledge of Mining Engineering Field and their processing, management, leadership and entrepreneurship skills. Ability to identify, formulate and model problems and find engineering solution based on a systems approach.

Students must observe following points to enrich their learning in Mining engineering during industrial training:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.
- Quality control and assurance.
- Maintenance system.
- Costing system.
- Stores and purchase systems.
- Roles and responsibilities of different categories of personnel.
- Customer services.
-Problems related to various areas of Work etc.
- Layout if any

To be submitted : The students has to submit the power point presentation of minimum15 slides of the training performed(comprising of points stated above) along with the original certificate of training performed with proper seal and signature of the authorized person.

Semester – VI

MIA 601- MINE ENVIRONMENT-II

MIA 601	MINE ENVIRONMENT-II	2L:1T:0P	3 credits	3Hrs/Week

Course Preambles:

- To study the measure and monitor different types of gases in mines.
- To study the theory of Mine Fans.
- To study ventilation survey
- To study the handling of rescue apparatus
- To study the dust sampling in mines.

Course outcomes:

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

- An ability to measure and monitor different types of gases in mines.
- An ability to do ventilation survey.
- An ability to handling of rescue apparatus.
- An ability to dust sampling in mines.

UNIT 1: VENTILATION SYSTEMS AND PLANNING (10 Hours)

Calculation of pressure and quantity requirements, network problems, Hardy-Cross method, Ventilation planning and economic analysis, central and boundary ventilation, ascensional and descensional ventilation, antitropal, homotropal ventilation

UNIT 2: MECHANICAL VENTILATION - I (6 Hours)

Theory of mine fans, Types of mine fans, their characteristics & suitability, Process for selection of mine fans

UNIT 3: MECHANICAL VENTILATION – II (8 Hours)

Auxiliary and booster fans, series and parallel operation of fans, fan drift and evasee, forcing and exhaust ventilation, fan reversal, ventilation in long headings

UNIT 4: VENTILATION SURVEY (8 Hours)

Object of ventilation survey, instruments for the measurement of pressure, velocity, and quantity of air.

UNIT 5: MINE DUST (10 Hours)

Classification, physiological effects, measurement of dust concentration, dynamics of small particles, sampling of air borne dust, prevention and suppression of dust

Reference Books:

1. Mine Environment - G.B. Mishra
2. Elements of Mining Technology, Vol.2, D. J. Deshmukh
3. Underground Mine Environment, M. Mcpherson
4. Subsurface Mine Ventilation, H.L. Hartman

MIA 601	MINE ENVIRONMENT-II	0L:0T:1P	1 credits	2Hrs/Week

List of experiments (Extendable):

1. Study of installation of axial flow fan.
2. Study of installation of centrifugal flow fan.
3. Study of installation and positioning of booster fan.
4. Study of characteristic curve of different fans and their comparison
5. Study of principal and working of vane anemometer
6. Study of principal and working of velometer.
7. Study of principal and working of pitot tube.
8. Study of central and boundary ventilation system.
9. Study of gravimetric dust sampler
10. Study of thermal precipitator dust sampler

MIA- 602 UNDERGROUND METAL MINING

MIA- 602	UNDERGROUND METAL MINING	2L:1T:0P	3 credits	3Hrs/Week

Course Preambles:

- Understand the construction of the mine developments to the deposit.
- Understand the different methods of extraction of ore blocks in metal mine.
- Understand the modern methods of extraction of ore blocks in metal mine.
- Understand the problems, method of extraction in deep mining and machineries used.

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

- Ability to construct the mine developments to the deposit
- Ability to extract the ore block by different methods.
- Ability to extract the ore block by modern methods.
- Ability to identify the machineries used, methods of extraction and to analyse the problems in deep underground mine.

UNIT-I GENERAL(8 Hours)

Status and scope of Underground metal mining methods; Definitions of important terms used in underground metal mining methods. Classification of mining methods; Factors affecting the choice of mining methods.

UNIT-II DEVELOPMENT (10 Hours)

Mode of access; Variables affecting the choice of mode of access; Crosscuts, Levels, Raises, Winzes, Ore passes; Their method of drivages with the description of various unit operations; Introduction to Raise boring and introduction to tunnel boring .

UNIT 3: STOPING METHODS-I (8 Hours)

Overhand, Underhand and Breast stoping methods; Open stoping; Vertical Crater Retreat method; Sub level stoping Room and Pillar method, Resuing method.

UNIT 4: STOPING METHODS-II (6 Hours)

Shrinkage stoping; Cut and fill stoping, Introduction to Square set stoping, Sub level caving, Block caving, Top slicing.

UNIT 5: SUPPORT SYSTEMS (10 Hours)

Pillars; Back fill, Cable bolting, Steel Rock bolting, Grouting, Shotcreting etc. Code of timbering rules.

REFERENCE BOOKS:

1. Elements of Mining Tech. Vol II by D. J. Deshmukh
2. S M E Handbook
3. Underground mining methods, Hustrulid
4. Introduction to Mining, H. L. Hartman

MIA- 602	UNDERGROUND METAL MINING	0L:0T:1P	1 credits	2Hrs/Week

LIST OF EXPERIMENTS:

1. Study of Underground metal mining methods.
2. Study of method of drivages
3. Study of Underhand and Breast stoping methods
4. Study of Cut and fill stoping methods
5. Study of Steel Rock bolting

Program Elective - II

MIA-603(A) SURFACE MINING

MIA-603(A)	SURFACE MINING	3L:1T:0P	4 credits	4Hrs/Week

Course Preambles:

- Understand the basic concept of surface mining and associated methods.
- Learn various aspects of drilling and blasting practices in open cast mines.
- Learn application of various heavy earth moving machinery and their selection criteria.

Course outcomes:

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

- An understanding of various design parameters associated with different methods of surface mining.
- Ability to design blasting round to have desired productivity with minimum damaging effect.
- Ability to select appropriate equipment for excavating, loading and transporting material in opencast mines.

UNIT-I

OPEN PIT DESIGN AND LAYOUTS (10 Hours)

Classification of surface mining method mineral deposits suitable for open pit mining, Important parameters of Open pit design; Design of Benches, Ultimate pit, Stripping ratio, Break even stripping ratio, Different methods of opening up the deposits; Box cuts, internal and external box cut, Methods of driving Box cuts; Layout of open pits; Layout of waste dumps, unit operations in opencast mining.

UNIT-II

ROCK DRILLING (10 Hours)

Theory of Rock Drilling, Different Types of Drill Machines Used in Open Pits; Rotary, Percussive and Rotary Percussive Drilling, Selection of Drill Machines on the basis of Drill ability; Computation of Productivity of Drill Machines; Inclined Drilling; their Advantages and Disadvantages.

UNIT-III

PIT PREPARATION (6 Hours)

Dozers, Scrapers, Front-End Loaders, Grader, Back Hoe, etc.; their Construction, Operation, Suitability and applicability; Calculation of Their Productivity.

UNIT-IV

LOADING AND EXCAVATION (10 Hours)

Different Types of Excavators used in Open Pits; Shovel, Dragline, Hydraulic Excavators, Multi Bucket Excavators, their Construction, Specifications, Operation, Suitability and Applicability; Calculation of their Productivity.

UNIT-V

TRANSPORT IN OPEN PITS (6 Hours)

Automobile Transport, Rail Transport and Conveyors; their Suitability; Computation of their Productivity; Automation in Open Pit transport such as Truck Dispatch System.

REFERENCE BOOKS:

1. Surface Mining: Pfleider
2. Mining Equipment: Boki
3. SME handbook: Hartman
4. Surface Mining Technology: S. K. Das
5. Rock Slope Engineering Hock and Bray, The Institution of Mining and Metallurgy, 1981
6. Opencast Mining R.T. Deshmukh M. Publications, Nagpur 1996

MIA-603(B) MINE VENTILATION AND CLIMATE ENGINEERING

MIA-603(B)	MINE VENTILATION AND CLIMATE ENGINEERING	3L:1T:0P	4 credits	4Hrs/Week

Course Preambles:

- To gain insights of mine air, mine climate and mine ventilation
- To comprehend the ventilation requirements of an underground mine.
- Analysis of mine air, mine climate, natural ventilation, mechanical ventilation and to conduct ventilation survey.

Course outcomes:

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

1. To be familiar with the mine air composition, climate and physiological effects
2. An ability to estimate the requirements of ventilation in an underground mine
3. An ability to analyze the components of mine air sample, design natural and mechanical ventilation and conduct ventilation survey.
4. An ability to decide and design ventilation system for underground mine.

UNIT-1

Composition Of Mine Atmosphere (10 Hours)

Mine gases - production, properties, effects and detection; sampling and analysis of mine air; methane content; methane drainage; methane layering; flame safety lamp and its uses; methanometer; radon gas and its daughter products; continuous monitoring of gases

UNIT- 2

Heat And Humidity (6 Hours)

Sources of heat in mines; effects of heat and humidity; psychrometry, kata thermometer; heat stress, air-conditioning

UNIT-3

Natural Ventilation (6 Hours)

Seasonal variations, calculation of NVP from air densities and thermodynamic principles

UNIT- 4

Air Flow Through Mine Openings (10 Hours)

Laws of flow, resistance of air ways, equivalent orifice, distribution of air; flow control devices; automation and remote control of ventilation installations; ventilation surveys; permissible air velocities in different types of workings

UNIT- 5

Mechanical Ventilation (10 Hours)

Types of mine fans; theory, characteristics and suitability of fans; selection, testing and output control; fans in series and parallel; forcing and exhaust configurations; reversal of flow; fan drifts, diffusers, evasees

Reference Books:

1. Mine Ventilation : G. B. Mishra
2. Sub-surface mine ventilation : Macperson
3. Mine ventilation and air-conditioning in mines : Hartman
4. Element of Mining Technology Vol 2 : D. J. Deshmukh

Program Elective-III MIA-604(A) GROUND CONTROL

MIA-604(A)	GROUND CONTROL	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles::

- Knowledge of underground excavation ; stability around the excavation, subsidence and stress around the excavation
- To comprehend the rock mass classification and support system for underground excavation
- To monitor and predict subsidence and underground disasters
- To design single and multiple opening and support system for underground excavations.

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

- To be familiar with the types of underground excavation and to stabilize the excavation.
- Support the rock mass based on different properties of rock.
- Ability to estimate the subsidence and monitor the disasters.
- To design an opening and support system for underground.

UNIT-1 DESIGN OF MINE OPENING (10 Hours)

Stress distribution around narrow and wide openings. Extent of failure around mine openings. Determination of size of opening and extent of failure.

UNIT-2 DESIGN OF PILLARS (6 Hours)

Mine pillars and their classification; pillar mechanics; Design of mine pillars and shaft pillar: stresses acting on pillars; stress distribution in pillars; mechanics of pillar failure; interaction of pillar,floor and roof; design of rooms and pillars; design of barrier and yield pillars, Numerical Problems.

UNIT-3 SUBSIDENCE (10 Hours)

Theories of subsidence. Factors affecting subsidence. Sub-critical, critical and super-critical widths of extraction. Subsidence prediction and control. Design of shaft pillar.

UNIT-4 SLOPES (10 Hours)

Types of slope failure. Analysis of slope failure. Factors affecting slope stability. Drainage and reinforcement of slopes. Monitoring of slopes. Stability of waste dump.

UNIT-5 ROCK BURSTS (6 Hours)

Phenomenology of rockbursts and coal bump; causes, prediction, monitoring and control of rockbursts; gas outbursts.

REFERENCE BOOKS:

1. Elements of Mining Tech. Vol I,II,III by D. J. Deshmukh
2. Coal Mine Ground Control by Syd S Peng
3. Underground Excavations in rock, E. Hoek and E.T. Brown, IMM, 1980
4. Underground Excavation in Hard Rock ,E. Hoeket. Al, Oxford and IBH 1995

MIA-604(B) MINE SAFETY ENGINEERING

MIA-604(B)	MINE SAFETY ENGINEERING	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

- To learn the level of risk associated with mining, risk assessment and management .
- To know the occupational diseases, mine disasters and mitigation.
- Gain insights of hazards and accidents of different working conditions in industries.
- Have knowledge of occupational health and safety in different industries

Course Outcome:

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

- The students will have deep knowledge about the mine accidents, disaster, disease and mine safety with risk assessment, mitigation and management**.**
- Be familiar with hazards in different industries.
- Decide precautions of safety and health in different occupation.

UNIT 1:(10 Hours)

Safety scenario in Indian mines., Safety management and organization.Permit to work-safety in operations, confined spaces, Safety in painting, welding,cutting and soldering operations, Safety in finishing operations like cleaning, polishing and buffing and related hazards, Selection, care and maintenance of associated equipment's and instruments, Maintenance of these machines and selection of equipment w.r.t safety, Shot blasting.

UNIT 2: (10 Hours)

Causes of accidents, accident report. ,Human behavioural approach in safety Heat treatment operations, Heat treatment methods, Hazards and safety measures, Control measures, Safety in handling medium_ Disposal methods, Power presses(all types)Shearing, Bending, Rolling,Drawing, Turning, Boring, Milling, Planning, Grinding.

UNIT 3: (8 Hours)

Accident analysis and control. Safety in demolition operation, Safety in underground works such as Excavation, Drilling and Blasting, Tunnelling, Pneumatic, Trenching, Safety in working of fragile roof.

UNIT 4: (8 Hours)

Cost of accident., Emergency organisation for disaster management.
Classification of accidents, statistics, causes and preventive measures of various accidents; Accident enquiry report for accidents due to roof fall, blasting, machinery failure etc.

UNIT 5: (6 Hours)

Systems engineering approach to safety, techniques used in safety analysis. Introduction, Hot working of metals, Cold working of metals, Foundry operations, Steps in casting process, Different types of furnaces, Process wise hazards and safety measures in casting, Major health hazards and safe methods in foundry,

REFERENCE BOOKS:

1. Mines Act-1952 & Mines Rules-1955 L. C. Kaku.
2. Vocational Training Rules L. C. Kaku.
3. Mine Accidents S.J. Kejeriwal

Open Core Elective - II

MIA -605(A) MINE DEVELOPMENT

MIA-605(A)	MINE DEVELOPMENT	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

- Design tunnels, rock support and grouting and evaluate the most important issues in the procedure
- To make students aware about the concept of excavation engineering and its relevance to minin
- To be familiar with the various methods for opening up of deposits.
- To understand the technical details of various unit operations involved in shaft sinking.
- To learn various methods of shaft sinking and Tunneling methods.

Course outcomes:

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

- The students will gain technical knowledge on stages of mining and methods of development.
- They will be able to design various drilling patterns used in drivage of adit, shaft, incline, drives, crosscut and tunnel.
- They will be able to identify, formulate and solve engineering problems in shaft sinking.
- They will possess ability to use the techniques, skills, and modern engineering tools necessary for mine development practice.
- Design tunnels, rock support and grouting and evaluate the most important issues in the procedure
- Students will acquire knowledge about excavation techniques and their selection

UNIT I INTRODUCTION TO MINING (10 Hours)

History of mining, contribution of mining to civilization and national economy Indian mineral resources and world status, role of mining engineers in industry. Introduction to opencast and underground coal & metalliferous mining – selection criteria, comparison. Modes of entry into deposits for underground mining – shafts, inclines, adits, etc.

UNIT II INTRODUCTION TO DRILLING (8 Hours)

Principles of drilling, methods, selection, applications and limitations, drill bits, flushing methods, fields of application, exploration and production drilling, drilling in underground workings, variables affecting the performance of drilling, novel methods of drilling.

UNIT III SHAFT SINKING (10 Hours)

Selection of site and size, sinking methods, support system, ventilation, lighting and drainage arrangements during sinking, material handling and safety in sinking shafts. Introduction to piling, caisson and freezing methods - cementation method – widening and deepening of shafts. Modern techniques of shaft sink – shaft boring, design of shaft insets, pit bottom excavation and shaft raising.

UNIT IV INTRODUCTION TO EXPLOSIVES AND BLASTING (8 Hours)

Types of explosives, fuses, detonators and other accessories, alternatives to explosives, cause of accidents and safety precautions, drilling and blasting pattern for underground excavations, merits, demerits and limitations of blasting. Storage and transport of explosives**.**

UNIT V DRIFTING AND TUNNELING (6 Hours)

Drivage of drifts, organization and cycle of operations, supporting of development workings, modern methods of drifting, tunneling, road heading and tunnel boring.

REFERENCE 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.
3. Chugh,C.P., Drilling Technology Hand Book, Oxford & IBH Publications, 1994.
4. Chugh, C.P. Diamond Drilling, Oxford & IBH Publishers, 1999.
5. Karnam,U.M.R., Principles of Rock Drilling, 1999.
6. Bhandari S., Engineering rock blasting operations, A. A. Balkema, 1997.

MIA-605(B) – MINE RECLAMATION

MIA-605(B)	**MINE RECLAMATION**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

UNIT-I MINE RECLAMATION PROCESSES (10 Hours)

Introduction and classification and types of Mine Reclamation processes, Salient features of the Mine Reclamation laws in India. Environmental Impact Assessment, Environmental Management Plan, Environmental Audit

UNIT-II Reclamation (8 Hours)

Act of 1977 Under the Surface Mining Control and Reclamation Act of 1977, Abandoned Mine Lands Program, Clean Water act, Land rehabilitation, Environmental remediation

UNIT-III MINE CLOSURE PLANNING (6 Hours)

Introduction, predevelopment conditions, mine operation explained, Reclamation technologies and methods.

UNIT -IV ENVIRONMENTAL IMPACT OF MINING (8 Hours)

Introduction , Environmental impact of mining coal industry, Environmental impact of iron ore mining, Ecological impact of Explosives.

UNIT-V LAND POLLUTION (10 Hours)

Land pollution and land reclamation, land reclamation techniques, Physical and Biological reclamation, Mine Closure Plan.

Reference Books:

1. Air & Water Acts.

2. Forest Conservation acts.

3. Legislation in Indian Mines - A Critical appraisal by Rakesh and Prasad.

4. Environmental Impact of Mining By Down and Stokes.

5.Surface mining Technology By S.K. Das.

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MIA-606	Minor Project	0L:0T:1P	2 credits	3Hrs/Week

Course Preambles:

- To support independent learning and innovative attitude.
- To guide to select and utilize adequate information from varied resources upholding ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organisation, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instil responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

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

- Present the mini-project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills.
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it.

Course content:

The student should work in groups to achieve the aforementioned objectives and the outcomes.

MIA 701-MINE MACHINERY-III

MIA 701	MINE MACHINERY-III	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

- To understand the functioning of winding engines and other winding accessories
- To study surface and pit bottom layouts, various coal face machinery
- To study the design and construction details of excavating & transporting equipments used in surface mines.
- To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

Course outcomes:

- The students will have the knowledge on functions of winding engines, winding accessories, pit-top and bottom mine circuits. They will also know about working of various coal face machinery, and design & constructional details of excavating and other prominent machinery used in surface mines.

UNIT 1: FACE MACHINERY (8 Hours)

Coal and rock Drilling, their constructional details, their applications, operation and maintenance, jumbo drill machines, introduction to coal cutting machine.

UNIT 2: LOADING AND TRANSPORTATION (8 Hours)

Rocker shovel, gathering arms loaders, LHD and SDL machines- their construction and operation and maintenance, cavo loader, shuttle car and underground trucks, its construction, operation and application.

UNIT 3: CUTTER LOADERS (10 Hours)

Different types of cutter loaders suitable for long wall and short wall faces, their constructions, operation and maintenance, winning methods different types of continuous miner & road headers their suitability, construction, operation and maintenance , mechanics of rock cutting, rock cutting tools and their performance.

UNIT 4: COMPRESSED AIR (8 Hours)

Basic concept, compression process, working and constructional features of single stage and multistage compressor, unloading arrangement of compressor, layout of pipelines, transmission of compressed air, testing of compressor, safety features of compressor

UNIT 5: USE OF ELECTRICITY IN MINES (8 Hours)

Flame proof enclosures & intrinsically safe apparatus, underground cables, drill panel, gate end box, circuit breakers, remote control (pilot circuit), installation of underground substation, earth leakage protection, cable joining, Electrical signaling provisions of IER related to mines.

Reference books:

1. Elements of Mining Vol. III by D. J. Deshmukh
2. UMS Booklet
3. Winning and Working of Coal: R. T. Deshmukh & D. J. Deshmukh
4. Modern Coal Mining Practices : R. D. Singh

5. Longwall Mining : Syd. S.Chaing & Peng
6. Mine Winding & Transport by S.C.Walker

MIA 701	**MINE MACHINERY-III**	**0L:0T:1P**	**1 credits**	**2 Hrs/Week**

LIST OF EXPERIMENTS:

1. Study of LHD.
2. Study of SDL.
3. Study of Continuous Miner.
4. Study Of Jumbo Drill.
5. Study of Coal Cutting Machine.

MIA-702 STRATA CONTROL

MIA-702	STRATA CONTROL	3L:0T:0P	3 credits	3Hrs/Week

Course objectives:

· Knowledge of underground excavation ; stability around the excavation, subsidence and stress around the excavation

· To comprehend the rock mass classification and support system for underground excavation

· To monitor and predict subsidence and underground disasters

· To design single and multiple opening and support system for underground excavations

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

· To be familiar with the types of underground excavation and to stabilize the excavation.

· Support the rock mass based on different properties of rock.

· Ability to estimate the subsidence and monitor the disasters.

· To design an opening and support system for underground.

UNIT 1 (10 Hours)

SUPPORTS -Timber & steel supports, Examination of roof, Roof bolting, roof stitching, method of supporting roadways. Supporting under different conditions viz. Pit bottom, crossing, junctions, faulted area, longwall faces, depillaring areas and stoping areas, support loads .SSR, CTR, Support plan, Support withdrawal.

UNIT 2 (8 Hours)

POWERED SUPPORTS - their principles of operation, Classification, designation, constructional features and applications, Hydraulic fluids.

UNIT 3 (6 Hours)

STOWING -Principal methods of stowing, their relative merits and applicability, Hydraulic stowing, Pneumatic stowing, Mechanical stowing, Hand packing, face arrangements, pipe wear, pipe jams.

UNIT 4 (10 Hours)

STRATA CONTROL -Theories of ground movement, Rock pressure due to Narrow and Wide excavation, Front abutment and back abutment, Failure of roof and floor, measurement of strata movement, rock burst, bumps, gas outbursts, pot holes.

UNIT 5 (8 Hours)

SUBSIDENCE-Theories of subsidence, damage and loss due to subsidence, vertical and lateral movements and their estimation, angle of fracture and angle of draw, factors affecting subsidence, subsidence control, protection of surface structures, design of protection pillars including shaft pillars. Pot holes.

Reference Books:

1. Strata control in mines Chaing & Peng
2. Winning and Working of Coal R. T. Deshmukh & D. J. Deshmukh
3. Modern Coal Mining Practices R. D. Singh

4. D.G.M.S. Circulars (Tech.) 1995onwards
5. Longwall Mining Syd. S. Chaing & Peng

MIA-702	**STRATA CONTROL**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

List Of Experiments :

1. Study of Timber and Steel types of Supports.
2. Study of Roof Bolting.
3. Study Of Powered support.
4. Study of Theories of Subsidence.
5. Study of Hydraulic and Pneumatic Stowing.
6. Study of Theories of Ground Movement.
7. Study of Angle of Fracture.

Program Elective - IV

MIA 703(A)-MINE DISASTERS

MIA 703(A)	MINE DISASTERS	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

· To understand the causes of mine fire and spontaneous heating.
· To know how to tackle the mine disasters like mine fire and inundation.
· To understand the lighting in underground and open cast mine.
· To understand the rescue and recovery operation in a mine.

Course outcomes:

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

An ability to know the causes of mine fire and spontaneous heating.
· An ability to tackle the mine disasters like mine fire and inundation.
· An ability to design the lighting in underground and open cast mine.
· An ability to carry out the rescue and recovery operation in a mine.

UNIT-1 (8 Hours)

Spontaneous Combustion Mechanism, causes, susceptibility indices, detection, preventive measures and control. Incubation period and its determination.

UNIT-2 (8 Hours)

Mine Fires Classification of fires, causes, detection, preventive measures. Dealing with underground and surface fires. Fire fighting – direct methods, sealing off and inertisation.

UNIT-3 (8 Hours)

Explosions Mechanism, causes, characteristics, preventive and control measures of firedamp and coal dust explosions. Investigation after explosion.

UNIT-4 (8 Hours)

Reopening of Sealed-off Area Monitoring of atmosphere behind sealed-off area. Precautions to be taken before reopening. Methods of reopening.

UNIT-5 (10 Hours)

Inundation Causes and preventive measures. Precautions to be taken while approaching old water-logged workings and while working under water bodies. Safety boring apparatus. Dewatering procedure. Design and construction of water dams and barriers.

Reference Books:

1. Mine Disasters and Mine Rescue- M.A. Ramlu
2. Mine Disasters- G.B. Mishra

MIA-703(B) MINING INDUCED SUBSIDENCE ENGINEERING

MIA-703(B)	**Mining induced subsidence engineering**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preambles:

The mine subsidence is a common phenomena in any underground coal mining operations. The subsidence prediction, causes and analysis and preventive measures to be taken form an important role in coal mining operations. The subsidence impact on surface structures, governing laws to subsidence control, instrumentation and monitoring techniques and to minimize such effects need to be emphasized.

Course Outcome:

The subsidence of mined out areas. The mechanism of failure of strata after creating the voids and filling the mine voids with different materials need to be addressed to monitor the ground movement.

UNIT-1 (10 Hours)

Introduction: strata movement at the mining horizon, convergence in mine working, factors influencing convergence in mine working. subsidence mechanism; Zones of movement in the ovelying beds, veritical and horizontal movements, subsidence trough, angle of draw, angle of break sub-surface subsidence.

UNIT-2 (9 Hours)

Types of subsidence – non-effective width, sub-critical, super-critical width.
subsidence prediction: different methods of surface subsidence prediction - graphical, analytical, profile function, empirical and theoretical models.

UNIT-3 (6 Hours)

Theories of subsidence, sub-surface subsidence due to mining.
Mining damage to building, industrial installations, railway lines, pipes cannels, etc.

UNIT-4 (7 Hours)

Rock kinematics, Extent of movement in the overlying beds.
calculation of ground movement over time. types of stress on structures stress-strain behavior of soils. Different standards suggested for mining and ground in respect of subsidence.

UNIT-5 (10 Hours)

Special Methods of Mining tocontrol subsidence. Prediction and nomograms of subsidence. Time influence and impact on structures: influence of item on subsidence, examplr from long wall and board and pillar working.

Reference Books:

1. Mining Induced Subsidence Engineering- Kolymbas, Dimitrios
2. Mining Induced Subsidence Engineering- Gattinoni, Paola, Pizzarotti, Enrico, Scesi, Laura
3. Mining Induced Subsidence Engineering -Dimitrakopoulos,

OPEN Core Elective-III MIA-704(A) MINING ECONOMICS

MIA-704(A)	MINING ECONOMICS	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

- Gain knowledge on role of mineral industry in national economy, national mineral policy, financial management and cost accounting applicable to mining industry.
- Comprehend sampling, classification of ore reserves and resources.
- Learn various methods of ore reserve estimation and mine valuation.
- Evaluate the economic feasibility of a mining project.

Course outcomes:

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

- An overall knowledge of mineral industry and related policy issues, basics of financial and cost accounting aspects.
- An ability to select proper sampling method and to classify the ore reserve and resources.
- An ability to compute ore reserve and value of a mining project.
- An ability to evaluate the economic feasibility of a mining project given the geological, mining and financial parameters.

UNIT 1: SAMPLING (10 Hours)

Methods of sampling, Errors in sampling, analysis of samples, estimation of grade and reserves Different types of reserves. Salting, precautions against salting.

UNIT 2: MINE VALUATION (8 Hours)

Different methods, Depreciation, Amortization and Redemption of capital, life and present value of a mine.

UNIT 3: FINANCIAL MANAGEMENT (8 Hours)

Methods of framing and financing industrial enterprises, Memorandum and articles of association, shares, debentures, dividends and interest. Break even chart and inventory control.

UNIT 4: INVESTMENT DECISIONS (10 Hours)

Discounted cash flow methods, non-discounted cash flow methods, advantages and disadvantages of them, internal rate of return, Net Present Value.

UNIT 5: BOOK KEEPING (6 Hours)

Preparation of Balance sheet, Profit and Loss Account.

REFERENCE BOOKS:

Mineral Economics , R.T. Deshmukh

SME Handbook, Vol. IMineral Economics , Sinha and Sharma

MIA-704(B) MINE HAZARD AND RESCUE

MIA-704(B)	MINE HAZARD AND RESCUE	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

- To understand the causes of mine fire and spontaneous heating.
- To know how to tackle the mine disasters like mine fire and inundation.
- To understand the lighting in underground and open cast mine.
- To understand the rescue and recovery operation in a mine.

Course outcomes:

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

- An ability to know the causes of mine fire and spontaneous heating.
- An ability to tackle the mine disasters like mine fire and inundation.
- An ability to design the lighting in underground and open cast mine.
- An ability to carry out the rescue and recovery operation in a mine.

Unit-1:Mine Fires : (10 Hours)

Causes of mine fires; spontaneous combustion - mechanism, susceptibility indices, factors affecting spontaneous combustion; detection and prevention of spontaneous heating; accidental fires – causes and prevention; dealing with mine fires - direct and indirect methods, fire stoppings; fires in quarries, coal stacks and waste dumps.

UNIT-2: Mine Explosions : (8 Hours)

Firedamp and coal dust explosions – mechanisms, causes and prevention; stone-dust and water barriers; investigations after an explosion.

UNIT-3 Inundation : (8 Hours)

Causes and prevention, precautions and techniques of approaching old workings; safety boring apparatus, pattern of holes; design and construction of water dams, shaft dams, emergency bulk heads, strengthening of dams**.**

UNIT-4:**Rescue And Recovery : (10 Hours)**

Rescue equipment and their uses, rescue stations and rescue rooms; organization of rescue and recovery areas, re-opening of sealed-off workings Illumination in mines- it's effect on safety, efficiency and health ; common types of safety lamps & their uses and limitations, maintenance and examination of lamps, their charging, cleaning, lighting, re-lighting ; lamp room design and organization;

UNIT-5:Lighting from mains –(6 Hours)

different types of illumination devices; illumination of pit bottoms. main roads, faces, pump houses and haulage rooms; standards of illumination in underground and opencast mines Airborne respirable dust in underground mines - generation, dispersion, measurement and contro; classification, physiological effects, dust measurement, sampling of air-bone dust

Reference Books:

1. Mine Hazard And Rescue -M.A. Ramlu
2. Mine Hazard And Rescue -R.D. Singh
3. Mine Hazard And Rescue- D. J. Deshmukh

MIA-705	**PROJECT STAGE-I**	**0L:0T:1P**	**10 credits**	**12Hrs/Week**

Course Preambles:

- To support independent learning and innovative attitude.
- To guide to select and utilize adequate information from varied resources upholding ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organisation, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instil responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Course outcomes:

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

- Present the project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills.
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it.

Project Work Phase - I: Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.

MIA-706	**SELF**	**0L:0T:1P**	**1 credits**	**2 Hrs/Week**

	STUDY/GD/SEMINAR			

Course Preambles:
The objective of the seminar is to inculcate self
skill, involve in group discussion and present and exchange ideas.
Each student, under the guidance of a Faculty, shall choose, preferably, a rece
relevant to the Course of Specialization.
- Carryout literature survey, organize the seminar content in a systematic manner.
- Prepare the report with own sentences, avoiding cut and paste act.
- Type the matter to acquaint with the use of Micro
facilities.
- Present the seminar topic orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit typed report with a list of references.

The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards.

Course outcomes: At the end of the course th eand become self
- Attain, use and develop knowledge in the field of engineering and other disciplines through independent learning and collaborative study.
- Identify, understand and discuss current, real
- Improve oral and written communication skills.
- Explore an appreciation of the self in relation to its larger diverse social and academic contexts.
- Apply principles of ethics and respect in interaction with others.

MIA-801 MINING SURVEYING-III

MIA-801	**MINING SURVEYING-III**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preambles:
To impart the knowledge of measurements of distances and angles, determination of different levels and level difference and computation of areas, volumes which includes determination of capacity of reservoirs, volumes of barrow pits. The knowledge of modern instruments like Theodolite surveying and tachometric surveying, designing & setup of curves and global positioning systems.
To Understand correlation and stope survey methods and know and limitations of photogrammetry and modern survey methods. To be Familiar with dip and strike problems and surveyor responsibility in underground .

UNIT 1: TRIANGULATION (8 Hours)

Principles of forming network of triangles; Selection of sites of triangulation stations; Base and Check base lines; Measurement and adjustment of angles by simple methods; Calculation of Co-ordinates.

UNIT 2: CORRELATION SURVEY (10 Hours)

Methods of correlation of surface and underground surveys through adits, inclines, and shafts; Use of magnetic needle and Gyro theodolites; Different methods of Stope surveying and open pit surveying.

UNIT 3: ASTRONOMICAL SURVEY (6 Hours)
Definitions of important terms; Determination of azimuth by astronomical observations.

UNIT 4: PHOTOGRAPHIC SURVEYING (8 Hours)

Terrestrial photogrammetry, General Principles; Phototheodolite; Stereo photographic Surveying; Aerial Surveying - Field of application; Vertical and oblique photographs; Aerial photography; Preparation of photographical maps by simple methods.

UNIT 5: MODERN SURVEYING TECHNIQUES (10 Hours)

Electronic distance measuring equipment; Geodimeter, Tellurometer, Distomat, Total station, Surveying software with plotting system, GPS, principle, method and its application in mining.

Reference Books:

1. Mine surveying by S. Ghatak
2. Surveying & Levelling by B. C. Punamia
3. Surveying & Levelling by Kanetkar & Kulkarni
4. Mine surveying by Winniberg

MIA-801	**MINING**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

	SURVEYING-III			

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

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

List Of Experiment:

1. Triangulation survey by theodolite
2. Measure horizontal and vertical angles by theodolite
3. Measure horizontal angles by method of repetition and reiteration using theodolite
4. Signs and conventions used by GSI, MMR, CMR
5. Curve setting – different methods by total station
6. Determine area using total station
7. Traversing using total station
8. contouring using total station
9 . Determination of remote height using total station
10. Coordinate measurement by total station and GPS
11. Traversing and recording position of points by GPS
12. Distance, gradient, Difference, height between two inaccessible points using total stations.

Program Elective-V

MIA-802 (A) MINING ENVIRONMENT – III

MIA-802 (A)	**MINING ENVIRONMENT – III**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preambles:

- To understand the causes of mine fire and spontaneous heating.
- To know how to tackle the mine disasters like mine fire and inundation.
- To understand the lighting in underground and open cast mine.
- To understand the rescue and recovery operation in a mine.

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

- An ability to know the causes of mine fire and spontaneous heating.
- An ability to tackle the mine disasters like mine fire and inundation.
- An ability to design the lighting in underground and open cast mine.
- An ability to carry out the rescue and recovery operation in a mine.

UNIT 1 : SPONTANEOUS HEATING (8 Hours)

Causes, detection and preventive measures in underground and surface coal mines, control of spontaneous heating in stacks and dumps.

UNIT 2: MINE FIRES (10 Hours)

Mine fires, control of fires and fires extinguishers, study of atmosphere behind sealed off areas, fire stopping and sealing off an area, pressure balancing, conditions and procedure of reopening a sealed off area, fire fighting organization. Fires in opencast mines and surface storage systems, emergency organization in mines.

UNIT 3: EXPLOSION (6 Hours)

Fire damp and coal dust explosions, their causes and prevention, stone dust and water barriers, investigations of explosion.

UNIT 4: MINE INNUNDATION (8 Hours)

Causes and precautionary measures, bulk head doors, barriers, dams, their design, precautions to be taken while approaching old workings, burnside drilling apparatus, recovery of flooded mines and de watering of old workings.

UNIT 5: RESCUE AND RECOVERY (10 Hours)

Types of rescue equipment and their use, features of rescue stations and rescue rooms, first aid appliances, training of personnel, and organization of rescue and recovery work during mine fires, explosion, inundation.

Reference Books:

1. Mine Environment By G.B. Mishra
2. Elements of Mining Tech. Vol.2 by D. J. Deshmukh
3. Subsurface Mine Ventilation. by Mcpherson
4. Mine fires by Dr. Ramlu

MIA-802(B) ROCK SLOPE ENGINEERING

MIA-802(B)	ROCK SLOPE ENGINEERING	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:
To introduce the basic mechanics of rock slope failures To learn the types of rock failure and its influencing parameters.

Course Outcome:
The students will know the fundamental mechanics of rock slope failure, types of failure and its influencing parameters.

UNIT 1:Basic Concepts: (8 Hours)

Engineering issues of Slope stability, Basic terminology, Slope failure causes and process, basic mechanism of slope failure Rock mass properties: various properties, data collection, stereographic projections

UNIT 2:Ground Water: (9 Hours)

Role of ground water flow, influence of ground water on slope stability, evaluation of ground water conditions in slopes

UNIT 3:Plane Failure : **(8 Hours)**

general conditions and failure analysis

UNIT 4:WedgeFailure: (9 Hours)

general conditions and failure analysis .**Circular Failure:** general conditions and failure analysis

UNIT 5:Toppling Failure: (8 Hours)

general conditions and failure analysis Rock slope stabilization techniques, Geotechnical Instrumentation and Monitoring Aspect of Waste dump stability analysis

Reference Books :

1. Rock Slope Stability, Charles A Kliche (SME publication)
2. Rock Slope Engineering, Hoek & Brown SME
3. Slope Stability in Surface mining, WA Hustrulid, SME

Open Core Elective-IV

MIA-803(A) MINE PLANNING)

MIA-803(A)	MINE PLANNING	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

- Understand the basic principles of mining law in India and role and influence of government on mining industries. To identify software for mine planning and designing.
- Explain the process of strategic mine planning and its impact on decision-making during project development and the factors considered in underground coal mine planning. Explain novel mining methods.
- Illustrate surface layouts, pit bottom and pit top layouts for different transport systems.
- Analyze and select suitable mine development and working methods.

Course outcomes:

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

- Knowledge of Mining laws in India and role and influence of government on mining industries and software for mine planning and designing.
- Ability to explain Process of strategic mine planning, Factors considered in underground coal mine planning and Novel mining methods.
- Ability to apply Surface layouts, pit bottom and pit top layouts for different transport systems.
- Ability to analyze and select suitable mine development and working methods.

UNIT 1: (8 Hours)

Coal reserves and their estimation, Geological and technological data needed for mine planning, Preparation of project and feasibility reports, project monitoring.

UNIT 2: (10 Hours)

Planning and scheduling of various mining operations, linear programming, Simplex methods and transportation problem. Operation Research - Scope of application in mining, Linear programming, formulation and solution, Network planning with special reference to CPM/PERT, System approach for project scheduling.

UNIT 3: (6 Hours)

Division of mine area into units and sub units, Area, Reserve, Life and Capacity of mine, Panel size, Design of long wall face.

UNIT 4: (8 Hours)

Cost of various mining operations, Optimum size of mines, Mode of opening up of deposits, Choice of opening, Location and size of Development openings.

UNIT 5: (8 Hours)

MINE SERVICES Design of haulage, hoisting and drainage systems, Design of pit top and pit bottom, Coal handling plants, Railway siding , design of rapid loading system etc

.

Books Recommended :

1. Advance Coal Mining by R.T. deshmukh and V.S. Vorobjev
2. Mine Planning by S.P. Mathur
3. Mine Planning by BJ. Bhattacharya
4. Modern Coal Mining Technology S.K.Das, Lovely Prakashan, Dhanbad, 1996

MIA-803(B) ROCK EXCAVATION ENGINEERING

MIA-803(B)	ROCK EXCAVATION ENGINEERING	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

- To make students aware about the concept of excavation engineering and its relevance to mining
- To expose the students to various excavation techniques and their design aspects.

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

- Students will acquire knowledge about excavation techniques and their selection.

UNIT 1: Introduction: (10 Hours)

Scope and importance of rock excavation engineering in mining and construction industries; physico-mechanical and geotechnical properties of rocks vis-a-vis excavation method; selection of excavation method.

UNIT 2: Drilling : (10 Hours)

Mechanics of rock drilling; design and operating parameters of surface and underground drilling; evaluation of drill performance; drillability of rocks; mechanism of bit wear; bit selection; problems of drilling; economics of drilling.

UNIT 3: Blasting: (8 Hours)

Mechanics of rock fragmentation by explosives; advancement in explosives and blasting technique; their selection criteria for rock excavation; blast design for surface excavations and optimization;

UNIT 4: Advanced Blasting Techniques: (8 Hours)

blast performance evaluation; cast blasting; techno-economic and safety aspects of surface and underground blasting; advances in blast design for underground excavations; control blasting; computer aided blast designs; review of tunnel blasting techniques, recent advances and novel techniques of blasting

UNIT 5: Rock Cutting: (6 Hours)

Theories of rock tool interaction for surface excavation machinery; design of cutter head - rippers, dozers, scrapers, BWE. Continuous surface miners, auger drills;

Reference Books:

1. Blasting Practices : G.K.Pradhan
2. Explosives and Blasting Practices in Mines : Dr. Sameer Kumar Das
3. Drilling : G. Chugh
4. SME – Mining Engineers Handbook
5. Surface Mining – SME . Introduction to Mining : Hartman

MIA 804 Projects –II (Major)

MIA- 804	**Projects –II (Major)**	**0L:0T:6P**	**16 credits**	**12Hrs/Week**

Preambles:

The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under EC P1, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone orjointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned in the light of the Report prepared under EEP1;

2. Review and finalization of the Approach to the Problem relating to the assigned topic;

3. Preparing an Action Plan for conducting the investigation, including team work;

4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;

5. Final development of product/process, testing, results, conclusions and future directions;

6. Preparing a paper for Conference presentation/Publication in Journals, if possible;

7. Preparing a Dissertation in the standard format for being evaluated by the Department.

8. Final Seminar Presentation before a Departmental Committee